Subject Title: PHARMACEUTICS-I Subject Code: 0805

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Subject Title: PHARMACEUTICS-I Subject Code: 0805

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any *Eight* of the followings:**	16M
1	**a)**	**Name some of the modern dosage forms.** 1. Implants 2. Liposome drug carriers 3. Nanoparticles 4. Prodrugs 5. Films and strips 6. Erythrocytes 7.Controlled drug delivery system 8.Sustained release system	**2M (0.5x4)**
1	**b)**	**In which year various editions of pharmacopoeia of India came out?** 1. First Edition in 1955 2. Second Edition in 1966 3. Third Edition in 1985 4. Fourth Edition in 1996 5. Fifth Edition in 2007 6. Sixth Edition in 2010 7. Seventh Edition 2014	**2M (0.5x4)**
1	**c)**	**Define 'Containers'. What are the basic materials used in making of container?** **Containers:** A device that holds the drug and it may or may not be in direct contact with the pharmaceutical dosage form or preparations. **Basic materials used in making of container:** i)Glass ii) Plastic iii) Metal iv) Paper and board	**2M (1M Def.) (0.5×2=1 M)**
1	**d)**	**What are the various factors which affect the size reduction of the drugs?** **1. Hardness:** Soft material easy break than hard. **2. Toughness:** Drug with fibrous nature or those having high moisture content are tough and hard to reduce in size. **3. Stickiness:** Material adheres to the grinding surface or sieve surface of the mill. It is very difficult to powder a drug of having gummy or resinous material. **4. Material structure:** Material with some special structure cause problem during size reduction e.g. Vegetable drug with cellular structure produce long fibrous particle on size reduction, similarly a mineral substance having lines of weakness, produce flake like particle on its size reduction.	**2M (0.5 X 4)**

		5. Moisture content: The presence of moisture in the material influence a number of its properties such as hardness, toughness or stickiness. The material having 5% moisture in case of dry grinding and 50% in case of wet grinding is permissible. **6. Temperature:** Waxy material such as stearic acid or drug containing oils or fat, become softened during the size reduction, due to heat. This can be avoided by cooling the mill. **7. Purity:** In some mills during size reduction there is chances of addition of impurities. If high degree of purity is required avoid such mills or Mills should be cleaned thoroughly. **8. Physiological effect:** Some drugs are very potent. During there size reduction in mill, dust is produced which may have effect on operator. **9. Ration of feed size to product size:** To get a fine powder in a mill, it is required that a fairly small feed size should be used. Hence to carry out size reduction in various stages e.g. preliminary crushing followed by coarse powder and then fine grinding. **10. Bulk density:** The output of the size reduction of the material in a machine depends upon the bulk density of the substance.	
1	**e)**	**Name the various standards of sieves.** **According to I.P. standards for sieves are as follows** I .Approximate sieve number ii. Nominal mesh aperture size iii. Approximate percentage of sieving area iv. Tolerance average aperture size According to I.P. sieves must confirm the above mentioned specifications for the given sieve number.	**2M (0.5×4)**
1	**f)**	**Give the list of equipments used for mixing of semi-solids.** **Equipment's used for mixing of semi solids:** i. Triple roller mill. ii. Agitator mixer. iii. Planetary mixer. iv .Sigma Mixer	**2M (0.5 X 4)**
1	**g)**	**Name the factors which affects the rate of filtration.** 1**.** Area 2. Pressure 3. Viscosity 4. Thickness of cake	**2M (0.5x4)**

		5. Temperature of liquid to be filtered 6. Particle size 7. Pore size of filter medium 8. Nature of solid material	
1	**h)**	**What is 'Water for Injection'?** Water which is free from volatile and non-volatile impurities, micro-organisms and pyrogens which is prepared by distillation and reverse osmosis called as water for injection. It is used for preparation of parenteral preparation.	**2M**
1	**i)**	**What are the two main steps in drying of materials?** Drying process involves both heat transfer and mass transfer. The steps needed for drying are; i.Heat must be supplied to provide latent heat of vaporization. ii.The liberated vapour must be removed by moving an air stream.	**2M (1×2)**
1	**j)**	**Give the list of chemicals which are used as bactericide?** **List of Bactericides** i. Chlorocresol . 0. 2% ii. Phenyl mercuric nitrate or acetate 0.002% iii. Benzalkonium chloride 0.01% iv. Thiomersal 0.01% v. Chlorohexidine acetate 0.01%	**2M (0.5×4)**
1	**k)**	**What does the term 'Desiccation'' mean?** **Definition:** Desiccation is the process of complete removal of mechanically admixed water from substances. **Examples of desiccants:** i. Dried Silica gel, ii. Phosphorous pentoxide iii. calcium sulfate, iv. Anhydrous calcium chloride, v. Conc. Sulphuric acid vi. Phosphorous trioxide	**2M (def.1M And 0.5 ×2)**
1	**l)**	**Difference between fine powders and granules.**	**2M (0.5×4)**

		<table><tr><th>Fine powder</th><th>Granules</th></tr><tr><td>1. Fine powder does not have free flowing property, hence weight variation in tablet is produced.</td><td>1.Granules flow easily and do not give weight variation in the tablet produced</td></tr><tr><td>2. In mixed powder, segregation of different components is possible.</td><td>2. Granules are of uniform composition and segregation is not a problem. But granules should contain 5-15%of fine</td></tr><tr><td>3. Tablets formed are brittle.</td><td>3. Granules packed down easily and produced hard tablets.</td></tr><tr><td>4. Fine particles tend to blow out of die cavity during compression.</td><td>4. Granules being heavier do not blow out of die cavity.</td></tr></table>	
2		**Attempt any FOUR of the followings**	**12M**
2	**a)**	**Define 'Viscosity'. Write the applications in Pharmacy.** **Defination of Viscosity:** It is the property of liquid to resistance to flow**.** **Applications of Viscosity in Pharmacy:** i.Viscosity plays an important role in the stability of emulsions and suspensions. ii. Ophthalmic preparations are made viscous to prolong the contact time of the drugs. E.g. methyl cellulose. iii. Paints are made more viscous so that they remain in contact with the skin for long time. E.g. glycerine in included in paint formulations to increase the viscosity. iv. Fats, waxes and other viscous substances are filtered at high temperature as at high temperature there is decrease in viscosity and hence rate of filtration is increased. v. Certain pharmaceutical formulations are standardized on the basis of its viscosity. E.g. liquid extract of liquorice. vi. The viscosity of certain liquid preparations is increased in order to improve pourability or to make preparation more palatable.	**3M** **1M** **(0.5 X 4)**
2	**b)**	**What are the equipments used for mixing of liquids? Give in detail about 'Propeller Mixer'.** **Equipments used for mixing of Liquids** i .Propeller mixer ii .Turbine mixer iii .Paddle mixer **Propeller Mixers** **Construction:** • .It consists of vessel and propeller, • Propeller usually operates at high speed which is upto 8000 rpm which gives lot of turbulence. • Propeller produced flow pattern parallel to their axis of rotation. • It is used when little shear is needed.	**3M** **(0.5M)** **(2.5M)**

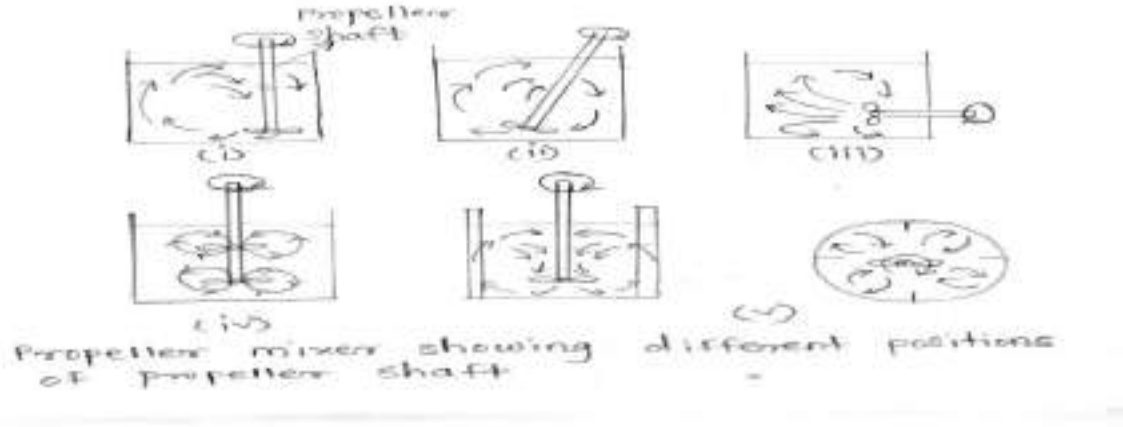
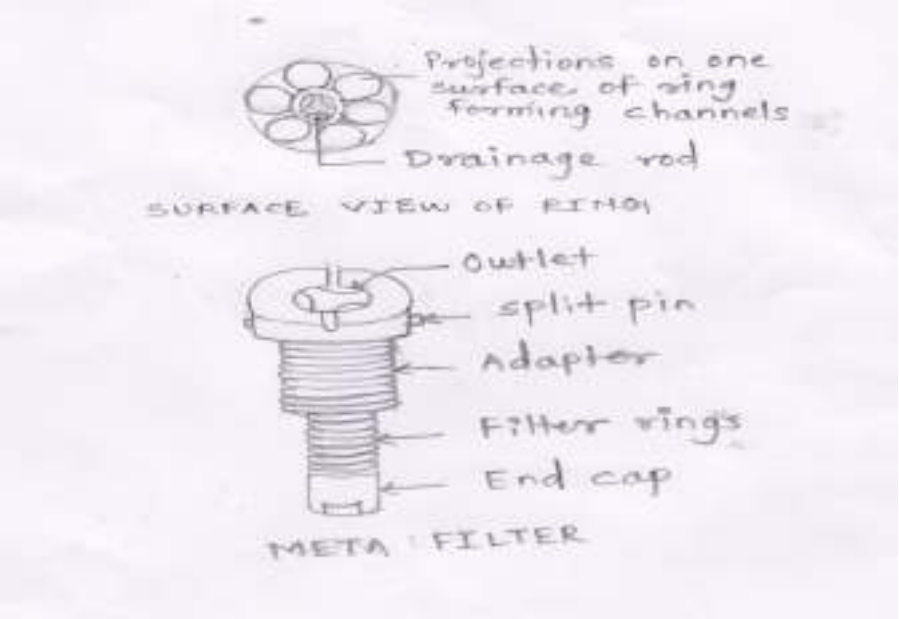
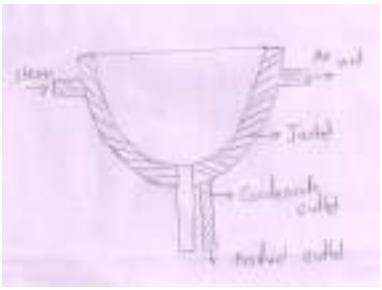
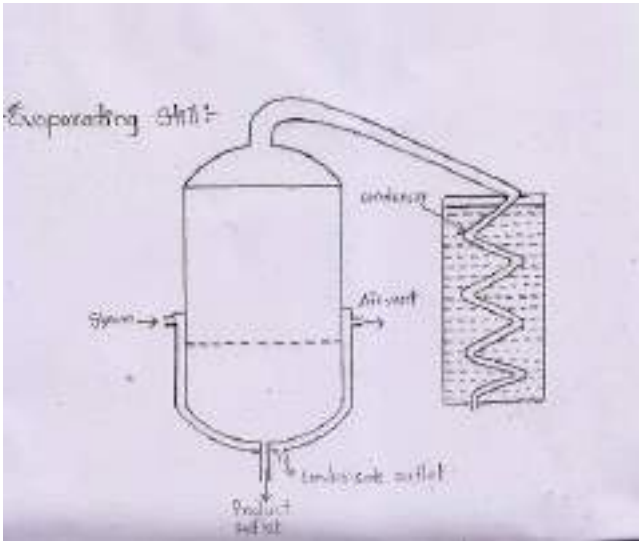
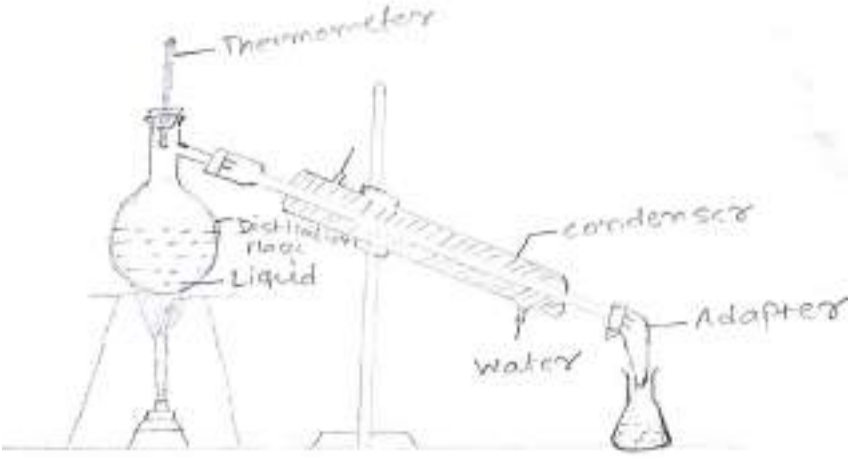
		Working: • Liquids to be mixed are placed in a vessel. • During the mixing of liquids, air gets entrapped in liquid or there is formation of vortex. • To avoid air entrapment and vortex formation ,position of propeller shaft can be changed as follows: i. Offset from centre. ii. Mounted at angle. iii. Enter the side of the vessel. iv. Using push-pull propeller: In which two opposite pitch is mounted on the same shaft so that rotator effect is in opposite direction and cancels each other. v. By the use of baffles: Install baffles along the sides of the tank **Diagram:**  Propeller mixer showing different positions of propeller shaft **Application:** It is used for mixing of liquids having low viscosity.	
2	**c)**	**Explain the construction and working of 'Meta Filter'.** **Construction:** i. It consists of grooved, drainage rod on which a number of metallic ring are packed. ii. The rings are usually of stainless steel and have 0.8 mm outer thickness, 15 mm inside diameter & 22 mm outer diameter. iii. The rings have a number of semicircular projections on one surface and when they are packed on the rod, the opening between the rings about 0.2 mm. **Working:** i. The entire assembly is placed inside a pressure vessel, containing the liquid to be filtered. ii. When vacuum is applied liquid will flow from outside to inside. iii. In this form a metafilter can only be used as strainer for coarse particle, but for separation of fine particle a bed of suitable material kieselguhr is used. iv. In this way pack of ring act as a base on which the fine filtration medium is supported	**3M** **1M** **1M**

		Diagram: 	**1M**
2	**d)**	**Write the qualities of an ideal filter aids. Give examples of filter aid.** **Ideal qualities of filter aid:** i.It should be remain suspended in the liquid. ii. It should be free from impurities. iii. It should be inert. iv. It should have a particle size distribution suitable for retention of solid. v. It should have structure that permits formation of porous cake **Examples of filter aid :** i. Asbestos. ii. Cellulose. iii. Carbon. iv. Diatomaceous earth (silica). v.Perlite. vi.Activated Charcoal	**3M (0.5 X 4=2M)** **(0.5X2=1 M)**
2	**e)**	**Why imbibition is necessary before packing of the drug into the percolator?** . Imbibition is done in order to: i. It allow the swelling of tissue of drug before packing. ii .It is imbibed for uniform packing in percolator. iii. It allows the entrapped air to escape. iv. Quantity of menstrum required can be reduced.	**3M**
2	**f)**	**Write in detail about modified percolation process.** **Modified Percolation:** In percolation process for tinctures drug\ percolate (d/p) ratio is 1:4.The drug/percolate ratio is reduced to 1:3 by modifying percolation process. Thus saves lot of heat, time and menstrum. It is proved that the menstrum remaining in contact with the drug dissolves more active constituents than the flowing menstrum. Hence simple percolation process requires more menstrum to exhaust the drug. But if continuous percolation stage has suitable	**3M**

		breaks by short maceration stages, the d/p ratio can be reduced to 1:3 e.g .In Simple Percolation process: Drug→ Imbibition → Maceration → Percolation (**200gm) (4hrs.) (for 24 hrs.)** collect the Percolate, i.e.3/4th of the volume of finished product. In modified percolation process: Drug → Imbibition → Maceration → Percolation- **(1000gm) (for 24 hrs.)** collect 1000ml of percolate → Maceration → Percolation- **(for 12 hrs.)** collect 1000ml of percolate → Maceration → Percolation- **(for 12 hrs.)** collect 1000ml of Percolate □ Drug : Percolate 1000gm : 3000ml d/p = 1:3 After exhaustion of the drug, the percolate is evaporated and then mixed with main percolate. Final volume is made by adding more menstrum.	
3		**Attempt any FOUR of the followings**	**12M**
3	**a)**	**Explain how heat is transferred from the source of the article.** Heat is Transferred from the source of the article by following Methods: 1. **Conduction:** The heat transfer takes place by transmission of momentum of individual molecule. Ex. Heat transfer in solid and liquid. 2. **Convection:** Heat transfer is takes place by the actual motion of the particle i.e. during mixing, heat transfer takes place in liquid. 3. **Radiation:** Energy transfer takes place through space i.e without using any medium.	**1X3=3M**
3	**b)**	**Explain with the help of a neat sketch one of the evaporators covered under the group of natural circulation evaporators.** **Natural circulation evaporators:** The movement of liquid takes place as a result of convection current set up by heating process. Ex. evaporating pan, evaporating still, and short tube evaporator.	**(Any one 3M, 2m explanation and 1 for**

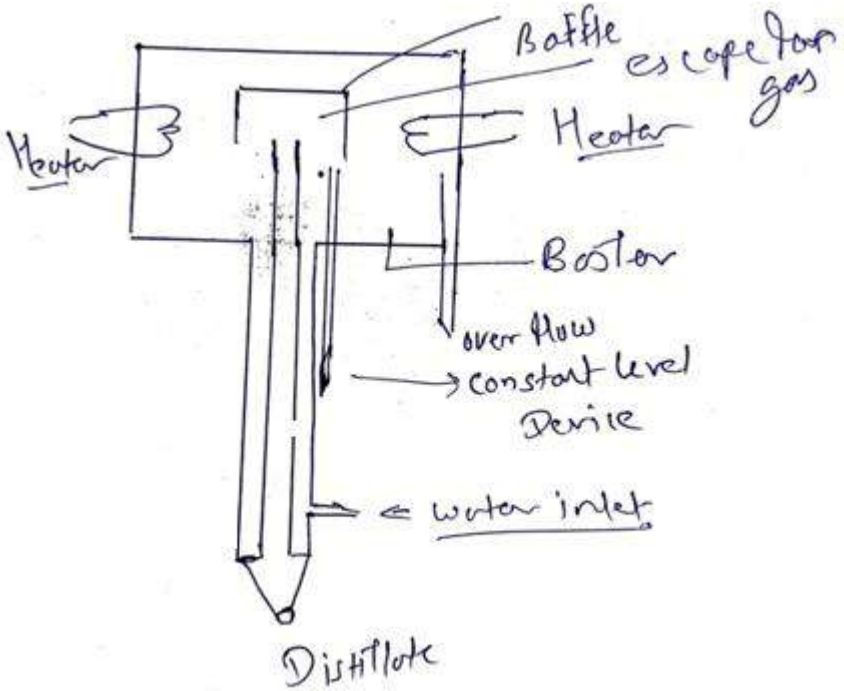
		1. **Evaporating pan:** • It consist of a hemispherical pan made from copper or stainless steel and surrounded by a steam jacket. • Hemispherical shape provide large surface area for evaporation. • It consist of product outlet for fixed evaporating pan. • In other type evaporator is mounted in such a way that they can be tilted. **Diagram**:  2. **Evaporating still:** • It consist of a hemispherical pan made from copper or stainless steel. • It is surrounded by a steam jacket. • Still is covered from top and connected to condenser. • Hemispherical shape provide large surface area for evaporation. • It consist of product outlet at bottom. **Diagram**: 	**diagram)**
3	**c)**	**Explain with a neat sketch the working of the apparatus used for distillation on laboratory scale.** There are two apparatus used for distillation on laboratory scale. 1. Simple apparatus. 2. Still apparatus. **Simple apparatus:**	**Any one apparatus: 2M for working and 1M for diagram**



Working:

1. Water is filled in the round bottom flask.
2. Flask connected to condenser and condenser to receiver though adaptor. (as shown in diagram).
3. Liquid in flask is boiled and vapours are formed which are condensed by condenser and collected in the receiver.

Still apparatus:

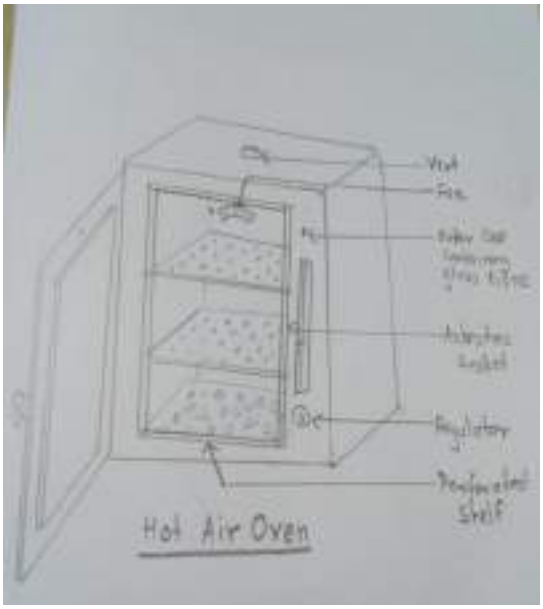


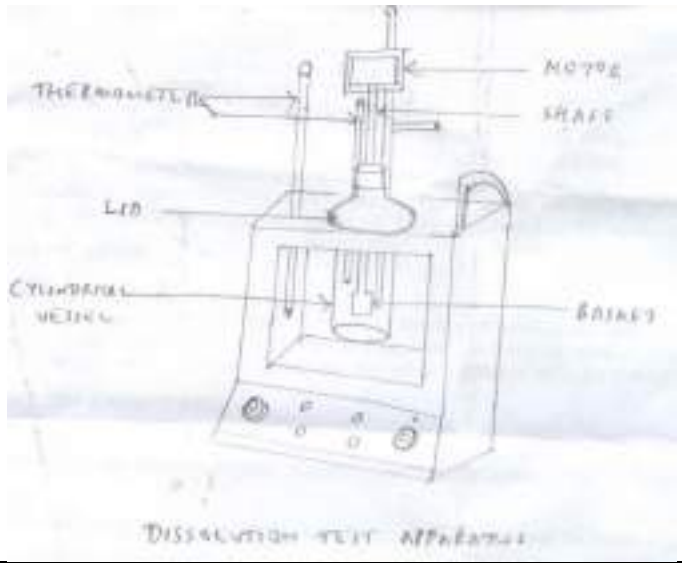
Working:

1. It consists of boiler which is made of cast iron.

		2. It is connected to the condenser tubes through the baffles. 3. The condenser tubes and baffles are made of stainless still. 4. Baffles are provided over the top of the condenser tubes to avoid water drops getting mixed with the vapours. 5. It is done to avoid carry-over of pyrogen and other water soluble material in the droplet. 6. The cooling water enters at the bottom of the condenser and heated by condensing vapours. 7. The flow rate is adjusted such a way that water gets heated at 900-950 C before it enters the boiler. 8. The top of condenser jacket is open, so that gases from the water can escape into atmosphere. 9. A constant level device is fitted in such a way that only heated water free from gases enters the boiler.	
3	**d)**	**Explain the theory of fractional distillation.** **Theory:** • When the substance dissolved in a liquid, the vapour pressure of the liquid is lowered. • When two miscible liquid are mixed together, each will act as solute or solvent for the other. So, when mixture of such two liquid is heated, vapour pressure of each is lowered. • The pressure exerted by each liquid is known as "partial pressure". • The liquid boils when the sum of partial pressure equals the atmospheric pressure. • It differs from simple distillation in that Partial condensation of vapour is allowed to occur in a fractionating column through which the vapour must pass before reaching the condenser. • This column enables ascending vapour from the still to come in contact with the condensing vapour returning to still. This results in enrichment of the vapour in the more volatile component.	**3M**
3	**e)**	**Write the applications of drying.** i. It is used in manufacturing of granules. ii. It reduces the bulk and weight of the material. iii. It helps in preservation of crude drug. iv. It helps in size reduction of crude drug. v. It is used in the drying of aluminium hydroxide. vi. It controls the moisture level in solids.	**03M.** **0.5 X 6**
3	**f)**	**Write the advantages and disadvantages of fluidised bed dryer.** **Advantages:** i. It give high drying rate. ii. Suitable for thermolabile material. iii. Drying takes place of individual particles. iv. Temperature can be controlled. v. Prevent the risk of migration of soluble material.	**Adv: 0.5 X 4 = 2M and disadv: 0.5 X 2=1M**

		vi. It can mostly used for drying of granules. **Disadvantages:** i. Turbulence produces cause attrition of particles. ii. Movement can generate electrical charges.	
4		**Attempt any FOUR of the followings**	**12M**
4	**a)**	**Classify the different methods of sterilizations.** A. Physical Method: 1. Dry heat sterilization. 2. Moist heat sterilization. 3. Radiation sterilization. B. Chemical method: 1. Sterilization by heating with bactericidal. 2. Gaseous sterilization. C. Mechanical Method: 1. Ceramic filter. 2. Seitz filter. 3. Sintered glass filter. 4. Membrane filter.	**1 X 3 = 3M**
4	**b)**	**Describe dry heat method of sterilization in detail.** **Principle:** • All the microorganism including spores are destroyed. • Principle of killing is by dehydration and oxidation of essential metabolites. • In hot air oven heating is done at 160^0 C for 2 hours. **Construction:** • It consists of double walled chamber made of steel. • Insulation is given of asbestos or other material for preventing heat loss. • The door is also double walled having insulation. • Two perforated shells provided to keep the material. • An electric fan is provided for uniform circulation of hot air. • A heater is fitted at the bottom for heating. • A thermometer for maintaining the temperature. **Working:** • Wrap the material with paper. • Keep the Wrapped material in perforated shelves. • Material should not be kept at floor of the oven. • Close the door. • Switch on the oven and set the temperature and time as required. • After time is over. • Switch off the oven. • Allow to cool. • Take out the material.	**3M** **0.5 + 1+1+0.5= 3M**

		Diagram: 	
4	**c)**	**Name the various manufacturing defects in tablets.** 1. Capping. 2. Picking and sticking. 3. Mottling. 4. Weight variation. 5. Hardness variation. **6.** Double impression.	**0.5 X 6 = 3M.**
4	**d)**	**Describe in brief about dissolution test for tablets.** **Dissolution test**: The test is done for measuring the amount of time required for a given percentage of drug substance in a tablet to go into solution under specified condition in vitro. The apparatus consists a cylindrical covered vessel made of glass or other transparent material having 1000 ml capacity. The vessel is fitted with a lid having 4 holes, one for shaft of stirrer, second for placing thermometer and remaining two for removing the sample. An electric motor which is capable of rotating the basket (woven wire cloth having aperture size 425 micrometer) in the vessel at varied speed between 25 and 150 revolutions per minute. 1000 ml of water at 37 o + 0.5 o C in placed and specified number of tablets are placed in the dry basket. The motor is started and the rotation speed is adjusted to 100 rpm or as directed in the monograph. Withdraw the stated volume of solution from the vessel after 45 minutes or after the time specified in the monograph. Filter and determine the amount	**3M** **2M for test and 1M for diagram**

		of active ingredient present in it. The tablets pass the test if for each of the five replicates; the amount of active ingredient in solution is not less than 70% of the stated amount. **Diagram.**  	
4	**e)**	**Write the approximate capacity in mg of a capsule having number 000, 0, 1, 2, 3, 4 and 5.** **Capsule no. / Capacity** **000 – 950** **00 – 650** **0 – 450** **1 – 300** **2 – 250** **3 – 200** **4 – 150** **5 – 100**	**0.5 X 6 = 3M.**
4	**f)**	**Differentiate between hard gelatin capsule and soft gelatin capsule.**	**0.5 X 6 = 3M.**

		<table><tr><th>SR. NO</th><th>HARD GELATIN CAPSULES</th><th>SOFT GELATIN CAPSULES</th></tr><tr><td>1.</td><td>The hard gelatine capsule shell consists of two parts: Body and cap</td><td>The soft gelatine capsule shell becomes a single unit.</td></tr><tr><td>2.</td><td>They are cylindrical in shape</td><td>They are available in round, oval and tube-like shapes.</td></tr><tr><td>3.</td><td>The contents usually consist of medicaments in the form of powder, beads or granules.</td><td>The contents usually consist of liquids or semisolids.</td></tr><tr><td>4.</td><td>These are prepared from gelatine, titanium dioxide, coloring agent and plasticizer.</td><td>These are prepared from gelatine, more amount of plasticizer (sorbitol or glycerine) and preservative.</td></tr><tr><td>5.</td><td>Filling and sealing takes place in different steps</td><td>Filling and sealing are done in a combined operation of machines.</td></tr><tr><td>6.</td><td>Shell is perfectly dry,</td><td>Shell is not perfectly dry.</td></tr><tr><td>7.</td><td>These capsules can be adulterated.</td><td>These capsules cannot be adulterated.</td></tr><tr><td>8</td><td>Ex. Amoxicillin capsule</td><td>Ex. Pudin Hara capsule</td></tr></table>	
5		**Attempt any FOUR of the followings**	**12M**
5	**a)**	**What are different types of vaccines? Write method of preparation of small pox vaccine.** There are 4 main types of vaccines: • Live-attenuated vaccines • Inactivated vaccines • Subunit, recombinant, polysaccharide, and conjugate vaccines • Toxoid vaccines **Small pox vaccine is prepared by two methods** 1) By using animals 2) By using Eggs **By using Animals** : it is done in following steps Selection of Animals: Healthy Sheep or calves selected and kept in an isolated area for 10-14 days under observation, it should be free from diseases. ↓ Preparation of animal for scarification (Abdomen and flanks are scrubbed, washed and disinfected). ↓ Inoculation (Light incisions are made on clear skin by scarifier, seed vaccine is inoculated in that area) ↓ Incubation	**3M** **0.5M** **Any one method 2.5M**

		(Incubate for 7-9 days, kept clean and aseptic, pustules are formed on line of Scarification). ↓ Collection of viruses (Abdomen and flanks are washed with sterile water. The Pustules are withdrawn aseptically) ↓ Purification(mixed with equal volume of glycerin, cool and finely ground and store at -10°C ↓ Filling and sealing (filled in final container and sealed aseptically) **By using eggs**: Hen egg is used (Which is incubated after 12 days) ↓ Small cut on the shell (exposed chorio-allantoic membrane) ↓ In this membrane, viruses are inoculated (by seed of known potency) ↓ Cut was sealed by flap or paraffin wax ↓ Again incubate for 72 hours ↓ Using aseptic condition, shell is removed and chorio-allantoic membrane is separated ↓ Contents are added in normal saline solution at 0° C ↓ Add 50 % glycerin ↓ Material is ground to produce homogenized suspension. ↓ Transfer to suitable sterile container and freeze dried	
5	**b)**	**Discuss natural immunity in brief.** **Natural immunity to diseases is possessed by an individual due to following factors:** **Age:** majority of children in the age between 2-5 years are susceptible to diphtheria, where as adults are immune to it **Race:** Negroes have a high resistance to yellow fever, the white races are very susceptible to it	**3M**

		Species: Men are susceptible to typhoid fever, whereas mice are immune to it. Fowls are immune to plague, where as men are susceptible**.** **Individual:** Some persons have more resistance against cold and skin diseases than others.	
5	**c)**	**Differentiate:** Maceration for organized drug vs Maceration for unorganized drug 1. Drug along with whole of menstrum is used in maceration process / Drug along with $4/5^{th}$ of the menstrum is used in the maceration process. 2. The period of Maceration is 7 days / The period of Maceration is 2 to 7 days 3. Strain off the liquid and press the marc / Decant the liquid and marc is not pressed 4. Mix the pressed liquid with the macerate and clarify by filtration. Filtrate is not adjusted to volume. / Filter the liquid and pass the remaining $1/5^{th}$ of menstrum through filter to make up the volume. 5. Example of tincture: Tincture of orange, Tincture of capsicum, tincture of lemon. / Example of tincture: Tincture of tolu, Tincture of catechu, compound tincture of benzoin.	**(0.5 X 6 =3M)**
5	**d)**	**Write importance of dosage form.** Transformation of drug into dosage forms is done for the following reasons: 1. To protect the drug substance from oxidation, hydrolysis and reduction. Eg. Coated tablets and sealed ampoules. 2. To protect drugs from destructive effect of gastric juice (HCl) of the stomach after oral administration eg. Enteric coated tablets. 3. To provide a safe and convenient delivery of accurate dosage. 4. To conceal the bitter, salty and obnoxious taste or odour of drugs. Eg. Capsules, coated tablets and flavoured syrups. 5. To provide for the optimum drug action through inhalation therapy. Eg. Inhalation aerosols and inhalants. 6. To provide for the insertion of drug into one of the body cavities e.g. rectal and vaginal suppositories. 7. To provide the maximum drug action from topical administration sites. E.g. creams, ointments, ophthalmic preparation. 8. To provide sustained release action through controlled release mechanism. E.g. sustained release tablets, capsules.	**(0.5 X 6 =3M)**

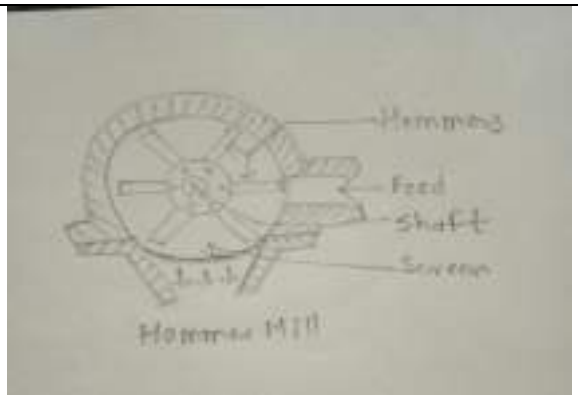
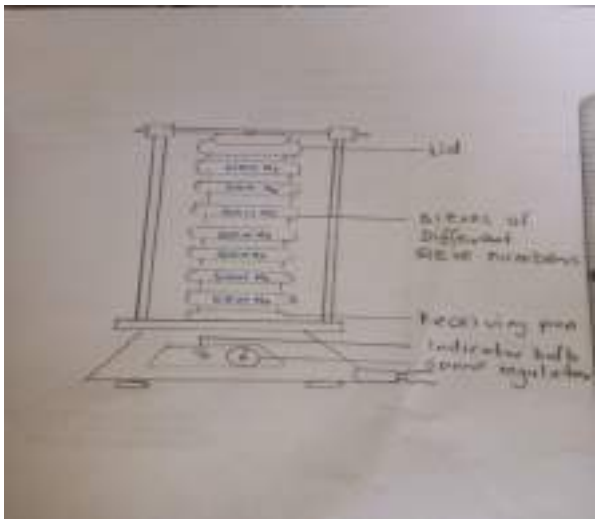
		9. To provide liquid dosage form of the drugs in a suitable vehicle. Eg. Solutions. 10. To provide liquid preparation of the drugs which are unstable or insoluble in different vehicles. E.g. suspensions. 11. Many dosage forms can be easily identified from their distinct colour, shape or identifying markings.	
5	**e)**	**Write the salient features of third edition of Indian Pharmacopoeia** **Salient Features III Edition 1985:** i. New analytical techniques such as flame photometry, Flurometry, have been introduced as official method for certain chemical analysis. ii. Dissolution test has introduced in the case of certain tablets. iii. Disintegration Test has been amended by modifying the design of apparatus and method of testing. iv. A microbial limit test has been prescribed for certain pharmaceutical aid & oral liquid preparation. v. Pyrogen test has been revised to make the test less time consuming than the previous method. vi. Gas liquid chromatography has been recognized as an alternative method for the determination of alcohol concentration in various preparations. vii. Test for determination of viscosity has been modified by introduction to other method involves. viii. The new appendix on water for pharmaceutical use" has been introduced to clearly indicate the different official standard in respect of purified water. ix. Some of the drugs have been renamed in this edition. x. Many drugs have been omitted from the third edition and many new drugs have been included in the third edition. xi. It provides the official standard to the new drug which came into use after the publication of first addendum to third edition.	**(0.5 X 6 =3M)**
5	**f)**	**By applying formula;** % of NaCl for adjustment to isotonicity = 0.9- (% of medicament solution× NaCl equivalent of medicament) = 0.9 - (1×0.12) = 0.78 0.78 of NaCl is needed for adjustment of isotonicity.	**3M**
6		**Attempt any FOUR of the followings**	**16M**
6	**a)**	**Give the full form of BCG. Discuss in brief about BCG vaccine.**	**4M**

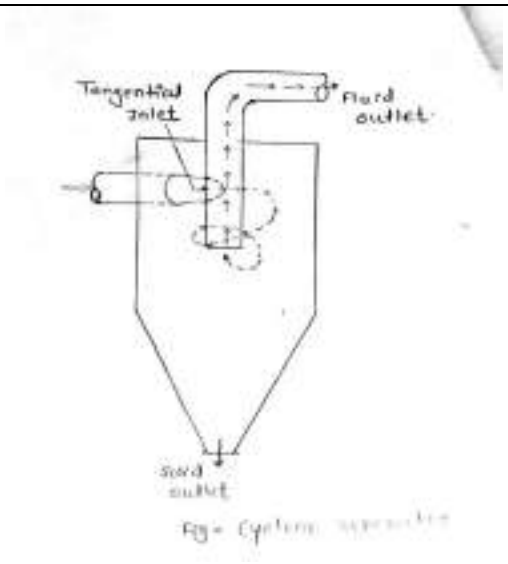
		Full form of B.C.G. **is Baccillus Calmettee Guerin** **Method of preparation of BCG vaccine** It is freeze- dried preparation containing live culture of the bacillus Calmette and Guerin strain of Mycobacterium tuberculosis. **Preparation**: The bacilli are grown on a suitable culture media until 1 mg when plated out on a suitable solid culture media shows not less than 20 million colonies. The growth period should not be more than 14 days in any case. After a suitable growth, they are separated by filtration in the form of a cake. The cake is homogenized in a grinding flask and suspended in a suitable sterile liquid medium designed to preserve the antigenicity and viability of the vaccine. The suspension is transferred into the final sterile containers and freeze-dried. Then containers are sealed so as to prevent contamination or deterioration of the vaccine. The vaccine contains no antimicrobial agent. **Storage**: Store in hermetically sealed light resistant glass containers at a temperature between 2^0 C and 8^0 C. The reconstituted vaccine should be used immediately after its preparation. **Uses**: Immunising agent which provides protection against tuberculosis. **Dose**: Prophylactic, 0.1 ml as a single dose by intra-cutaneous injection	**1M** **1.5M** **0.5M** **0.5M** **0.5M**
6	**b)**	**Explain different types of excipients used in formulation of tablets with suitable examples.** **The following are some of the excipients which are generally required in the formulation of tablets:** • **Diluents** • **Granulating agents** • **Binding agents** • **Disintegrating agents** • **Lubricants ,Glidant , Anti adherents** • **Absorbents** • **Colouring agents , flavouring agents and sweetening agents** 1 Diluent: Diluent is added when medicament is small quantity and to improve flow property and cohesiveness. Eg. lactose, sucrose, sodium chloride, dextrose and starch, mannitol , sorbitol ,dibasic calcium phosphate dihydrate and calcium sulphate dihydrate . 2.Granulating agents A granulating agent provided proper moisture to convert the fine powder into a damp mass which after passing through a sieve of suitable number forms of granules. Eg.water , alcohol , mucilage of starch , mucilage of acacia , mucilage of tragacanth ,	**4M** **0.5×6**

		gelatin solution , iso-propyl alcohol , acetone etc. 3 Binding agents: Used in granulation to provide proper binding to granules. E.g. Gum acacia, gum tragacanth, gelatin, sucrose MC etc. 4 Disintigrating agents: Disintegrants are added to the formulation as it breaks the dosage form into smaller particles when it comes in contact with the liquid, these smaller fragments have greater surface area which will increase the dissolution of the drug They act by i. Swelling: potato ,maize starch, Methyl cellulose etc ii. By producing effervescence: Sodium bicarbonate, citric and tartaric acid. iii. By melting at body temperature: cocabutter 5 **Lubricants ,Glidant , Anti adherents** : **Lubricants** It will reduce interparticular friction during ejection of tablet. E.g. Lubrcants: talc, Mg stearate, Ca stearate etc **Glidants**: It will improve flow property of granules from hopper to die. Eg.Na Cl, Mg stearate. Boric acid etc **Anti adherents**: They prevent sticking of the material eg .liquid paraffin, stearic acid etc. **6Adsorbing agents**: These substances are used to adsorb volatile oils, liquid extracts and tinctures etc. which are included in the formulations. E.g. Mg carbonate, kaolin and starch. 7 Colour flavour and sweetening agents are added to improve patient compliance. E.g. approved FD and C dyes, volatile oils and saccharin respectively.	
6	**c)**	**Discuss in brief Freeze drying.** **Principle:** • The material is frozen in a suitable container connected to a high vacuum system, so that the vapour pressure of water is reduced to less than that of material being	**4M** **1 M**

		dried. • Thus, it reduces the temperature and pressure to values bellow the triple point. • Under these conditions, any heat transfer is used as latent heat and the ice sublimes directly to the vapour state. • The water vapour is removed from the system by condensation in a condenser maintained at a temperature lower than a frozen material.	
		Components of Freeze dryer: 1 A chamber for vacuum drying **2 A vacuum source** **3A heat source** **4 A vapour removal system**	**0.5 M** **1.5 M**
		Working: **Pre-treatment**: It is done to reduce volume of solution. The solution is pre-concentrated under normal vacuum tray drying. This reduces drying time by 8-10 times. **Pre-freezing:** This is done to solidify water. Sample is frozen at a temp. below -50 °C. **Primary drying:** Material is spread on the surface to increase surface area. Temp. & pressure is kept below the triple point of water. Heat is supplied & ice sublimes directly into vapour form. **Secondary drying:** Moisture remained after primary drying is removed by an ordinary vacuum drying. Vacuum drying is done at a temp. 50-60 °C. **Packing:** Packaging of product is performed carefully to protect it from moisture. The containers should be closed under aseptic conditions. Containers are labeled and packed in card-board boxes.	
		Advantages: • The product obtained is light and porous having excellent solubility. • The chances of hydrolysis are minimized as drying takes place at a very low temperature. • Drying takes place under vacuum; hence oxidation is minimized as there is no contact with air. • The heat-sensitive materials can be dried. • The loss of volatile material is minimum. • The freeze-dried material can be stored at room temperature if it is properly sealed in an inert atmosphere. • The sterility of the product can be maintained.	**0.5M** **Any 1**
		Disadvantages: 1. The process is very expensive because a complicated plant is used.	**0.5M** **Any 1**

		2. The product obtained is very hygroscopic, so packaging requires special precautions. **3.** The period of drying is quite long.(usually not less than 10 hours)	
6	**d)**	**Define the term 'Closures'. Write in detail about different types of closures commonly used in pharmaceutical industry.** **CLOSURES** are devices by means of which containers can be opened and closed. **TYPES OF CLOSURES WITH EXAMPLES**: 1. **Plug type** – It is a push-fit into the neck of the container. **E.g. cork or glass stopper.** Nowadays plastic stoppers being flexible and unbreakable are used to ensure a good fit into the container. 2. **Crown cap** – The cap is commonly used as crimped closure for beverage bottles. E.g.Cap of glass beverage bottle. 3. **Push-fit cap** – These are simple slide fit over the neck of the container. These are made of plastic and are shaped in such a way that these must be stretched over the neck to fit on the container. It provides tight fit. 4. **Screw closures** – It consists of three components – i) Cap: It is made of tin plate of aluminium. The container is simply closed by screwing the cap on the container. Ii) Wad: it is a seal which prevents contamination of the product. Made of rubber or silicone rubber, however cork or cardboard wads are also used. Iii) Liner: It is made of metal foils, rubber, plastic films, and paper impregnated with a suitable resin, wax or plastic. **E.g. Caps of pharmaceutical liquid dosage forms.**	**4M** **1M** **(1X3=3M)**
6	**e)**	**Give principle construction and working of hammer mill with neat diagram.** **PRINCIPLE:** Impact **CONSTRUCTION:** It consists of a stout metal casing enclosing to which four or more swinging hammer are attached. The lower part of the casing consists of a screen , through which material can pass and collected in a suitable receiver , when the desired degree of size reduction is reached **WORKING:** The material is put in to the hopper which is connected with the drum. The material is powdered to the desired size , due to fast rotation of hammer and is collected under the screen . This mill has the advantage of continuous operation because of change of jamming is less as the hammers are not fixed . The mill can produce coarse to moderately fine powder. **DIAGRAM:**	**4M** **1M** **1M** **1M** **1M**

			
6	**f)**	**Name different methods of size separation. Explain any one with labelled diagram.** **Different methods of size separation are**: 1 Sieving 2 Cyclone separator 3 Air separator 4 Elutriation **SIEVING:** Diagram:  **Construction:** • In this method fine powder is separated from coarse by using sieve of desired number. • In sieve separator sieves are arranged in descending order of size. • The bottom sieve is attached to receiving pan. **Working** :Different methods used: 1 Agitation 2 Brushing 3 Centrifugation **CYCLONE SEPARATOR:**	**4M** **(0.5X2=1 M)** Description of any one method **3Marks**



Construction-

- Cyclone separator is size separation device
- It consists of a cylindrical vessel with a conical base.
- The upper part of the vessel is fitted with a tangential inlet and a fluid outlet.
- At the base it is fitted with solid outlet

Working of cyclone separator

- The suspension of a solid gas (Usually air) is introduced tangentially at a very high velocity so that rotary movement takes place within the vessel.
- The fluid is removed from a central outlet at the top. The rotator flow within the cyclone separator causes the practices to be acted on by centrifugal force.
- The solid are thrown out to the walls. There after it falls to the conical base and discharge through the solid outlet.

AIR SEPARATOR:

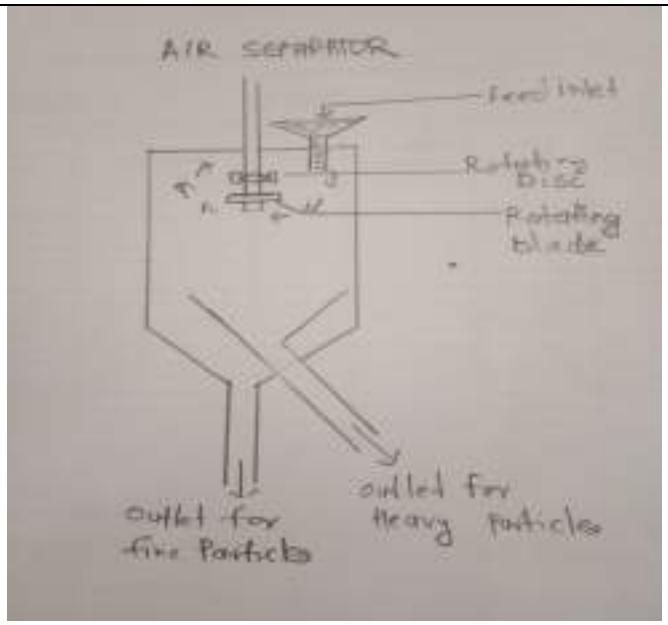
Construction:

- It consist of a cylindrical vessel with conical base
- The upper part of the vessel is fitted with a feed inlet and at base there are two outlets. One for fine and other for heavy particles.
- Rotating disc and blades are attached to the central shaft to produce air movement.

Working:

The sample of powder is passed through the feed inlet, which falls on the rotating disc. The rotating blades are attached to same shaft. The fine particles are picked up and are carried to the space, where air velocity is sufficiently reduced. The fine particles were dropped and collected at outlet. The heavy particles are removed at outlet for heavy particles.

Diagram:



ELUTRIATION:

Construction

- The size separation of powder is based on the low density of fine particles and high density of coarse particles.
- . The dry powder or paste is kept in an elutriating tank and mixed with large quantity of water.
- The solid particles are uniformly distributed in the liquid by stirring and then it is allowed to settle down.
- Depending on the density of the solid particles, it will either settle down or remain suspended in water.
- The sample is withdrawn at different heights through the outlets. These are dried and thus the powder with various size fractions is collected.

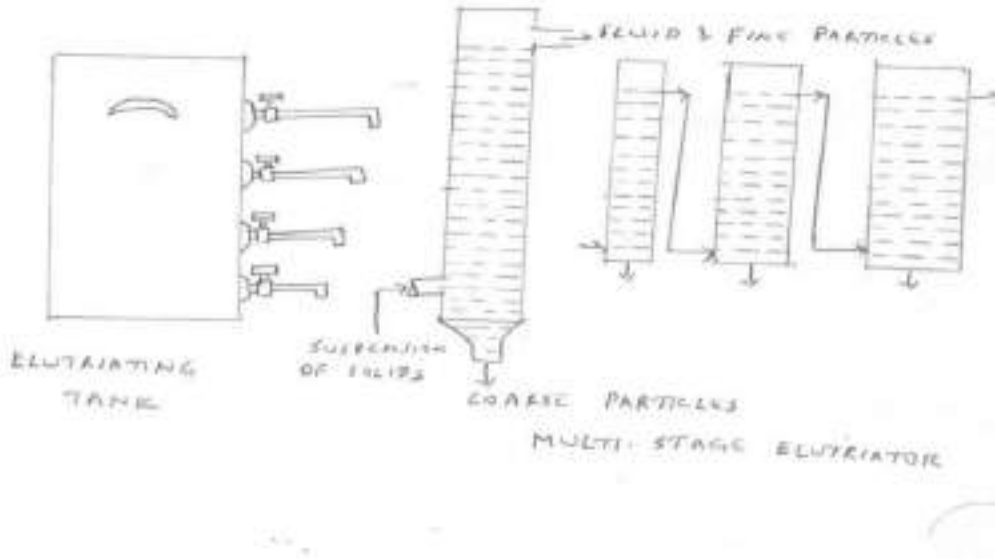
Working:

- The particles are suspended in a moving fluid, generally water or air.
- The apparatus consists of a vertical column with an inlet near the bottom for suspension, an outlet at the base for coarse particles and an overflow near the top for fluid and fine particles.
- One column will give a single separation into two fractions.
- If more than one fraction is required, a number of tubes of increasing area of cross-section can be connected in series.
- The velocity of fluid decreases in succeeding tubes as the area of cross-section increases, thus giving a number of fractions. These fractions are separated and dried.

Application:

Elutriating tank is used to separate the coarse and fine particles of powder after levigation

Diagram:

		 MULTI STAGE ELUTRIATOR	

Subject Title: PHARMACEUTICS-I Subject Code: 0805

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any *Eight* of the followings:**	16M
1	**a)**	**Give any four reasons for film coating**. •To mask the disagreeable odour, colour or taste of the drug/tablet. • To offer a physical and/or chemical protection to the drug. • To protect drug from the deterioration effect of external environment. • Increasing the mechanical strength of the dosage form. • To improve the appearance of tablets	**2M** **(0.5x4)**
1	**b)**	**Explain any four factors affecting size reduction** **Factor affecting size reduction are:** **1.Hardness:** Soft material easy break than hard. 2.**Toughness:** Drug with fibrous nature or those having high moisture content are tough and hard to reduce in size. 3.**Stickiness:** Material adheres to the grinding surface or sieve surface of the mill. It is very difficult to powder a drug of having gummy or resinous material. **4.Material structure:** Material with some special structure cause problem during size reduction e.g. Vegetable drug with cellular structure produce long fibrous particle on size reduction, similarly a mineral substance having lines of weakness, produce flake like particle on its size reduction. 5.**Moisture content:** The presence of moisture in the material influences a number of its properties such as hardness, toughness or stickiness. The material having 5% moisture in case of dry grinding and 50% in case of wet grinding is permissible. **6.Temperature**: Waxy material such as stearic acid or drug containing oils or fat, become softened during the size reduction, due to heat. This can be avoided by cooling the mill. **7.Purity**: In some mills during size reduction there is chances of addition of impurities. If	**2M** **(0.5x4)**

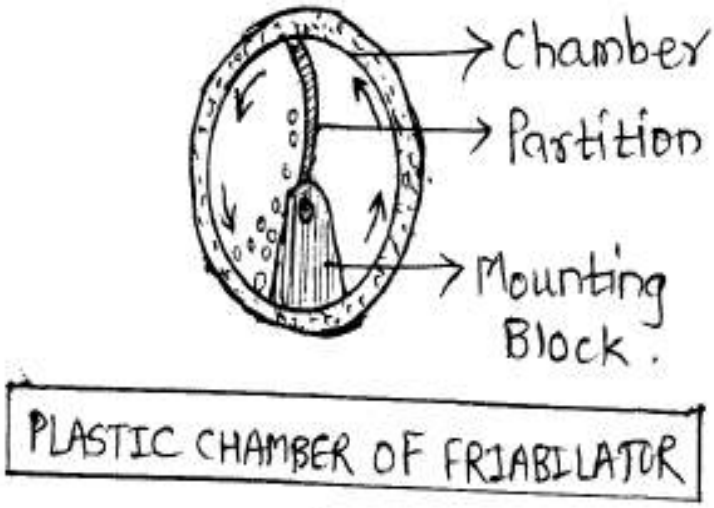
		high degree of purity is required avoid such mills or Mills should be cleaned thoroughly. 8.**Physiological effect:** Some drugs are very potent. During their size reduction in mill, dust is produced which may have effect on operator. 9.**Ratio of feed size to product size:** To get a fine powder in a mill, it is required that a fairly small feed size should be used. Hence to carry out size reduction in various stages e.g. preliminary crushing followed by coarse powder and then fine grinding. 10.**Bulk density:** The output of the size reduction of the material in a machine depends upon the bulk density of the substance.	
1	**c)**	**Define** **(i) Drug**- A chemical agent intended for use in the diagnosis, mitigation, treatment, cure or prevention of disease in man or in other animals. **(ii) Dosage forms**- Dosage form is a transformation of a pure chemical compound into a predetermined form by admixing drug components with non- drug components.	**2M** **(1 X2 = 2M**
1	**d)**	**Give Significance of drying.** 1) In pharmaceutical industry it is used as a unit process in the **manufacture of granules** which can be dispensed in bulk or converted into tablets or capsules. 2) Drying can also be used to **reduce the bulk** and weight of the material, thereby lowering the cost of transportation and storage. 3) It helps in the **preservation** of crude drugs of plant from mould growth, which occurs due to presence of moisture. 4) It helps in the **size reduction** of crude drugs. The presence of moisture in the crude drug does not allow it to get powdered easily. 5) Drying is also used in the **processing of materials**eg. the preparation of dried aluminium hydroxide, the spray drying of lactose and in the preparation of solid extract. 6) **Improves solubility** of product, when powder is dried it gets solubilised fast. 7) Drying ensures **free flowing** of powders.	**2M** **(0.5 X 4)**

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>1</td><td>e)</td><td>Write difference between Hard and Soft gelatin capsules
<table>
<tr><th>Sr. No.</th><th>Hard gelatin capsules</th><th>Soft gelatin capsules</th></tr>
<tr><td>1</td><td>The hard gelatin capsule shell consists of two parts: Body and cap</td><td>The soft gelatin capsule shell becomes a single unit.</td></tr>
<tr><td>2</td><td>They are cylindrical in shape</td><td>They are available in round, oval and tube-like shapes.</td></tr>
<tr><td>3</td><td>The contents usually consist of medicaments in the form of powder, beads or granules</td><td>The contents usually consist of liquids or semisolids.</td></tr>
<tr><td>4</td><td>These are prepared from gelatin, titanium dioxide, colouring agent and plasticizer</td><td>These are prepared from gelatin, more amount of plasticizer (sorbitol or glycerin) and preservative.</td></tr>
<tr><td>5</td><td>Filling and sealing takes place in different steps.</td><td>Filling and sealing are done in a combined operation of machines</td></tr>
<tr><td>6</td><td>Shell is perfectly dry</td><td>Shell is not perfectly dry</td></tr>
<tr><td>7</td><td>These capsules can be adulterated</td><td>These capsules cannot be adulterated</td></tr>
<tr><td>8</td><td>Eg: Amoxycillin Capsule</td><td>Eg: Pudin Hara Capsule</td></tr>
</table></td><td>2M (0.5×4)</td></tr>
<tr><td>1</td><td>f)</td><td>Find out the proportion of procaine HCL which will yield solution iso-osmotic with blood plasma (FP 1% procaine HCL = -0.122^{0}C)
Formula: %w/v of adjusting sub needed=0.52-a/b
Calculation : % w/v procaine HCLrequired = 0.52 – 000/ 0.122
= 4.26% w/v</td><td>2M</td></tr>
</table>

1	**g)**	**Explain tyndallisation process** **Tyndallization**, also called **fractional sterilization** and **discontinuous heating**, is a form of sterilization.This method is relatively simple but somewhat time-consuming. **Process:** This is a fractional sterilization method. This method is used for sterilization of medicaments unstable at 115^0C but able to withstand low temperature heating. This method consist of heating the material at 80^0C for 1 hour on three successive days presuming that on the first day all vegetative bacterial cells will be destroyed and the spores may germinate in the days to follow and will be killed subsequently.	**2M**
1	**h)**	**List the steps involved in slugging process** i) Sieving ii) Weighing iii) Blending iv) Slugging v) Screening vi) Blending **vii)** Compression Or. **Drug + Excipients → Blending → Slugging(formation of big size tablet) → Screening → Blending → Compression.**	**2M** **(0.5×4)**
1	**i)**	**Write advantages of water as solvent for extraction** • It is cheap & easily available. • Non –toxic • Non inflammable. • It has wide solvent action	**2M** **(0.5×4)**
1	**j)**	**Write the precautions to be taken while placing the material in hot air oven** 1. It should be filled to its capacity only should not be overloaded. 2. Glass apparatus and equipment should be wrapped individually. 3. Articles should be placed in such a way that they should not interfere with air flow 4. Articles should not be placed at the floor of the oven. 5. Once in operation oven should not be open	**2M** **(0.5×4)**

		6. Proper biological indicators should be used 7. Thermolabile substance should not be sterilized in hot air oven	
2		**Attempt any FOUR of the followings**	**12M**
2	**a)**	**Define emulsion and list the different emulsifying agents** **Definition:** Emulsions are biphasic liquid preparation consisting of two immiscible liquid phasesone of which is dispersed as minute globules into other phase that is continuous phase and made miscible by addition of emulsifying agents. **Examples:** Gum acacia, tragacanth, agar, starch, pectin, iris moss, wool fat, egg yolk, gelatin. Methyl cellulose, Na CMC, SLS, Cetrimide, benzalkonium chloride, Glycerylester-glyceryl monoesters, Milk of magnesia, Mg oxide, Mg trioxide, Carbowax, cholesterol and lecithin.	**3M** **1M for def.** **(0.5 X 4=2 M for ex.)**
2	**b)**	**Write the salient features of <u>fourth</u> edition of I.P.** 1. It contains 1149 monographs and 123 appendices and available in two volumes. 2. Introduction of computer generated formula 3. Some titles have been changed to include more commonly accepted names in India e.g.HyoscineHydrobromide for Scopolamine hydrobromide. 4. I.R and U.V absorption spectrophotometric tests for identification of drug substance have been introduced. 5. HPLC has been widely used as method of analysis in many formulations. 6. Test for bacterial endotoxins as a more suitable substitute for test for pyrogens. 7. Number of general monographs e.g. eye drops ,eye ointments pessaries have been included. 8. A quantitative method for determining particulate matter in injectable preparation has been replaced by qualitative test. 9. Biological assays provided for vaccines, hormones, blood products. 10. ORS-Citrate formula recommended by WHO introduced.	**3M** **0.5 X 6 = 3M)**

2	**c)**	**Write any three qualities of packaging material and any three disadvantages of glass as a material for packaging.** **Qualities of packaging material** i. Neutral ii. No interaction. iii. Stability against environmental factor. iv. Withstand wear and tear during handling. v. Withstand changes in pressure and temperature. vi. Labelled easily vii. Non-toxic. viii. Closure easily removable/replaceable **Disadvantages of glass** 1) Glass is fragile, 2) Glass is heavy, that can increase transportation charges, 3) Glass containers may release alkali to aqueous preparations, 4) Flaking and weathering of glass are two serious issues related to glass.	**3M** **(0.5 X 3)** **1.5M** **(0.5 X 3)** **1.5M**
2	**d)**	**Explain following evaluation test for tablet (any one)** **(i) Friability** Friability test is performed to evaluate ability of the tablet to with stand wear and tear in Packing, handling, and transporting. The apparatus used to perform this test is known as "Friabilator". **The apparatus**: consists of a plastic chamber, which is divided into two parts and itrevolves at a speed of 25 rpm. Twenty tablets are weighed and placed in a plasticchamber. The chamber is rotated for 4 minutes or 100 revolutions. During eachrevolution the tablet falls from a distance of 6 inch. The tablets are removed from thechamber after 100 revolutions and weighed. Loss in weight indicates the friability. **Result:** The tablets are considered to be of good quality if the loss in weight is less than 0.8%.	**3M** **(1 method +1 result +1 diagram= 3M)**



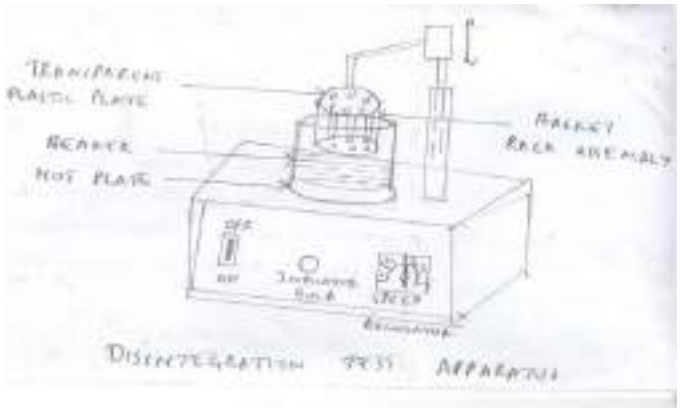
PLASTIC CHAMBER OF FRIABILATOR

(ii) **Disintegration**

Disintegration of a tablet means to break a tablet into smaller particles after swallowing. The time required to disintegrate the tablet is called disintegration time.

Method: The apparatus consists of a rigid basket-rack assembly supporting 6 cylindrical glass tubes placed with one tablet in each tubes. The assembly should be raised and lowered between 28 and 32 times per minute in the liquid medium at 37^0 C. The assembly is suspended in the liquid medium in a 1000 ml beaker. The apparatus is operated generally for 15 minutes and observed for disintegration of tablets.

Result: The tablets pass the test if all the tablets disintegrate. In case one or two tablets fail to disintegrate, repeat the test on 12 additional tablets. The tablets pass the test if not less than 16 of the total 18 tablets tested have disintegrated.

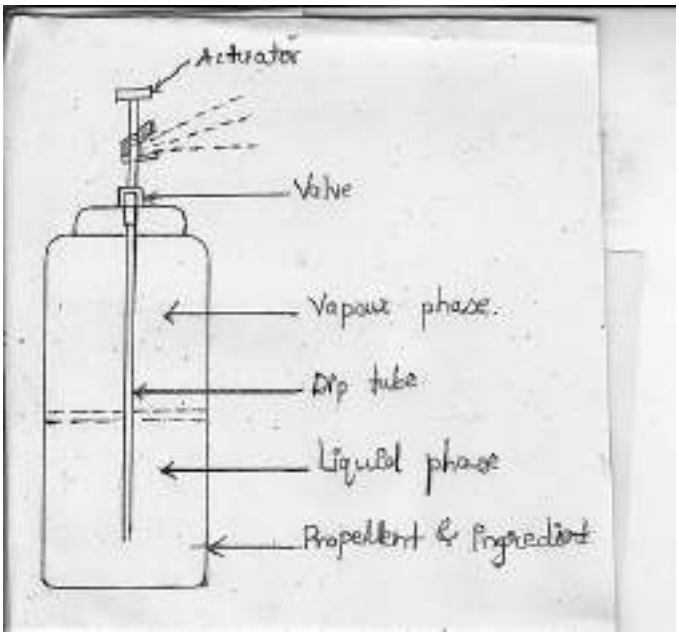


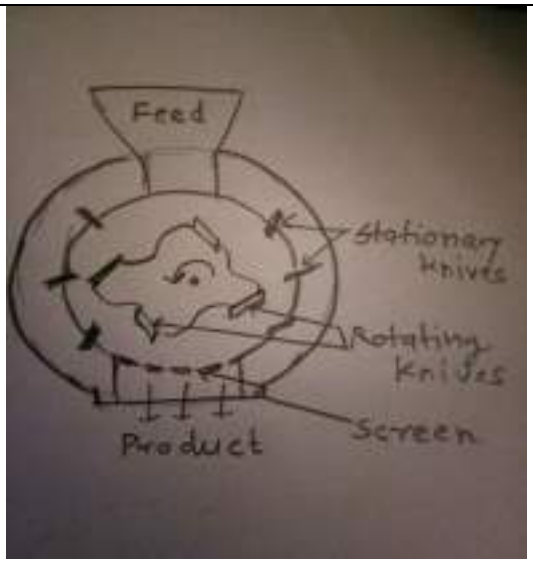
Sr. No.	Type of Tablet	Time Limit
1.	Oral Uncoated Tablets	15 minutes
2.	Film Coated Tablets	30 minutes
3.	Sugar Coated Tablets	60 minutes
4.	Soluble Tablets	3 minutes
5.	Effervescent Tablets	5 minutes
6.	Enteric Coated Tablets In acidic medium pH 1.2 In phosphate buffer pH 6.8	Should not disintegrate for 120 minutes. Must disintegrate within 60 minutes

2 e) Describe aerosol container with labelled diagram — **3M (0.5 X 4 = 2M for parts and 1 M for dig.)**

PARTS OF AEROSOL PACKAGING:

1. Container: In pharmaceutical aerosol packaging, the containers are made from metal (tin-plated steel, aluminium and stainless steel), glass and plastic. These containers can withstand high pressures.
2. Valve: The valve should be such that it can be opened and closed. It delivers the content in the desired form. Three types of valves are continuous spray valve, metered valve and foam valve.
3. Actuator: It is fitted on the valve stem. It helps in easy opening and closing of the valve whenever it is required.
4. Dip tube: These are made from polyethylene or polypropylene. It is used to convey the liquid from the bottom of the container to the valve at the top and also

		prevents the propellant to come out without dispensing content of package. **Aerosol container:**  	
2	**f)**	**Explain construction and working of Cutter mill or Hammer mill** **Cutter mill** **CONSTRUCTION:** It consists of a hopper at top and metal casing enclosing two sets of knives i.e. stationary knives attached to stator and rotating are attached to rotor. The lower part of the casing consists of a screen , through which material can pass and collected in a suitable receiver, when the desired degree of size reduction is reached **WORKING:** The material is put in to the hopper. The material is powdered to the desired size, due to fast moving knives (cutting phenomenon) and is collected under the screen This mill has the advantage of continuous operation because of change of jamming is less as the cutters are not fixed.	**3M** **(1+1+1)**



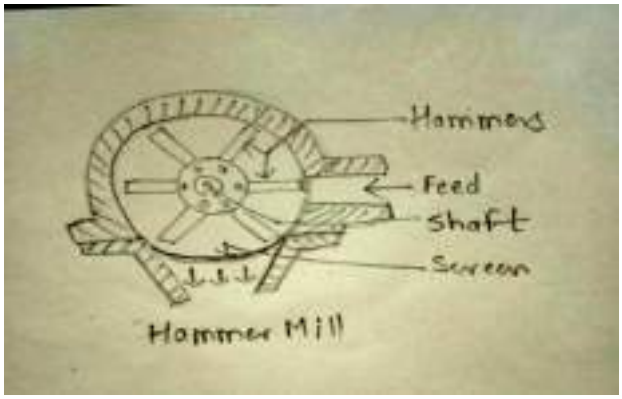
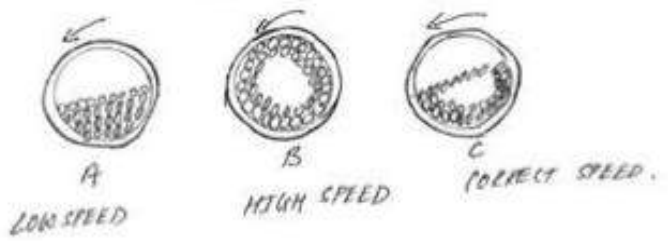
Hammer mill

CONSTRUCTION:

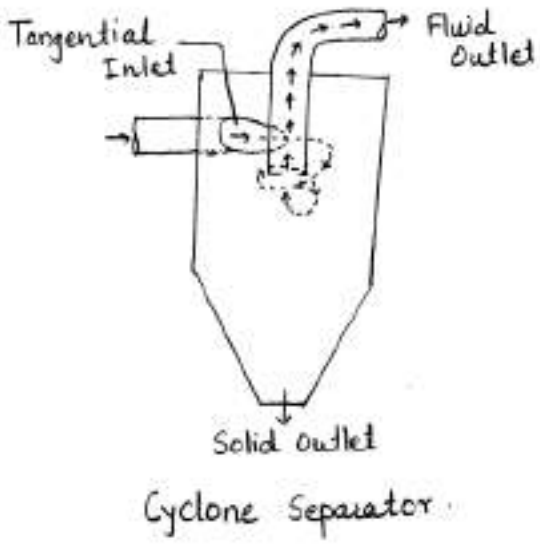
It consists of a stout metal casing enclosing to which four or more swinging hammer are attached. The lower part of the casing consists of a screen , through which material can pass and collected in a suitable receiver , when the desired degree of size reduction is reached

WORKING:

The material is put in to the hopper which is connected with the drum. The material is powdered to the desired size, due to fast rotation of hammer and is collected under the screen. This mill has the advantage of continuous operation because of change of jamming is less as the hammers are not fixed. The mill can produce coarse to moderately fine powder

		DIAGRAM: 	
3		**Attempt any FOUR of the followings**	**12M**
3	**a)**	**Explain the working of ball mill with a well labeled diagram and give any two advantages** **Working**: **(1.5M)** The drug to be ground is put into the cylinder of the mill and is rotated. The speed of the rotation is very different. At low speed, the mass of balls will slide or roll over each other and only a negligible amount of size reduction will occur. At a high speed, the balls will be thrown out to the walls by centrifugal force and no grinding will occur. But at about 2/3rd of the speed, the centrifugal force just occurs, the balls are carried almost to the top of the mill and cascading occurs. By this way, the maximum size reduction is effected by the impact of particles between the balls and by attrition between the balls. After a suitable time, the material is taken out and passed through a sieve to get powder of the required size. **Diagram :0.5M** 	**3M** **Working 1.5M,diagram 0.5M and advantage 1M**

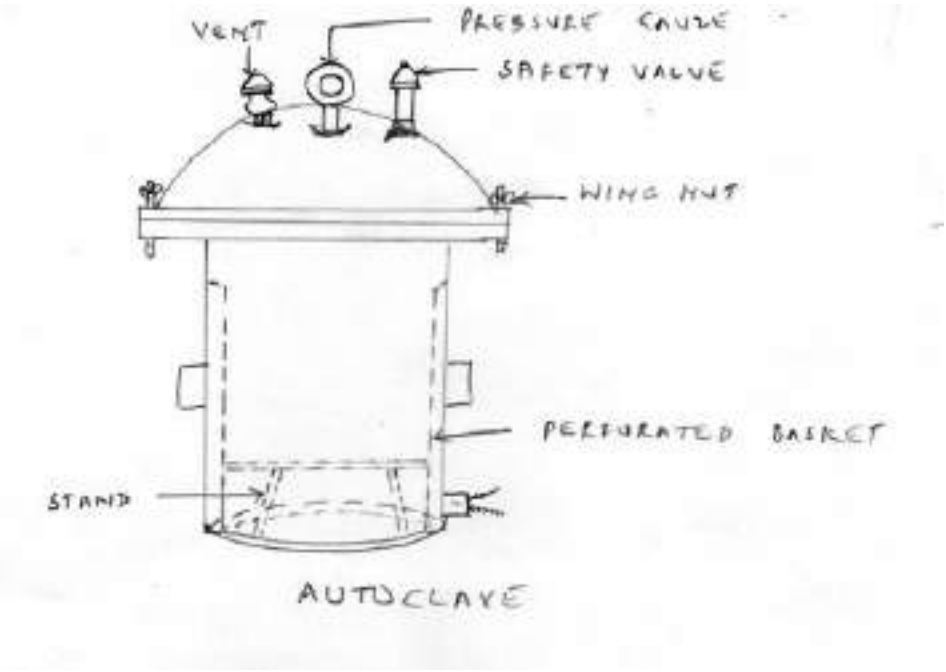
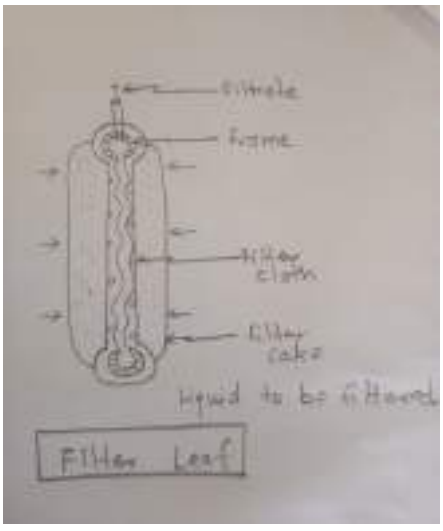
		Advantages:(1M=0.5x2) i)It can produce very fine powder ii)It is capable of grinding wide variety of materials of differing character & of different degree of hardness. iii)It can be used in a completely enclosed form , which makes it especially suitable for use with toxic materials. iv)Can be sterilized & usedfor parenteral& ophthalmic preparations. v)Can be used for batch as well as continuous grinding vi)can be used for dry as well as wet grinding.	
3	**b)**	**Explain construction and working of cyclone separator with a well labelled diagram.** **Construction: (1M)** • It consists of cylindrical vessel with a conical base. • In upper part of vessel is fitted with a tangential inlet and fluid outlet. • At the base it is fitted with solid outlet. **Working: (1M)** • In cyclone separator the centrifugal force is used to separate solids from fluids separation depends on particle size and density of particles • The suspension of solid in gas is introduced tangentially at a very high velocity. • The rotary movement takes place within the vessels. • The fluid is removed from the outlet at the top. • The rotatory flow within the cyclone separator causes the particle to be acted on by centrifugal force. • The solids are thrown out to the wall and fall to the conical base for discharge.	**3M,** **(1 Construction,1M working and 1 for diagram)**

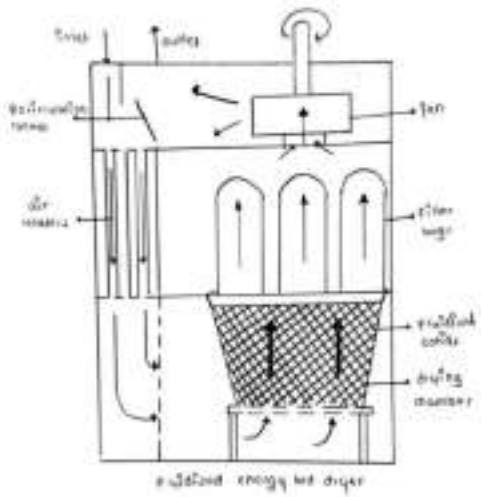
		Diagram (1M)  Cyclone Separator	
3	**c)**	**Describe the stages of percolations** **a. Imbibition**: • Drug is kept is moistened with sufficient quantity of menstruum. • Allow to stand for 4 hr. **Significance**: i. It allow the swelling of tissue of drug before packing. ii. It is imbibed for uniform packing in percolator. iii. It allows the entrapped air to escape. iv. Quantity of menstrum required can be reduced. **b.Maceration**: • The moistened drug is left in contact with menstruum for 24 hrs. • During this period, menstruum dissolves the active constituents of the drug. **c.Percolation**: • It consists of downward displacement of the saturated menstrum formed in maceration and extraction. • After collecting 3/4th volume of product then marc is pressed. • Mix the liquids.	**3M** **For each stage 1M**

3	**d)**	**Explain various grades of powders** **According to IP 2010 official grades of powders are as follows:** **(consider if 5 grades are correctly mentioned according to old volumes)** **i. Coarse powder:** A powder of which all particles pass through sieve no 10 with nominal aperture size 1.7mm and not more than 40% pass through sieve no 44 with nominal aperture size 355um. **ii. Moderately Coarse powder:** A powder of which all particles pass through sieve no 22 with nominal aperture size 710um and not more than 40% pass through sieve no 60 with nominal aperture size 250um. **iii. Moderately fine powder:** A powder of which all particles pass through sieve no 44 with nominal aperture size 355um and not more than 40% pass through sieve no 85 with nominal aperture size 180um. **iv. Fine powder:** A powder of which all particles pass through sieve no 85 with nominal aperture size 180 um. **v.Very fine powder:** A powder of which all particles pass through sieve no 120 with nominal aperture size 125 um. Vi. **Microfine powder:** A powder of which not less than 90%by weight of particles pass through a sieve with nominal mesh aperture size of 45 um vii. **Superfine powder:** A powder of which not less than 90%by weight of particles are less than 10 µm in size.	**3M** **(0.5 X 6 = 3M)**
3	**e)**	**Write the applications of simple distillation in pharmacy.** i.It is used for the preparation of distilled water and water for injection. ii. Preparation of many volatile oils and aromatic water. iii. Purification of organic solvent. iv. Preparation official compound like spirit of nitrous ether. v. Preparation official compound like spirit of aromatic spirit of ammonia. vi. To separate volatile and non-volatile solvents	**03M.** **0.5 X 6**

3	**f)**	**State the following:** **i)Arista:** These are weak alcoholic preparations prepared by making a decoction of the drugs and then allowing them to undergo fermentation by the help of raw sugar or honey. The fermentation is done for a period of 7-10 days in hot weather and for 15-30 days in cold weather **ii) Churna:** These are powdered mixtures prepared by mixing dry mineral, animal or vegetables substances in a pestle mortar. The powdered mixture is then passed through cloth, linen or fine sieve. In case jiggery is to be mixed with powder, it should be equal to the quantity of churna and in case of sugar, it should be double the quantity of churna. Churnas are usually taken with milk, hot water and cow's urine. Churnas are usually given in bulk. Its action is quick but its effect is only temporary. **iii)Taila:** These are medicated oils which are prepared by boiling drugs in water, milk or other liquid substances mixed with oil until water content is evaporated .The oil thus prepared are generally meant for local application in some cases ,the oils are used internally.	**3M** **1M for each definition**
4		**Attempt any FOUR of the followings**	**12M**
4	**a)**	**Describe the factors which affect rate of the evaporation of liquid** **Factors affecting evaporation:** **1)Temperature:** The rate of evaporation is directly proportional to temp of liquid. **2)Temperature and time of evaporation:** It has been observed that exposure to relatively a high temp for short period of time may be less harmful to the active principles of a drug than a lower temp with exposure for a longer period. **3)Temp and moisture content:** Some drug constituent decomposes more readily in the presence of moisture if heated at high temp. This is due to the hydrolysis of the active constituent To avoid decomposition to the active principle of such material the evaporation is done at low temp and then final drying is done at high temp. When only little moisture remains in it.	**03M.** **0.5 X 6**

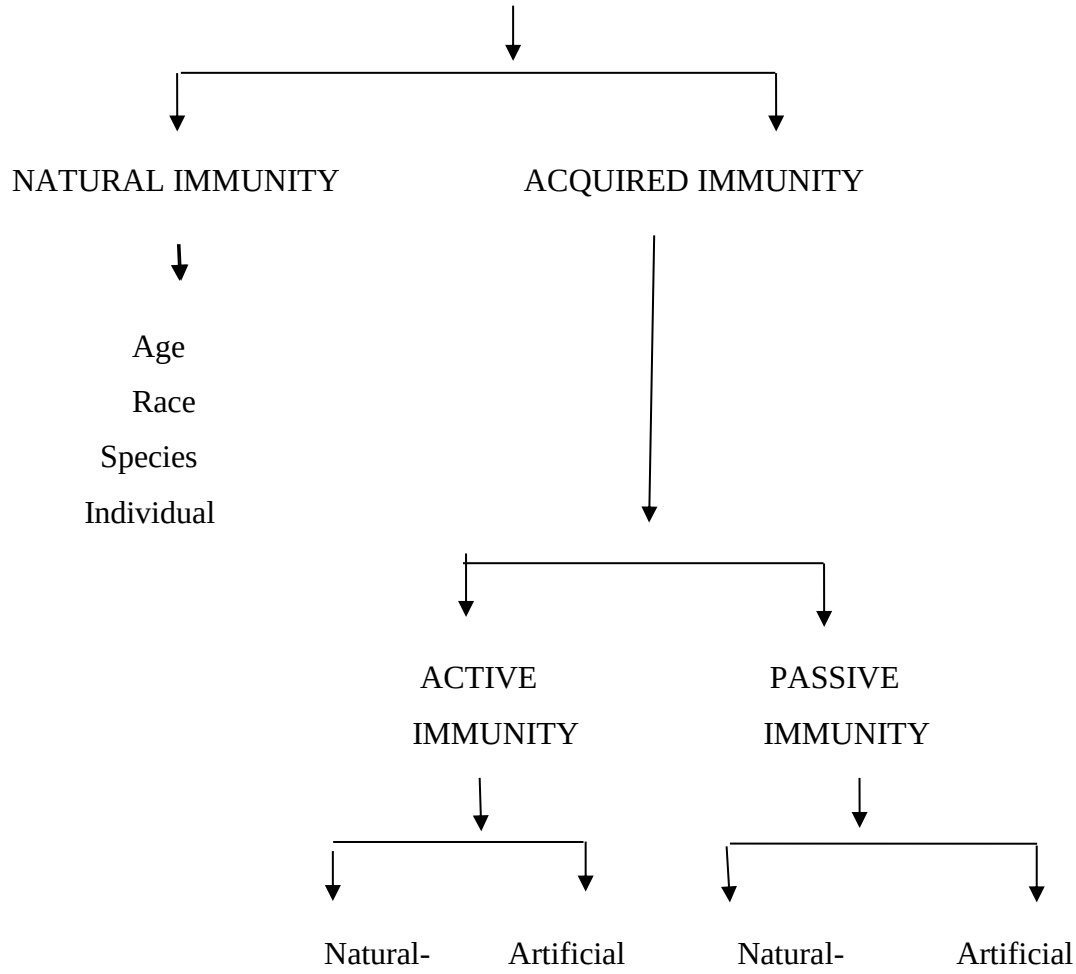
		4)Types of product required: On evaporation of the liquid the conc. Liquid, semisolid and solid are formed. The selection of the method and the equipment required for the evaporation depends upon the type of the product required **5)Effect of concentration:** During evaporation the upper layer of the liquid under evaporation has a tendency to form a film and formation of precipitate in the product which results in lowering down of the rate of evaporation. Therefore, efficient steering is required in order to prevent degradation of the product at the bottom due to excessive heat and it will also prevent deposition of solid **6)Surface area:** The rate of evaporation is directly proportional to the surface area of the evaporator, in which the liquid is evaporated. **7)Vapour pressure of the liquid to be evaporated:** The rate of evaporation is directly proportional to the vapour pressure of the evaporating liquid.	
4	**b)**	**Describe construction of autoclave with diagram.** **Construction: (2 mark)** It consists of a string metallic chamber usually made of stainless steel. It has a cover fitted with a steam vent, pressure gauze and a safety valve. Rubber gasket is fitted on the inner side of the lid in order to make autoclave airtight. The cover is closed with wing nuts and bolts. The electrically heated element is fitted at the bottom to heat the water to convert into steam. The perforated inner chamber is place on the stand. The material to be sterilized is loosely packed into it.	**3M** **1M Diagram and 2M construction**

		Diagram: (1 mark)  AUTOCLAVE	
4	**c)**	**Explain working,construction of filter leaf with neat diagram.** **Construction of filter leaf (1M)** It consists of metal frame enclosing a wire screen or a grooved plate. The screen is covered by filter cloth which is fitted in frame, to grip the cloth. The frame may be square, rectangle or circular in shape & outlet is connected to vacuum. **Diagram: (1M)** 	**3M.** **(1+1+1)**

		Working of Filter leaf: • The filter leaf is placed in a vessel containing slurry. • When vacuum is applied, the liquid flows inside the filter through filter cloth, leaving behind the cake on the surface of cloth. • The cake can be washed by immersing in a vessel containing water or reverse flow of air	
4	**d)**	**Describe working of FBD with well labelled diagram.** **Working of FBD(2M)** Two types of FBD are used in pharmaceutical industry. There are: 1. Vertical FBD 2. Horizontal FBD The fluidising air stream is induced by a fan which is mounted in the upper part of dryer. The air is heated to the required temperature in air heaters and passed through the wet material contained in a drying chamber fitted with a wire mesh support at bottom. The air flow rate is adjusted by means of recirculation control and fabric filter bags are provided to prevent the passage of fine particles. This type of FBD is a batch type dryer and the drying chamber is removed from the unit for charging ad dumping. The FBD available in different capacities ranging from 5 kg to 200 kg with an average drying time of about 20-40 min. **Diagram:(1M)** 	**3M** **2M Working and 1M for diagram**

4	**e)**	**Explain types of Immunity.**	**3M.**

TYPES OF IMMUNITY

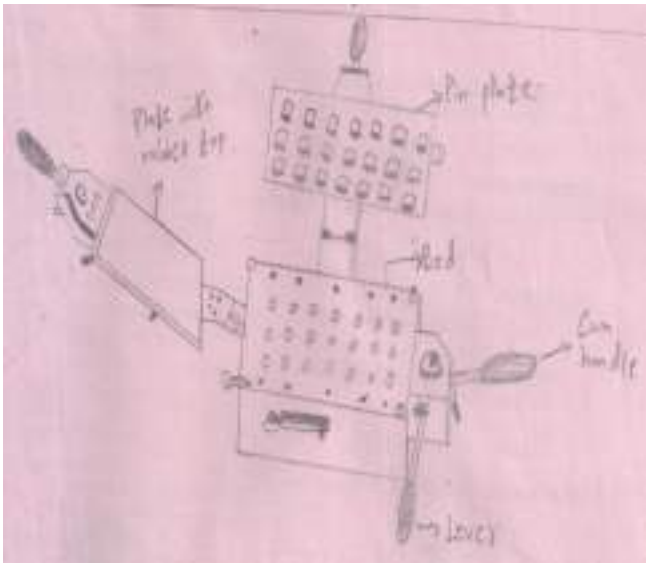


Natural immunity

- **Age** : Majority of children in the age group between 2-5 years are susceptible to diphtheria disease, whereas adults are immune to it.
- **Race** : While the negroes have a high resistance to yellow fever, the white races are very susceptible to it.
- **Species**: Men are susceptible to typhoid fever, whereas mice are immune to it.
- **Individuals**: Some persons have more resistance against cold and skin diseases than others.

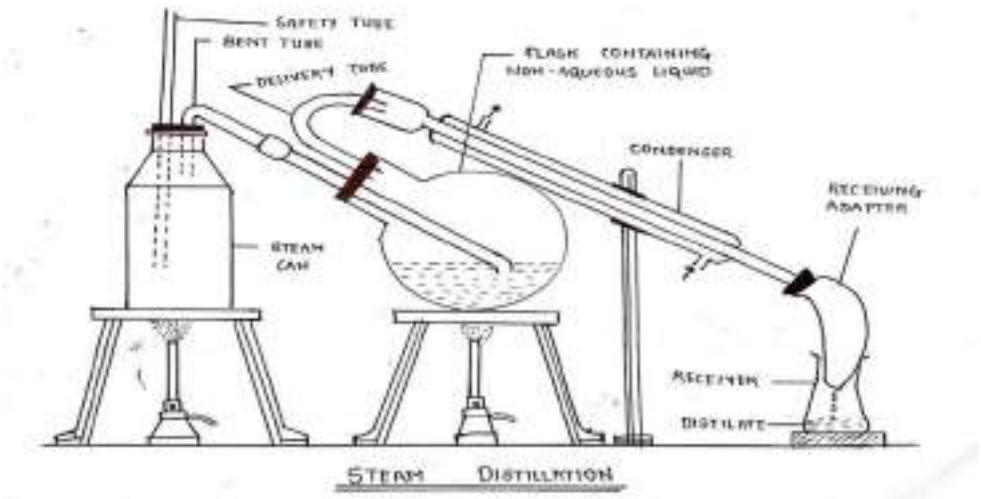
Acquired Immunity

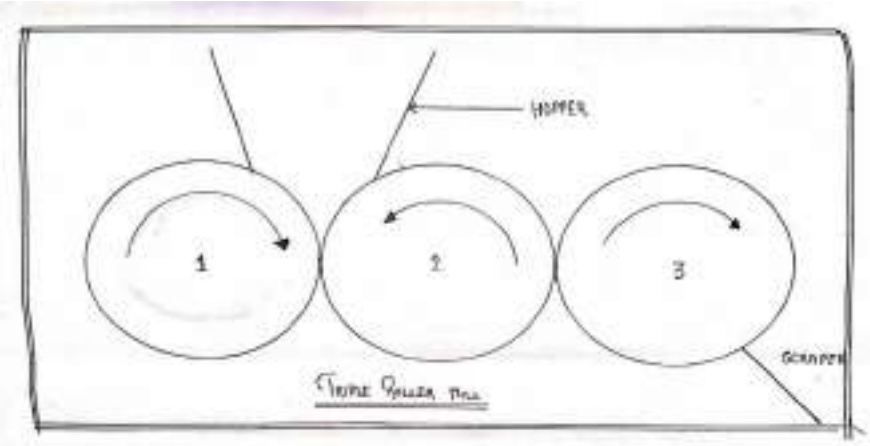
		(i)Naturally acquired active immunity • Body takes active part in formation of antibodies • The infection stimulates the body to produce antibodies, which remain in the body to immune the person. • Immunity may last for a life time *e.g.* small-pox, polio *etc.*, • May be for a short duration e.g. pneumonia, influenza **(ii)Artificial acquired active immunity** • When **the antigenic substances** such as vaccines are introduced into the body, it stimulates the body, to produce antibodies. • It is produced by **injecting** attenuated living micro-organisms, dead bacteria and bacterial derivatives. The process is also called immunization**.** **Passive immunity** • The body does **not play an active role** in, having immunity against a disease. • It **receives readymade antibodies** to produce immunity. **(i)Naturally acquired passive immunity** • Children aged less than a month, are generally immune to certain infectious diseases. This is because they have received the antibodies from the mother. • The antibodies of diphtheria, measles and chicken-pox are transmitted in this way. **(ii) Artificial acquired passive immunity:** • The immunity is produced by injecting ready-made antibodies containing preparation (antiserum, sera) into the body • It lasts for a short time only.	
4	**f)**	**Describe the process of manufacturing of hard gelatine capsules.** **Process of manufacturing of hard gelatine capsules. (2M)** i)Capsules are filled in the loading tray& placed over the filling bed. ii) Cam handle is operated to separate the capsule caps from their bodies. iii) The powder tray is placed on the filling tray to prevent the material from being lost, iv) The powder to be filled in the capsules is placed in powder trays and spread with the	**3M.** **2M for process and 1M for**

		help of a powder spreader, to fill the bodies of the capsules uniformly. v) The pin plate is lowered so as to press the powder into the bodies vi) After pressing, the pin plate is raised and the excess powder is filled into the bodies of the capsules. vii) The cap-holding tray is again placed in position. The sealing plate with rubber top is lowered and the lever is operated forcing the bodies into the caps, vii)The well-filled capsules are then cleaned by wiping with clean cloth. This gives good shine to the capsules. **Diagram (1 M)** 	**diagram**
5		**Attempt any FOUR of the followings**	**12M**
5	**a)**	**Describe the method of preparation of BCG vaccine with dose, storage and uses.** **Method of preparation of BCG vaccine**: It is freeze- dried preparation containing live culture of the bacillus Calmette and Guerin strain of Mycobacterium tuberculosis. **Preparation**: The bacilli are grown on a suitable culture media until 1 mg when plated out on a suitable solid culture media shows not less than 20 million colonies. The growth period should not be more than 14 days in any case. After a suitable growth, they are separated by filtration in the form of a cake. The cake is homogenized in a grinding flask	**3M (1.5 + 0.5+0.5+0 .5)**

		and suspended in a suitable sterile liquid medium designed to preserve the antigenicity and viability of the vaccine. The suspension is transferred into the final sterile containers and freeze-dried. Then containers are sealed so as to prevent contamination or deterioration of the vaccine. The vaccine contains no antimicrobial agent. **Dose**: Prophylactic, 0.1 ml as a single dose by intra-cutaneous injection. **Storage**: Store in hermetically sealed light resistant glass containers at a temperature between 2^0 C and 8^0 C. The reconstituted vaccine should be used immediately after its preparation. **Uses**: Immunising agent which provides protection against tuberculosis.	
5	**b)**	**Give the significance of sterilization using bactericidal solution, explain the method and name the bactericidal agents.** **Significance:** The lethal effect of bactericide increases with the rise of temperature. This method is used for sterilizing aqueous preparation, which is unstable at the higher temperature, hence moist heat sterilization is not applicable method for sterilization. It is official in British Pharmacopoeia and Indian Pharmacopoeia. **Method** In this process the medicament is dissolved or suspended in a suitable solution of following bactericidal, as given in table, then preparation is sealed in final container and heated at 98°-100°C for 30 minutes in boiling water. IP 1985 permitted the use of following bactericides-	**3M (1+1+1)**

Name of Bactericides	**Concentration of Bactericide % w/v**
For Injection:1) Chlorocresol	0.2
2) Phenyl mercuric acetate or Phenyl mercuric nitrate	0.002
For Eye drops: 1) Chlorohexidine acetate	0.01
2) Benzalkonium chloride	0.01
3) Thiomersal	0.01

5	**c)**	**Describe the method of distillation for immiscible solution.** **Method of separation of two immiscible liquids**. • The apparatus consists of steam generator,still,condenser,and receiver. In steam distillation process, a current of steam is passed through a immiscible liquids in a still at boiling point of water. • The mixed vapour from still (steam vapour& immiscible liquid) vapour are condensed & mixed distillate is collected. The distillate consists of water & immiscible liquid in suitable proportion • The distillate can be collected in Florentine receiver for separation of oil & water. **Diagram:**  STEAM DISTILLATION	**3M** **(1.5 +1.5 =3M)**
5	**d)**	**Explain the construction and working of triple roller mill.** **Construction:** • It consists of 3 rollers. • Rollers are made up of hard abrasion resistant material. • Rollers are arranged very close to each other's. • Rollers are rotated at different speed & in opposite directions. • Material gets crushed when it comes in between rollers.	**3M** **(1+1+1)**

		Working: • Material want to be mixed put in to hopper. • From hopper material come between roller no.1 and roller no.2 and is reduced in size. • The gap between roller no.2 and roller no.3 is less than that between roller no.1 and roller no.2 • Due to which material is crushed and gets mixed. • A Scraper is provided to remove the material from roller no.3 **Diagram**: 	
5	**e)**	**Write the stages involved in sterilization of surgical dressing.** **Stages of sterilisation are:** 1) Pack or wrap the unsterilized surgical dressing into a suitable device/perforated container or any packaging material i.e parchment paper. 2) Load this container into sterilizer. Loading ang packaging should be done properly to ensure the uniform steam penetration and movement. 3) Close the sterilizer and expose the surgical dressing at 121°C for 30-45 min. 4) Switch off the sterilizer and condense the steam in it, allow to cool and unload the sterilizer. 5) Containers are labelled with date of sterilization to prevent overload storage.	**3M**

5	**f)**	**How will you prepare 5 fl. 02 solutions and using that prepare a 5 litre 1 in 2000 solutions?** **Note: Let the student assume any data for strength of concentrated solution and solve the problem, appropriate marks should be allotted** Data Given: Strength of concentrated solution = 5% (assumption) Strength of Dilute solution = 1/2000 = 0.05% Volume of dilute solution required = 5 litre = 5000 ml **Part A: Preparation of 5% , 5 Fl.Oz solution** Amount required for preparing 1% w/v solution in imperial = 4.375 grain Therefore, for preparing 5% w/v solution = 4.375 X 5 X 5 = 109.37 grain. **Part B: Preparation of dilute solution.** Degree of dilution = Strength of concentrated/ Strength of Dilute solution = 5/0.05 = 100 times. Volume of concentrated solution required = volume of dilute solution to be prepared/ Degree of dilution = 5000/100 = 50 ml. Therefore, 50 ml of 5% concentrated solution is used to prepare 5 litre 1 in 2000 solution.	**3M**
6		**Attempt any FOUR of the followings**	**16M**
6	**a)**	**Explain any four manufacturing defects in tablet manufacturing.** **i) Capping:** There is partial or complete removal of top or bottom portion of the tablet. The reasons are: Excessive fines, defective punches and dies, high speed of the machine, too dry granules, or high degree of compaction. **ii) Picking and sticking:** In picking, the material is removed or picked up by the upper punch from the upper surface of the tablet. In sticking, the material sticks to the wall of the die. These defects appear due to worn out dies and punches, small quantity of	**4M** **(1 X 4 = 4M)**

		lubricants, presence of moisture in granules, excess powder in granules, scratches on the surface of face of punch or defects in the formulation. **iii) Mottling:** Mottling means an unequal distribution of colour on the surface of coloured tablets. This defect occurs due to following reasons: migration of dye in the granules during drying, use of different colour of medicament and excipients. **iv) Weight variation:** During compression of granules in a tablet machine, the tablets do not have a uniform weight. The reasons are: Granules not uniform in size, Excess powder in granules, no proper mixing of lubricants, no uniform flow of granules from hopper to die, variation in speed of machine. **v) Hardness variation:** Causes same as weight variation. Hardness depends upon weight of material and space between upper and lower punches during compression. If any of these varies the hardness will vary. **vi) Double impression:** This defect occurs when the lower punch has a monogram or some other engraving on it. During compression, the tablet receives an imprint on the punch. Due to some defect in the machine, the lower punch moves slightly upward before ejection of a tablet and gives a second though light imprint on the tablet.	
6	**b)**	**What is aseptic technique? List the various sources of contamination and explain the sterility test.** **Aseptic technique**: **(0.5 M)** The method which is used to prevent the access of microorganism during the preparation of parenteral product and their testing are called "Aseptic Technique". **Sources of contamination: (any 4 = 2M)** 1) Atmosphere, which is contaminated with dust, droplet and droplet nuclei becomes the breeding ground of microorganism. 2) The hands are a major means of transmitting infection. 3) Coughing, sneezing and spitting can cause contamination considerable distance. 4) The clothes which absorb dust particles are also a source of contamination. A handkerchief is the richest source of contamination. 5) The hair. 6) Unsterile equipment.	**4M (0.5 +2+1.5 = 4M)**

7) Working surface.

Test for Sterility: (1.5M)

Principle: These tests are based on the principle that if bacteria or fungi are placed in medium provided favourable conditions like nutritive material, moisture temperature, the organism will grow and their presence can be indicated by the turbidity in clear solution. These test should be carried out in strictly aseptic condition.

Method of testing : Test of sterility may be carried out by

1) Membrane filtration method

2) Direct inoculation method

1) Direct inoculation method: The substance to be tested is aseptically drawn from the container by a suitable device and transferred to the final culture medium in the test tube. The inoculated medium (test tubes) are incubated at 20-25°C for fungi and 30-37°C for bacteria for the period of seven days. Observe the growth of micro-organism in the medium.

2) Membrane filtration method : This method is preferred in the following cases-

An oil or oily preparations, ointment, A non-bacteriostatic solid, soluble powder or a liquid that possesses bacteriostatic and fungistatic properties, liquid products where volume in a container is 100 ml or more.

Carry out filtration of sample under test through membrane filter having pore size of 0.45 µ and diameter of about 47 mm. After the filtration, the membrane is removed aseptically from the metallic holder and divided into two halves. The first half is transferred into 100 ml of culture media meant for fungi and incubated at 20 to 25°C for not less than 7 days. The other half is transferred into 100 ml of fluid thioglycolate medium meant for bacteria and incubated at 30 to 35°C for not less than 7 days. Observe the growth of the media.

Results : If no growth of micro-organism is found in any of the tubes, the sample is declared to have pass the test and same test is repeated for two times.

6	**c)**	**Find the volume of 20%, 15%, 10% and 8% alcohol should be mixed to get 12% alcohol 300 ml** 20 % 12-8 = 4 parts of 20 % 15 % 12-10 = 2 parts of 15 % 12 % 10 % 12-15 = 3 parts of 10 % 8 % 12-20 = 8 parts of 08 % Total parts = 4 + 2 + 3 + 8 = 17 parts For 300 ml of 20 % alcohol = $\frac{300 \times 4}{17}$ = 70.58 ml For 300 ml of 15 % alcohol = $\frac{300 \times 2}{17}$ = 35.29 ml For 300 ml of 10 % alcohol = $\frac{300 \times 3}{17}$ = 52.94 ml For 300 ml of 8 % alcohol = $\frac{300 \times 8}{17}$ = 141.17ml	**4M**
6	**d)**	**Define mixing, explain types and mechanism of mixing.** **Definition of Mixing: (1M)** Mixingis the method in which two or more than two substances are combined together.	**4M (1+1.5+1.5)**

		Types of mixtures- (any three 1.5M) **1) Positive Mixture**-When two/more miscible liquids are mixed or soluble solid is dissolved in water, the mixtures are called as positive mixture .e.g. Solution. It is irreversible. **2) Negative Mixture**-Two immiscible liquids are mixed or insoluble solids are mixed with water it forms negative mixture. E.g. emulsion, suspension, mixtures. It is reversible. **3) Neutral Mixture**-The substances do not have tendency to mix but once mix, don't separate after mixing. E.g. ointment, paste, cream. **Mechanisms Of Mixing:(any three 1.5M)** **1. Connective Mixing**: There is bulk movement of groups of particle from one part of powder bed to another. It occupy by inversion of the powder bed by means of blades or paddles. **2. Shear Mixing:** When shear force occur it reduces the scale of segregation by thinning of dissimilar layers of a solid particles. **3. Diffusion Mixing:** It occur when random motion of particles within a powder bed causes them to change position relative to one another. It produced by any agitation of powder.	
6	**e)**	**Discuss novel drug delivery system.** New drug delivery system delivers or aimed at maximizing the drug effectiveness or minimizing the side effects. Some of the Novel dosage forms are: 1) Implants 2) Controlled drug delivery system 3) Sustained release system 4) Liposomes 5) Erythrocytes 6) Nanoparticles	**4M (any four 1 marks each)**

7) Prodrugs

8) Film and strips.

1) Implants:

The hypodermic tablets are placed under the skin by a minor surgery in order to release drugs over a prolonged periods of time. Now the magnetically controlled implants have been developed which can be opened or closed in order to release or stop the drug. The implants which are in capsule form, consist of a body and a cap. It can be opened by placing a magnet onthe skin and moving it in the desired direction. These implants are placed in the upper thigh at a depth of 5 mm. These implants are useful in hormone therapy

2) Controlled Drug Delivery System:

Controlled Drug Delivery Systems are devices which are formed by embedding the drug within polymeric matrix so that it get released slowly to the body over a very long period of time .The polymeric matrices used to hold drug reversibly are polyethylene silicon elastomer and cellulose ester.

These controlled drug delivery modules are punctured before administration with laser beam to make a small orifice of a few microns in diameter for the release of drug.

3) Sustained Release system:

Sustained released dosage forms are the new drug delivery system. They provide a therapeutic blood level of the drug which is attained rapidly and is maintained within narrow limits over extended period of a time, usually for 10 to 12 hrs. afer administration of single dose. Sustained release of dosage are achieved because they are enteric coated which get released in specific part of body.

4) Liposomes:

They are phospholipids which can be transported with hydrophilic and hydrophobic drugs.

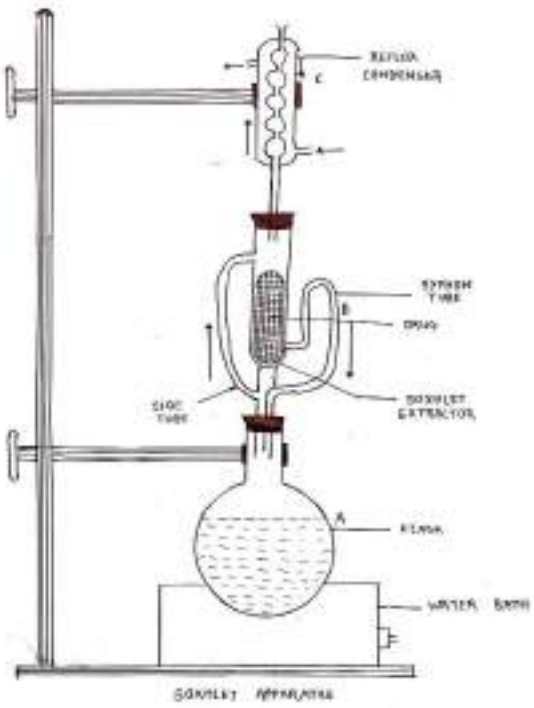
Applications:

1) Liposomal drugs are used in diseases caused by intracellular parasites.

e. g. Malaria, Tuberculosis

2) Liposomes can be used to transport functional DNA/RNA molecules into cells.

		5) Erythrocytes: As the life span of Erythrocytes is 120 days drugs are encapsulated in Erythrocytes. The drug release for a prolonged period of time. Applications: 1) Resealed erythrocytes of asparaginase have shown good results in asparaginase dependant leukaemia. 2) Resealed erythrocytes of methotrexate and adrianycin have been tried in cancer therapy. **6) Nanoparticles:** The particle size ranges from 200-500 nm. The system consists of drug and carrier to deposit the drug at the target site. The carrier used are serum albumin, bovine serum, albumin, gelatin, casein, s ethyl cellulose. **7) Prodrugs:** The compounds that shows desirable pharmacological activity after its metabolism are called as prodrugs. Prodrugs are used to increase solubility, stability and bioavailability of drug, masking the unpleasant taste and odour of the parent drug and reducing the toxicity. **8) Film and strips:** These are meant for topical application for slow release of drug over predetermined period of time. The film and strips which are becoming popular these days are I. Zero order release film. II. Buccal Stip. III. Spray bandages.	

6	**f)**	**Explain the method of hot percolation process with well labelled diagram and write its limitations.** **Diagram: (1.5M)**  **Procedure : (1.5M)** 1) The menstrum is placed in a round bottom flask. 2) The drug to be extracted is packed in a filter paper and placed in the body of Soxhlet extractor. 3) Solvent is boiled on heating a flask. 4) The vapour enter into the condenser through the side tube. The vapour get condensed into hot liquid, which falls on the column of drug. 5) The extractor gets filled with the solvent. Hot solvent extracts the active constituents of the drug. 6) The solvent having active constituents syphon over and run into the flask through the syphon tube. 7) The alternate process of filling and emptying the body of extractor goes on	**4M (1.5 +1.5 + 1)**

		continuously. 8) The soluble active constituents of the drug remain in the flask, while the solvent evaporates respectively. 9) This process continues till drug exhausted. 10) Normally the process is repeated about 15 times to exhaust the drug properly. **Limitation : (0.5 X 2=1)** 1. Physical character of the drug: If the drug would block the soxhlet apparatus then this process cannot be used for extraction. Eg opium. Gum, resin, orange peel, etc. 2. Solvent: Only pure solvents or constant boiling mixtures can be used. 3. Chemical constituents of the drug: The process is unsuitable for drugs having thermolabile active constituents such as enzymes, alkaloids, anthraquinone derivatives, esters, etc.	

WINTER– 18 EXAMINATION

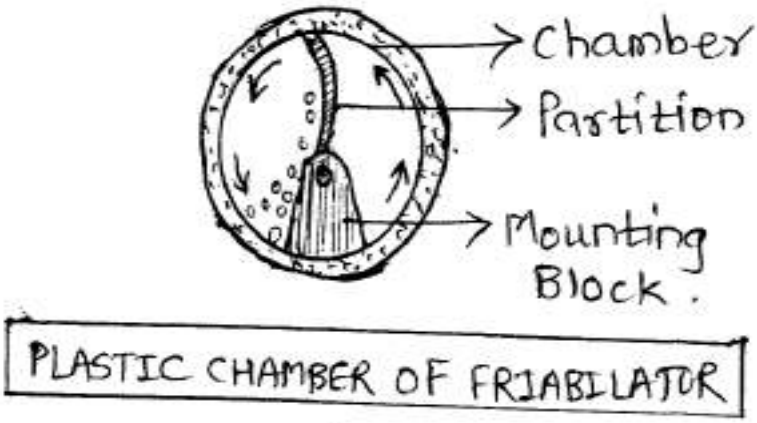
Subject Title: PHARMACEUTIC-1 Subject Code: 0805

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any TEN of the followings:**	20M
1	**a)**	**Define following terms:** (i) **Syrups**: are concentrated aqueous solution of sucrose (66.7%W/W) or other sugars .They are viscous in consistency & sweet in taste. (ii) **Cream:**Creams usually signifies a solid or semisolid emulsions or non-aqueous products of oils, fats &waxes usedfor emollient &protective effect.	**2M (1M each)**
1	**b)**	**Enlist the ideal qualities of container.** 1. Neutral 2. No interaction. 3. Stability against environmental factor. 4. Withstand wear and tear during handling. 5. Easy to remove dose. 6. Withstand changes in pressure and temperature. 7. Labelled easily 8. Non-toxic. 9. Closure easily removable/replaceable.	**2M (0.5x4)**
1	**c)**	**Explain any four factors affecting size reduction.** **Factors affecting Size Reduction:** i. **Hardness:** Soft material easytobreak than hard. ii. **Toughness:** Drug with fibrous nature or those having high moisture content are tough and hard to reduce in size. iii. **Stickiness:** Material adheres to the grinding surface or sieve surface of the mill. It is very difficult to powder a drug of having gummy or resinous material. iv. **Material structure:** Material with some special structure cause problem during size reduction e.g. Vegetable drug with cellular structure produce long fibrous particle on size reduction, similarly a mineral substance having lines of weakness, produce flake like particle on its size reduction. v. **Moisture content:** The presence of moisture in the material influence a number of its properties such as hardness, toughness or stickiness.The material having 5% moisture in case of dry grinding and 50% in case of wet grinding is permissible. vi. **Temperature:** Waxy material such as stearic acid or drug containing oils or fat, become softened during the size reduction, due to heat. This can be avoided by cooling the mill. vii. **Purity:** In some mills during size reduction there is chances of addition of impurities. If high degree of purity is required avoid such mills or Mills should be cleaned thoroughly. viii. **Physiological effect:** Some drugs are very potent. During their size reduction in mill, dust is produced which may have effect on operator. ix. **Ratio of feed size to product size:** To get a fine powder in a mill, it is required that a fairly small feed size should be used. Hence to carry out size reduction in	**2M (0.5×4)**

		various stages e.g. preliminary crushing followed by coarse powder and then fine grinding. x. **Bulk density:** The output of the size reduction of the material in a machine depends upon the bulk density of the substance.	
1	**d)**	**Describe simple maceration process**. Simple maceration is a maceration process for tinctures made from organised drugs. In this process, the drug is placed with the whole of the menstruum in a closed vessel for seven days. During this period, shaking is done occasionally. After seven days, the liquid is strained and marc is pressed. The expressed liquid is mixed with strained liquid. It is then filtered to make a clear liquid. The final volume is not adjusted. The tinctures made by simple maceration process are Tincture of Orange, Tincture of Lemon, Tincture of Squill, etc.	**2M**
1	**e)**	**List the precautions to be taken while using hot air oven.** 1. Glass apparatus and equipment should be wrapped individually. 2. Articles should be placed in such away that they should not interfere with air flow 3. Once in operation oven should not be open 4. Proper biological indicators should be used 5. Thermolabile substance should never be sterilized in hot air oven. 6. It should never be over loaded.	**2M (0.5×4)**
1	**f)**	**Explain friability test for evaluation of tablets.** Friability test is performed to evaluate ability of the tablet to with stand wear and tear in packing, handling, and transporting. The apparatus used to perform this test is known as "Friabilator". The apparatus consists of a plastic chamber, which is divided into two parts and it revolves at a speed of 25 rpm. Twenty tablets are weighed and placed in a plastic chamber. The chamber is rotated for 4 minutes or 100 revolutions. During each revolution the tablet falls from a distance of 6 inch. The tablets are removed from the chamber after 100 revolutions and weighed. Loss in weight indicates the friability. The tablets are considered to be of good quality if the loss in weight is less than 0.8%.	**2M**



PLASTIC CHAMBER OF FRIABILATOR

1 g) Differentiate between Endotoxins and exotoxins. **2M (0.5x4)**

Exotoxin	Endotoxin
1) These are toxins which can diffuse freely through the bacterial cell wall into the blood or the medium in which the microorganisms are growing	1)These toxins cannot diffuse through the bacterial cell wall, but remains in the cell of bacteria
2) These toxins are carried to all parts of the body	2) Endotoxins are liberated only when the bacteria are disintegrated.
3) In its response the human body produces antibodies to neutralize its effect which is called as antitoxin	3) The antibodies are named according to their mode of action
4) Diphtheria Antitoxin	4) Diphtheria Toxoid

1 h) Name various Novel drug Delivery systems. **2M (0.5x4)**

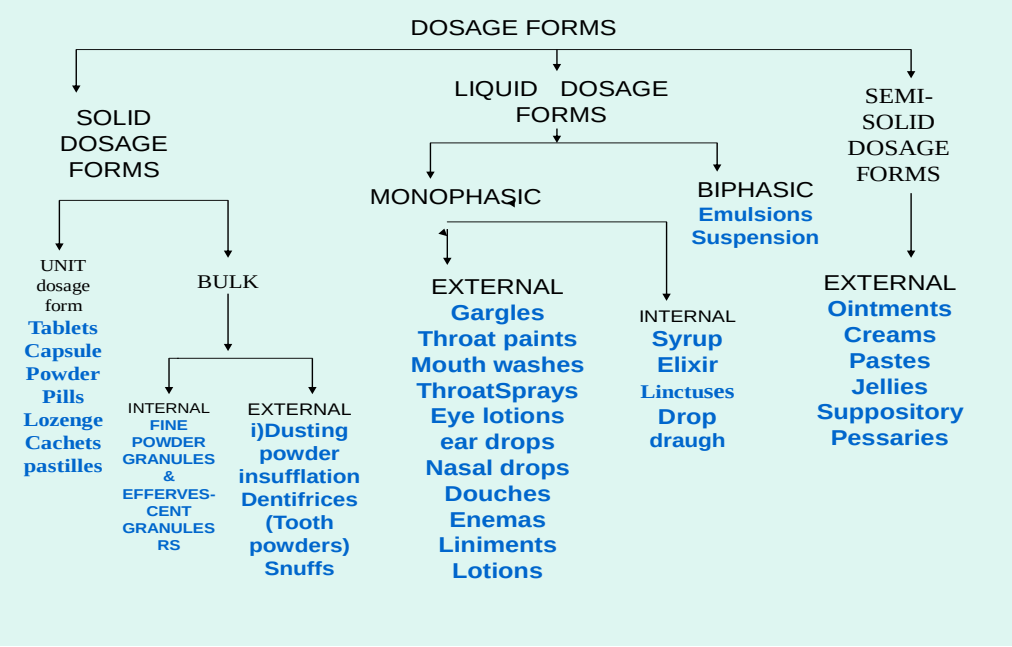
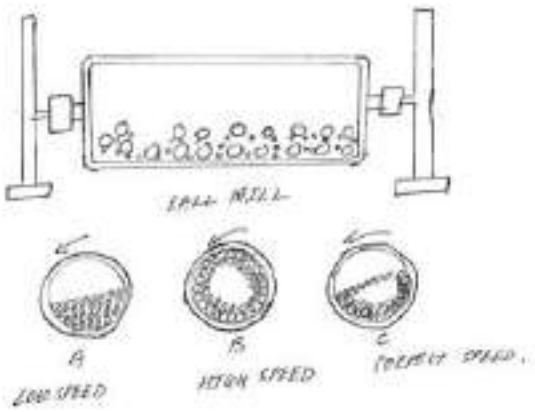
1. Implants
2. Liposome drug carriers
3. Nanoparticles
4. Prodrugs
5. Films and strips
6. Resealed Erythrocytes etc.

1 i) Enlist the ideal qualities of Filter aids. **2M (0.5x4)**

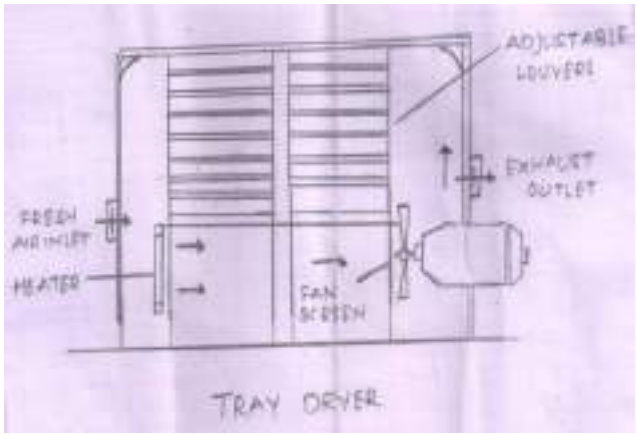
Ideal qualities of filter aid: It should remain suspended in the liquid.

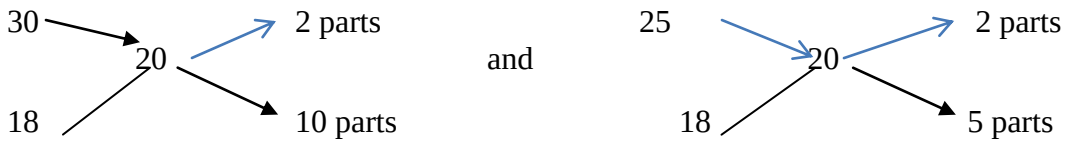
1. It should be free from impurities.
2. It should be inert.
3. It should have a particle size distribution suitable for retention of solid.
4. It should have structure that permits formation of porous cake.

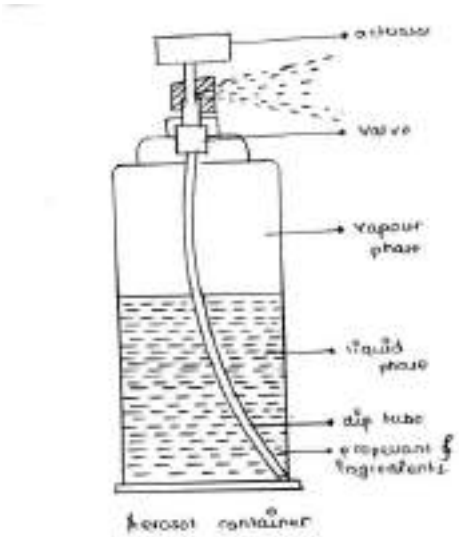
<table>
<tr><td>1</td><td>j)</td><td>Write the <u>disadvantages</u> of formaldehyde gas when used for sterilization.
i. Weak penetration power.
ii. Difficult to maintain high conc.
iii. Require high humidity for effectiveness.
iv. Readily inactivated.
v. Irritant to respiratory tract.
vi. Difficult to remove adsorbed gas.</td><td>2M
(0.5×4)</td></tr>
<tr><td>1</td><td>k)</td><td><u>Differentiate</u> between hard and soft gelatin capsules.
<table><tr><th>Sr.No</th><th>Hard gelatin capsules</th><th>Soft gelatin capsules</th></tr><tr><td>1.</td><td>The hard gelatin capsule shell consists of two parts: Body and cap</td><td>The soft gelatin capsule shell becomes a single unit.</td></tr><tr><td>2.</td><td>They are cylindrical in shape.</td><td>They are available in round, oval and tube-like shapes.</td></tr><tr><td>3.</td><td>The contents usually consist of medicaments in the form of powder, beads or granules.</td><td>The contents usually consist of liquids or semisolids.</td></tr><tr><td>4.</td><td>These are prepared from gelatin, titanium dioxide, colouring agent and plasticizer.</td><td>These are prepared from gelatin, more amount of plasticizer (sorbitol or glycerin) and preservative.</td></tr><tr><td>5.</td><td>Filling and sealing takes place in different steps.</td><td>Filling and sealing are done in a combined operation of machines</td></tr><tr><td>6.</td><td>Shell is perfectly dry.</td><td>Shell is not perfectly dry</td></tr><tr><td>7.</td><td>These capsules can be adulterated</td><td>These capsules cannot be adulterated</td></tr><tr><td>8.</td><td>Eg. Becosules capsules</td><td>Eg. Pudin Hara</td></tr></table></td><td>2M
(0.5 ×4)</td></tr>
<tr><td>1</td><td>l)</td><td><u>Describe</u> the type of mixing.
Positive Mixing:
In Positive mixing ,two or more than two miscible liquids are mixed or soluble solids are dissolved in water,
This mixture does not represent any problem in mixing.
Mixture formed is irreversible.
Negative Mixing:
In negative mixing,two immiscible liquids are mixed or insoluble solids are mixed with water it forms negative mixtures.
For preparing such type of mixing a higher degree of mixing of materials is required.
The mixture formed is reversible mixture.
Neutral Mixing:
In Neutral mixing, substances do not have the tendency to mix with each other immediately, but once mixed they do not separate after mixing. These mixtures are static in their behaviour</td><td>2M</td></tr>
</table>

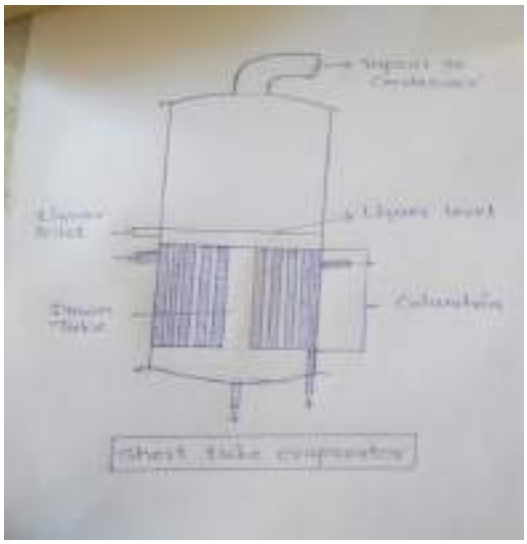
2		**Attempt any FOUR of the followings**	**12M**
2	**a)**	**<u>Define and classify</u> dosage form.** **Defination:** Is a combination of the drug and different kinds of non drug components called additives.  	**3M** **Defi. 1M** **2M**
2	**b)**	**Explain <u>construction and working</u> of ball mill.** **Construction:** It consists of a hollow cylinder which is mounted on a metallic frame in such a way that it can be rotated on its longitudinal axis. The cylinder contains balls that occupy 30-50% of the mill volume. The ball size depends on the size of the feed and the diameter of the mill. The cylinder and balls are made of metal (also of rubber or porcelain)  	**3M** **(1M)** **Dig.** **(1M)**

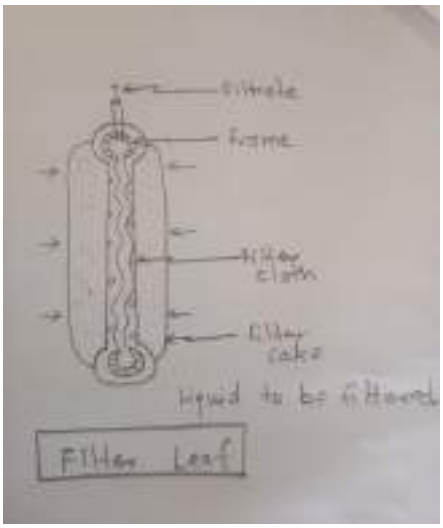
		Working of Ball Mill: The drug to be ground is put into the cylinder of the mill and is rotated. The speed of the rotation is very different. At low speed, the mass of balls will slide or roll over each other and only a negligible amount of size reduction will occur. At a high speed, the balls will be thrown out to the walls by centrifugal force and no grinding will occur. But at about 2/3rd of the speed, the centrifugal force just occurs, the balls are carried almost to the top of the mill and cascading occurs. By this way, the maximum size reduction is effected by the impact of particles between the balls and by attrition between the balls. After a suitable time, the material is taken out and passed through a sieve to get powder of the required size.	**(1M)**
2	**c)**	**Define extraction and explain reserve percolation process.** **Definition:** Extraction may be defined as the treatment of the plant or animal tissues with solvent, whereby active constituents are dissolved, and most of the inert matter remains undissolved. **Reserve percolation:** • In this process a part of percolate, generally 3/4th volume of the finished preparation is reserved.(contains high solute concentration) • Then the percolation process is continued till the drug is completely exhausted. • The percolate is subjected to evaporation or distillation to convert in to soft extract. • Distillation will help to recover the costly solvent. • Hence the major portion of active constituents of the drugs are saved from deterioration • This soft extract is dissolved in reserve portion of percolate and sufficient menstruum is added to make up the volume.	**3M** **1M** **2M**
2	**d)**	**Give any <u>two</u> applications of simple distillation.Describe method of separation of two immiscible liquids**. **Applications of simple distillation(0.5 ×2)** 1) Preparation of distilled water and water for injection. 2)Recovery of alcohol in preparation of dry extracts 3)Many volatile oils and aromatic waters are prepared by simple distillation. 4)Many official preparations are prepared by distillation, eg spirits of nitrous ether and Aromatic spirit of ammonia. 5)Concentration of liquid and to separate non-volatile solid from volatile liquids such as alcohol and ether. **Method of separation of two immiscible liquids**. • In case of immiscible liquids , each liquid exerts its own vapour pressure & neither liquid has any appreciable effect on the vapour pressure of the other.A mixture of immiscible liquids begins to boil, when sum of their vapour pressure is equal to atmospheric Pressure. • Thus in case of water & liquid which boils at much higher temp. than	**3M** **(1M)** **2M**

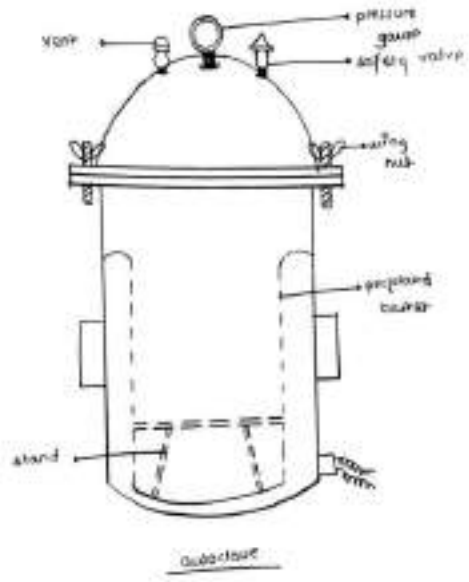
		water, the mixture boils below the boiling point of pure water  **Separation of immiscible liquid is carried out by steam distillation.** • The apparatus consists of steam generator , still , condenser , receiver. In steam distillation process, a current of steam is passed through a immiscible liquids in a still at boiling point of water. • The mixed vapour from still (steam vapour& immiscible liquid) vapour are condensed & mixed distillate is collected. The distillate consists of water & immiscible liquid in suitable proportion • The distillate can be collected in Florentine receiver for separation of oil & water.	
2	**e)**	**Explain <u>construction and application</u> of tray dryer.** **Construction of tray dryer.**  • The simplest form of dryer , the source of heat (electric heater or steam coil) is at floor level & relies on natural convection. • Therefore no efficient heat transfer. • Modern dryer consists of well insulated cabinet with strategically placed fans and heating coils.	**3M (1+1+1)**

		• The air circulates through the dryer at 200- 2000 feet/mins • In small ovens , there may be provision for a single passage of heated air , while in large units, the thermal efficiency is improved by recirculation of air which is reheated after its passage over each shelf. • The forced air circulation increases heat transfer & reduces local vapour concentration. **Application of tray dryer.** Used1) For drying of crude drugs 2)For chemicals 3)For powders 4)For Granules used in tablet manufacturing	
2	**f)**	**In what volumes 30%.25%,18% alcohol should be mixed to get 500ml 20% alcohol.**  30 % = 2 parts 25% = 2 parts and 8 % = 10 + 5 = 15 parts. **Volume of 30%:** 19 parts; 02 parts 500 ml; ? 500 X 2/19 = 52.63 ml **Volume of 25%:** 19 parts; 02 parts 500 ml ; ? 500 X 2/19 = 52.63 ml **Volume of 18%:** 19 parts; 15 parts 500 ml ; ? 500 X 15/19 = 394.73 ml Therefore, 52.63 ml of 30%, 52.63 ml of 25 % and 394.73 ml of 18 % alcohol should be mixed to get 20 % alcohol.	**3M**
3		**Attempt any FOUR of the followings**	**12M**

3	a)	**Define and Classify immunity.** **Definition:** The power of body to resist the effects of invasion of micro-organisms is called immunity. **Classification:** Immunity Natural Immunity — acquired Immunity 1)age 2)Race 3)Species 4)Individual Active — Passive Natural — Artificial — Natural — Artificial	**3M** **1M** **2M**
3	b)	**Define container and closure. Draw a well labelled diagram of Aerosol container.** **Definition:** **Container** is a device that holds the drug and it may or may not be in direct contact with the pharmaceutical preparations. **Closure** is the device by means of which container can be opened and closed. **Diagram of aerosol container:**  	**(1M for each def., 1 M diagram)**
3	c)	**Write construction and disadvantages of short tube evaporator.**	**3M (1+1+1)**

		Construction: (1M) • It consists of number of tubes which are from 1 to 2 meters in length and from 40-80 mm in diameter. • About 1000 tubes are fitted in a vessel upto 2.5 meter or more in diameter. • This part is called as "calandria". • The tubes are filled with liquid and surrounded by steam. • The level of liquid is maintained slightly above the top of the tube so that the space which is left in the evaporator can be used for the purpose of separation of from boiling liquid. **Diagram: (1M)**  **Dias advantages: (0.5 X 2 = 1M)** 1. It is quite complicated and expensive in construction. 2. Difficult to clean. **3.** Maintenance is costly.	
3	**d)**	**Explain any four factors affecting filtration. Draw a well labelled diagram of leaf filter.** **Factors which affect the rate of filtration are: (0.5x 4)** **1. Pressure:** The rate of filtration of liquid is directly proportional to the pressure difference between the filter medium and filter cake. Thus, the rate of filtration can be increased by applying pressure on the liquid being filtered or by decreasing the pressure beneath the filter. **2. Viscosity:** The rate of filtration is inversely proportional to the viscosity of the liquid undergoing filtration. Liquids which are very viscous get filtered slowly. Reduction of viscosity of a liquid by raising the temperature is frequently done in order to accelerate filtration. **3. Surface area of filter media:** The rate of filtration is directly proportional to the surface area of filter media. Filter press works on this principle. **4. Temperature of liquid to be filtered:** Viscosity is reduced by a rise in temperature and filtration of viscous oils, syrups, etc. is often accelerated by filtering them while they	**3M** **(2+1)**

		are still hot. **5. Particle size:** The rate of filtration is directly proportional to the particle size of the solid to be removed. It is easier to filter a liquid having coarse particles than that having finely divided particles. **6. Pore size of filter media:** The rate of filtration is directly proportional to the pore size of filter media. **7. Thickness of cake:** The rate of filtration is inversely proportional to the thickness of the filter cake formed during filtration. As the filtration process proceeds, thickness of cake increases which decreases the rate of filtration. **Diagram of leaf filter :** 	
3	**e)**	**Define the official grades of powders according to I. P.** **According to IP 2010 official grades of powders are as follows:** **(consider if 5 grades are correctly mentioned according to old volumes)** **i. Coarse powder:** A powder of which all particles pass through sieve no 10 with nominal aperture size 1.7mm and not more than 40% pass through sieve no 44 with nominal aperture size 355um. **ii. Moderately Coarse powder:** A powder of which all particles pass through sieve no 22 with nominal aperture size 710um and not more than 40% pass through sieve no 60 with nominal aperture size 250um. **iii. Moderately fine powder:** A powder of which all particles pass through sieve no 44 with nominal aperture size 355um and not more than 40% pass through sieve no 85 with nominal aperture size 180um. **iv. Fine powder:** A powder of which all particles pass through sieve no 85 with	**3M**

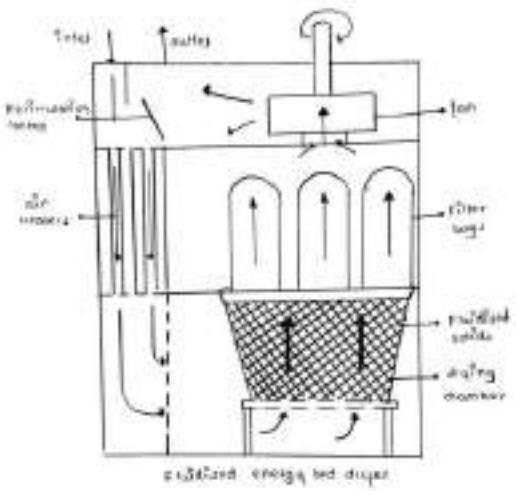
		nominal aperture size 180 um. **v.Very fine powder:** A powder of which all particles pass through sieve no 120 with nominal aperture size 125 um. Vi. **Microfine powder:** A powder of which not less than 90%by weight of particles pass through a sieve with nominal mesh aperture size of 45 um vii. **Superfine powder:** A powder of which not less than 90%by weight of particles are less than 10 µm in size	
3	**f)**	**Define Menstrum and Marc. Write the advantages of alcohol as menstrum.** **Menstrum :-**Solvent used to extract the drug. **Marc:-**The drug residue which remains behind after extraction. **Advantages of alcohol as menstrum (0.5 X 2) =1M** i) The mould and bacteria cannot grow in an alcoholic solution (20% or more). ii) It is neutral and hence extraction products obtained are compatible with other products. iii) It is non-toxic in the concentration mostly present in the preparations. iv) A small amount of heat is required to concentrate the alcoholic preparations. **v)** It dissolves selective active ingredients of drugs.	**3M** **(1+1+1)**
4		**Attempt any FOUR of the followings**	**12M**
4	**a)**	**With a well labeled diagram explain the <u>construction</u> of Autoclave.**  **Construction:** It consists of a strong metallic chamber usually made of stainless steel.	**3M** **(2+1)**

		It has a cover fitted with a steam vent, pressure gauze and a safety valve. Rubber gasket is fitted on the inner side of the lid in order to make autoclave airtight. The cover is closed with wing nuts and bolts. The electrically heated element is fitted at the bottom to heat the water to convert into steam. The perforated inner chamber is place on the stand. The material to be sterilized is loosely packed into it.	
4	**b)**	**Give any three importance of dosage forms. Differentiate between Mouthwash and Gargle.** **Importance of dosage forms :** 1. To protect drug substances from oxidation, hydrolysis, reduction etc.eg. coated tablets, sealed ampoules etc. 2. To protect the drug from destructive effect of gastric juice. eg. - Enteric coated tablets. 3. To provide a safe and convenient delivery of accurate dose. eg. - Tablet, Capsule. 4. To conceal the bitter taste or obnoxious odour of a drug substance.eg. – Capsule, coated tablets, flavoured syrups. 5. To provide optimum drug action in inhalation therapy.eg. Aerosols and inhalers. 6. To provide for the insertion of drug into body cavity. Eg. Suppositories &pessaries. 7. To provide maximum drug action from topical administration sites. Eg. Creams, ointments, ophthalmic preparations, ENT preparations. 8. To provide liquid dosage form of the drugs which are insoluble or unstable in different vehicles.eg. Suspension 9. To provide liquid dosage form of the drugs which are soluble in a suitable vehicle.eg. Solutions **10.** To provide drugs within body tissues. Eg. Injection xi. Sustained release action to control the release mechanism. Eg. Sustained release tablets, capsules and suspensions.	**3M** **1.5 M (0.5x 3)**

Mouthwash	**Gargle**
1. Mouth washes are aqueous solutions with pleasant taste and smell for refreshing effect.	1. Gargles are aqueous solutions to prevent & treat throat infections
2. Used to cleanse & deodorize buccal cavity	2.Used to relieve soreness in mild throat infections.
3.These are used for rinsing mouth cavity	3.The gargle brings drug into intimate contact with mucous membrane of throat

			4. More used for cosmetic purpose	4. used for medicated purpose.		**1.5 M (0.5x 3)**
			5.It contains antibacterial agent,Coloring&flavoring agent.	5.It contains antibacterial agent -Phenol, thymol and Astringent-Potassium chlorate etc.		
			6 Examples: Compound sodium chloride mouth wash, Listrin.	6. Examples: Phenol gargle, potassium chlorate gargle, Betadine.		
4	**c)**	**Write any six salient features of <u>IVthedition</u> of I. P.** 1. It contains 1149 monographs and 123 appendices and available in two volumes. 2. Introduction of computer generated formula 3. Some titles have been changed to include more commonly accepted names in India e.g.HyoscineHydrobromide for Scopolamine hydrobromide. 4. I.R and U.V absorption spectrophotometric tests for identification of drug substance have been introduced. 5. HPLC has been widely used as method of analysis in many formulations. 6. Test for bacterial endotoxins as a more suitable substitute for test for pyrogens. 7. Number of general monographs e.g. eye drops ,eye ointments pessaries have been included. 8. A quantitative method for determining particulate matter in injectable preparation has been replaced by qualitative test. 9. Biological assays provided for vaccines, hormones, blood products. 10. Monograph for (ORS) Bicarbonate dropped due to stability problem			**0.5 X 6 = 3M.**
4	**d)**	**Find the amount of sodium chloride required to make 0.5% Ephedrine HCL isotonic with blood plasma.** **(Given: F.P. 1%, w/v solution of ephedrine HCL= -0.165^0 C** As the concentration of ephedrine hydrochloride in the preparation is 0.5% w/v, the depression in freezing point of ephedrine hydrochloride = 0.165 X 0.5 = 0.0825^{o}C Percentage w/v of sodium chloride required = <u>0.52 – 0.0825</u>				**3M**

		0.576 = 0.759 % w/v Amount of sodium chloride required to make 100 ml of solution ofEphedrine HCL isotonic with blood plasmais **0.759 g**	
4	**e)**	**Write the <u>advantages</u> of microencapsulation and list different <u>methods</u> of microencapsulation.** **Advantages of microencapsulation:(0.5 X 3)** 1. To mask the bitter taste of drugs like Paracetamol, Nitrofurantoin etc. 2. To reduce gastric and other gastro intestinal (G.I) tract irritations, For eg., sustained release. 3. A liquid can be converted to a solid for easy handling and storage, 4. Hygroscopic properties of core materials may be reduced by microencapsulation. 5. Protection against external environment. 6. Microencapsulation has been employed to provide protection to the core materials 7. Separation of incompatible substance has been achieved by encapsulation. **Different methods of microencapsulation: (0.5 X 3)** 1) Pan Coating 2) Fluidized bed Coating 3) Coacervation 4) Electrostatic Deposition 5) Vacuum deposition 6) Polymerization 7) Multiorific Centrifugal Process.	**3M** **(1.5+ 1.5)**
4	**f)**	**Explain <u>theory and construction</u> of FBD.** **Theory of FBD:** The equipment works on a principle of fluidization of the feed materials. In fluidization process, hot air is introduced at high pressure through a perforated bed of moist solid particulate. The wet solids are lifted from the bottom and suspended in a stream of air (fluidized state). Heat transfer is accomplished by direct contact between the wet solid and hot gases. The vaporised liquid is carried away by the drying gasses. **construction of FBD:** In FBD, good contact between hot air and particles to be dried is obtained which cause rapid drying. Two types of FBD are used in pharmaceutical industry. They are: 1. Vertical FBD 2. Horizontal FBD The fluidising air stream is induced by a fan which is mounted in the upper part of dryer. The air is heated to the required temperature in air heaters and passed through the wet material contained in a drying chamber fitted with a wire mesh support at bottom. The air	**3M** **(1+1+1)**

		flow rate is adjusted by means of recirculation control and fabric filter bags are provided to prevent the passage of fine particles. This type of FBD is a batch type dryer and the drying chamber is removed from the unit for charging ad dumping. The FBD available in different capacities ranging from 5 kg to 200 kg with an average drying time of about 20-40 min. 	
5		**Attempt any FOUR of the followings**	**12M**
Q.5	**a.**	**Explain any <u>one</u> method for preparation of small pox vaccine.** **Ans:** Small pox vaccine is prepared by two methods : **By using animals and by using Eggs** **1) By using animals:** • **Animal: calves or Sheep.** • **Selection of animal:** healthy, non-diseased, animal kept for 10 to 14 days under observation. • **Scarification:** Abdominal part & flanks parts shaved and disinfected. • **Inoculation:** light incision made in the cleared skin without drawing blood with scarifies. Then area is rubbed with some seeds vaccine of known potency. • **Incubation:** 7-9 days, pustule formed at lining. • **Collection of virus:** Animal operated and killed, the material in pustules is withdrawn in aseptic condition. • **Purification:** pustules + glycerin mixed and stored at -10^{0}C to remove impurities. • **Filling sealing and storage:** filled in final container under aseptic condition and freeze drying.	**3M** **(Any one 3M)**

2) By using Eggs:

Hen egg is used

(Which is incubated after 12 days)

↓

Small cut on the shell

(exposed chorio-allantoic membrane)

↓

In this membrane, viruses are inoculated

(by seed of known potency)

↓

Cut was sealed by flap or paraffin wax

↓

Again incubate for 72 hours

↓

Using aseptic condition, shell is removed and chorio-allantoic membrane is

separated

↓

Contents are added in normal saline solution at 0° ↓

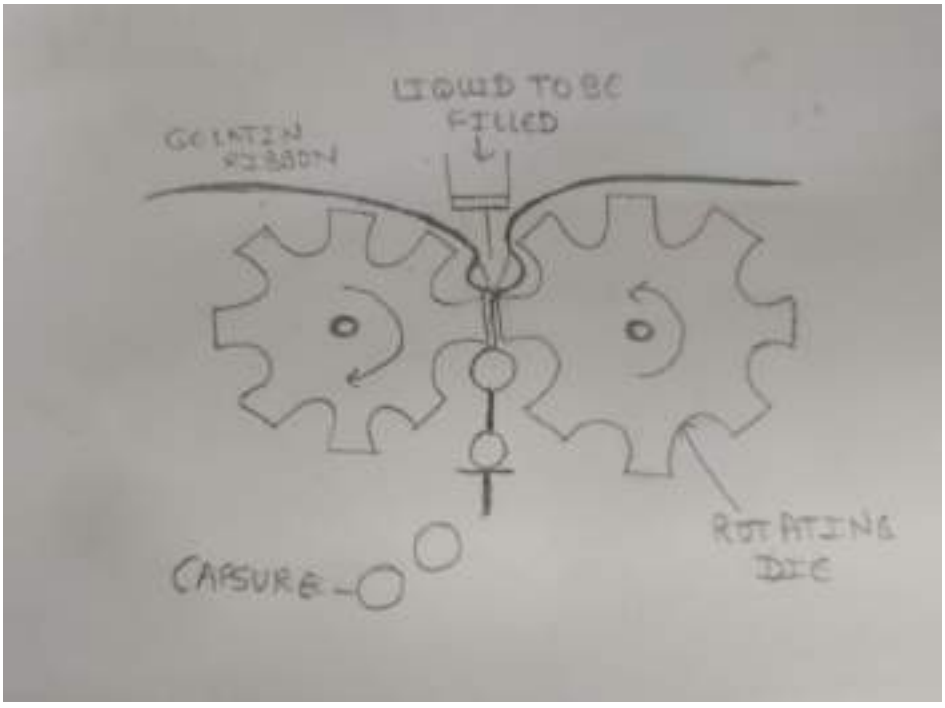
Add 50 % glycerin

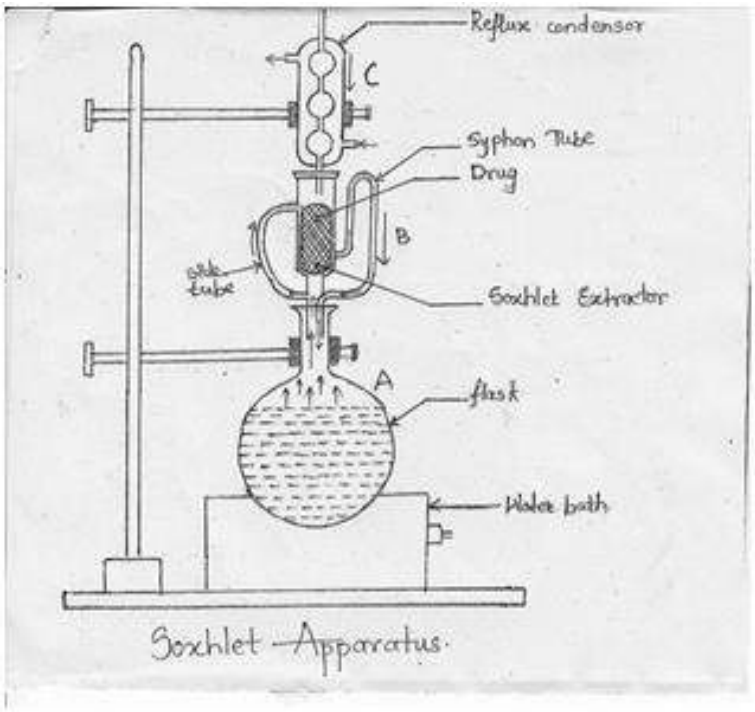
↓

Material is ground to produce homogenized suspension.

↓

Transfer to suitable sterile container and freeze dried

Q.5	b.	**Describe method for preparation of soft gelatin capsule using rotary machine.** **Method of Preparation: (2M)** **Liquid gelatin produce two ribbon** ⇩ **These come between rotating dies which rotates in opposite direction.** ⇩ **Form half shell of capsule** **At this stage measured quantity of drug is filled in shell** ⇩ **With further movement of dies other half is formed** ⇩ **Sealing is done by hot rotating dies** ⇩ **The capsule formed are washed and dried.** **Diagram: (1M)** 	**3M** **(2+1)**

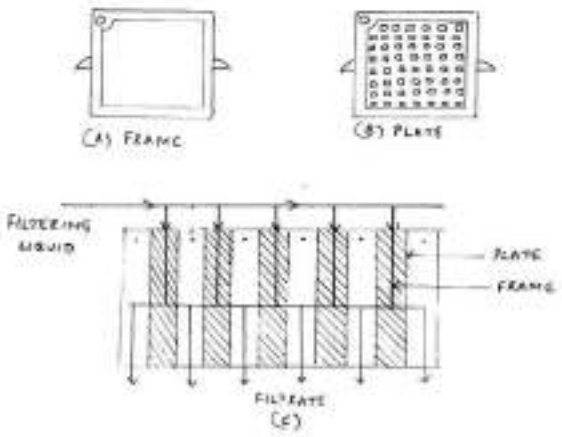
Q.5	**c.**	**Draw a labelled diagram of apparatus used for continuous hot extraction process. Mention limitations of the process.** **Diagram: (2M)**  **Limitations: process cannot be used in following conditions. (0.5 X 2 = 1)** • **Physical character of the drug:** Drugs which may block the apparatus such as opium, gums, resins, etc cannot be used. • **Solvent:** Only pure solvents or constant boiling mixtures can be used for this process. • **Chemical constituents:** Unsuitable for thermolabile drugs, such as enzymes, alkaloids, etc	**3M** **(2+1)**
Q.5	**d.**	**Explain the <u>construction and working</u> of filter press.** **Construction: (1M)**	**3M** **(1+1+1)**

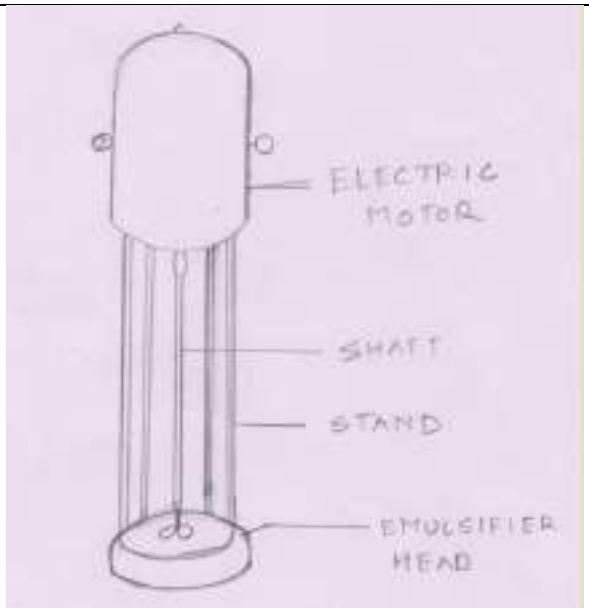
- It consists of alternative plate and frame mounted on two parallel support bars.
- The pressure can be applied through screw thread so that the plate and frame are rigidly fixed between two end plates.
- The frame is open and is used as an inlet for material to be filtered.
- Plates has grooved surface which give support to the filter cloth.
- The plate and frame are made of non-corrosive material.
- Filter cloth is placed at each side of the plate.
- Each plates acts as single filtration unit and outlet is connected to common outlet for plate.

Working: (1M)

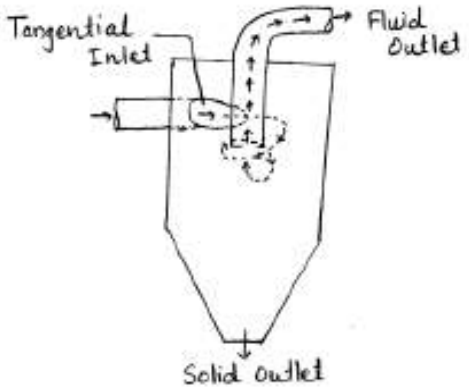
- The slurry is pumped in under positive pressure up to 20 bar and fill each frame.
- The filtrate passes through the cloths on opposite sides of the frame and runs down between the studs on the plate surface.
- There is an outlet cock in the bottom right hand corner of the frame allowing the filtrate to discharge in to channel.
- The solid in the slurry build up to form cake in each frame which will eventually meet in the centre of the frame.
- When the process is stopped, the frame is emptied and cycle is restarted.
- Thickness of cake can be varied by using frame of different thickness.

Diagram: (1M)

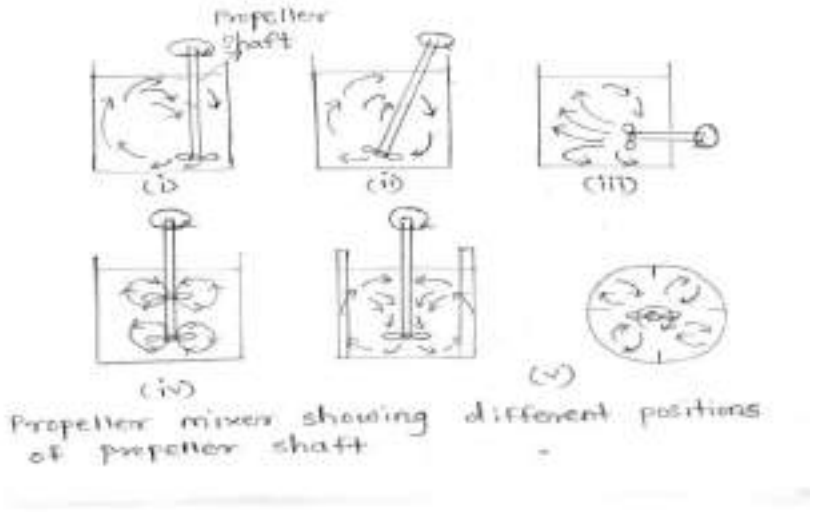
			
Q.5	**e.**	**Explain the <u>construction and working</u> of silverson mixer homogenizer.** **Ans: Construction (1M)** • It consists of emulsified head which is covered with fine meshed stainless steel sieve. • The emulsifier head consist of a number of blades which rotates at a very high speed, to produce powerful shearing action. • The blades are rotated by using an electric motor fitted at the top. **Working: (1M)** • The emulsified head is placed in the vessel containing immiscible liquid, in such a way that it should get dipped into it. • When the motor is started, the liquid is sucked through the fine holes and the oil is reduced into fine globules due to the rotation of blades. • So a fine emulsion is produced which is then expelled out. **Diagram: (1M)**	**3M** **(1+1+1)**

			
Q.5	**f.**	**Explain the following manufacturing defects of tablets:** **1. Capping and lamination: (1.5M)** **Capping**: is partial or complete removal of top or bottom portion of tablet. **Lamination:** is whenever tablet is breaking or separating anywhere rather than top. **Reasons:** • Excessive fine. • Defective punch and die. • High speed of machine. • Granules too dried • Entrapment of air. • Less use of binder etc. **Remedies:** • Setting the die and punch properly. • Reduce % of fine. • Punches should be polished. • Maintain the desire moisture in granules. • Maintain the speed at optimum. • Regulate the pressure of punches.	**3M** **(1.5 +1.5)**

		2. Picking and Sticking: (1.5M) • The material is removed or picked up by upper punch from the upper surface of the tablet. • In the sticking he material sticks to the wall of the die cavity. • **Reasons:** i. Use of worn out die and punch. ii. Use of small quantity of lubricants. iii. Presence of excess moisture in the granules. iv. Scratches on the surface of the face of the punches. v. Defect in formulation. • **Defect can be removed:** i. Using new set of die. ii. Adding proper quantity of lubricants in granules. **iii.** Dry granules.	
Q.6		**Answer any FOUR of the following:**	**12M**
Q.6	**a.**	**Explain the <u>construction and working</u> of cyclone separator.** **Construction: (1M)** • It consists of cylindrical vessel with a conical base. • In upper part of vessel is fitted with a tangential inlet and fluid outlet. • At the base it is fitted with solid outlet. **Working: (1M)** • The suspension of solid in gas is introduced tangentially at a very high velocity. • The rotary movement takes place within the vessels. • The fluid is removed from the outlet at the top. • The rotatory flow within the cyclone separator causes the particle to be acted on by centrifugal force. • The solids are thrown out to the wall and fall to the conical base for discharge. **Diagram (1M)**	**3M** **(1+1+1)**

		 Cyclone Separator	
Q.6	**b.**	**Give <u>principle, method and application</u> of sterilization using UV radiation.** **Principle: (1M)** • Direct sunlight can destroy the microorganism on account of its ultra-violet rays of longer wave length. • UV light of shorter wavelength kills or inactivates microorganisms by destroying nucleic acids and disrupting their DNA, leaving them unable to perform vital cellular functions. • UV light of 265 nm wave length is lethal to microorganism. **Method: (1M)** • UV rays for sterilization are produced by passing a low current at high voltage through mercury vapour in an evacuated glass tube. **Application: (0.5 X 2 =1M)** • Sterilization of air. • Sterilization of aseptic area. • Sterilization of thermolabile material. • Sterilization of surface of working table.	**3M** **(1+1+1)**
Q.6	**c.**	**Define evaporation and explain any <u>four</u> factors affecting evaporation.** **Definition: (1 M)** • Evaporation is the free escape of vapour from the surface of a liquid bellow its boiling point**.** **Factors affecting evaporation: (0.5 X 4 =2M)**	**3M** **(1 + 2)**

		1) **Temperature:** The rate of evaporation is directly proportional to temp of liquid. 2) **Temperature and time of evaporation:** It has been observed that exposure to relatively a high temp for short period of time may be less harmful to the active principles of a drug than a lower temp with exposure for a longer period. 3) **Temp and moisture content:** Some drug constituent decomposes more readily in the presence of moisture if heated at high temp. This is due to the hydrolysis of the active constituent to avoid decomposition to the active principle of such material the evaporation is done at low temp and then final drying is done at high temp. When only little moisture remains in it. 4) **Types of product required:** On evaporation of the liquid the conc. Liquid, semisolid and solid are formed. The selection of the method and the equipment required for the evaporation depends upon the type of the product required 5) **Effect of concentration:** During evaporation the upper layer of the liquid under evaporation has a tendency to form a film and formation of ppt in the product which results in lowering down of the rate of evaporation. Therefore, efficient steering is required in order to prevent degradation of the product at the bottom due to excessive heat and it will also prevent deposition of solid 6) **Surface area:** The rate of evaporation is directly proportional to the surface area of the evaporator, in which the liquid is evaporated. 7) **Vapour pressure of the liquid to be evaporated:** The rate of evaporation is directly proportional to the vapour pressure of the evaporating liquid.	
Q.6	**d.**	**List the various equipment's used for liquid mixing and explain how vortex formation can be avoided in liquid mixing.**	**3M**

		Equipment used for mixing of liquid: (0.5 X 2 =1M) 1. Propeller mixture. 2. Turbine Mixture. **3.** Paddle mixture. **Vortex formation can be avoided in liquid mixing by making the following changes in the position of the propeller shaft. (0.5 X 4 = 2M)** 1. Offset from center. 2. Mounted at angle. 3. Enter the side of vessels. 4. Using push pull propeller. 5. Using baffles.  Propeller mixers showing different positions of propeller shaft	**(1+2)**
Q.6	**e.**	**Define tables. Enlist various excipients used in tablet manufacturing with one example each.** **Definition: (1M)** Tablet is a solid unit dosage form congaing medicament/s usually circular in shape and may be flat or biconvex. OR Tablet is a solid unit dosage form prepared by compression. **List of excipients : (0.5 X 2 = 2)**	**3M** **(1+2)**

		i. Diluents: e.g. lactose, sorbitol, starch etc. ii. Granulating agents:. e g. water, alcohol, starch mucilage, acacia mucilage, tragacanth mucilage, gelatin solution, isopropyl alcohol, etc iii. Binding agents: e.g. gum acacia powder, gum tragacanth, gelatin, sucrose, methyl cellulose, etc. iv. Disintegrating agents: e.g. starch, sodium bicarbonate, citric acid and tartaric acid. v. Glidants& lubricants: e.g. talc and magnesium stearate. vi. Colours, flavours and sweetening agents:	
Q.6	**f.**	**Give advantages and disadvantages of glass as a material used for pharmaceutical container and state its types.** **Advantages: (0.5 X 2 =1M)** ❖ Economical. ❖ Available in variety of sizes and shapes. ❖ Chemically inert, impermeable, strong and rigid. ❖ Does not deteriorate with age. ❖ Easy to label. ❖ Excellent barrier against light. **Disadvantages: (0.5 X 2 =1M)** ❖ Fragile, easy to break. ❖ Heavy, Bulky to carry. ❖ Leaching and absorption of alkalis. ❖ Flake formation **Types of Glass: (0.5 X 2 =1M)** 1. Neutral Glass (Type-I) 2. Surface treated soda-lime glass (Type-II) 3. Regular soda-lime glass or Alkali glass (Type-III). 4. General Purpose soda-lime glass (Type-IV).	**3M** **(1+1+1)**

WINTER– 19 EXAMINATION

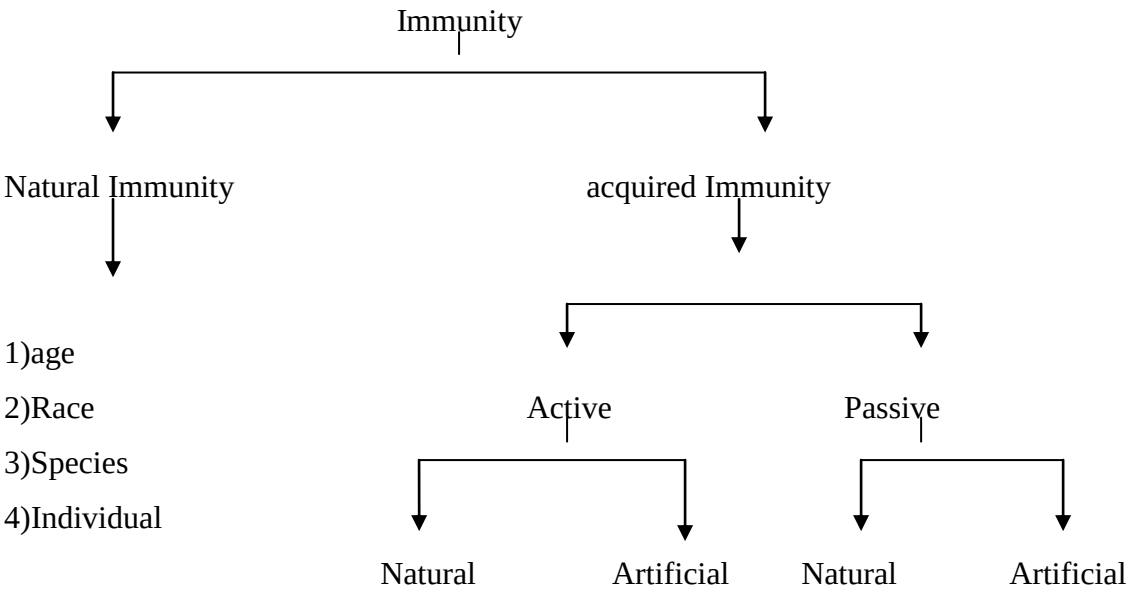
Subject Title: PHARMACEUTIC-I Subject Code: 0805

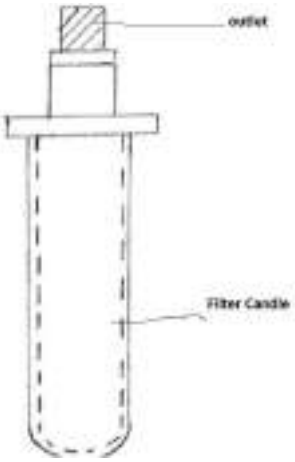
Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

WINTER– 19 EXAMINATION

Subject Title: PHARMACEUTIC-I Subject Code: 0805

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any EIGHT of the followings:**	**16M**
1	**a)**	**Define:** **(1) Sieve number:** It is the number of mesh in 2.54cm transverse direction parallel to wire. **(2) Pharmaceutical Aid:** Pharmaceutical aids are the substances which have no or little pharmacological effect but they are essentially used in the preparation of pharmaceutical dosage form.	**(1+1=2M)**
1	**b)**	**Define and classify Immunity.** **Definition:** The power of body to resist the effects of invasion of micro-organisms is called immunity. **Classification:**  	**(0.5 +1.5=2M)**
1	**c)**	**Give disadvantages of glass.** **Disadvantages:** ❖ Fragile, easy to break. ❖ Heavy, Bulky to carry. ❖ Leaching and absorption of alkalis. ❖ Flake formation	**(0.5 X 4 =2M)**
1	**d)**	**Mention precautions to be taken while using of eye drop.** ☐ Do not touch the tip of the dropper.	**(0.5 X 4 = 2M)**

		☐ Never rinse the dropper. ☐ Never use eye drop that have changed colour. ☐ After instillation of drop, do not close eyes tightly or blink more than usual. ☐ Discard the content after one month of use.	
1	**e)**	**Give reason why glycerine is added in throat paint.** **Glycerine** is commonly added in throat paint as a base because being viscous; it adheres to mucous membrane for a long period. It also provides a sweet taste to preparation.	**(2M)**
1	**f)**	**Mention different mechanisms for size reduction.** i. Cutting ii. Compression iii. Impact iv. Attrition v. Combined impact and attrition	**(0.5 X 4= 2M)**
1	**g)**	**Draw well labelled diagram of filter candle.** 	**2M**
1	**h)**	**What is galanicals?** A standard medicinal preparation (as an **extract** or tincture) containing usually one or more active constituents of a plant and made by infusion decoction, maceration or percolation process that leaves the inert and other undesirable constituents of the plant undissolved.	**(2M)**
1	**i)**	**Name any two polymers used for film and enteric coating.** **Film Coating.** 1. Hydroxypropyl methyl cellulose. 2. Hydroxyethyl methyl cellulose. 3. Carbowax.	**(1+1=2M)**

		4. PEG-400 5. Ethyl cellulose **Enteric coating:** 1. Cellulose acetate phthalate. 2. Cellulose acetate trimellitate. 3. Cellulose acetate succinate. 4. HPMC acetate succinate. 5. HPMC phthalate. 6. Polymethacrylate. 7. PVAP	
1	**j)**	**State difference between syrup and elixirs** **Syrup** | **Elixir** Syrup is sweet, viscous, concentrated or nearly saturated aqueous solution of sucrose containing 66.7%w/w of sugar | Elixirs are clear, sweetened and flavored hydroalcoholic liquid preparation intended for oral use. Syrup does not contain alcohol. | Elixirs contain both water and alcohol. Syrup contains 66.7%w/w of sucrose. | Elixir does not contain 66.7%w/w of sucrose. Syrup not necessarily a clear preparation | Elixirs are clear preparation Syrups are more viscous than elixir | Elixirs are less viscous than elixir	**(0.5 X 4 = 2M)**
1	**k)**	**List different excipients used in processing of capsule.** i. **Diluents:** To increase bulk, e.g. lactose, sorbitol, starch etc. ii. **Absorbents:** Eutectic or hygroscopic drug need absorbent, e.g. oxides and carbonates of magnesium and calcium. iii. **Glidants:**	**(0.5 X 4 = 2M)**

		To ensure a regular flow of powder, e.g. talc and magnesium stearate. iv. **Antidusting agents:** During filling of capsule in automatic filling machine a lot of dust comes out to avoid this antidusting agent added e.g. inert oils.	
1	**l)**	**Give Metric equivalents for :** (i) **One pint =** 576ml ≈ 600ml (ii) **One fluid drachm =** 4 ml. (iii) **One teaspoonful =** 4 ml (iv) **15 grain =** 972 mg ≈ 1gram.	**(0.5 X 4 =2M)**
2		**Attempt any FOUR of the followings**	**12M**
2	**a)**	**Define sterilization. Classify different methods used for sterilization.** **Sterilization:** It is the process of complete destruction of microorganisms present in the system **Different methods of Sterilization :** **I. Physical methods** 1. Dry heat sterilization 2. Moist heat sterilization 3. Radiation sterilization i) Use of U.V rays ii) Ionizing radiation **II. Chemical methods** 1. Sterilization by heating with bactericide 2. Gaseous sterilization **III. Mechanical methods** 1. Ceramic filters 2. Seitz filters 3. Sintered glass filters 4. Sintered metal filters 5. Membrane filters	**(1+2=3M)**
2	**b)**	**Give principle, working and use of fluidized bed drier.** **Principle:** • If a gas is allowed to flow upward through a bed of solid particle at a velocity greater than the settling velocity of the particle, particle partially suspended in the	**(1+1+1=3 M)**

		gas stream. • The resultant mixture behaves like a liquid and the solid are said to be fluidized. • Each individual particle is surrounded by drying gas with the result that drying take place in much shorter period. • It also provides uniform condition of temperature, composition and size distribution. **Working:** • In fluidized bed dryer air is introduced by fan situated in the upper part of dryer. • Air is heated by heater to required temp and air flow is adjusted by recirculation control and air is filtered by filter bags to prevent the passage of fine particles to dryers, then air is passed to the bottom to flow through the bed of material to be dried. • They are available in different capacity ranging from 5 kg to 200 kg and drying time is 20 to 40 mins. **Use: (0.5X2=1M)** • Used in granulation process for tablet preparation • It is used in coating. • Used for drying of filter cake.	
2	**c)**	**Define capsule. Differentiate between hard and soft gelatine capsules.** **Capsule:(1M)** Capsules are a solid unit dosage form in which the drug substances are enclosed in a water soluble shell or an envelope.	**(1M +2M = 3M)**

Differentiate: (0.5 X 4=2M)

Sr.No	**Hard gelatin capsules**	**Soft gelatin capsules**
1.	The hard gelatin capsule shell consists of two parts: Body and cap	The soft gelatin capsule shell becomes a single unit.
2.	They are cylindrical in shape.	They are available in round, oval and tube-like shapes.
3.	The contents usually consist of medicaments in the form of powder, beads or granules.	The contents usually consist of liquids or semisolids.
4.	These are prepared from gelatin, titanium dioxide, colouring agent and plasticizer.	These are prepared from gelatin, more amount of plasticizer (sorbitol or glycerin) and preservative.
5.	Filling and sealing takes place in different steps.	Filling and sealing are done in a combined operation of machines
6.	Shell is perfectly dry.	Shell is not perfectly dry
7.	These capsules can be adulterated	These capsules cannot be adulterated
8.	Eg. Becosules capsules	Eg. Pudin Hara

2 d) Mention advantages and disadvantages of plastic containers. **(1.5 +1.5 = 3M)**

Advantages: (Any 3, 1.5 mark)

1. Light in weight and can be handled easily.
2. Poor conductor of heat.
3. Sufficient mechanical strength.
4. Transported easily.
5. Unbreakable.
6. Available in various shapes and sizes.
7. Good protection power.
8. No formation of flakes.

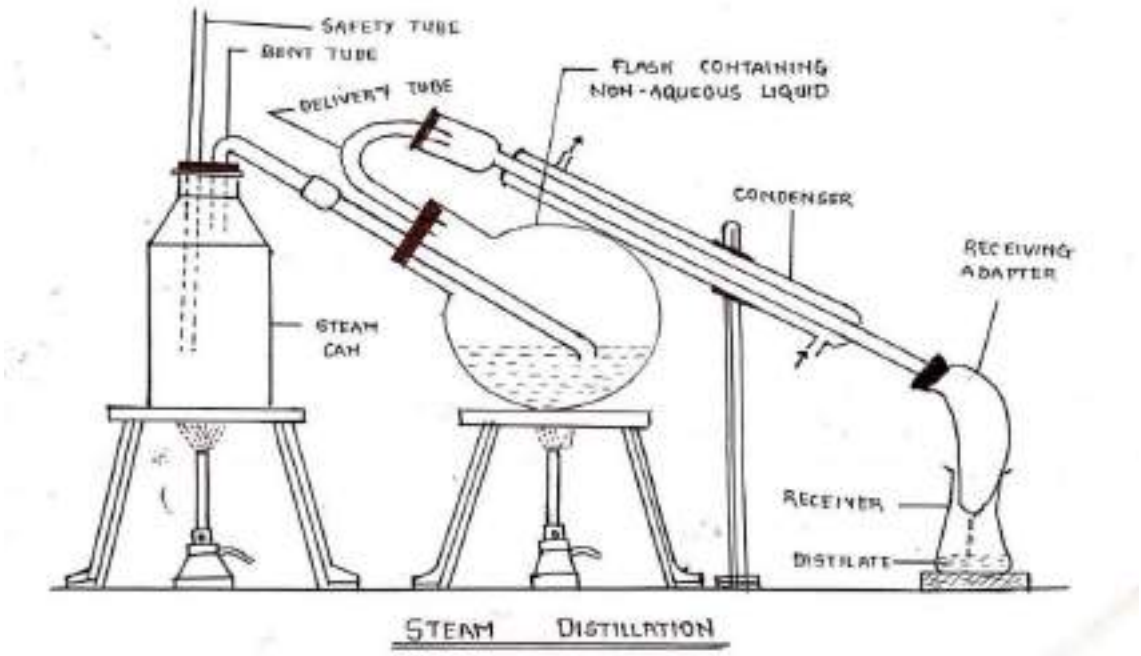
Disadvantages: (Any 3, 1.5 mark)

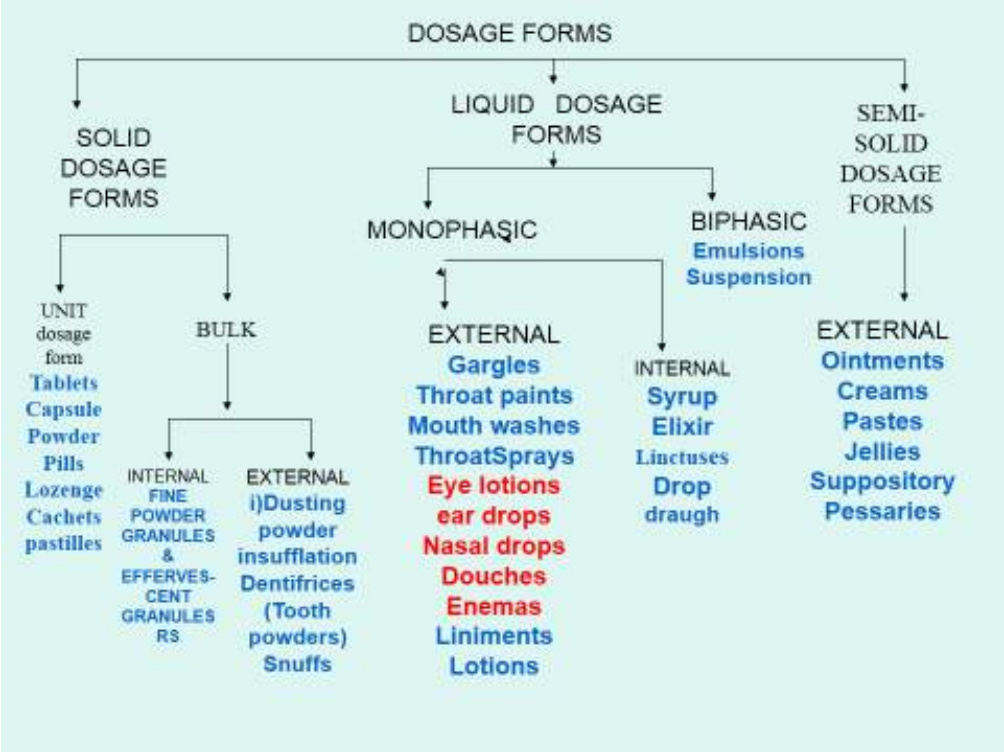
		1. Permeable to water vapour and atmospheric gases. 2. Cannot withstand heat without softening or distortion. 3. May interact with certain chemical to cause softening or distortion. 4. May absorb chemicals such as preservatives. 5. Relatively expensive. 6. Special type of gum or adhesive required for labelling.	
2	**e)**	**Give salient features of IIIrd edition of I.P.** ■ New analytical techniques like flame photometry, flurometry, electrophoresis and photometric haemoglobinometry were introduced. ■ Dissolution test for tablet introduced. ■ Disintegration test amended with modification. ■ A Microbial limit test prescribed for some pharmaceutical aids and oral liquid preparations. ■ Pyrogen test revised. ■ Gas liquid chromatography recognized as alternate method for alcohol determination. ■ Test for Viscosity modified. ■ New appendix "water for pharmaceutical use" has been introduced. ■ Drugs renamed e.g. acetyl salicylic acid-aspirin. ■ Many drugs omitted and new drugs added.	**(0.5 X 6 = 3M)**
2	**f)**	**How many tablets, each containing 8.75 grains of mercuric chloride will be required to make one quart of 0.05% solution?** 4.375 gr. in 1 fl ounce = 1% w/v solution 4.375 gr X 0.05 = 0.2187 gr required to get 1 fl.oz 0.05% 0.2187 gr x 40 = 8.748 gr≈ 8.75 grain required to get 40 fl.oz 0.05 % 8.75 gr/8.75 gr = 1 tablets Therefore, one tablet is required to prepare one quart of 0.05% solution.	**3M**
3		**Attempt any FOUR of the followings**	
3	**a)**	**Define and classify different types of tablets** **Definition(1M)** Tablets are solid unit dosage form containing medicament or medicaments usually	**(1+2= 3M)**

		circular flat or biconvex. OR Tablet is a solid unit dosage form prepared by compression. **Classification of tablets:(0.5X4=2M)** **1. Tablets ingested orally:** a)compressed tablet b)multiple compressed tablets c) multi-layered tablets d)sustained release tablets d)enteric coated tablets e)sugar coated tablets f)film coated tablets g)chewable tablets **2. Tablet used in oral cavity:** a) Buccal tablets b) Sublingual tablets c) Lozenge tablets and traches d) Dental cones **3. Tablets administered by other routes:** a) Implantation tablets b) Vaginal tablets **4. Tablets used to prepare solutions** a) Effervescence tablets b) Dispensing tablets c) Hypodermic tablets d) Tablet triturates	
3	**b)**	**Give principle, working and use of autoclave** **Principle:** • The steam has more penetration power than dry heat and thermal capacity of steam is more than thermal capacity of dry heat. • The method is useful for killing of bacterial spores. • The moist steam penetrate the spores and capsules of bacteria, rupture it and • Escaping protoplasma it coagulated. • The temperature conditions for autoclaving: 1 115^0C to 118^0C for 30 min. 2 121^0C to 124^0C for 15 min. 3 126^0C to 129^0C for 10 min. 4 134^0C to 138^0C for 5 min. **Working:** • A sufficient quantity of water is poured into the chamber after removing the perforated basket. • The level of water adjusted in such a way that it should not touch the bottom of perforated basket.	**(0.5+1.5+1 =3M)**

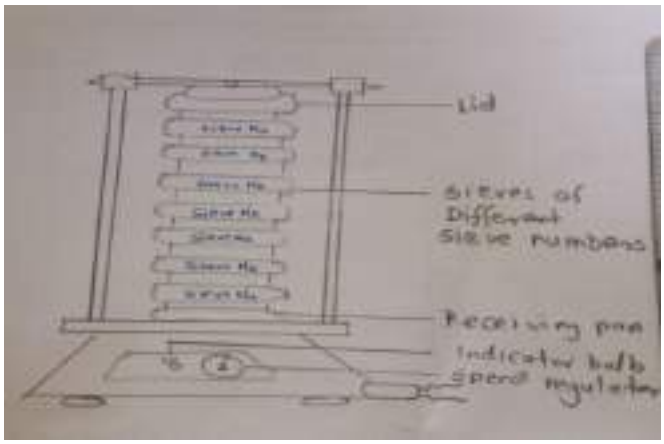
		• The material is placed in the basket and it placed in the autoclave. • Close the lid with wing nuts and bolts. • Switch on the heater. • Vent is opened and safety valve is set to required pressure. • When steam comes out for 5 min, then close the vent, the steam pressure stats rising it should be maintained to required level. • After the stated time, switch off the autoclave. • Allow to cool to about 40^{o}C. • Open the vent and allow the complete steam to pass from autoclave. • Lid is opened and sterilized material is taken out **Use: (0.5X2=1M)** • Sterilization of surgical dressings and surgical instruments. • Sterilization of containers and closers. • Sterilization of official injections	
3	**c)**	**Based on Darcy's law, discuss different factors which affect rate of filtration** This is also called as theory of filtration which gives idea about factors affecting rate of filtration through the filter medium. Any fluid while passing through porous medium offers resistance, the rate of filtration through the filter media is expressed in the form of an equation which is known as Darcy's law The equation is, $V = KA \Delta P/ \mu l$ Where , V = Volume of filtrate K = permeability coefficient & is dependent on filter medium & filter cake. A = Area of filter bed. ΔP = Pressure drop across filter medium & filter cake. l = Thickness of filter cake μ = Viscosity of filtrate Thus, According to Darcy's law different factors which affect rate of filtration are: **(0.5X4=2)** **1. Surface area of filter media:** The rate of filtration is directly proportional to the surface area of filter media. Filter press works on this principle. **2. Pressure difference on the liquid and below the filter medium:** The rate of filtration of liquid is directly proportional to the pressure difference between the filter	**(1+2= 3M)**

		medium and filter cake. Thus, the rate of filtration can be increased by applying pressure on the liquid being filtered or by decreasing the pressure beneath the filter. **3. Viscosity:** The rate of filtration is inversely proportional to the viscosity of the liquid undergoing filtration. Liquids which are very viscous get filtered slowly. Reduction of viscosity of a liquid by raising the temperature is frequently done in order to accelerate filtration. **4. Thickness of cake:** The rate of filtration is inversely proportional to the thickness of the filter cake formed during filtration. As the filtration process proceeds, thickness of cake increases which decreases the rate of filtration.	
3	**d)**	**Define and discuss different types of container** **Container** is a device that holds the drug and it may or may not be in direct contact with the pharmaceutical preparations. **containers are divided into following types on the basis of their utility (0.5X4=2M)** 1. **Well-closed containers:** A well-closed container protects the contents from loss during transportation, handling, storage or sale etc. 2. **Single dose containers:** These containers are used to supply only one dose of medicament and hold generally parenteral products e.g. ampoules and vials. 3. **Multi dose containers:** These containers allow the withdrawal of dose at various intervals without changing the strength, quality or purity of remaining portion. These containers hold more than one dose. e.g. vials. 4. **Light-resistant containers:** These containers protect the medicament from harmful effects of light. Used for photo-sensitive medicaments. 5. **Air-tight containers:** These are also called hermetic containers. These containers have air-tight sealing or closing to protect the products from dust, moisture and air. 6. **Aerosol containers :** These containers have adequate mechanical strength in order to bear the pressure of aerosol packing	**(1+2= 3M)**

3	**e)**	**Draw a neat labelled diagram showing steam distillation at laboratory scale**  	**3M**
3	**f)**	**How many ml of 80%, 60% and 50% of alcohol to be mixed to obtain 100ml of 70% alcohol?** 80 20 parts of 80 % 60 70 20 parts of 60 % 50 10 + 10 = 20 parts of 50 % --------- 60 parts Thus, 100 ml gives 60 parts X ml for 20 parts of 80%=33.33 ml X ml for 20 parts of 60%=33.33 ml X ml for 20 parts of 50%=33.33 ml Answer: One should thus mix 33.33 ml each of 80%, 60% and 50% alcohol to get 70% of 100ml alcohol	**3M**

4		**Attempt any FOUR of the followings**	
4	**a)**	**Define drug. Classify different types of dosage forms with examples** **Drug**- A chemical agent intended for use in the diagnosis, mitigation, treatment, cure or prevention of disease in man or in other animals.  	**(1+2=3M)**
4	**b)**	**Discuss working of freeze dryer.** **Working: steps involved in freeze drying are** 1. **Pre-treatment:** Solution is concentrated in normal vacuum tray dryer before introducing in the chamber this reduces drying by 8-10 times. 2. **Pre-freezing**: Ampoules, vials and bottles having aqueous solution are packed and frozen in cold shelves at a temp. below - 50^0C. 3. **Primary drying:** The material to be dried is spread to increase the surface area for sublimation.98-99% moisture removed. 4. **Secondary drying:** Remaining moisture is removed by vacuum drying done at 50-60^0C.It takes 10-20 hrs. 5. **Packing:** Packaging of product is performed carefully to protect it from moisture. The containers should be closed under aseptic conditions. Containers are labeled and packed in card-board boxes.after drying.	**3M**

4	**c)**	**Explain why there is need of different dosage form.** **Need of dosage forms :** 1. To protect drug substances from oxidation, hydrolysis, reduction etc.eg. coated tablets, sealed ampoules etc. 2. To protect the drug from destructive effect of gastric juice. eg. - Enteric coated tablets. 3. To provide a safe and convenient delivery of accurate dose. eg. - Tablet, Capsule. 4. To conceal the bitter taste or obnoxious odour of a drug substance.eg. – Capsule, coated tablets, flavoured syrups. 5. To provide optimum drug action in inhalation therapy.eg. Aerosols and inhalers. 6. To provide for the insertion of drug into body cavity. Eg. Suppositories &pessaries. 7. To provide maximum drug action from topical administration sites. Eg. Creams, ointments, ophthalmic preparations, ENT preparations. 8. To provide liquid dosage form of the drugs which are insoluble or unstable in different vehicles.eg. Suspension 9. To provide liquid dosage form of the drugs which are soluble in a suitable vehicle.eg. Solutions **10.** To provide drugs within body tissues. Eg. Injection xi. Sustained release action to control the release mechanism. Eg. Sustained release tablets, capsules and suspensions.	**0.5 X 6 = 3M**
4	**d)**	**Give advantages, disadvantages and applications of sterilization by ionising radiation**. **Advantages:** • The method is reliable and can be accurately controlled • No degradation of media during sterilization, thus it can be used for thermally labile media • Gamma rays have high penetration power thus can be used after packaging	**(1+1+1= 3M)**

		• Leaves no chemical residue • Administration of precise dosage and uniform dosage distribution • Immediate availability of the media after sterilization • Exposure time is less thus can be used for larger quantity **Disadvantages:** • This method is a more costly alternative to heat sterilization Requires highly specialized equipment • The process cannot be stopped once started • The radiations are harmful to the workers **Applications: this method can be used for sterilization of** • Plastic syringes, hypodermic needles, scalpels, surgical blades and adhesive materials. • Bones and tissue transplant, plastic tubing, catheters and sutures. • Sterilization of thermolabile medicaments.	
4	**e)**	**Mention different methods of size separation and explain any one.** **Different methods of size separation are:** 1. Sieving 2. Cyclone separator. 3. Air separator. 4. Elutriation. **SIEVING:** Diagram:  **Construction:** • In this method fine powder is separated from coarse by using sieve of desired	**1+2=3M**

number.

- In sieve separator sieves are arranged in descending order of size.
- The bottom sieve is attached to receiving pan.

Working :Different methods used: 1 Agitation 2 Brushing 3 Centrifugation

CYCLONE SEPARATOR:

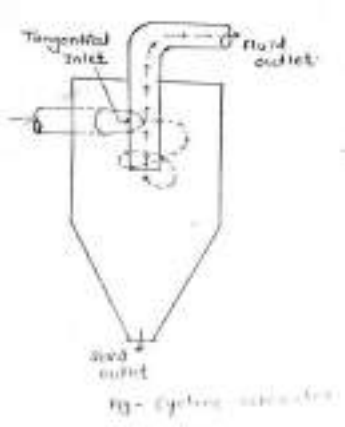


fig- Cyclone separator

Construction-

Cyclone separator is size separation device

It consists of a cylindrical vessel with a conical base.

The upper part of the vessel is fitted with a tangential inlet and a fluid outlet.

At the base it is fitted with solid outlet

Working of cyclone separator

- The suspension of a solid gas (Usually air) is introduced tangentially at a very high velocity so that rotary movement takes place within the vessel.
- The fluid is removed from a central outlet at the top. The rotator flow within the cyclone separator causes the practices to be acted on by centrifugal force.
- The solid are thrown out to the walls. There after it falls to the conical base and discharge through the solid outlet.

AIR SEPARATOR:

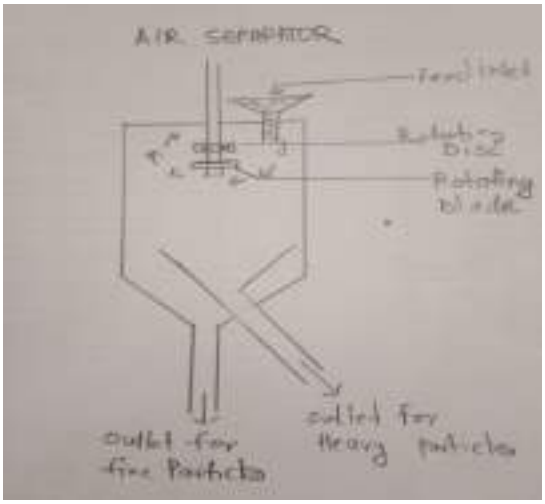
Construction:

- It consist of a cylindrical vessel with conical base
- The upper part of the vessel is fitted with a feed inlet and at base there are two outlets. One for fine and other for heavy particles.

- Rotating disc and blades are attached to the central shaft to produce air movement.

Working:

The sample of powder is passed through the feed inlet, which falls on the rotating disc. The rotating blades are attached to same shaft. The fine particles are picked up and are carried to the space, where air velocity is sufficiently reduced. The fine particles were dropped and collected at outlet. The heavy particles are removed at outlet for heavy particles.



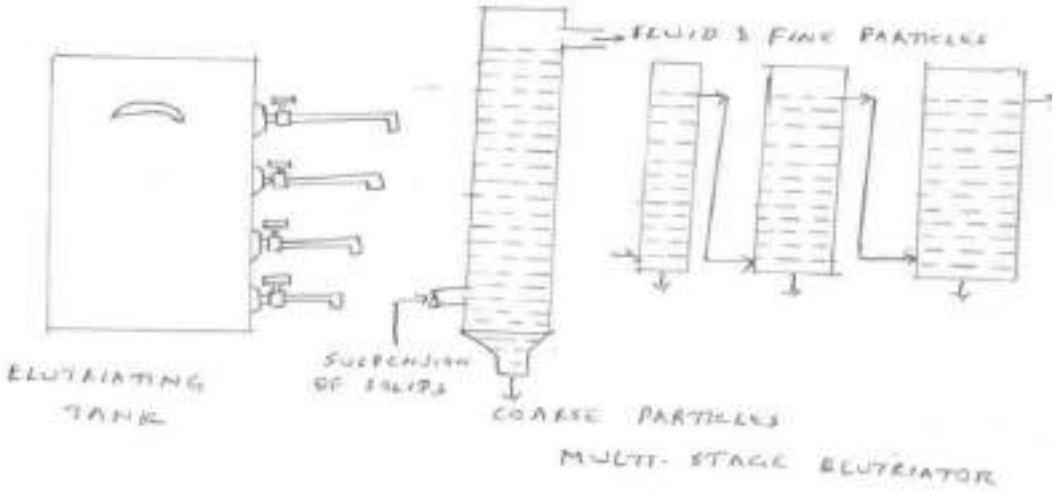
ELUTRIATION:

Construction

- The size separation of powder is based on the low density of fine particles and high density of coarse particles.
- The dry powder or paste is kept in an elutriating tank and mixed with large quantity of water.
- The solid particles are uniformly distributed in the liquid by stirring and then it is allowed to settle down.
- Depending on the density of the solid particles, it will either settle down or remain suspended in water.
- The sample is withdrawn at different heights through the outlets. These are dried and thus the powder with various size fractions is collected.

Working:

- The particles are suspended in a moving fluid, generally water or air.
- The apparatus consists of a vertical column with an inlet near the bottom for

		suspension, an outlet at the base for coarse particles and an overflow near the top for fluid and fine particles. • One column will give a single separation into two fractions. • If more than one fraction is required, a number of tubes of increasing area of cross-section can be connected in series. • The velocity of fluid decreases in succeeding tubes as the area of cross-section increases, thus giving a number of fractions. These fractions are separated and dried. **Application:** Elutriating tank is used to separate the coarse and fine particles of powder after levigation **Diagram:** 	
4	**f)**	**Write in brief about special applications of capsules.** **Special applications of capsules: (any three)** Applications of capsule: **1. Enteric coated capsule:** These capsules do not disintegrate in stomach (Acidic Medium) but break up in intestine (Alkaline medium). On commercial scale, a coating of cellacephate (cellulose acetate phosphate) and mixture of waxes with fatty acids and esters are given. Categories of drug needed coatings: Irritation to GIT • Destroyed in GIT • Specially intended to intestine	**(1 X 3 =3M)**

		• Required to produce delayed action **2. Sustained release capsule:** In order to maintain a proper blood concentration. • Preparation of coated pellets according to different release rate. • E.g. a capsule may be filled with mixture containing 30 % uncoated pellets for immediate release of the drug, 30 % each of the coated pellet, that release the drug 4 hour and 8 hour intervals and 10 % of neutral pellets are mainly used to fill capsule. **3. Rectal Capsule:** • Soft gelatine capsule may be used as substitutes for rectal and vaginal suppositories. • Soft gelatine capsule of various shapes and sizes available but pear shape commonly used. • Both solid and liquid medicament can be filled in to soft gelatine capsule. • Also base used for incorporating medicament is non-toxic, non-irritant and compatible with capsule shell. **4. Capsule containing ophthalmic ointments:** It must be sterile • It required to fill in single dose container • Soft gelatine commonly used • Capsule punctured by using sterile needle and then instilled into the eyes	
5		**Attempt any FOUR of the followings**	**12M**
Q.5	**a.**	**Define Pharmacopoeia. Discuss history of Indian Pharmacopoeia.** **Pharmacopoeia:** Pharmakon means "a drug" and poein means "to make". Pharmacopoeia is defined as a compressive book which is issued under the authority of government and contains a list of drug and formulae used for medicinal preparation with description and the tests for those substances and the standards to which they must confirm. **History of Indian Pharmacopoeia:** The government of India directed the Drugs Technical Advisory Board to list the drugs that are used in India, which are not mentioned in British Pharmacopoeia and also recommend the standards to be prescribed to maintain uniformity and the chemical tests to be used to establish identity and purity. The Government of India published the Indian Pharmacopoeial List in 1946 as a supplement to British Pharmacopoeia. The term	**(1+ 2= 3M)**

list in the title was ‘misleading’ in that, the book not only contained a list of drugs which were of substantial medicinal value but also laid down standards.

The Indian Pharmacopoeial List contained about 180 monographs and a number of appendices prepared on the lines of the British Pharmacopoeia. Approximately 100 monographs were on vegetable drugs growing in India and on their galenicals. `The drugs of plant origin such as artemesia, bael, berberis, cannabis, ispaghula, kaladana, kurchi, myrobalan,picrorhiza, punarnava, rauwalfia, vasakaetc.were included in it. Similarly several oils such as ajowan,cassia, chaulmoogra, neem and pudina were included it. The appendices gave detail for a number of determinations referred to in the monographs.

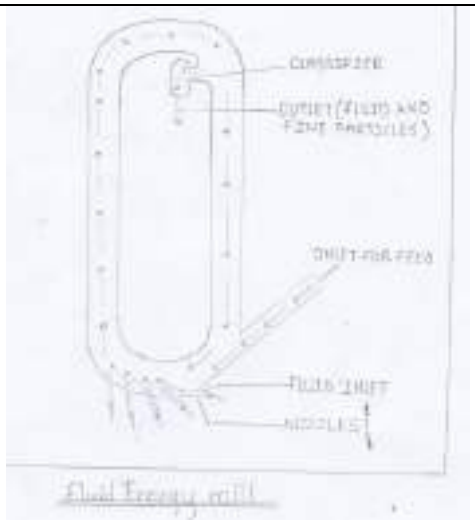
The Pharmaceuticals and Drugs Research Committee of the Council of Scientific and Industrial Research decided in February 1947 to compile a ’Brochure’ to highlight the information and clinical users of the important indigenous drugs of India. Later on it was decided to prepare a ’Codex’ instead of Brochure on the lines of the British Pharmaceutical Codex.

The first Indian Pharmaceutical Codex published in 1953.The Codex consisted of two parts. The part carried about 190 general monographs on natural product and drugs of vegetable and animal origin, and a few chemicals. The second part consisted of formulary of galenicals and other preparations.

After the publications of the Indian Pharmacopoeial List the Government of India, constituted an eleven member Indian Pharmacopoeial Committee in 1948, in their notification No. F.1-1/48-DS dated 23rd November, 1948, for preparing the Pharmacopoeia of India. The tenure of the office of the members of the Committee was five years. It was extended by one year vide Government notification no F.6-10/53-DSdated 21st November 1953. In compiling the monographs of the first Pharmacopoeia of India, help was taken from all available established scientific data in the modern Pharmacopoeia, such as British Pharmacopoeia, the United States Pharmacopoeia, and the international Pharmacopoeia and from scientific institutions interested in drugs and Pharmaceuticals products. The first edition of Pharmacopoeia of India was compiled and then published in 1955.

The second edition of Pharmacopoeia of India was compiled and then published in 1966. The third edition of Pharmacopoeia of India was compiled and then published in

		1985. The fourth edition of Pharmacopoeia of India was compiled and then published in 1996. The fifth edition of Pharmacopoeia of India was compiled and then published in 2007. The seventh edition of Pharmacopoeia of India was compiled and then published in 2010. The eight edition of Pharmacopoeia of India was compiled and then published in 2014.	
Q.5	**b.**	**Explain working of fluid energy mill with a neat diagram.** **Working:(2M)** 1. The material which is to be size reduced is fed in the grinding chamber from the bottom through the feed inlet. 2. The air or inert gas is introduced with a very high pressure through nozzles. 3 .Due to high degree of turbulence, impact and attritional forces between the particles there is size reduction. 4. The air moves at a very high speed in elliptical part carrying with it fine particles that pass through the outlet in a classifier and are collected. 5. The large particles are carried by centrifugal force to the end whereby they are further exposed to the moving air. 6. The design of the mill provides for the internal classification of the particles whereby lighter, finer particles are discharged and heavier particles are retained due to effect of centrifugal force to be reduced to smaller size. 7. Feed should be of 20 to 200 # size &mill produces particles of 1 to30 micron range to get a very fine powder even up to 5μ, the material is pre-treated to reduce the particle size to the order of 100# and then passed through fluid energy mill. **Diagram: (1M)**	**2+1= 3M**

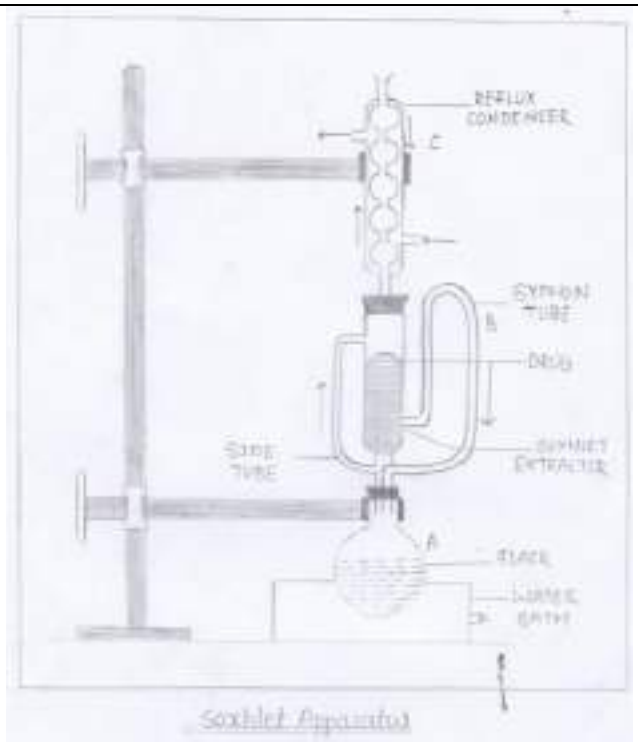
			
Q.5	**c.**	**Define evaporation. Explain any four factors affecting rate of evaporation.** **Definition: (01M)** Evaporation is the free escape of vapour from the surface of a liquid bellow its boiling point. **Factors affecting rate of evaporation:(0.5X4=2M)** **1. Temperature:** The rate of evaporation is directly proportional to the temperature of the liquid. The evaporation can be accelerated by increasing the temperature but it will cause decomposition of heat sensitive principles of many drugs. Many glycosides and alkaloids are decomposed at a temperature below 100oC. Hormones, vitamins, enzymes, antibiotics, malt extract need special treatment to avoid decomposition **2. Temperature and time of evaporation:** It has been observed that exposure to a relatively high temperature for a short period of time (as in film evaporators) may be less harmful than exposure to a lower temperature for a longer period. **3. Temperature and moisture content:** Some drug constituents decompose more readily in the presence of moisture if heated at a high temperature due to hydrolysis. To avoid this, the evaporation is done at a low temperature and then the final drying is done at a high temperature when only little moisture remains in it. **4. Types of product required:** The selection of the method and equipment required for evaporation depends upon the type of product required (liquid, semisolid or solid). **5. Effect of concentration:** During evaporation the upper layer tends to form a film and there is formation of precipitate in the product which results in lowering down the rate of evaporation. Therefore, efficient stirring is required which will prevent degradation of the product at the bottom due to excessive heat and also prevent deposition of solids.	**(1+2 =3M)**

		6. Surface area: The rate of evaporation is directly proportional to the surface area of the evaporator. **7. Vapour pressure of the liquid to be evaporated:** The rate of evaporation is directly proportional to the vapour pressure of the evaporating liquid. The rate of evaporation is maximum at its boiling point when the liquid has maximum vapour pressure.	
Q.5	**d.**	**Describe various stages of sugar coating.** **Steps of sugar coating of tablet:- (0.5X6=3M)** i) Sieving ii) Sealing iii) Sub-coating iv) Syrup coating v) Finishing vi) Polishing **i) Sieving :-** The tablets to be coated are shaken in a suitable sieve to remove the fine powder or broken pieces of tablets **ii) Sealing :-** • Sealing is done to ensure that a thin layer of water proof material, such as, shellac or cellulose acid phthalate is deposited on the surface of the tablets. • The shellac or cellulose acid phthalate is dissolved in alcohol or acetone & its several coats are given in coating pan. • A coating pan is made up of copper or stainless steel. • The pan is rotated with the help of an electric motor. **iii) Sub coating :-** • In sub coating several coats of sugar & other material such as Gelatine, Acacia etc. are given to round of tablet and to help in building up to tablet size. • Several coats of concentrated syrup containing acacia or gelatine are given. • After each addition of the syrup, dusting powder is sprinkled. • The dusting powder is a mixture of starch, talc & powdered acacia. **iv) Syrup coating :-** • This is done to give sugar coats, opacity &color to tablets • Several coats of the syrup are applied • Coloring materials & opacity agent are also added to the syrup	**(0.5X6=3 M)**

		• The process of coating is repeated until uniform colored tablets are obtained **v) Finishing :-** • Three to four coats of sugar are applied in rapid succession without dusting powder and cold air is circulated to dry each coat. Thus forms a hard smooth coat **vi) Polishing :-** • Beeswax is dissolved in volatile organic solvent & a few coats of it are given. • The finished tablets are transferred to a polishing pan is rotated at a suitable speed so the wax coated tablets are rubbed on the canvas cloth. • This gives a proper shining to the tablets	
Q.5	**e.**	**What is aseptic technique? State its importance.** **Definition: Aseptic technique** The method which is used to prevent the access of microorganism during the preparation of parenteral product and their testing are called "Aseptic Technique". **Importance of Aseptic Technique: (0.5X4=2M)** 1. It helps to maintain sterility of product. 2. It avoids contamination of product. 3. It prevents access of microorganism & particles. 4. It helps in filling and sealing of injectable. 5. It helps preparation of ophthalmic products. 6. Safety and efficacy of product can be maintained. 7. It helps to maintain required environment for testing of sterile products.	**(1+2M=3 M)**
Q.5	**f.**	**Mention different types of closures. Comment on materials used for making closures.** **Types of closures with examples: (0.5X3=1.5)** **1. Plug type.** **2. Crown cap.** **3. Push-fit cap.** **4. Screw closures.** **Materials used in pharmaceutical closures: (0.5X3=1.5)** **1) Rubber**	**(1.5+1.5= 3M)**

		• Cork is obtained from the bark of oak tree. • Cork is chemically inert and it does not impart any odour or flavour to the product. • Not used for liquid preparations because of danger of mould growth • Cork closures are rarely used nowadays & replaced by plastic or rubber closures. **2) Glass** • Glass closures are ideal but they mostly slip during transportation and handling. • Mainly used for reagent bottles in laboratories. **3)Plastic** • Plastic closures are nowadays commonly used • They are available in various shapes and sizes. • They are light in weight and are unbreakable. • Plastic closures must be tested for any extractable matter ,physiochemical & biological testing **4)Metal** • Made from tin plate and aluminium. • Aluminium closures are preferred because of their durability and also ease of conversion into desired shape. • Metal closures can be made pilfer-proof by using a liner. **5)Rubber** • Rubber is used mainly for the construction of closure meant for vials, transfusion fluid bottles. • Rubber, two types natural or synthetic,	
Q.6		**Answer any FOUR of the following:**	**16M**
Q.6	**a.**	**Discuss different official grades of powders according to I.P. 2010** **According to IP 2010 official grades of powders are as follows:** **i. Coarse powder:** A powder of which all particles pass through sieve no 10 with nominal aperture size 1.7mm and not more than 40% pass through sieve no 44 with nominal aperture size 355um. **ii. Moderately Coarse powder:** A powder of which all particles pass through sieve no	**4M**

		22 with nominal aperture size 710um and not more than 40% pass through sieve no 60 with nominal aperture size 250um. i**ii. Moderately fine powder:** A powder of which all particles pass through sieve no 44 with nominal aperture size 355um and not more than 40% pass through sieve no 85 with nominal aperture size 180um. **iv. Fine powder:** A powder of which all particles pass through sieve no 85 with .nominal aperture size 180 um. **v. Very fine powder:** A powder of which all particles pass through sieve no 120 with nominal aperture size 125 um. **vi. Microfine powder:** A powder of which not less than 90%by weight of particles pass through a sieve with nominal mesh aperture size of 45 um **vii. Superfine powder:** A powder of which not less than 90% by weight of particles are less than 10 µm.	
Q.6	**b.**	**Classify different methods used for extraction. Draw a labelled diagram of soxhelt extractor** **Methods Of Extraction: (0.5X4=2M)** a) Infusion b) Decoction c) Maceration d) Percolation **e)** Digestion **Diagram of Soxhlet apparatus: (2M)**	**4M**

		 Soxhlet Apparatus	
Q.6	**c.**	**Mention all Q.C. tests to be performed on tablets. Explain any one in detail.** **Q.C. Tests: (0.5X4=2M)** 1. Size and shape of tablet. 2. Appearance. 3. Content of active ingredient. 4. Uniformity of weight/weight variation test 5. Uniformity of content 6. Disintegration. 7. Dissolution. 8. Hardness test. 9. Friability 1. Shape of tablets: Circular with flat or convex faces. 2. Appearance: Uncoated tablet under lens either a relatively uniform texture or a stratified structure. No signs of coating. 3. Content of active ingredient: The amount of active ingredient in tablet is determined by doing the assay. Generally 20 tablets or such other number as may be indicated in the monograph are used in the assay. The result lies within the range for the content of	**(2+2=4M)**

active ingredient in the monograph. The stated limits are between 90 and 110%.

Weight of medicament in each tablet	Subtract from the lower limit for the sample of			Add to the upper limit for sample of		
	15	10	5	15	10	5
0.12 g or less	0.2	0.7	1.6	0.3	0.8	1.8
More than 0.12 g and less than 0.3 g	0.2	0.5	1.2	0.3	0.6	1.5
0.3 g or more	0.1	0.2	0.8	0.2	0.4	1.0

4. Uniformity of weight: Weigh 20 tablets selected at random and determine their average weight. Not more than 2 of the individual weights may deviate from the average weight by more than the percentage deviation given in the table and none should deviate by more than twice that percentage.

Sr. No	Average weight of a tablet deviation	Percentage
1	80 mg or less	10
2	More than 80 mg and less than 250 mg	7.5
3	250 mg or more	5

5. Uniformity of content: Percentage of medicament is calculated by doing assay for a particular drug. 20 tablets are taken, powdered and assayed. The average weight of medicament present in each tablet is calculated which is then compared with the desired weight. The pharmacopoeia has prescribed the limit in percentage of medicament per tablet in the monograph**.**

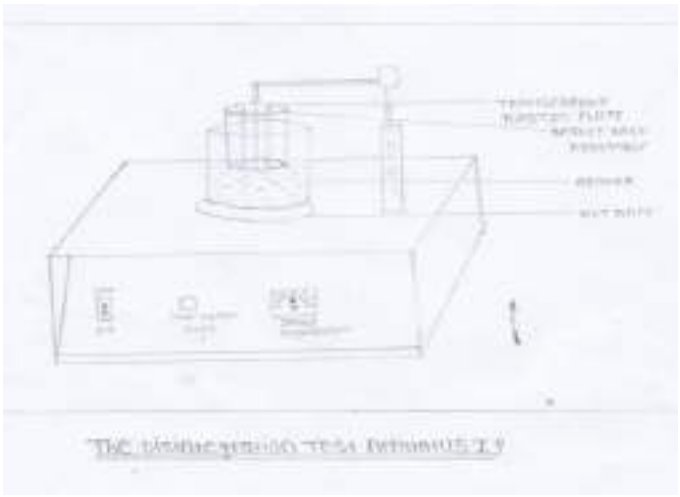
6. Disintegration test: Disintegration of a tablet means to break a tablet into smaller particles after swallowing. The time required to disintegrate the tablet is called disintegration time.

The apparatus consists of a rigid basket-rack assembly supporting 6 cylindrical glass tubes held vertically by two superimposed transparent plastic plates with six holes having the same diameter as the tubes. Woven wire gauze made from stainless steel is attached to the underside of the lower plate. The assembly should be raised and lowered between 28 and 32 times per minute in the liquid at 37^0C.

The tablets are kept immersed in the liquid within the tubes by means of cylindrical guided discs. The assembly is suspended in the liquid medium in a 1000 ml beaker. The

apparatus is operated generally for 15 minutes and observed for disintegration of tablets. The tablets pass the test if all the tablets disintegrate. In case one or two tablets fail to disintegrate, repeat the test on 12 additional tablets. The tablets pass the test if not less than 16 of the total 18 tablets tested have disintegrated.

Diagram:

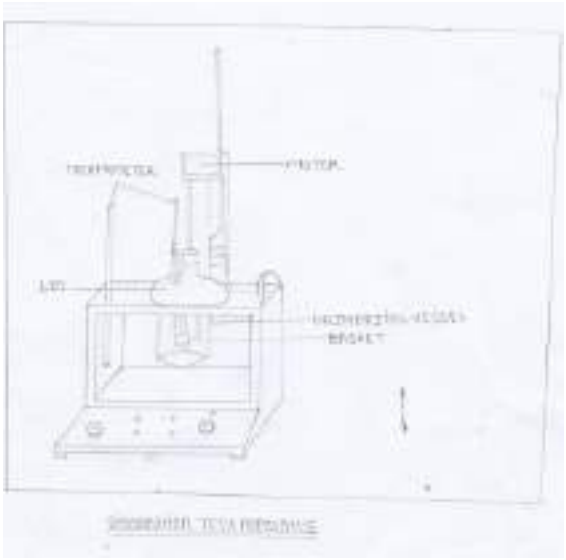


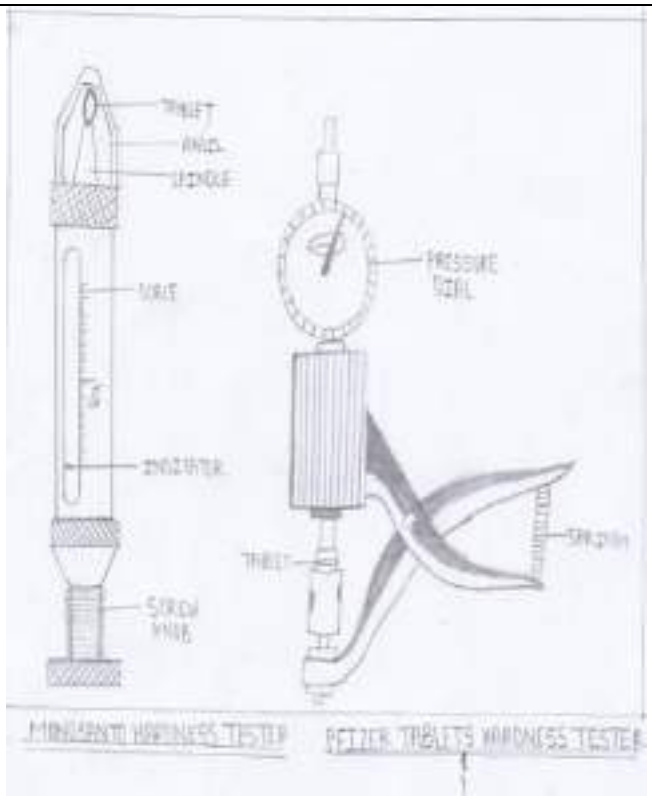
7. Dissolution test: The test is done for measuring the amount of time required for a given percentage of drug substance in a tablet to go into solution under specified condition in vitro.

The apparatus consists a cylindrical covered vessel made of glass or other transparent material having 1000 ml capacity. The vessel is fitted with a lid having 4 holes, one for shaft of stirrer, second for placing thermometer and remaining two for removing the sample.

An electric motor which is capable of rotating the basket (woven wire cloth having aperture size 425 micrometer) in the vessel at varied speed between 25 and 150 revolutions per minute.

1000 ml of water at 37^0 C + 0.5 ^{o} C in placed and specified number of tablets are placed in the dry basket. The motor is started and the rotation speed is adjusted to 1000 rpm or as directed in the monograph. Withdraw the stated volume of solution from the vessel after 45 minutes or after the time specified in the monograph. Filter and determine the amount of active ingredient present in it. The tablets pass the test if for each of the five replicates; the amount of active ingredient in solution is not less than 70% of the stated

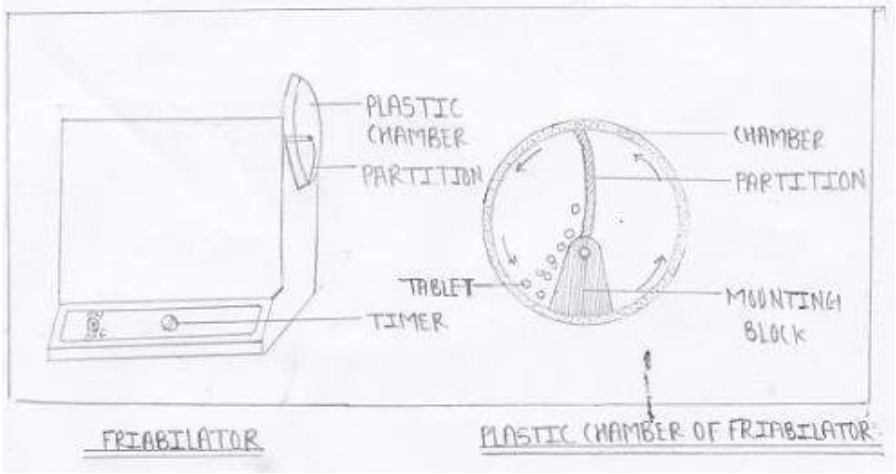
		amount Diagram:  8. **Hardness test:** Manufacturers have set their own limit for the hardness. Monsanto hardness tester or Pfizer tablet hardness tester are the devices used for finding the mechanical strength of tablets. Monsanto hardness tester has a graduated scale which gives the reading in kg/sq. cm. The tablet to be tested is placed between the spindle and anvil. The pressure is applied till the tablet breaks. Pfizer tablet hardness tester is based on the principle of an ordinary plier. The tablet is placed between the jaw of the plier and the pressure is applied by pressing the handles with hand unit until the tablet breaks. Diagram:	



9. Friability test: This test is performed to evaluate ability of the tablet to with stand wear and tear in packing, handling, and transporting. The apparatus used to perform this test is known as "Friabilator".

The apparatus consists of a plastic chamber, which is divided into two parts and it revolves at a speed of 25 rpm. Twenty tablets are weighed and placed in a plastic chamber. The chamber is rotated for 4 minutes or 100 revolutions. During each revolution the tablet falls from a distance of 6 inch. The tablets are removed from the chamber after 100 revolutions and weighed. Loss in weight indicates the friability. The tablets are considered to be of good quality if the loss in weight is less than 1%.

Diagram:

			
Q.6	**d.**	**Define the term vaccine. Discuss the method of preparation of small pox vaccine using animals** **Definition: (1M)** Vaccines are antigenic preparations which stimulate antibody formation and producing immunity. Small pox vaccine is prepared by two methods 1) By using animals 2) By using Eggs By using eggs: **1) By using animals: (3M)** • Animal: calves or Sheep. • Selection of animal: healthy, non-diseased, animal kept for 10 to 14 days under observation. • Scarification: Abdominal part & flanks parts shaved and disinfected. • Inoculation: light incision made in the cleared skin without drawing blood with scarifies. Then area is rubbed with some seeds vaccine of known potency • Incubation: 7-9 days, pustule formed at lining. • Collection of virus: Animal operated and killed, the material in pustules is withdrawn in aseptic condition. • Purification: pustules + glycerine mixed and stored at -100C to remove impurities. • Filling sealing and storage: filled in final container under aseptic condition and freeze drying.	**(1+3 = 4M)**

<table>
<tr><td>Q.6</td><td>e.</td><td>What are NDDS? Differentiate between sustained and controlled release dosage forms.
NDDS: (2M)
New drug delivery system delivers or aimed at maximizing the drug effectiveness or minimizing the side effects. Some of the Novel dosage forms are:
1) Implants
2) Controlled drug delivery system
3) Sustained release system
4) Liposomes
5) Erythrocytes
6) Nanoparticles
7) Prodrugs
8) Film and strips.
Difference between Sustained and Controlled release dosage form: (0.5 X4=2M)
<table>
<tr><td>Sr.No.</td><td>Sustained Release</td><td>Controlled Release</td></tr>
<tr><td>1.</td><td>Onset of action is slow and duration of action is less.</td><td>Onset of action is fast and longer duration of action.</td></tr>
<tr><td>2.</td><td>Frequency of dosing is more.</td><td>Frequency of dosing is less.</td></tr>
<tr><td>3.</td><td>Dose concentration in plasma is not maintained.</td><td>Therapeutically effective and constant concentration of the drug in the plasma is maintained.</td></tr>
<tr><td>4.</td><td>The rate of release is not at predetermined rate.</td><td>The rate of release at predetermined rate.</td></tr>
<tr><td>5.</td><td>It prolongs the release of drug.</td><td>It controls the release of drug.</td></tr>
<tr><td>6</td><td>e.g. sustain release tables.</td><td>e.g. Transdermal patches.</td></tr>
</table></td><td>(2+2=4M)</td></tr>
<tr><td>Q.6</td><td>f.</td><td>Suggest instruments for following operations.
(i)Drying of thermolabile drug: Spray Dryer, Freeze dryer</td><td>4M</td></tr>
</table>

		(ii)Film coating of tablet (iii)Sterilization of powder (iv)Preparation of WFI I.P. (v)Size reduction of Brittle drug (vi)Mixing of ointment (vii)Classification of syrups (viii)Preparation of emulsion **(i) Drying of thermolabile drug:** Spray Dryer, Freeze dryer, vacuum dryer. **(ii) Film coating of tablet:** Tablet Coating Pan, fluidised bed coat. **(iii) Sterilization of powder:** Hot air oven. **(iv) Preparation of WFI I.P.:** Distillation unit **(iv) Size reduction of Brittle drug:** Ball Mill **(v) Mixing of ointment:** Triple Roller Mill, Planetary Mixer. sigma bled mixer etc. **(vi) Classification of syrups (read as clarification of syrup):** Meta filter, **(vii) Preparation of emulsion:** Silverson mixer homogenizer, colloidal mill, hand homogenizer.	

MODEL ANSWER

SUMMER– 2019 EXAMINATION

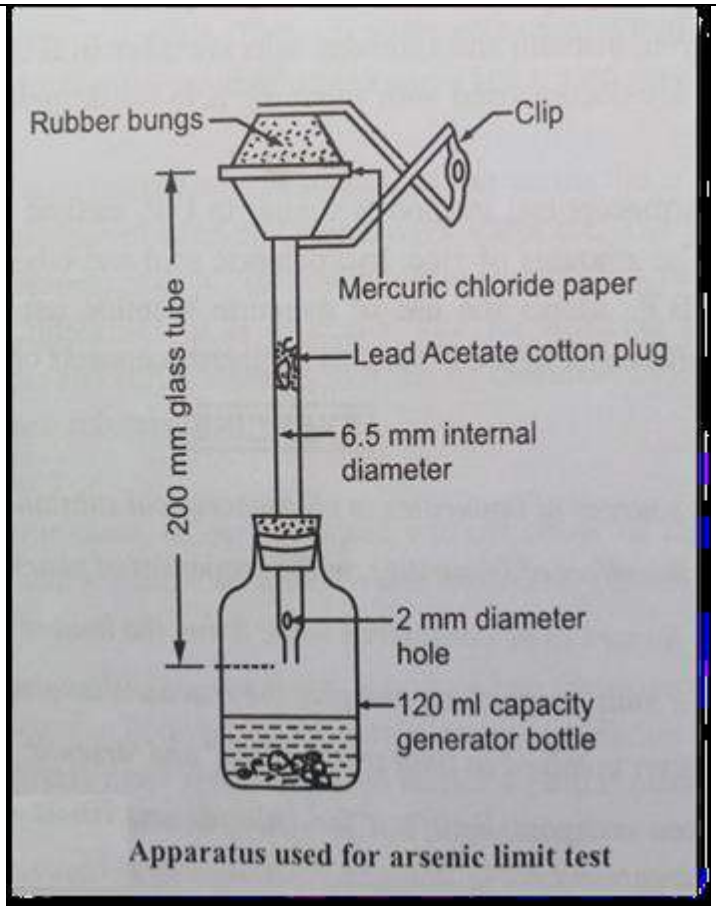
Subject Title: PHARMACEUTICAL CHEMISTRY-I **Subject Code:** 0806

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

1		**Attempt any FIVE of the following**	**20M (4x5)**
1	**a)**	**Explain Arrhenius theory of acid and bases with example. Give its limitations.** **Ans-** Acid or Base on dissolution in water dissociates forming ions and establishes equilibrium between ionized and unionized molecule. Acid is defined as a substance which when dissolved in water gives hydrogen ions. (H +) E.g. $HCl \rightarrow H^+ + Cl^-$ $CH_3COOH \rightarrow CH_3COO^- + H^+$ Base is defined as a substance which when dissolved in water gives hydroxyl ions. (OH-) E.g. $NaOH \rightarrow Na^+ + OH^-$ $NH_4OH \rightarrow NH_4^+ + OH^-$ The process of neutralization is the combination of hydrogen ions and hydroxide ion to forms neutral water molecule. Neutralization reaction:- $H^+ + OH^- \rightarrow H_2O$ **Limitations of Arrhenius Theory:** 1) The definition of acid and base are only in term of aqueous solution not in term of substance. 2) The theory does not explain acidic and basic properties of substance in non-aqueous solvent. 3) The neutralization of acid and base in absence of solvent is not explained. 4) The basic substance which does not contain hydroxide ion is not explained by the theory.	**2M EACH**
1	**b)**	**Define antimicrobial agents. Explain mechanism of action of topical antimicrobials.** Antimicrobials are the chemical agents used to destroy or inhibit the growth of pathogenic Microorganisms. Antimicrobial is a broad terminology describing activity against microbes. **Mechanism of action:** Inorganic compounds generally exhibit antimicrobial action by, either of the three mechanisms viz. **(i) Oxidation** **(ii) Halogenation**	**1M Def. 3 for Mech.**

		(iii) Protein binding or precipitation. **Oxidation Mechanism :** Compounds acting by this mechanism belong to class of peroxide, peroxyacids, oxygen liberating Compounds like permanganate and certain oxo-halogen anions. They act on proteins containing sulphadryl group and oxidises free sulphadryl to disulphide bridge and inactivate its function. **Halogenation Mechanism:** Compounds which liberate chlorine or hypochlorite or iodine act by this mechanism. This category of agents act on peptide linkage and alter its potential and property. The destruction of specific function of protein results in death of microorganisms. **Protein Precipitation :** Many metals in their cation form exhibit protein binding or protein precipitation. The nature of interaction with protein occurs through polar group of protein which acts as ligands and metal ion acts as Lewis acid. The complex formed may be a strong chelate leading to inactivation of protein. This action in general is non-specific. Protein precipitants do not distinguish between the protein of microbes and that of host. Germicidal action results when the concentration of ion is such that reaction is restricted largely to the parasite cell.	
1	**c)**	**Draw a well labelled diagram of apparatus used for limit test for Arsenic. Name it.**	**3M Diag. 1M For Name**

		 Apparatus used for arsenic limit test **Name of apparatus :Gutzeit apparatus**	
1	**d)**	**Define antioxidants. Enlist the criteria for selection of antioxidant.** Antioxidants are the agents which prevent oxidation and deterioration when added to pharmaceutical preparations. Antioxidants are selected based on their property- i) They should be non-toxic. ii) They should be physiologically & chemically inert (other than the action required to prevent oxidation of active ingredient). iii) They should be physiologically & chemically compatible. iv) They should not have solubility problem. v) They should be effective in very small concentration.	**1M Def. 3M Criteria**

1	e)	**Define "Achlorhydria". Write a short monograph of drug used for it.** **Achlorhydria**- Is defined as the condition in which there is absence or no secretion of hydrochloric acid in stomach. Or When due to some reasons, there is no secretion of hydrochloric acid in gastric secretion; the condition is called as achlorhydria. **Example**- Dilute Hydrochloric acid **Molecular Formula** -HCl **Properties of Hydrochloric acid:-** 1. It occurs as a colourless fuming liquid with pungent odour. 2. It is miscible with water, alcohol & has a specific gravity of 1.18. 3. It is a strong acid & attacks metals forming their hydrochlorides with the evolution of hydrogen gas. **Storage of Hydrochloric acid**: It is stored in glass-stoppered containers at a temperature not exceeding 30°C. **Uses Hydrochloric acid:-** 1. Hydrochloric acid as such cannot be used as medicine. 2. The dilute hydrochloric acid is used as acidifying agent. 3. It is also used as a solvent in numerous industries. 4. Also used as laboratory reagent. 5. It is administered with the help of straw in order to protect its abrasive action on teeth. 6. It is used in the management of metabolic alkalosis. It is given by infusion diluted with water or in infusion fluids.	**1M Def. 3M Monograph**
1	f)	**Enlist properties for an ideal antacids. Why antacids are preferred in combination.** **Ideal requirements of an antacid-** 1. It should not be absorbable and cause systemic alkalosis. 2. It should not be laxative or cause constipation. 3. It should exert effect rapidly & over a long period of time.	**2M For Each**

		4. It should buffer in pH 4-6. 5. It should not produce large volume of gas. 6. It should be palatable & inexpensive. 7. It should probably inhibit pepsin. 8. It should be insoluble in water & have fine particle size. 9. It should not have side effects. **Why antacids are preferred in combination.** Any single antacid does not meet the ideal requirements of antacid. So combination antacid preparations are formulated. The objectives of combination antacids are – • The rationale behind such combination is to balance the constipative action of calcium and aluminium containing antacids with laxative effect of magnesium containing antacid. • Antacids are combined so that one has rapid onset of action and another has longer duration of action. • They are combined with Simethicone type compounds which are antifoaming agents. They cause dispersion of gases. E.g. -Combination of Aluminium hydroxide gel and Magnesium hydroxide Combination of Aluminium hydroxide gel and Magnesium trisilicate Combination of Aluminium hydroxide gel and Calcium carbonate Combination of Aluminium hydroxide gel, Calcium carbonate and Magnesium hydroxide. Sodium bicarbonate and alginic acid.	
1	**g)**	**Elaborate the role of iron and calcium in human physiology.** **Role of Iron:** 1. Essential part of Haemoglobin in blood (Treatment of anemia) 2. In blood it transports Oxygen from lung to various organs. 3. It has significant part in Oxidation-reduction reaction constantly taking place in normal metabolism. 4. It is associated with myoglobin, catalase, ferredoxin, Cytochrome P450, electron transport,	**2M EACH**

		enzyme cofactor etc. 5. It is required during growth, Menstrual cycle, pregnancy, pathological bleeding 6. Involved in cellular respiration 7. Production of ATP 8. It is an essential element of several nucleoproteins. 9. Externally used as astringent. **Role of calcium:** 1. Calcium is essential for normal functioning of autonomic nervous system & voluntary Systems. 2. For normal cardiac function. 3. It is important in coagulation of blood 4. Formation of certain tissues & bones. 5. Muscle contraction. 6. Cell membrane permeability.	
1	**h)**	**Explain physiological acid-base balance.** The acid- base balance in the body is well regulated by internal mechanism. A number of chemical reactions take place in the cell to maintain the body pH. The control of pH is done by three mechanisms **1. Buffering system** :- Three major system of buffering occurring in the body – i) Carbonic acid / bicarbonate which mainly occure in plasma and kidney. ii) Monohydrogen phosphate / dihydrogen phosphate found in cells and kidney iii) Protein buffer system. All above buffer system maintain the pH of blood in different organs and prevent drastic changes in pH of body fluids. **2. Respiratory Mechanism**: When respiration is decreased, there is an accumulation of CO_2 in the body which uses up the alkali reserve of the blood resulting in the acidosis. On the other hand, if there is over-breathing which results in excessive excretion of CO_2, the condition of alkalosis may develop? Thus acidity and CO_2 increases are the powerful stimulants of	**4M**

		respiratory mechanism which increase in the rate and depth of respiration. **3. Renal Mechanism:** Kidney has the ability to form ammonia which combine with the acids produced during the protein metabolism and is excreted in the urine. The pH of urine is highly variable between 4.8 to 8.The unstable carbonic acid is removed by respiratory mechanism; the fixed acids like phosphoric, hydrochloric acids are removed by kidneys.	
2		**Attempt any THREE of the following:**	**12M (3X4)**
2	**a)**	**Discuss mechanism of action of antioxidants. Give properties and uses of hydrogen peroxide.** **Mechanism of action of Antioxidants:-(1&1/2 marks)** • The mechanism of action of inorganic type of antioxidants is the same as it is involved in redox chemical reaction. • In a redox reaction, there is a transfer of electron from one compound to the other. • Since oxidation is the loss of electrons from chemical species and reduction is the gain of electrons the overall reaction can be shown as OX + e- → Red • When a substance acts as antioxidant (it being a reducing agent) it gets oxidised itself and prevents the oxidation of the active pharmaceutical species. • A strong antioxidant will protect the material when used in small amount and for longer period. • The inorganic type of antioxidants basically acts as reducing agents. • They are used in pharmaceutical preparations containing easily oxidizable substances to protect them in their original form. • The antioxidant usually prevents the oxidation of active compound and in place gets oxidised itself. **Hydrogen peroxide- properties**: 1) Colourless and odourless liquid with slight acidic taste. 2) Soluble in water, alcohol and ether. 3) Decomposes in contact with oxidisable matter, reducing agents, on making alkaline, or on standing.	**2M Mech. 1M Prop. 1M uses**

		$2\ H_2O_2 \rightarrow 2\ H_2O + O_2$ 4) It acts as an oxidizing or reducing agent depending upon the chemical environment. **Uses-** 1. Mild antiseptic. 2. Disinfectant. 3. Cleansing agent for cuts & wounds and for loosening ear wax. 4.1.6% solution is used in deodorants, Gargles & mouth washes. 5. Antidote in phosphorous & cyanide poisoning. 6. Bleaching agent.	
2	**b)**	**Write molecular formula and uses of ammonium chloride and sodium bicarbonate.** **Molecular formula :- NH_4Cl** **Properties of Ammonium chloride:** 1. It occurs as white crystals, odorless, cooling or saline taste 2. Slightly hygroscopic, soluble in water, sparingly soluble in alcohol but freely soluble in glycerine. 3. It sublimes on heating. 4. Its aqueous solution is acidic to litmus. 5. It shows reactions of ammonium and chloride radicals. **Uses of Ammonium chloride:** 1. Expectorant 2. Replaces chloride lost during vomiting 3. Systemic acidifier (treatment of metabolic alkalosis) 4. It is also used in the treatment of urinary tract infections. 5. Sodium bicarbonate **Molecular formula-$NaHCO_3$** **Uses of Sodium bicarbonate:** 1. It is used as Antacid. 2. It is used as systemic antacid in treatment of systemic acidosis.	**2M EACH**

		3. It is used as electrolyte replenisher. 4. 3 to5% solution in warm water is used as eye lotion. 5. It is used as an ingredient of compound $NaHCO_3$ tablets.	
2	**c)**	**Define quality control and give its importance in pharmacy.** **Definition of Quality control**:-The term quality as applied to drugs and drug products includes all those factors which contribute directly or indirectly to the safety, effectiveness and reliability of the product. **Importance of Quality control in pharmaceutical industry:** The term Quality control is most important parameter in Pharmaceutical field. The good quality product should be available to the patient which must be – i) For a genuine quality and of nature ii) Physically and chemically pure iii) Retains quality in terms of shelf life The responsibility of Pharmaceutical industry and Pharmacist has increased considerably to maintain the Good Manufacturing Practices. The term quality as applied to drugs and its products includes all those factors which contribute directly or indirectly to the safety, effectiveness and reliability of the product. The quality control include all those aspects starting with the procurement of raw material to the finished products available at the drug store and till it consumed by the customer. The job of quality control is to test a drug for quality and quantity. Hence qualitative identification and quantitative determination should be done by following the standard given official books.	**1M Def. 3M Imp.**
2	**d)**	**Write properties and uses of sodium thiosulphate and sodium nitrite.** **Properties of sodium thiosulphate-** 1. Sodium thiosulphate occurs as transparent, colourless, monoclinic prisms, or as a crystalline powder. 2. It has a cooling, bitter taste. 3. It effloresces in dry air and deliquesces in moist air. 4. It is soluble in water but insoluble in alcohol. 5. The aqueous solution decomposes on boiling because of reduction to sulphide and oxidation to sulphate.	**2M for EACH**

		Uses of sodium thiosulphate- 1. It is used as an antioxidant. 2. It is considered useful in parasitic skin diseases. 3. It is used in controlling the infection of athlete's foot. 4. It is effective in cyanide poisoning as an antidote. 5. Sodium thiosulphate when used in large doses causes cathartic action. **Sodium nitrite-** **Properties-** 1. It occurs in the form of white granular powder or white crystals with saline taste 2. When exposed to atmosphere it deliquesces and gets oxidised to sodium nitrate. 3. It is very soluble in water and sparingly soluble in alcohol. 4. Its aqueous solution is alkaline to litmus. **Uses-** 1. It is used as food preservative. 2. It is used as effective antidote in cyanide poisoning. 3. It is used as an antioxidant. 4. Due to its vasodilation action, it is considered effective in angina	
2	**e)**	**Give uses, storage condition and labelling of carbon dioxide gas.** **Carbon dioxide:** **Uses –** 1. Regulation of acid-base balance 2. Rarely used as respiratory stimulant 3. Along with oxygen it is used in the treatment of Carbon monoxide poisoning. 4. Liq. CO_2 promote the absorption of liquid by mucous membrane 5. Frozen CO_2/ dry ice is used in the treatment of eczema, acne, psoriasis and also used in minor surgical operation for destroying tissue.	**2M for uses** **1M storage** **1M Labeling**

		6.It is widely used in beverages industry for preparation of cold drinks 7. It is also used to replace air in some pharmaceutical preparations. 8. .It is used in treatment of drug addiction. **Storage and labeling:** The gas is stored in metal cylinders under pressure & at a temperature not exceeding 31^0C. The cylinder is painted GREY & carries a label stating the name of gas & symbol CO_2 stencilled in paint on the shoulder of the cylinder and clearly and indelibly stamped on the cylinder valve.	
3		**Answer any <u>THREE</u> of the following**	**12M (3X4)**
3	**a)**	**Enlist different "sources of impurities"** 1)Raw materials used in the manufacture 2)Processes used in the manufacture 3) Intermediate products in manufacturing process 4) Defects in manufacturing process/ manufacturing hazards 5) Solvents 6) Action of solvent and reagents on reaction vessel 7) Material of the plant 8) Inadequate storage : a) Filth b) Decomposition of the product during storage 9) Accidental substitution or deliberate adulteration with spurious or useless substances 10) Manufacturing hazards: i) Particulate contamination ii)Process errors	**4M 0.5 for EACH**

iii)Cross contamination

iv Microbial contamination

v) Packing errors

b) Elaborate ORS mixture. Give its composition according to WHO. **2M for EACH**

<u>Oral rehydration salt mixtures</u>:

ORS is used to supply water and electrolytes in amounts needed for maintenance as soon as intake of usual foods and liquids is discontinued, and before serious fluid losses occur. They are also given to replace mild to moderate fluid loses due to excessive vomiting, diarrhoea, or prolonged fever. Large number of oral rehydration preparations are available in the market which contain anhydrous glucose, NaCl, KCl and either $NaHCO_3$ or sodium citrate. These dry powder preparations are dissolved in specified amount of water and are used for oral rehydration therapy. These preparations may contain a flavouring and suitable agent for free flow of the powder. The following three formulations are usually prepared when glucose is used, sodium bicarbonate is packed separately. The quantities given below are for preparing one litre solution.

Composition of according to WHO:

Ingredients	Formula I	Formula II
Sodium chloride	**3.5g**	**3.5g**
Sodium bi- carbonate	**2.5g**	**--**
Sodium citrate	**--**	**2.9g**
Potassium chloride	**1.5g**	**1.5g**
Anhydrous glucose	**20g**	**20g**
Or Glucose	**22g**	**---**

	c)	**Write a note on cyanide poisoning.** 1. Cyanide poisoning may occur by inhalation of hydrocyanic acid like fumigates or from the ingestion of soluble inorganic cyanide salts or cyanide releasing substances like cyanamide, cyanogens chloride, photographic chemicals etc. 2. Symptoms of Cyanide poisoning : Nausea, drowsiness, headache, hypotension, dyspnoea, coma, convulsion, death 3. Death may occur within minute of inhalation of hydrogen cyanide 4. Effect of Cyanide poisoning: Cyanide stops cellular respiration and oxidation-reduction reactions. **Treatment:** 1. Sodium nitrite and Sodium thiosulphate is useful in the treatment of cyanide poisoning 2. Firstly Sodium nitrite injection is given which causes the oxidation of ferrous ion of haemoglobin to the ferric ion of methaemoglobin, hence it convert Haemoglobin in to methaemoglobin. 3. The methaemoglobin so formed then combine with serum cyanide that has not yet entered the cell, to produce cynomethaemoglobin, thus protecting essential enzymes from cyanide ions. 4. After 5 minutes, slow intravenous infusion of Sodium thiosulphate is given. 5. Thiosulphate ion react with cyanide ion and it convert toxic cyanide ion to non-toxic thiocyanate ion which is excreted in the urine easily.	**4M**
3	**d)**	**Explain metabolic acidosis & metabolic alkalosis. Name one compound in metabolic acidosis & metabolic alkalosis** **Metabolic acidosis:** 1. Metabolic acidosis occurs due to disturbance in acid-base balance in which acid concentration is increases in blood & body fluid. It occurs due to excess loss of base or bicarbonate (HCO_3-) or increase in acid load. Reasons are excessive diarrhoea, vomiting. 2. Excess acid production occurs due to diabetic acidosis, lactic acidosis, inadequate food intake, lack of oxygen etc. Excess acid retention occurs due to renal failure or excess administration of acidifying salts like ammonium chloride.	**1M EACH**

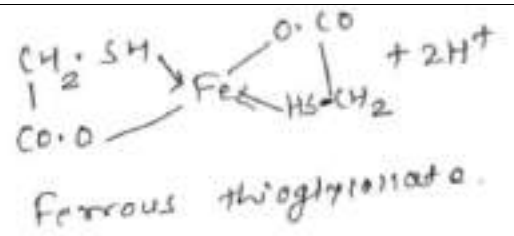
		3. This can be overcome by respiratory & renal mechanism. E.g. lungs increase CO_2 elimination. 4. It is treated by using drugs like Sodium bicarbonate, Sodium acetate, Potassium acetate, Sodium citrate, Potassium citrate, Sodium lactate etc. **Metabolic alkalosis:** 1. Metabolic alkalosis occur due to disturbance in acid-base balance in which alkali (HCO_3-) concentration is increases in blood & body fluid 2. It occurs due to retention of base or bicarbonate (HCO_3-) or decrease in acid load. Reasons are excess use of bicarbonates, loss of H+, vomiting, use of diuretics etc. 3. Excess alkali retention occurs due to renal failure or excess administration of alkaline drugs like Sodium acetate, Potassium acetate. 4. This can be overcome by respiratory & renal mechanism. E.g. lungs decrease CO_2 elimination. 5. It is treated by using acidifying drugs like ammonium chloride & ammonium chloride injection.	
3	**e)**	**Give medicinal uses of** **i) Zinc oxide :** 1) Mild astringent 2)Weak antimicrobial & topical antacid 3)It is also used in some bandages & adhesives **ii)Titanium dioxide** 1) It is used to prevent sunburn in the form of suntan preparations 2) It is used as a white pigment in lotions & cosmetic preparations 3) As a skin protective & for the relief of pruritus 4) For application to the exudative dermatoses. **iii) Talc** 1) As a skin protective dusting powder	**1M EACH**

		2) As a base for medicated dusting powder 3) Used as a lubricating agent in the tablet manufacturing 4)Also used as a filtering aid **iv) Kaolin:** 1) Light kaolin is used as an intestinal adsorbent in various enteritis 2) It is used in the symptomatic treatment of gastrointestinal conditions associated with diarrhoea 3) It is also used as a clarifying agent.	
4		**Answer any <u>THREE</u> of the following**	**12M (3X4)**
4	**a)**	**Write formula & uses of ferrous sulphate & calcium gluconate** **Ferrous sulphate :** **Formula: $FeSO_4.7H_2O$** **Uses :** 1) It is used as Haematinic (treatment of anaemia caused by iron deficiency) 2. It is used to dye fabrics & cloths 3. Manufacturing of ink 4. It has also applications in photography 5. It has disinfectant properties 6. Ferrous sulphate is used as colouring agent in paint **Calcium gluconate :** **Formula :$C_{12}H_{22}$ Ca O $_{14}.H_2O$** **Uses :** 1) It is used as a Calcium replenisher. 2) It is used in the treatment of hypocalcaemia tetany and calcium deficiency disorders such as dental carries, fractures, rickets, spasmophilia, pregnancy and lactation, hyperthyroidism, haemorrhage.	**2M EACH**

		3) Also used in the hypocalcaemia 4) Used as a substitute for calcium lactate because it is less irritant to the tissue.	
4	**b)**	**Explain radio opaque contrast media. Give properties and uses of any one compound used for it** **Radio opaque contrast media:** Radio opaque Contrast Media:-Radio-opaque substances are those compounds both inorganic and organic that have the property of casting a shadow on X-ray films, have the ability to stop the passage of X-rays and hence appear opaque on X-ray examination. Such compounds and their preparations are called as X-ray contrast media. X-rays are electromagnetic radiation of short wavelength and thus have high penetrating power. The electrons of high atomic number element can interact with X-rays .The interaction cause interference in their passage through the medium. In diagnostic study using X-rays the soft tissues are permeable to the passage of X-rays and hence cause darkening on X-ray film. The bony structure cast shadow on film as the bones contain elements having high atomic number like calcium and phosphorous. As a result bony tissues can be distinguished on an exposed X-ray film. Compound used for radio opaque contrast media : **Ex.: Barium sulphate** **Properties** : i) It is a fine white powder ,ii)It is odourless ,iii) It is free from grittiness ,iv) It is practically insoluble in water & organic solvents ,v)It is very slightly soluble in acids & alkalies and in many solutions of salts **Uses:** i) Barium sulphate is used as a contrast medium for X ray examination of the alimentary tract.	**2M Explain ation 1M Prop. 1M Use**

		ii) Barium sulphate is ingested for use in GIT.in the form of a suspension usually with flavouring and sweetening agents. iii) Barium sulphate is given for X ray examination of colon by enema in a dose of 400 to 750g rectally.	
4	**c)**	**Define the the tems:** **i) Desensitizers:** Desensitizers are the compounds used in treatment of sensitive tooth. Sometimes tooth become sensitive to heat &cold. During tooth decay or in tooth ache, the perception to heat & cold is felt strongly. Some desensitizing agents are incorporated in dental preparations to reduce the sensitivity of tooth to heat & cold. E.g.-Strontium chloride, Zinc chloride. **ii)Emetics :** Emetics are defined as the drugs which are used to cause emesis (vomiting). Emetics are generally used in the treatment of different poisoning caused due to ingestion of poisons / toxic materials. eg : Sodium chloride , Antimony potassium tartrate OR Emetics- These are the agents which induce vomiting. They produce their action directly by stimulating chemoreceptor trigger zone (CTZ) or by directly irritating intestinal mucosa. i**ii) Expectorant:** The drugs that remove sputum from the respiratory tract. These drugs either increase the fluidity of sputum or increase the volume of fluids that are to be expelled from the respiratory tract by coughing. Expectorants are used orally to stimulate the flow of respiratory tract secretions. Ex. Potassium iodide, Ammonium chloride, Antimony potassium tartrate.	**1M EACH**

		iv) Laxatives : Laxatives are substances that loosen stools and increase bowel movements. They are used to treat and prevent constipation. Ex. Isabgol, agar-agar, methyl cellulose, sodium carboxy methyl cellulose, liq.paraffine.	
4	**d)**	**Explain the principle involved in limit test for iron with reactions.** **Principle:** Limit test for iron depends upon the interaction of thioglycolic acid with iron in the presence of citric acid and in the ammonical alkaline medium. This results in the formation of purple coloured ferrous thioglycolate complex. The limit test of iron is carried out in two Nessler's Cylinders, one for the Test and other for standard. The intensity of purple colour produced in the two is compared by viewing vertically downwards. If the intensity of colour is more in the test sample than in the standard, it means that the sample contains more quantity of iron impurity than the permissible limit and hence sample is declared as not of standard quality. **Role of Thioglycolic acid-** 1. Iron impurity may be present in trivalent ferric form or in the divalent ferrous form. If it is in ferric form, thioglycolic acid reduces ferric form of impurity into ferrous form. 2. It produces purple coloured ferrous thioglycolate complex by acting as complexing agent. **Role of Citric acid**- It prevent precipitation of iron (ferrous) with ammonia by forming ammonium citrate buffer. **Role of Ammonia**- To maintain alkaline condition. **Reactions:** ii) $2Fe^{3+} + 2(CH_2{\cdot}SH{\cdot}COOH \longrightarrow 2Fe^{++} + \begin{matrix} S{\cdot}CH_2{\cdot}COOH \\ | \\ S{\cdot}CH_2{\cdot}COOH \end{matrix} + 2H^+$ Ferric iron — Thioglycolic acid — Ferrous iron	**2M Principle 2M reaction**

		ii) $Fe^{++} + 2(CH_2 \cdot SH \cdot COOH) \longrightarrow$  Ferrous thioglycollate.	
4	**e)**	**Define respiratory stimulants .Give properties and uses of ammonium carbonate** **Respiratory stimulants**: The substances which increase the rate of respiration are called as Respiratory stimulants. OR Respiratory stimulants increase Pulmonary ventilation by their effect on depth and rate of respiration by stimulating respiratory center in the medulla.. **Ex:** Gaseous ammonia, Dilute Ammonia solution, Ammonium carbonate etc. **Ammonium carbonate:** **Properties** : 1) It occurs as a white powder or a white translucent crystalline material. 2) It has a strong odour of ammonia and having a sharp ammonical taste. 3) It is volatile, even at room temperature. 4) It volatilises rapidly at above 60^0 C. 5) Ammonium carbonate is readily soluble in water and sparingly soluble in alcohol. **Uses:** 1) It is used as a respiratory stimulant 2) It is also used as a reflex stimulant for the medullary respiratory & vasomotor centres. 3) It has been also used as an expectorant	**1M Def. 1.5M Properties 1.5M Uses**

5		**Answer any <u>THREE</u> of the following**	**12M (3X4)**
5	**a)**	**What are inhalants? Give properties and uses of nitrous oxide.** **Definition:** Inhalants are gaseous substances directly administered by nasal or oral respiratory route for its local or systemic effect. **OR** Inhalants are drugs or chemicals which in vapor form are inhaled in the body. Inhalation of gases cause changes in physiological functions and bring pharmacological action. This will depend upon the gas, its concentration, the condition in which it is used. Thus action and effect of gas will be different under different conditions. **Properties –** • It is colourless gas slightly sweetish odour and taste. • It dissolves in water and is soluble in alcohol. • At high temperature it decomposes and liberates oxygen which helps for burning. **Uses-** • It is safe general anaesthetic with strong analgesic properties. • It is used in dental and obstetric field for producing anaesthetic and analgesic effect. • 50% N_2O with O_2 is used to obtain relief from pain of myocardial ischemia. • It is used as local anaesthetic and muscle relaxant. • It is also effective in calming mentally excited patients.	**1M def.** **1.5M Properties** **1.5M for uses**
5	**b)**	**Define Antidote and classify it.** **Definition-** Antidote is a chemical agent which counteracts or reverses or stops the action of poison.	**1M def.** **3M classify**

		Classification: Depending on their mechanism of antidote action they are classified as- **1. Physiological antidote:** It counteract effect of poison by producing other effect e.g. Sodium nitrite (convert Haemoglobin (Hb) in to methaemoglobin in order to bind cyanide) **2. Chemical antidote:** It changes chemical structure of poison. e.g. Sodium thiosulphate (convert toxic cyanide (CN^-) in to nontoxic thiocyanate) Chelating agents- Sodium & Calcium edetate **3. Mechanical antidote:** They prevent absorption of poison across the intestinal wall. e.g. Activated charcoal (It absorbs poison prior to its absorption across the intestinal wall) copper sulphate, magnesium sulphate	
5	**c)**	**Enlist various intra and Extra cellular electrolytes. Give properties and uses of Sodium Chloride.** **Intra cellular Electrolytes-** • Potassium • Phosphate • Magnesium **Extra cellular Electrolytes-** • Chlorides • Sodium • Calcium • Bicarbonates. **Properties of Sodium Chloride-** 1. It is colourless or white crystalline powder. 2. It is odourless with saline taste. 3. It is freely soluble in water, more soluble in boiling water, soluble in glycerin and slightly soluble in glycerin. **Uses of Sodium Chloride-** 1. It is source of both sodium and chloride ions.	**1M EACH**

		2.0.9% w/v solution used as wet dressing and irrigating body cavities or tissues 3. Its injection and infusion alone or in combination is used as electrolyte replenisher. 4. Hypertonic solution is given orally to induce vomiting for the case of poisoning as a first aid. 5. It is used as taste enhancer in common food. 6. It is used in Iodine deficiency in the form of iodised salt. 7. is major ingredient of ORS, hence is used in electrolyte replacement therapy.	
5	**d)**	**Explain Anti caries agent giving examples** **Definition-** The agents which prevent the formation of dental caries are called anticaries agents. E.g.: Sodium Fluoride, Stannous fluoride, ammoniated tooth pastes etc. In order to prevent dental caries and to maintain clean and healthy teeth use of fluoride and their salts is well accepted. **Role of fluoride:** • Administration of traces of fluoride containing salts or their use in topical use to the teeth has found to give encouraging results. • When a fluoride containing salt or solution is taken internally, it gets readily absorbed, transported and deposited in the bone or developing teeth and remainder is excreted by the kidneys. • The deposited fluoride on the surface of teeth prevents the action of acids or enzymes in producing lesions. • The mechanism by which fluoride inhibits caries formation is still to be completely elucidated. There are two current hypotheses: (1) decreased acid solubility of enamel;& (2) bacterial inhibition.	**4M**

		• A small quantity (1 ppm) of fluoride is thus necessary to prevent caries. However when more quantity of fluoride (more than 2-3 ppm) is ingested it is carried to bones and teeth and produces mottled enamel known as dental fluorosis. • Fluoride is administered by two routes (i) orally and (ii) topically. • The use of fluoridation of public water supply is the most common and effective way of oral administration. • Water supply containing about 0.5 to 1 ppm is provided which is sufficient. • Alternatively, it can be given in drinking water or fruit juice in such a concentration to have about 1 ppm per day. • Sodium fluoride tablets or solution of sodium fluoride in a dose of 2.2 mg per day is employed. • For topical application 2% solution is used on teeth. Besides fluoride inorganic phosphate salts have been considered to be useful in reducing dental caries.	
5	**e)**	**Define and classify gastro intestinal agents with example.** **Definition-** Gastrointestinal agents are the drugs which are used to treat gastrointestinal disorders like achlorhydria, hyperacidity, constipation and diarrhoea. **Classification :** 1. **Gastric acidifier**-Dilute Hydrochloric acid 2. **Antacids** A) Systemic/ Absorbable antacids- Sodium Bicarbonate B) Non systemic/ Non absorbable antacids a) Aluminium containing antacids- Aluminium Hydroxide, Aluminium Phosphate, Basic aluminium carbonate b) Calcium containing antacids- Calcium carbonate, Calcium Phosphate c) Magnesium containing antacids- Magnesium carbonate, Magnesium oxide, Magnesium	**1M Def. 3M classify**

		hydroxide, Magnesium trisilicate d) Combination antacids- Aluminium Hydroxide and Magnesium hydroxide, Aluminium Hydroxide gel and Magnesium trisilicate **3. Protectives & adsorbents** a) Bismuth containing compounds: Bismuth subcarbonate, Bismuth subnitrate, Milk of bismuth b) Activated clays: Light kaolin, Activated charcoal 4. **Cathartics** a) Laxatives: Methyl cellulose, Sodium carboxy methyl cellulose, Liquid paraffin. b) Purgatives: Magnesium hydroxide, Sodium Potassium tartrate etc.	
6		**Answer any <u>THREE</u> of the following**	**12M (3X4M)**
6	**a)**	**Give biological role of Oxygen. Give properties and uses of oxygen.** **Biological role of Oxygen-** • Oxygen is important for the living cells. • It is necessary for normal oxidative metabolic process in cell for the production of energy, to synthesize Adenosine Triphosphate (ATP). • When ATP is hydrolyzed, energy is released. • Transport of oxygen (after it has been inhaled) is carried by hemoglobin, a constituent of blood. • Concentration of hemoglobin in blood is important in transport mechanism. • Oxygen combines with hemoglobin reversibly as shown below:- • $Hb + 0_2 \rightarrow Hb0_2$ where in Hb = deoxyhemoglobin and $Hb0_2$ = oxyhemoglobin • This loose combination readily dissociates and releases oxygen in the medium of cell. • Number of factors affects the formation and dissociation of oxyhemoglobin. • These include temperature, electrolytes, effect of carbon dioxide, carbon-monoxide, pH etc.	**2M for Role 1M Properties 1M Uses**

		• Under physiological conditions, the action of electrolyte and CO_2 on the liberation of oxygen from oxyhemoglobin is important. **Properties-** 1. It is colourless, odourless, tasteless gas. 2. It is heavier than air with density 1.105 3. Oxygen dissolves in about 32 volumes of water, 36 volumes of alcohol. 4. Oxygen readily dissolves in some molten metals like silver. 5. It is a paramagnetic in nature. 6. Oxygen supports combustion. 7. Chemically oxygen is strong oxidizing agent. **Uses :** 1. Oxygen is widely used in the treatment of hypoxia & anoxia. 2. It is also used in treatment of carbon monoxide poisoning. 3. In industry oxygen is used in oxy acetylene flame required for welding or cutting metals. 4. Liquid oxygen is used as a fuel in rocket technology. 5. Used as Inhalant during anaesthesia and for post-operative pulmonary conditions. 6. Oxygen mixed with 5-7% Co_2 is used as respiratory stimulant. 7. It is used in treatment of cardiac failure.	
6	**b)**	**Define Radiopharmaceuticals. Enlist its various applications.** **Definition-** Many heavy elements like uranium, thorium, radium and their compounds emit radiations spontaneously & these radiations can penetrate through solid material, can ionize gases, produce a glow on zinc sulphide paint or affect the photographic plates. The substances which emit such radiations are called radioactive substances or radiopharmaceuticals. **Applications-** • Diagnostic application • Radiotherapy • Sterilization techniques • Research application	**1M Def. 3M applica tion**

		• Analytical application	
6	**c)**	**Write two Identification tests for-** **i) Calcium** **ii) Chlorides**	**2M EACH**

i) Calcium :-

1) When solution of calcium salt is prepared with minimum amount of HCl, neutralized with ammonium carbonate solution gives a white ppt. of calcium carbonate. On boiling & cooling the amorphous ppt. of calcium carbonate becomes crystalline. The ppt. is sparingly soluble in ammonium chloride solution.

$$Ca^{++} + Co_3^{--} \longrightarrow CaCO_3$$

2) When ammonium oxalate solution is added to a solution of calcium salt, a white ppt. of calcium oxalate is obtained. This ppt. is sparingly soluble in dilute acetic acid but dissolves in HCl.

$$Ca^{++} + C_2O_4 \longrightarrow CaC_2O_4 \longrightarrow CaCl_2 + H_2C_2O_4$$

3) Concentrated solutions of calcium salts on treatment with potassium chromate solution give a yellow crystalline ppt. of calcium chromate on shaking. On dilution with water the ppt. dissolve

$$Ca + 2CrO_4^{-} \longrightarrow 2CaCrO_4$$

4) When a solution of calcium salt is acidified with glacial acetic acid and treated with few drops of potassium ferrocyanide solution, the salt solution remains clear; on addition of ammonium chloride it gives a white precipitate which is less soluble. The exact composition of second ppt is depend upon amount of ammonium ions.

$$Ca^{++} + 2K^{+} + Fe(CN)_6^{----} \longrightarrow CaK_2(Fe(CN)_6) \longrightarrow CaNH_4KFe(CN)_{6]}$$

ii) Chloride-

1) Dissolve in 2ml of water a quantity of the substance being examined equivalent to about 2mg of chloride ion. Acidify with dilute nitric acid & add 0.5ml of silver nitrate solution. Shake & allow to stand, a curdy white ppt. is formed, which is insoluble in nitric acid but soluble after being well washed with water, in dil. ammonia solution, which is reprecipitated by addition of

		dil. nitric acid. $NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$ 2) Take 2mg of substance in test tube add 0.2gm of potassium dichromate & 1ml of Sulphuric acid. Place filter paper strip moistened with 0.1ml of diphenylcarbazide solution over the opening of the test tube, the paper turns violet red. 3) Chloride when heated with manganese dioxide & sulphuric acid, chlorine gas liberated. $NaCl + 2H_2SO_4 + MnO_2 \longrightarrow MnSO_4 + Na_2SO_4 + 2H_2O + Cl_2\uparrow$	
6	**d)**	**Explain with examples:** **i) Haematinics** **ii) Systemic Alkaliser** **i)Haematinics-** These are the agents which are used in treatment of Iron deficiency anaemia/ These are the agents that increase Hb content. Iron deficiency anaemia occurs due to inadequate dietary intake of Iron. e.g1) Ferrous Sulphate is one of the most commonly used Iron preparations in the form of tablets which are coated with glucose or lactose. Ferrous sulphate mixture is used for paediatric purpose. 2) Ferrous gluconate and ferrous succinate are used in the form of tablets or capsules. Ferric ammonium citrate has constipating effect than inorganic form of Iron. 3) Some of the Iron preparations are used parentrally e.g.- Iron and Dextran injection and Iron sorbitol injection. These are alternatives to oral preparations. **ii) Systemic Alkaliser-** These are the agents which counteract or neutralize acidity. / These are the agents which are used in treatment of systemic acidosis. e.g.- i) Sodium bicarbonate is a systemic alkaliser. It reacts with HCl and forms salt and water	**2M EACH**

		with evolution of CO_2. ii) Sodium acetate, Potassium acetate, Sodium citrate, potassium citrate etc.	
	e)	**Define topical agents. Discuss the uses of astringent with examples.** **Definition:** Topical agents are the compounds that act locally on skin or mucous membrane, their action is of different types depending upon the nature of compound and its chemical properties and they mainly act by mechanical or physical mechanism. **Astringent uses :** 1) 1 It causes constriction of small blood capillaries, and promote the coagulation of blood hence used as styptic (able to stop bleeding). 2) It decreases the volume of exudates from wounds & skin eruption. 3) Astringent causes constriction of skin pores & destroy body odor, hence used as an antiperspirant & deodorant. 4) Higher concentration of astringent is used to remove warts (extra growth of cell on skin). 5) It promotes healing and toughens the skin. 6) It restricts blood flow to the surface of mucous membrane hence astringent decreases inflammation. e.g. Alum and Zinc Sulphate.	**1M Def. 3M For Uses**

MODEL ANSWER

WINTER-2019 EXAMINATION

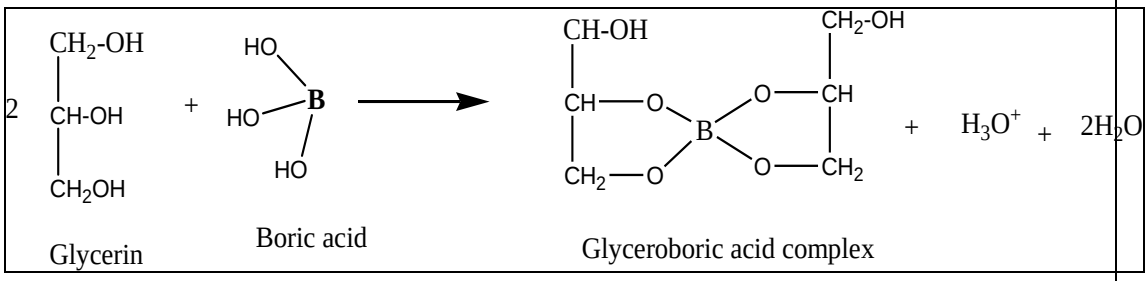
Subject Title: PHARMACEUTICAL CHEMISTRY-I **Subject Code:** 0806

Important Instructions to examiners:

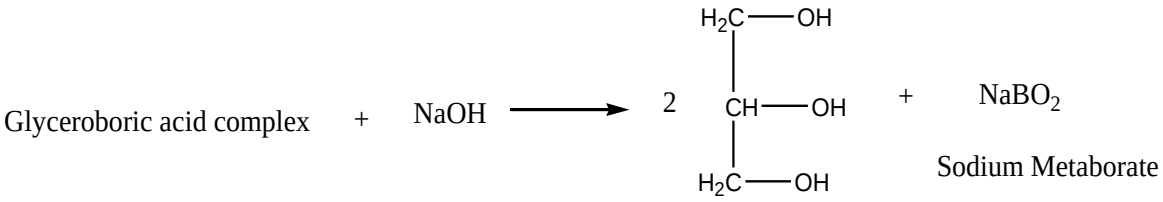
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1		**ATTEMPT ANY FIVE OF THE FOLLOWING.**	**20M (5x4)**
1	**a)**	**Define the terms with examples** **i) Lewis Acid and Lewis Base** **Definition of Lewis Acid:-** An acid is an electron pair acceptor or acid is electron seeking species or electrophilic species. Ex.H^+,Na^+,K^+,$M_g^{+,}Al^+$,BF_3,$FeCl_3$ **Definition of Lewis Base:-** A base is an electron pair donor and which have unshared electron pairs to share with proton or nucleophilic species. Ex.H_2O,OH^-,,F^-,CH_3COOO^-,SO_4^{-2},NH_3 **ii) Respiratory stimulants-** Respiratory stimulants increases Pulmonary ventilation by their effect on depth and rate of respiration by stimulating respiratory centres in the medulla Examples- Gaseous ammonia, Dilute Ammonia solution, Ammonium carbonate etc. **Inhalants** Inhalants are gaseous substances directly administered by nasal or oral respiratory route for its local or systemic effect. **OR** Inhalants are drugs or chemicals which in vapour form are inhaled in the body. E.g. - Oxygen, Carbon dioxide, Nitrous oxide, Hydrogen, Nitrogen etc.	**2M Each**
1	**b)**	**Give synonyms and molecular formula for** **i) Sodium Hydroxide:** **Synony-**Caustic soda **Molecular formula-** NaOH **ii) Chlorinated lime** **Synonym -** Bleaching powder **Molecular formula -** Ca(OCl)Cl. H_2O or $CaOCl_2$	**2M EACH**

1	c)	**Explain why glycerine is used in the assay of Boric acid. Give reactions involved.** • The assay of boric acid is based upon acid-base type of titration in which Boric acid, a very weak acid is titrated against strong alkali like Sodium hydroxide. Boric acid is a weak acid having a pKa =9.19 for the ionization of its first proton. • Hence it must be combined with a polyhydroxy compound, in this case glycerin, for a titration assay to be performed. • This is because the glycerin esterifies the boric acid to produce a complex glyceroboric acid that behaves like a strong monoprotic acid, which in turn allows the titration to be carried out. • Once combined, it can be titrated against a strong base like sodium hydroxide, which causes the indicator(phenolphthalein) to change colour (from colourless to light pink).	**2M EACH**



Glycerin Boric acid Glyceroboric acid complex



Sodium Metaborate

Glycerol

Net reaction:

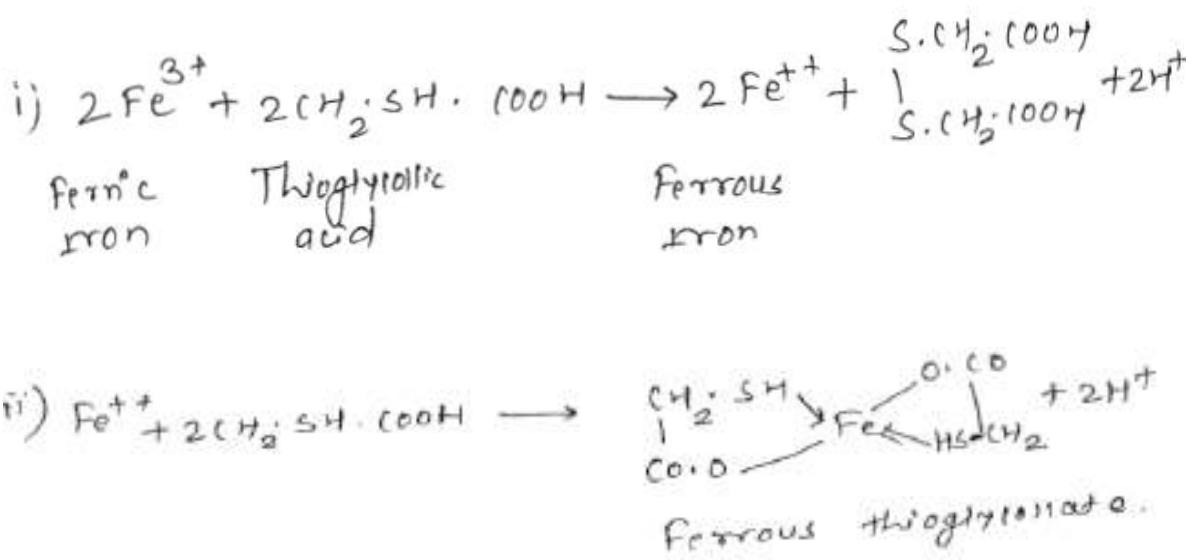
Glycerine

H_3BO_3 + NaOH ----------→ $NaBO_2$ + $2H_2O$

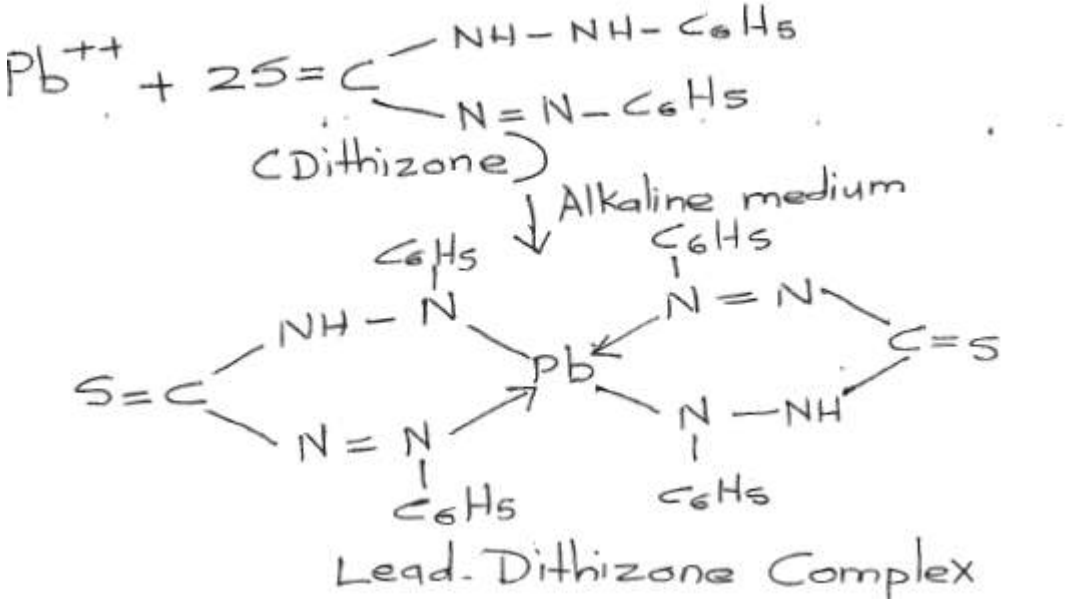
1	d)	**Define and classify "Topical Agents" with examples.** **Topical agents:** Topical agents are compounds or preparations applied locally on the surface of skin or mucous membranes. OR Topical agents are substance applied on body surface, including application within the body cavities that open to the outside. E.g. oral, vaginal, colonal, nose, ear, rectum etc. **Classification:** **1. Protectives & Adsorbents:** Talc, Zinc oxide, calamine, Zinc stearate, Titanium dioxide, Silicon polymers etc. **2. Antimicrobial agents:** a) Compounds acting by oxidation: Hydrogen peroxide, Potassium permanganate, Chlorinated lime b) Compounds acting by halogenation: Iodine preparations e.g. Iodine, povidone iodine, Chlorinated lime, Sodium Hypochlorite c) Compounds acting by Protein precipitation: Silver nitrate, Mild silver protein, Mercury & mercury compounds like yellow mercuric oxide, Ammoniated mercury, Boric acid, Borax **3. Sulfur & its compounds:** Sublimed sulfur, Precipitated sulfur, Selenium sulphide **4. Astringents:** Alum, Zinc sulphate, Aluminium chloride, etc.	**1M Def. 2M Class.**
1	e)	**Define "Astringents". Mention their uses.** Astringents are the agents which cause local or surface or mild protein precipitation when applied to damaged skin or mucus membrane. **Astringent uses:** 1. It causes constriction of small blood capillaries, and promote the coagulation of blood hence used as styptic (able to stop bleeding). 2. It decreases the volume of exudate from wounds & skin eruption. 3. Astringent causes constriction of skin pores & destroy body odor, hence used as an antiperspirant& deodorant.	**1M Def. 3M Uses**

		4. Higher concentration of astringent is used to remove warts (extra growth of cell on skin). 5. It promotes healing and toughens the skin. 6. It restricts blood flow to the surface of mucous membrane hence astringent decreases inflammation.	
1	**f)**	**Classify antacids with example. Write properties of ideal antacids.** **Classifications :** A) Systemic/ Absorbable antacids- Sodium Bicarbonate B) Non systemic/ Non absorbable antacids a) Aluminium containing antacids- Aluminium Hydroxide, Aluminium Phosphate, Basic aluminium carbonate b) Calcium containing antacids- Calcium carbonate, Calcium Phosphate c) Magnesium containing antacids- Magnesium carbonate, Magnesium oxide, Magnesium hydroxide, Magnesium trisilicate d) Combination antacids- Aluminium Hydroxide and Magnesium hydroxide, Aluminium Hydroxide gel and Magnesium trisilicate **Properties of ideal requirements of an antacids:-** • It should not be absorbable and cause systemic alkalosis. • It should not be laxative or cause constipation. • It should exert effect rapidly & over a long period of time. • It should buffer in pH 4-6. • It should not produce large volume of gas. • It should be palatable & inexpensive. • It should probably inhibit pepsin. • It should be insoluble in water & have fine particle size. • It should not have side effects.	**2M EACH**
1	**g)**	**Define expectorants. Write mechanism of action of expectorants with example.** **Expectorant:** The drugs that remove sputum from the respiratory tract. These drugs either increase the fluidity of sputum or increase the volume of fluids that are to be expelled from the respiratory tract by coughing. Expectorants are used orally to stimulate the flow of	**1M Def. 3M MOA.**

		respiratory tract secretions. **Mechanism of action of expectorants:** **Mechanism of action of expectorants is categories in two ways that is sedative type and** **Sedative type :-**It acts by reflex action by irritating the gastric mucosa and thereby stimulating respiratory tract secretion. Ex.Ammoniumchloride, Potassium iodide. **Stimulant type**:- These drugs bring about a stimulation of the secretory cells of the respiratory tract directly or indirectly, since the drug stimulates secretion, more fluid is produced in respiratory tract and sputum gets diluted. Ex.Terpenoid oils like Eucalyptus, Lemon	
1	**h)**	**Discuss principle involved in limit test for iron with reactions.** **Principle:-** • Limit test for iron depends upon the interaction of thioglycolic acid with iron in the presence of citric acid and in the ammonical alkaline medium. • This results in the formation of purple colored ferrous salts of thioglycolic acid. • The limit test of iron is carried out in two Nessler Cylinders, one for the 'Test' and other for'standard'. • The intensity of purple color produced in the two is compared by viewing vertically downwards. • Role of Thioglycolic acid-Iron impurity may be present in trivalent ferric form or in the divalent ferrous form. If it is in ferric form, thioglycolic acid convert ferric form of impurity into ferrous form and then forms a ferrous thioglycolate complex. • Role of Citric acid: It prevents the precipitation of iron in presence of ammonia. • Role of Ammonia: It maintains alkaline PH for the formation of stable purple colored ferrous thioglycolate complex.	**2M EACH**

		Reaction:  	
2		**Attempt any <u>THREE</u> of the following.**	**12M (3x4)**
2	**a)**	**Define achlorhydria. Give properties, uses and molecular formula of agent used to treat achlorhydria.** **Achlorhydria :-** When due to some reasons, there is no secretion of hydrochloric acid in gastric secretion in stomach the condition is called as achlorhydria. **Properties of Hydrochloric acid :-** • It occurs as a colourless, fuming liquid with pungent odour. • It is miscible with water, alcohol & has a specific gravity of 1.18. • It is a strong acid & attacks metals forming their hydrochlorides with the evolution of hydrogen gas. • It is stored in glass-stoppered containers at a temperature not exceeding 30°C. **Uses of Hydrochloric acid :-** • Hydrochloric acid as such cannot be used as medicine. • The dilute hydrochloric acid is used as acidifying agent.	**1M EACH**

		• It is also used as a solvent in numerous industries. • Also used as laboratory reagent. **Molecular formula : HCl**	
2	**b)**	**Define the following terms** **i) Antioxidants:** Antioxidant is an agent which is added to any preparation to prevent oxidation of ingredients and subsequent deterioration of the product. Chemically they act as reducing agents. **ii) Anticaries Agent:** These are the agents used to treat Dental caries or tooth decay which has been defined as a disease of the teeth caused by acids formed by the action of microorganisms on carbohydrates. **iii) Emetics:** A drug or substance given to induce vomiting is known as Emetic. OR The drugs or compounds which expel contents from the GIT are known as emetics. **iv) Dental fluorosis:** More quantity of fluoride if ingested, it is carried to bones and teeth and produces mottled enamel known as dental fluorosis.	**1M EACH**
2	**c)**	**Explain the principle involved in the limit test for lead IP with reaction.** • The limit test for lead as per I. P. and U. S.P is based upon the reaction between lead and diphenylthiocarbazone (dithizone). • Dithizone in chloroform extracts leads from alkaline aqueous solutions as a lead dithizone complex (red in colour). • The original dithizone has a green colour in chloroform, thus the lead-dithizone shows a violet-red colour. • The intensity of the colour of complex depends upon the amount of lead in the solution. • The colour of the lead-dithizone complex in chloroform is compared with a standard volume of lead solution, treated in the same manner. • In this method, the lead present as an impurity in the substances, is separated by	**2M EACH**

		extracting an alkaline solution with a dithizone extraction solution. • The interference and influence of other metal ions etc., is eliminated by adjusting the optimum pH for the extraction, by using ammonium citrate, potassium cyanide, hydroxylamine hydrochloride reagents, etc. **Reaction:-**  	
2	**d)**	**Give properties and uses of calcium carbonate and hydrogen peroxide.** **i) Calcium carbonate** **Properties:** • It is a fine, white, microcrystalline powder. • It is odourless and tasteless. • It is insoluble in water and alcohol and water solubility is increased by the presence of CO_2 and also by ammonium salt. **Uses:** • It is used as an antacid and adsorbent • It reduces gastric hyperacidity and pain in gastric and duodenal ulcers. • It is used as emulsifying agent.	**2M EACH**

		ii) Hydrogen peroxide: **Properties**: • Colourless and odourless liquid with slight acidic taste. • Soluble in water, alcohol and ether. • Decomposes in contact with oxidisable matter, reducing agents, on making alkaline, or on standing. $2\ H_2O_2 \rightarrow 2\ H_2O + O_2$ • It acts as an oxidizing or reducing agent depending upon the chemical environment. **Uses:** • Antiseptic and Disinfectant- For cleaning of wounds. • 1.6% solution is used as Deodorant, gargle and mouth wash. • Used for bleaching the hair. • As an antidote in phosphorous and cyanide poisoning.	
2	**e)**	**Define Antimicrobial agents and explain their mechanism of action. Give properties of Potassium Permanganate.** Antimicrobial is a broad terminology describing activity against microbes. Specific terminology describes exact mode or mechanism of action. e.g. Antiseptics, Disinfectant, Germicide (bactericide against bacteria), fungicide (against fungi), virucide (against virus) etc. denotes exact action.), Bacteriostatic. Inorganic compounds generally exhibit antimicrobial action by, either of the three mechanisms viz. **(i) Oxidation** **(ii) Halogenation** **(iii) Protein binding or precipitation.** **i) Oxidation Mechanism :** Compounds acting by this mechanism belong to class of peroxide, peroxyacids, oxygen liberating compounds like permanganate and certain oxo-halogen anions. They act on proteins containing sulphadryl group and oxidize free sulfhydryl to disulphide bridge and inactivate its function. **ii) Halogenation Mechanism:**	**1M Def. 2M MOA 1M Prop.**

		Compounds which liberate chlorine or hypochlorite or iodine act by this mechanism. This category of agents acts on peptide linkage and alter its potential and property. The destruction of specific function of protein results in death of microorganisms. **iii) Protein Precipitation Mechanism :** Many metals in their cation form exhibit protein binding or protein precipitation. The nature of interaction with protein occurs through polar group of protein which acts as ligand and metal ion acts as Lewis acid. The complex formed may be a strong chelate leading to inactivation of protein. This action in general is non-specific. Protein precipitants do not distinguish between the protein of microbes and that of host. Germicidal action results when the concentration of ion is such that reaction is restricted largely to the parasite cell. **Potassium permanganate:** **Properties**: • Dark purple coloured, crystalline powder. • It is Strong oxidizing agent. • Odourless but has sweet, astringent taste • Soluble in water.	
3		**Attempt any THREE of the following:**	**12M (3X4)**
3	**a)**	**Define and explain mechanism of antioxidants. Give properties and uses of Sodium thiosulphate.** **Definition:** Antioxidants are defined as the agents which have the capability of functioning chemically as reducing agents and are commonly used to prevent rancidity of oils and fats or deterioration of other pharmaceutical materials through oxidative processes. **Mechanism of action-** • When a substance acts as antioxidant (it being a reducing agent) it gets oxidised itself and prevents the oxidation of the active pharmaceutical species. • If the active pharmaceutical species is already oxidized, then the antioxidant will reduce it back to its original reduced form. • Inert gas like nitrogen displaces the oxygen in container & prevents oxidation.	**1M EACH**

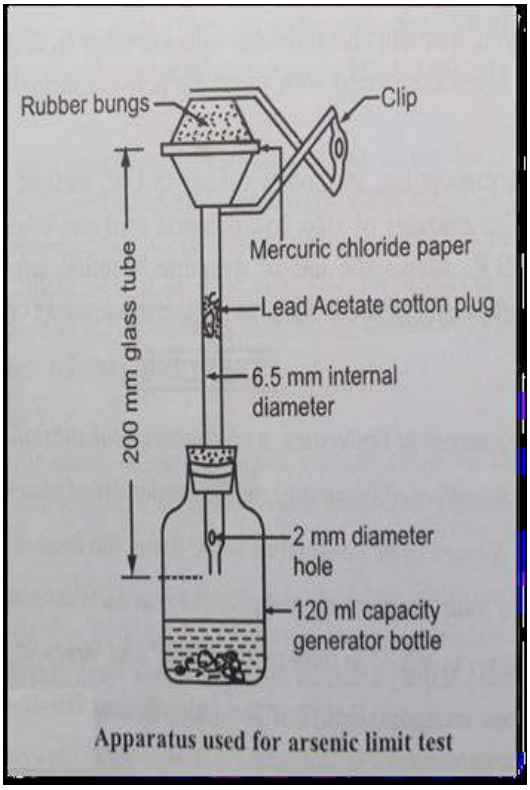
		Properties- • It occurs as transparent, colourless monoclinic prisms or as a crystalline powder. • It has cool and bitter taste. • It effloresces in dry air and deliquesces in moist air. • It is soluble in water but insoluble in alcohol. **Uses-** • It is useful as Antioxidant. • It is used as antidote in cyanide poisoning. • It is an effective Antifungal and used in skin infections such as dermatophytosis. • When used in large doses it causes cathartic action.	
3	**b)**	**Define with example** **i) Radio Isotopes** **ii) Protectives and Adsorbents** **iii) Buffers** **iv) Radio opaque contrast media** **i) Radioisotopes-** The elements having same atomic number but different atomic mass number or atomic weight are called as radioisotopes. e.g.- ^{60}CO,^{131}I, ^{32}P, ^{14}C,^{24}Na,^{90}Y etc **ii) Protective and adsorbents-** Are the chemical agents used internally in treatment of disturbances of gastrointestinal tract like diarrhoea & dysentery because they are water insoluble substances and they form a protective coat on the mucosal membrane and offer mechanical protection, furthermore, they adsorb bacterial toxins which are believed to stimulate flow of electrolytes into intestine resulting in watery stools. e.g. - Bismuth Sub carbonate, Kaolin etc. **iii) Buffers-**Buffers are solutions or systems that resist a sudden change in pH	**1M EACH**

		upon addition of small quantities of acids & bases.e.g.- Ammonium acetate. Acetic acid and sodium acetate. Ammonia and Ammonium chloride **iv) Radio-opaque contrast media-** Are the chemical compounds which have the ability to absorb X-rays & block the passages of X-rays. Thus, they are opaque to x-ray examination, such compounds & their preparations are called as radio opaque contrast media. X-rays are electromagnetic radiation of short wavelength & thus have high penetrating power. The electrons of high atomic number element can interact with x-rays. The interaction causes interference in their passage through the medium. e.g.- Barium sulphate	
3	**c)**	**Give two identification tests for-** **i) Chloride ion** **ii) Calcium ion** **i) Chloride ion:-** 1) Dissolve in 2ml of water a quantity of the substance being examined equivalent to about 2mg of chloride ion. Acidify with dilute nitric acid & add 0.5ml of silver nitrate solution. Shake & allow to stand, a curdy white ppt. is formed, which is insoluble in nitric acid but soluble after being well washed with water, in dil. ammonia solution, which is reprecipitated by addition of dil. nitric acid. $NaCl + AgNO_3 \longrightarrow AgCl + NaNO_3$ 2) Take 2mg of substance in test tube add 0.2gm of potassium dichromate & 1ml of Sulphuric acid. Place filter paper strip moistened with 0.1ml of diphenylcarbazide solution over the opening of the test tube, the paper turns violet red. 3) Chloride when heated with manganese dioxide & sulphuric acid, chlorine gas Liberated. $NaCl + 2H_2SO_4 + MnO_2 \longrightarrow MnSO_4 + Na_2SO_4 + 2H_2O + Cl_2\uparrow$ **ii) Calcium ion:-** 1) When solution of calcium salt is prepared with minimum amount of HCl, neutralized with ammonium carbonate solution gives a white ppt. of calcium carbonate. On boiling & cooling the amorphous ppt. of calcium carbonate becomes crystalline. The ppt. is sparingly soluble in ammonium chloride solution.	**2M EACH**

		$Ca^{++} + Co_3^{--} \longrightarrow CaCO_3$ 2) When ammonium oxalate solution is added to a solution of calcium salt, a white ppt. of calcium oxalate is obtained. This ppt. is sparingly soluble in dilute acetic acid but dissolves in HCl. $Ca^{++} + C_2O_4 \longrightarrow CaC_2O_4 \longrightarrow CaCl_2 + H_2C_2O_4$ 3) Concentrated solutions of calcium salts on treatment with potassium chromate solution give a yellow crystalline ppt. of calcium chromate on shaking. On dilution with water the ppt. dissolve $Ca + 2CrO_4^- \longrightarrow 2CaCrO_4$ 4) When a solution of calcium salt is acidified with glacial acetic acid and treated with few drops of potassium ferrocyanide solution, the salt solution remains clear; on addition of ammonium chloride it gives a white ppt which is less soluble. The exact composition of second ppt is depend upon amount of ammonium ions. $Ca^{++} + 2K^+ + Fe(CN)_6^{----} \longrightarrow CaK_2(Fe(CN)_6) \longrightarrow CaNH_4KFe(CN)_6$	
3	**d)**	**Discuss the biological effects of radiations on human body.** **Biological effects of Radiation** The effect of radiation upon biological tissue depends upon a number of factors such as: -Ability of the radiation to penetrate tissue. -The energy of Radiation -The kind of Tissue -Surface area of the tissue exposed -Dose rate of the Radiation The radiation interacts with the molecules present in the tissue & forms abnormal chemical species like ions &/or free radicals. These ions or free radicals can alter the local PH in the tissue & initiate the undesirable free radical chain reactions, producing peroxides & other compounds toxic to the tissue .this may lead to necrosis &ultimately destroy the tissue or organ. Water molecules in the tissue are the most probable reactive species in the path of ionizing radiation. Other Free Radicals & Hydrogen peroxidases also formed.	**4M EACH**

		×H2O →×H+×HO ↓ ↓ yH2 yH2O2 Free radicals formed from water can also abstract radicals from other molecules &produce various toxic species which can alter the DNA in cells & cause cross linking between certain amino acids in proteins. Thus the particular tissue gets destroyed. Alpha particles also have a potential to produce a tremendous amount of ionization or free radicals but the range & penetration of these particles are very slight. Therefore, the isotopes emitting alpha particles must be close enough to the individual for the radiation to reach the skin, in order to get observable effects. Gamma rays have relatively low ionizing power, even though the range & penetrating power of this type of radiation are high enough to produce significant damage in the particular tissue at distances of several meters from the source.	
3	**e)**	**Define cathartics. Classify with examples. Give synonym and molecular formula of Sodium Potassium tartarate.** **Cathartics**: Cathartics are the agents used to promote defecation or to relieve constipation. Laxatives are mild cathartic and Purgatives are strong cathartics. **Cathartics Classification:** **1. Laxatives** **A) Bulk producing drugs**- Isapgol, agar-agar, methyl cellulose, sodium car boxy methyl cellulose. **B) Stool softners (Emollient)** - liquid Paraffin **2. Strong purgatives** **A) Irritant/Stimulant purgatives**- senna glycoside, phenolphthalein, aloe, castor oil, rhubarb. **B) Saline cathartics/ Osmotic laxatives** (i) Sodium Containing products- Sodium Potassium Tartrate, Sodium Phosphate (ii) Magnesium Containing products- Magnesium hydroxide, Magnesium sulphate, Magnesium Citrate	**1M EACH**

		(iii) Sulfur as cathartic (iv) Non official Cathartics- Sodium Sulphate, Potassium Phosphate. **Synonym-** Rochelle salt, seignette salt, Potassium sodium tartarate. **Molecular formula-** $C_4H_4O_6NaK.4H_2O$	
4		**Attempt any THREE of the following:**	**12M (3X4)**
4	**a)**	**Give storage and labelling for-** **i) Oxygen** **ii) Carbon dioxide** **i) Oxygen**: It should be stored under compression in metal cylinder. It should be stored in a special storage room which should be cool and free from inflammable materials. The shoulder of the metal cylinder is painted WHITE and remainder is painted BLACK. The cylinder carries a label stating the name of the gas and in addition, the symbol "O_2" is stencilled in paint on the shoulder. **ii) Carbon dioxide:-** It should be stored under compression in metal cylinder.The shoulder of cylinder is painted grey and has the name and symbol of "CO_2" stencilled in paint on the shoulder.	**2M EACH**

4	**b)**	**Draw a well labeled, neat diagram of Gutzeit-Apparatus**  Apparatus used for arsenic limit test	**4M**
4	**c)**	**Classify Gastrointestinal Agents with examples.** **Classification :** **1) Gastric acidifiers/Acidifying agent:** Dilute Hydrochloric Acid **2) Antacid**: **i) Systemic Antacid**- Sodium Bicarbonate **ii) Non systemic Antacid**- Aluminium Hydroxide, Aluminium Phosphate, Basic aluminium carbonate , Magnesium carbonate, Magnesium oxide, Magnesium hydroxide, Magnesium trisilicate, Calcium carbonate, Calcium Phosphate, Sodium bi-carbonate etc. **3) Protective and Adsorbent**: Bismuth Sub carbonate , Bismuth sub nitrate , kaolin , Milk of bismuth etc **4) Cathartics** –it is also classified as i) Stimulant ii) Bulk purgative iii) Lubricants iv) saline cathartics E.g. – Castor oil, Methyl cellulose, liquid paraffin, Mineral oil, Senna, Magnesium sulphate, Isapgol, etc.	**4M**

4	**d)**	**Name four devices used for measurement of radiations. Explain GM counter.** **Devices-** 1. Ionization chamber 2. Proportional counters 3. GM counters 4. Scintillation counter 5. Semiconductor detectors 6. Photographic plate method **GM counter-** **Construction & working of GM counter** 1. It consists of stainless steel or glass cylinder with silver on the inner side which acts as a cathode. 2. A fine metal wire is mounted coaxially inside the cylinder which acts as an anode. 3. The cylinder is fitted with argon gas & radiation enters through the window. 4. Due to radiations, argon gas is ionized. A high voltage (800-1300 V) is maintained between the electrodes. 5. Due to ionization of argon gas, positively charged ions are attracted towards cathode & negatively charged ions are attracted towards anode. 6. The passage of these ions through the tube constitutes flow of current. 7. Each particle of radiation causes a brief flow or pulse of current which is recorded by a device known as scaler. Scaler shows total number of pulses & results are analysed.	**1M** **Names** **3M** **Expl.**

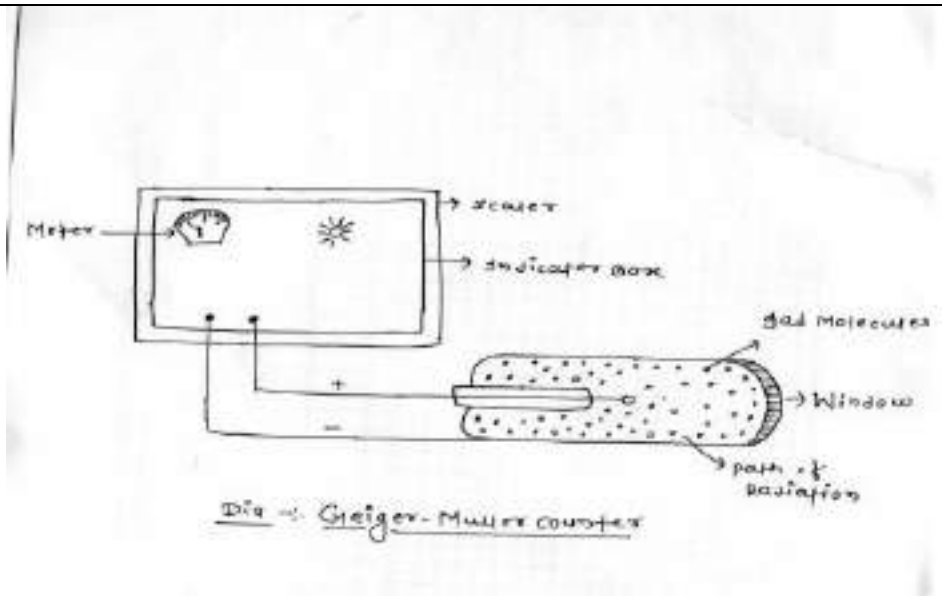
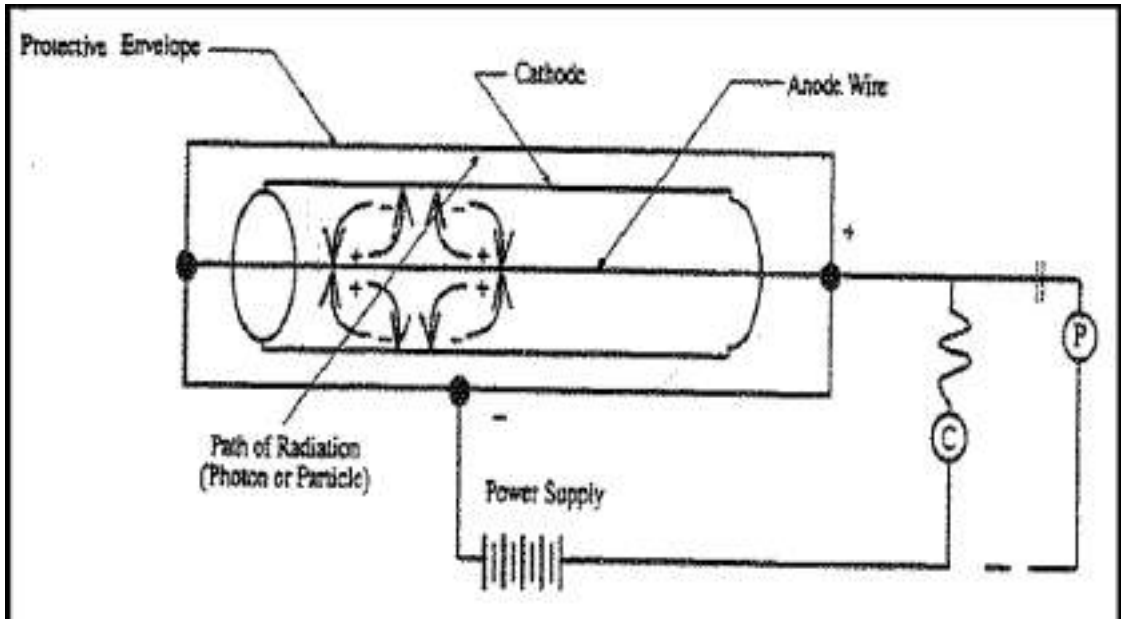


Fig :- Geiger-Muller counter



4	**e)**	**Define and classify antidote with examples. Name two antidotes used in cyanide poisoning.** **Definition:** Antidotes are the agents which are used to reverse, stop or counteract the action of poisons. **Classification of Antidotes-** (1) Physiological antidote:	**1M Def. 2M Classify**

		It acts by producing the effect opposite to that of poison, or counteract the effect of poison physiologically. e.g. Sodium nitrite used in cyanide poisoning (2) Chemical antidote: It acts usually by combining with the poison and thus Changes the chemical nature and detoxifies the poison. e.g. sodium thiosulphate used in cyanide poisoning. (3) Mechanical antidotes: These usually act by preventing the absorption of Poison in the body or expelling out the poison by emesis or elimination through urine. e.g. Activated charcoal,$MgSo_4$,$NaHPO_4$,$Cuso_4$ **Antidotes used in cyanide poisoning-** • Sodium Nitrite • Sodium thiosulphate.	**1M names of ant.**
5		**ATTEMPT ANY <u>THREE</u> OF THE FOLLOWING**.	**12M (3X4)**
5	**a)**	**Explain "Physiological acid-base balance".** • The acid-base balance in the body is well regulated by intricate mechanisms. • Number of chemical reactions takes place inside the cells and the activity of cell and the reactions occurring inside the cell is greatly influenced by pH or hydrogen ion concentration. • The hydrogen ion concentration in the extra-cellular fluid is regulated at a value of approximately 4 x 10^{-8}Eq/Iit. • The pH of blood of healthy person remains constant around 7.38-7.42. • When the pH of the blood falls below 7.38, the condition is known as metabolic acidosis**,** while when the pH of blood is higher than 7.42, it is known as metabolic alkalosis. The control of hydrogen ion concentration (pH). (Physiological Acid- Base Balance) is mainly carried by three mechanisms viz. **<u>(1) Buffering system :-</u>** Three major systems of buffers occurring in the body are:-	**4M**

(i) Carbonic acid/bicarbonate **[H_2C0_3/HCO_3^-]** which mainly occurs in plasma and kidney,

(ii) Monohydrogen phosphate/dihydrogen phosphate **[$HPO_4^{-2}/H_2PO_4^-$]** found in cells and kidney and

(iii) Protein buffer system.

- Proteins are composed of amino acids which are bound together by peptide linkage.
- It is the most abundant buffer in body cells & plasma. Proteins are composed of amino acids that contain at least one carboxyl group (COOH) & at least one amino (NH_2) group.
- When there is an excess of hydrogen ions, the amino group acts as a base & accepts the proton.
- Thus, protein serves both the functions of acid & base components of a buffer system because of its amphoteric nature.
- At physiological pH, histidine & cysteine are the most important amino acid buffers.
- Since haemoglobin is a protein composed of histidine residues, it is also an effective buffer.

(2) Respiratory centre:-

- The other important pH control is through the control of "respiratory centre".
- When this is stimulated, it alters the rate of breathing.
- Through the rate, the removal of $CO_2$from body fluids leads to the changes in pH of blood.
- Retention of CO_2in the body due to decrease in ventilation as a result of mechanical/muscular impairment, lung disease, pneumonia, CNS depression due to narcotic drugs, etc. induces respiratory acidosis.
- This can be overcome by renal mechanismby
  i) Increase in acid excretion by Na^+- H^+ exchange
  ii) Increase in reabsorption of HCO^{3-} (bicarbonate)
- In respiratory alkalosis there is excess loss of CO_2 from body due to over breathing or hyperventilation as a result of emotional factor, fever, hypoxia, loss of appetite, salicylate poisoning etc. This can be overcome by renal mechanism by :

		• Increase in bicarbonate (HCO_3^-) excretion • Decrease in ammonia (NH_3) formation • Decrease in reabsorption of HCO_3^- (bicarbonate) **(3) Kidneys:-** • The third mechanism is via elimination of some ions through urine by kidney. • Absorption of certain ions and elimination of others control the acid-base balance of blood and thus of body fluids.	
5	**b)**	**Define impurity and explain its effect on pharmaceutical preparations.** **Impurity-**Any foreign matter present in a given sample is termed as an impurity. **Effect of impurity on pharmaceutical preparations-** • Toxic impurities- These impurities have toxic effect on body if present beyond prescribed limit. E.g.- Lead or Arsenic. • Impurities which are harmless- These may lower the active strength of the substance. E.g- impurities of Sodium salts in Potassium salts. • Impurities which affects the storage capacity of pharmaceuticals. E.g- presence of moisture beyond limit may affect the flow property of substance or decompose it. • Impurities causing technical difficulties. E.g.- presence of carbonate impurity in ammonia solution. • Impurities may cause changes in odour, colour, and taste thereby making the substance unethical and unhygienic. • Impurities may cause incompatibility with other substances. • Impurities may decrease the shelf life of substances. • Impurities, even when present in traces, may show a cumulative toxic effect after a certain period.	**1 M def. 3M effect.**
5	**c)**	**Discuss Arrhenius theory of acids and bases with examples. Write uses of Boric acid and Calcium hydroxide.** Acid is defined as a substance which when dissolved in water gives hydrogen ions. **(H^+)** E.g. $HCl \longrightarrow H^+ + Cl^-$ $CH_3COOH \longrightarrow H^+ + CH_3COO^-$	**1M each**

		Base is defined as a substance which when dissolved in water gives hydroxyl ions. **(OH^-)** e.g. $NaOH \longrightarrow Na^+ + OH^-$ $NH_4OH \longrightarrow NH_4^+ + OH^-$ Acid or Base on dissolution in water dissociates forming ions and establishes equilibrium between ionized and unionized molecule. **Uses of Boric acid-** • Boric acid is used in preparation of buffer solution. • It is used to maintain acidic pH in various topical medications. • Boric acid is used in ointment for emollient & antiseptic action. • Boric acid solutions are used mainly as eye & mouth wash for local anti-infective action. • Since boric acid has smooth unctuous nature it is employed as an ingredient in dusting powder. **Uses of Calcium hydroxide-** • It acts as an antacid. • Used as an astringent in infantile diarrhea & vomiting in the form of lime water. • It reacts with fatty acids, forming calcium soaps which act as emulsifying agent. • It is an ingredient in some skin lotions. • Calcium hydroxide along with sodium hydroxide in a particular mixture known as Soda Lime is used for its ability to absorb CO_2 from expired air. • Its CO_2 absorbing property is useful in certain types of gas traps.	
5	**d)**	**State the reactions and explain the principle of assay of hydrogen peroxide or ferrous sulphate.** **Hydrogen peroxide** **Theory:** • This assay is based upon the oxidation –reduction type of titration in which solution of potassium permanganate acts as an oxidizing agent and hydrogen peroxide in	**2 M each**

		presence of strong oxidizing agent like potassium permanganate acts as reducing agent. The potassium permanganate solution acts as self-indicator. • The ability of potassium permanganate solution to oxidize is due to the conversion of the MnO_4^- to Mn^{++} in acidic solution. MnO_4^- are purple in colour & solution of salts containing Mn^{++} are colourless, hence permanganate solution is decolorized by reducing agent like hydrogen peroxide. The moment there is an excess addition of potassium permanganate; solution becomes purple at the end point. **Chemical reaction for assay:** $2KMnO_4 + 3H_2SO_4 + 5H_2O_2 \rightarrow K_2SO_4 + 2MnSO_4 + 5O_2\uparrow + 8H_2O$ **Ferrous sulphate** **Theory-** • Assay of ferrous sulphate depends upon oxidation-reduction type of titration where Fe^{2+} (Ferrous ions) are readily oxidized by potassium permanganate in acidic solution (H_2SO_4) in to Fe^{3+}(ferric ion). • Thus ferrous sulphate acts as a reducing agent and potassium permanganate acts as an oxidising agent. • The ability of potassium permanganate solution to oxidize ferrous ion is due to conversion of the MnO_4^- ion to Mn^{++} in acidic solution. Solutions containing MnO_4^- ion are purple in colour , solution of salt containing Mn^{++} ions are colourless, hence potassium permanganate in acidic solution acts as a self-indicator. **Chemical reaction for assay:** $10\ FeSO_4 + 8H_2SO_4 + 2KMNO_4 \rightarrow 5Fe_2(SO_4)_3 + 2MNSO_4 + K_2SO_4 + 8H_2O$ $MnO_4 + 8H^+ + 5e^- \longrightarrow Mn^{+2} + 4H_2O$ $Fe^{2+} \rightarrow Fe^{3+} + e^-$	
5	**e)**	**Give properties, uses, storage and labelling of Nitrous oxide.** **<u>Properties</u>** • Nitrous oxide, commonly known as laughing gas or nitrous, is a chemical compound,	**1 M each**

		an oxide of nitrogen with the formula N_2O. • At room temperature, it is a colourless non-flammable gas, with a slight metallic scent and taste. • At elevated temperatures, nitrous oxide is a powerful oxidizer similar to molecular oxygen. • It is soluble in water. **Uses** • It is used by inhalation for operation of short duration like dental extractions, minor operations of boils and abscesses. • It produces anesthesia with analgesia. • It is also effective in calming excited mental patients. • Nitrous oxide is given by inhalation in 60-80% or with oxygen 20-40% as required. **Storage and Labeling:-** • The gas is stored in metal cylinder under compression and at a temperature not exceeding 37°C. • The cylinder is painted blue and carries a label stating the name of gas and symbol N_2O stenciled in paint.	
6		**Attempt any THREE of the following.**	**12M (3X4)**
6	**a)**	**Explain the importance of Electrolyte combination therapy and ORS mixture and give recommended by WHO and UNICEF.** • Electrolyte combination therapy-Usually when patient is unable to take normal diet before or after surgery, the electrolyte combination therapy is used. • Infusions containing glucose and normal saline are used. • But when the patient is deficient or in protracted illness, other electrolytes are also needed and in such cases the combination of electrolytes are prepared and given as per the need of the patient. • Various combinations of electrolytes, varying in concentration are available commercially.	**2M impor tance 1M each formu la**

- Electrolyte combination products are divided in two categories:-
  (i) Fluid maintenance therapy.
  (ii) Electrolyte replacement therapy.

Oral rehydration salt (ORS):

- ORS is used to supply water and electrolytes in amounts needed for maintenance as soon as
- Intake of usual foods and liquids is discontinued, and before serious fluid losses occur.
- They are also given to replace mild to moderate fluid loses due to excessive vomiting, diarrhoea, or prolonged fever.
- Large number of oral rehydration preparations are available in the market which contain anhydrc NaCl, KCl and either $NaHCO_3$ or sodium citrate.
- These dry powder preparations are dissolved in specified amount of water and are used for oral Rehydration therapy.
- These preparations may contain a flavouring and suitable agent for free flow of the powder.

  The following three formulations are usually prepared when glucose is used, sodium bicarbonate is packed separately. The quantities given below are for preparing one litre solution –

Composition of ORS recommended by WHO and UNICEF.

Ingradients	**Formula-WHO**	**Formula-UNICEF**
Sodium Chloride	**3.5 gm**	**3.5 gm**
Sodium bicarbonate	**2.5 gm**	**……..**
Sodium citrate	**…….**	**2.9 gm**
Potassium chloride	**1.5 gm**	**1.5 gm**
Anhydrous glucose	**20 gm**	**20 gm**
Or Glucose	**22.0 gm**	**…….**

6	**b)**	**Define and classify Dental products. Give the role of fluorides in dental caries.** **Dental products**-The products which are used in cleaning, polishing, treating dental caries, desensitizing, or for any dental infection are called as dental products. They are also known as dentifrices. **Classification :** 1.Anticaries agents: Dental caries is a disease of teeth caused by acids formed by action of microorganism on carbohydrate and it is characterized by decalcification of tooth and foul mouth odour. Anticaries agents help in the prevention of dental caries. Ex. Sodium fluoride, Stannous fluoride 2. Cleaning agents: It helps to remove stains from teeth and gives abrasiveness. Ex. Calcium phosphate dibasic ,sodium metaphosphate 3. Polishing agents: It gives whiteness to the teeth. Ex. Calcium carbonate, Calcium pyrophosphate 4. Desensitizing agents: It reduces the sensitivity of teeth to hot and cold. Ex. Zinc chloride, Strontium chloride **Role of fluorides in dental caries** • Administration of traces of fluoride containing salts or their use in topical use to the teeth has found to give encouraging results. • When a fluoride containing salt or solution is taken internally, it gets readily absorbed, transported and deposited in the bone or developing teeth and remainder is excreted by the kidneys. • The deposited fluoride on the surface of teeth prevents the action of acids or enzymes in producing lesions. • The mechanism by which fluoride inhibits caries formation is still to be completely elucidated. There are two current hypotheses: (1) decreased acid solubility of enamel; & (2) bacterial inhibition.	**4 M**

6	c)	**Write the molecular formula and uses of the following.** **(i) Ferrous Sulphate-$FeSO_4.7H_2O$** **Uses-** • It is used as a haematinic and used in the treatment anaemia. • It is used to dye fabrics and in tanning leather, manufacturing of ink and in photography. It has disinfectant properties. **(ii) Magnesium Sulphate-$MgSO_4$** **Uses-** • Magnesium sulphate is given orally in dilute solutions. Because of bitter and nauseating taste it is given in fruit juices. • The mechanism of action is that magnesium sulphate is not absorbed from intestinal tract and thus retains sufficient water within the lumen. The hydrostatic pressure promotes motor activity or peristalsis of bowel. • It should be used with care in patients with impaired renal function. • It is also used as antidote in heavy metal poisoning. • Wet dressings of a 25% solution of magnesium sulphate are sometimes used in the treatment of carbuncles & boils.	**1M each**
	d)	**Write the principle and reaction involved in the limit test for chloride IP.** **Principle-** • The principle for limit test for chloride is based upon the measurement of opalescence or turbidity produced in the known amount of substance (by addition of precipitating reagent), and comparing it with the standard opalescence or turbidity. • The limit test for chlorides is based upon the chemical reaction between soluble chloride ions with silver nitrate reagent in a nitric acid media. • The insoluble silver chloride renders the test solution turbid (depending upon the amount of silver chloride formed and therefore on the amount of chloride present in the substance under test). • This opalescence is compared with the standard opalescence produced by the addition of silver nitrate, to the known amount of chloride ion (sodium chloride)	**3M** **principle** **1M react.**

		solution. • If the test solution shows less opalescence than the standard the sample complies the test. **Reaction:-** **$NaCl^- + AgNO_3 \rightarrow AgCl \downarrow + NaNO_3^-$**	
6	**e)**	**Explain Lowry-Bronsted theory with examples. Discuss advantages of this theory over other acid-base theories.** According to Bronsted Lowry concept, an acid is any substance capable of donating a proton in a chemical reaction. A base is any substance capable of accepting a proton in a chemical reaction. An acid is a proton donor and a base is a proton acceptor. This theory is also called Protonic concept. According to this concept, Bronsted acid ionizes to produce a proton and the conjugate base of the acid. This can be shown in following half reaction: $HCl \rightarrow H^+ + Cl^-$ Bronsted base accepts a proton & forms conjugate acid. This is shown by: $OH^- + H^+ \rightarrow H_2O$ **Advantages over other acid-base theories-** i) It can explain the basic character of substances like Na_2CO_3, NH_3 i.e. which do not contain OH^- group and hence were not bases according to Arrhenius concept on the basis that they accept protons. ii) This concept is not limited to molecules but also covers even the ionic species to act as acids or bases. iii) It can also explain the acid-base reactions in the non-aqueous medium.	**2M for each**

MODEL ANSWER

WINTER -18 EXAMINATION

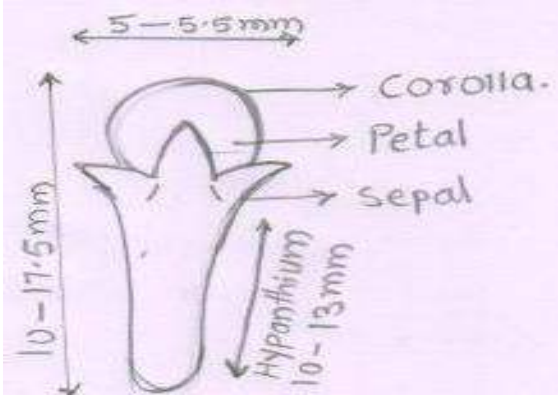
Subject Title: PHARMACOGNOSY **Subject Code:** 0807

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any TEN of the followings: (2marks each)**	**20M**
1	a)	**When,Where and who coined the term pharmacognosy?** In 1815, in the book Analecta pharmacognostica ,a German scientist C.A Seydler coined the term Pharmacognosy.	**2M**
1	b)	**Differentiate between leaf and leaflets(½ mark each for any 4 points)**	**2M**
1	c)	**Define – (1 mark each)** i)**Carminatives:** These are the agents that remove gases from gastro intestinal tract. **OR** These are the agents that act by relieving pain in the stomach and intestine and expel gas from the GI tract by increasing peristalsis. ii) **Antihypertensive:** The drug which is used in the treatment of high blood pressure is called as antihypertensive drug.	**2M**
1	d)	**Draw a well labelled diagram showing morphological characters of clove bud.**	**2M**

Leaf	**Leaflet**
1)Lamina is one entire piece	1)Lamina is completely divided into separate segment called leaflets
2) In case of leaf, bud or branch is present in the axil.	2) It is absent in leaflets.
3) Leaves are arranged spirally and they are solitary in nature.	3) Leaflets are arranged in pairs.
4) Lamina lies in different planes.	4) Lamina lies in one plane.
5) Lamina is generally symmetrical at the base. .Ex. Digitalis, Belladona, Vasaka	5) Lamina is asymmetrical at the base. Ex. Senna, Neem

			
1	**e)**	**Explain Goldbeater's skin test for tannins.** In this test, a piece of gold beater skin, (intestine of ox) is treated with 2%. HCL and washed with distilled water. It is then placed in the solution of tannin for 5 mins, again washed with distilled water and transferred to1% ferrous sulphate solution. A change in colour of goldbeater's skin to brown or black indicates the presence of tannin.	**2M**
1	**f)**	**Mention the synonym of following drugs (½ mark each)** i) **Rauwolfia** – Rauwolfia root /chhotachand /sarpagandha/ snake root/Chandrika/Pagla kadawa/ Patala – Gandhi / Dhanbura /Covanamipori ii) **Gymnema-** Gudmar /Madhunashini / Gurmar iii) **Gokhru -** Punture vine iv) **Vinca -** Catharanthus/vinca rosea /periwinkle/sadaphuli/ Madagascar periwinkle /Rattanjot	**2M**
1	**g)**	**Write the biological source with family- (1 mark each)** **i) Rhubarb :** It consist of dried rhizomes of Rheum palmatum ,Rheum emodi and Rheum webbianum belongs to Family-Polygonaceae **ii)Tobacco** : It consists of dried leaves of Nicotiana tobacum belongs to Family Solanaceae	**2M**
1	**h)**	**Enlist different types of Ash value. (1/2 mark for each type)** **<u>Types of Ash</u>** 1) Total ash 2) Acid insoluble ash 3) Water insoluble ash	**2M**

		4) Sulphated ash	
1	**i)**	**Mention one example of crude drug from the following family – (½ mark each)** **i)** **Zingiberaceae-** Cardamom/ Ginger /Turmeric **ii)** **Styraceae –** Benzoin iii) **Ranunculaceae –** Aconite **iv)** **Rutaceae-** Orange oil / Lemon oil	**2M**
1	**j)**	**What is Garbling? (2 marks)** Garbling is the process applied to remove sand, dirt and foreign organic parts of the same plant, not constituting drug.	**2M**
1	**k)**	**Identify a drug containing following chemical constituents- (½ mark each)** **i)** **Withanolide -** Ashwagandha **ii)** **D – linalool** - Coriander **iii)** **Allin –** Garlic **iv)** **Vitamin A –** Shark liver oil	**2M**
1	**l)**	**Which part of the plant is used as crude drug in case of: (½ mark each)** **i)** **Cinchona –** dried bark **ii)** **Black pepper –** fruit **iii)** **Ephedra-** young stem **iv)** **Colchicum-** seeds or corm	**2M**
2		**Attempt any THREE of following(4 marks each)**	**12M**
2	**a)**	**Assign the name and explain chemical test for the crude drug containing – (1 mark each for name of the test and explanation of test)** **i)Tropane alkaloid** **ii) Mucilage** **i)Tropane alkaloid : Vitali –Morin test :** The tropane alkaloid is treated with fuming nitric acid, followed by evaporation to dryness	**4M**

		and to the residue methanolic potassium hydroxide solution is added .It gives a bright purple (violet) colouration that changes to red and finally fades to colourless indicating the presence of tropane alkaloids. **ii) Mucilage : Swelling factor test:** It is determined by putting 1 g of the drug in 25ml of measuring cylinder. Add 20 ml of water with occasional shaking; keep it for 24hrs.After 24hrs, the seeds swell. The volume occupied by seeds is the swelling factor.	
2	**b)**	**Describe method of collection and preparation of Senna Leaf for market.** **(2 marks each for collection and preparation)** **Collection of Senna:** Alexandrian senna is collected mainly in September from both wild and cultivated plants. The pods and large stalks are first separated by means of sieves. By the tossing process leaves get separated from the heavier stalks. The leaves are then graded, partly by means of sieves and partly by hand picking into 1. Whole leaves 2. Whole leaves and half leaves mix. **Preparation for market:** The harvested leaves are spread on the floor under the shade without overlapping .The leaves are shuffled to attain uniform drying .Leaves loose about 50 - 60 % of their weight on drying. After drying leaves are packed in bales under hydraulic press and store it away from light and send to market.	**4M**
2	**c)**	**Enlist various methods for isolation /extraction of volatile oil. Explain any two methods in detail. (1 mark to enlist the methods of extraction , 1 ½ marks each for explanation of any two methods)** **<u>Methods of isolation: (1 mark)</u>** 1. Distillation Method 2. Solvent Extraction 3. Ecuelle Method 4. Enfleurage Method	**4M**

		Methods of extraction: (any 2 methods – 1 ½ marks each) **A) Distillation :**Most of the oils are obtained by distillation which are of following 3 types 1.Water distillation-It is mostly applicable to such plant material, which is dried initially in air and the constituents are not degraded by boiling upto 100^0C e.g Turpentine oil 2.Water and steam distillation – It is often suitable for plant materials (whether fresh or dried), the constituents of which undergo degradation by direct boiling e .g Clove oil 3. Direct steam distillation- It is invariably applicable to fresh drug that is loaded with sufficient natural moisture and hence no maceration is required e.q. peppermint oil. **B) Solvent Extraction :** Extraction is done by using some organic solvents like ether, benzene, petroleum etc. Some essential oils are sensitive to heat and hence get decomposed during distillation, in such cases the plant material is directly treated with organic solvent at 50°C and the solvent is removed by distillation under reduced pressure. **C) Ecuelle Method**: is used for extraction of citrus oils, wherein oil cells in rind are ruptured mechanically using pointed projections by twisting raw material over them in clockwise direction either mechanically or manually. **D) Enfleurage Method**: It is used in the extraction of delicate perfumes. The fresh flower petals are spread on a fatty material. The spread petals are exhausted after sometime as the fatty material absorbs the oil. These exhausted petals are replaced by fresh petals. The process is continued till the fatty layer is saturated with volatile oil which are then extracted with lipid solvent.	
2	**d)**	**What are cardiotonics? Write the biological source ,chemical constituents and uses of Arjuna (1 mark for definition and 1 mark each for biological source ,chemical constituents and uses)** These are the drugs which gives strength or energy to the activity of the heart. **OR**	**4M**

		Cardiotonics are the drugs which gives strength or energy to the cardiac muscles. **Arjuna :** **Biological Source:** It consists of dried stem barks of the plant Terminalia arjuna Family: Combretaceae. **Chemical constitutents:** Arjuna contains about 15% of tannins. It also contains triterpenoids saponins, arjunolic acid, arjunic acid, arjunogenin. It also contains β-sitosterol, ellagic acid and arjunic acid. **Uses: (any 2 uses)** It is used as cardiotonic. It is also styptic, febrifugal and antidysentric. It possesses diuretic and tonic properties.	
2	**e)**	**Define Antiseptics and Disinfectants. Give biological source with family of – (1 mark each for definition and 1 mark each for biological source)** **Antiseptics:** Antiseptics are the chemical sterilizing agents which are used to kill pathogenic microbes or for prevention of their growth. **OR** An antiseptic is an agent which prevents sepsis by destroying or inhibiting the growth of microorganisms on living tissues. **Disinfectants:** Disinfectants are the substances which are used to make a surface free from pathogenic organisms but these substances are applied only on inanimate objects. **OR** These are the substances which kill the bacteria as well as their spores. **Biological Sources:** **(i)** **Neem**: It is dried Leaves (aerial parts) & seed oil of Azadirachta indica, belonging to family Meliaceae. **ii)** **Myrrh** : It is an Oleo-gum-resin obtained from Commiphora molmol,belongs to family: Burseraceae	**4M**

3		**Attempt any THREE of following (4 marks each)**	**12M**
3	**a)**	**Give the chemical constituents and uses of –** **(i)Fennel** **(ii)Sandalwood** **(1 mark for chemical constituents and 1 mark for any two uses of each drug)** **(i) Fennel –** **Chemical constituents -** Fennel consist of 3 to 7 % of volatile oil, about 20% each of proteins and fixed oil. The chief active constituents of volatile oil are a ketone, fenchone (about 20%) and phenolic ether, anethole (about 50%). The other constituents are phellandrene, limonene, methyl chavicol, anisic aldehyde. **Uses -** 1) Carminative, 2) An aromatic and a stimulant. 3) Expectorant. 4) Pharmaceutically, it is used as a flavouring agent. **(ii) Sandalwood -** **Chemical constituents -** The main product of sandal wood is the volatile oil (2.5%) called sandal wood oil. All the wood elements of this drug contain volatile oil. Sandal wood oil contains about 95% of two isomeric sesquiterpene alcohols, α- santalol and β – santalol. The oil also contains an aldehyde santalal, santene, santenone, teresantol. **Uses-** **1)** It is used as a source of sandal wood oil. 2) The oil is used for symptomatic treatment of dysurea and in diminishing the frequency of micturition marked in the tuberculosis of the bladder.	**4M**

3) The oil is mainly used as a perfume in cosmetics and in incense sticks.

4) The wood is utilized for other purposes like carvings and manufacture of boxes.

3 b) Explain chemical classification of crude drug with its merits and demerits **4M**

(2 marks for any four classes with atleast one example, 1 mark each for merits and demerits)

This type of classification is based on type of chemicals present in the drugs.

Class	Examples
1. Alkaloids	Aconite, cinchona, nux-vomica, vinca, ipecac, belladonna, opium , tea
2. Glycosides	Digitalis, senna, squill, aloe, dioscorea, liquorice, wild cherry.
3. Lipids	Castor oil. Peanut oil, mustard, wool fat, cod -liver oil.
4. Volatile oils	Peppermint, clove, eucalyptus, valerian.
5. Tannins	Myrobalan, kino, catechu, galls
6. Vitamins	cod –liver oil, shark-liver oil
7. Resin and resin combinations	Benzoin, balsamof tolu, storax, asafoetida, myrrh , colophony, guggul , shellac.
8.Carbohydrates and derived products	Yeast, Agar, honey, starch, tragacanth, acacia, Guar gum, sterculia.

Merits: (any two)

1. This type of classification is applicable to crude drugs containing similar type of chemicals.

2. It is useful for phytochemical studies of crude drugs.

3. Combination of drugs can be done for more or better therapeutic action.

Demerits:

1. It is difficult to categorise the drug when it contains two or more active chemical constituents

2. The drugs from various sources are grouped together.

3 c) How will you distinguish silk fibres from wool fibres using its source, solubility tests and two chemical tests? **4M**

(2 marks for source, 1 mark for solubility test and 1 mark for chemical test.)

Sr No.	Silk fibre	Wool fibre
1) Source	These are the fibre obtained from cocoons of Bombyx mori, family Bombycidae	These are the fibre obtained from fleece of sheep, Ovis aries, family Bovidae
2)Solubility test	Silk is soluble in cuoxam, sulphuric acid (66%) and concentrated hydrochloric acid.	Wool is insoluble in cuoxam, sulphuric acid (66%) and concentrated hydrochloric acid. It is soluble in 1.25M sodiumhydroxide solution.
3) Chemical test	Silk does not contain sulphur containing amino acids hence the test with lead acetate & KOH solution does not form black precipitate	Wool contain sulphur containing amino acids hence it gives black precipitate with lead acetate & KOH solution.

3	**d)**	**Describe the life cycle of Ergot. (diagram 2marks & explanation 2 marks)**	**4M**

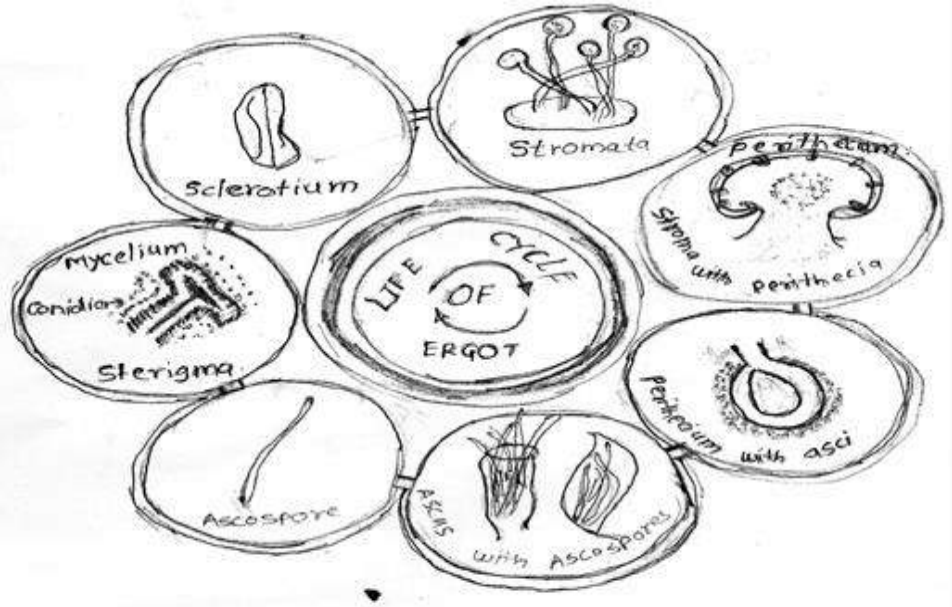
Stages of life-cycle of Ergot are as follows -

i) Over wintering stage

ii) Stage of sexual reproduction iii) Stage of asexual reproduction

The sclerotia are produced in late summer. They fall on the ground in autumn. When the favourable conditions for germination are available, these sclerotia germinate in the spring to produce purple coloured stalks which on further growth form flattened spherical cavities known as perithecia. Each peritheciumcontain severalasci. Each ascus contains eight threads like ascopores. Ascopores come out & get dispersed by air. The dispersal of ascopores takes place at time of flowering of rye plant. Ascopore become entangaled with the stigma of host & produce mycelia which penetrate through ovary. The mycelia give rise to conidia, produced from the surface of ovary. Honey –dew attracts insects, along with it conidia are carried from one place to another by insects & is known as honey –dew stage.

In second stage , hyphae penetrate deeply into the ovary & develop into mass covering entire ovary which results in formation of elongated sclerotium & known as sclerotium stage. Sclerotium developes , attains maximum size & falls on ground and the cycle begins.

		 Life cycle of ergot.	
3	**e)**	**Name any two adulterants for –(1 mark for any two adulterants of each drug)** **(i) Senna –** i. Dog senna (Italian senna) ii. Palthe senna iii. Arabian senna (ii) **Clove –** i. Mother clove ii. Blown clove iii. Clove stalks iv. Exhausted clove. (iii) **Nux-vomica-** i. Dried seeds of Strychnos nuxblanda ii. Dried seeds of Strychnos potatorum iv) **Digitalis -** i. Leaves of Verbascum thapsus ii. The Primrose leaves iii. Comfrey leaves	**4M**

4		**Attempt any THREE of following(4 marks each)**	**12M**
4	**a)**	**Define evaluation of crude drugs. Describe any three leaf constant used for drug evaluation with examples.** **(1 mark for definition and 1 mark each for any three leaf constants with any one example)** **Definition:** Evaluation of a drug means confirmation of its identity and determination of its quality and purity. The various leaf constant used for drug evaluation are as follows – i. Stomatal number ii. Stomatal index iii. Vein islet number iv. Palisade ratio i. **Stomatal number –** It is the average number of stomata present per square mm. of the epidermis. Stomatal number is constant for particular species of same age which grows in same environment.	**4M**

Species	**Stomatal number**
Datura stramonium	087 (upper epidermis)
Hyoscyamus niger	125 (upper epidermis)

ii. **Stomatal index -** It is the percentage which the number of stomata form to the total number of epidermal cells, each stoma being counted as one cell. It can be calculated by the formula :

$$I = \frac{S \times 100}{E+S}$$

Where, I - Stomatal index

S – Number of stoma per unit area

E – Epidermal cells in same area

Species	**Stomatal Index (lower surface)**
Atropa belladona	20.2 to 23.0
Atropa acuminata	16.2 to 18.3
Indian senna	17.0 to 20.0
Alexandrian senna	10.8 to 12.6

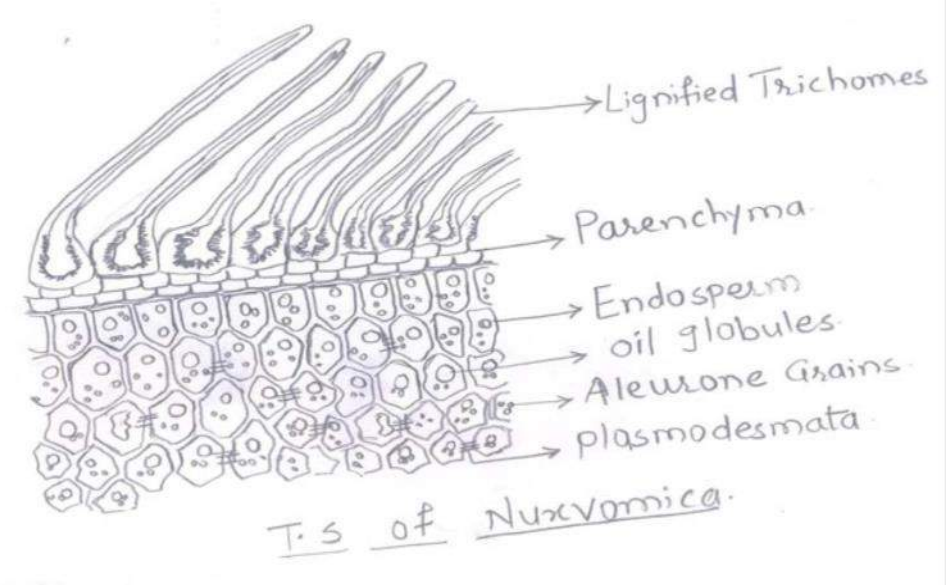
iii. **Vein islet number –** It is the number of Vein islets per square mm. of leaf surface.

Species	**Vein islet number**
Digitalis purpurea	02 – 5.5
Digitalis thapsi	8.5 – 16
Cassia angustifolia	19 – 23
Cassia acutifolia	25 - 30

iv. **Palisade ratio –** It is the average number of palisade cells, beneath one epidermal cell , using four continuous epidermal cells for the count.

Species	**Palisade ratio**
Atropa belladona	06 – 10
Datura stramonium	04 – 07
Digitalis purpurea	3.7 – 4.2

4	**b)**	**Draw a well labelled diagram of T.S. of Nux vomica and describe its microscopy by giving minimum four points. (Diagram 2 marks , ½ mark each for any four points.)**	**4M**

		 1) Lignified trichomes: Thick walled, bent and twisted lignified trichomes, immerged from epidermis, parallel in one direction. Length: 600 to 1000, diameter about 25µ 2) Epidermal cell: Single layer, forms lignified trichomes, large thick walled with oblique linear pits (base of trichomes). 3)Collapsed parenchyma: 2 layers, flattened parenchyma. 4)Endosperm: Thick walled cellulosic parenchymatous cells. Cell shows hemicelluloses in the cell wall 5)Plasmodesma: fine protoplasmic strands between the walls of endospermic cells. 6)Aleurone grains: About 30µ in diameter. Only globoids are presents. 7) Oil globules: fixed oils as small oil droplets in the cells	
4	**c)**	**Name the drug and their uses belonging to following family. (Any two)** **(1 mark for name of the drug, 1 mark for any two uses of any two of the above families.)** (i) **Acanthaceae - Vasaka** **Uses:** It is used as an expectorant, bronchodilator and as mild bronchial antispasmodic. Vasicine is reported to possess oxytocic action. (ii) **Caricaceae - Papaya** **Uses:** It is used in clarification of beverages and as a meat tenderiser. It is used in cheese manufacture as a substitute of rennin . Medicinally it is used as digestant and an anti-	**4M**

inflammatory agent. It has shown relieving symptoms of episiotomy.

(iii) **Gentianaceae – Shankhpushpi**

Uses: It is used as bitter and nervine tonic. The fresh juice of the plant is prescribed in insanity, epilepsy and nervous debility. Alcoholic extract possesses antiviral activity against Ranikhet disease virus (chicks). It is also used in hypertension and tranquilizer.

4 d) Define pharmaceutical aids. Classify it according to their uses and application with examples. (1 mark – Definition , 3 marks for any 6 classes) **4M**

Definition: The substances which are of little or no therapeutic value, but are essentially used in manufacture or compounding of various pharmaceuticals are known as pharmaceutical aids.

Classification with examples (any 6 classes with any one example for 3 marks)

Sr.No.	Class	Example
1	Acidulent	Tamarind, lemon juice
2	Colours	Turmeric, saffron, indigo, caramel, chlorophyll, β - carotene
3	Disintegrating agent	Starch, CMC, psyllium husk, microcrystalline cellulose.
4	Diluents	Cinnamon water, peppermint water, corn oil, peanut,oil,wild cherry syrup, sesame oil, glucose ,lactose
5	Emulsifying & suspending agent	Acacia, agar, gelatin, alginic acid, bentonite, methyl cellulose ,tragacanth ,guar gum
6	filter aid	Talc, bentonite, ,kieselghur.
7	flavours	Cardamom, rose, nutmeg, cinnamon, benzaldehyde, anethol, lemon oil, orange peel ,nutmeg
8	Hardening agents	Bees wax, hard paraffin

		9	lubricants	Talc, cocoa butter, magnesium stearate.	
		10	solvents	Alcohol, glycerine, propylene glycol, paraffin, triethanolamine.	
		11	Sweetening agent	Honey, saccharin, glycyrrhiza, sorbitol.	
		12	Ointment bases	Bees wax ,lanolin ,polyethylene glycol, paraffin, petroleum jelly, spermaceti, wool fat	
		13	Thicknening agents	Pectin , tragacanth, methyl cellulose.	
		14	vehicles	Arachis oil, honey ,sesame oil	
4	**e)**	**Explain the Borntrager's test and Modified Borntrager's test. Give the significance for each test. (1 mark for each test and 1 mark for significance of each test)** **Borntrager's test:** Boil the powdered leaves with dilute sulphuric acid. Filter immediately, separate the filtrate and cool. Mix the filtrate with double volume of organic solvents like benzene, chloroform or carbon tetrachloride. Shake it well and separate the organic solvent layer. To the layer of organic solvent add equal quantity of dilute ammonia. The ammonical layer becomes pink and finally red indicating the presence of anthranquinone derivatives. **Significance:** Borntrager's test is mainly used to identify anthraquinones derivatives present in Senna and Rhubarb. **Modified Borntrager's test :** To 0.1g of drug add 2ml 5% solution of ferric chloride and 2ml of dilute hydrochloric acid, heat on boiling water bath for 5 minutes, cool and shake gently with benzene. Separate benzene layer and add equal volume of dilute ammonia. A pinkish red		**4M**

		colour is produced with all varieties of aloes. **Significance:** Modified Borntrager's test is mainly used to identify C – glycoside in Aloe.	
5		**Attempt any THREE of following(4 marks each)**	**12M**
5	**a)**	**Define and classify resin and resin combinations with examples.(1 Mark each for definition and 1 mark each for classification with any one example)** **Definition:** Resins are amorphous mixture of essential oils, oxygenated product of terpenes and carboxylic acid and found as an exudation from the trunk of trees. **According to the principle constituents ; (1 mark for any 2 classes)** 1.**Acid Resins**- Acid is the main constituent of the resins. e.g. Abiatic acid (colophony), Commiphoric Acid (Myrrh). **2.Ester Resins** - Ester is the main constituent of the resins e.g.Benzyl Benzoate (benzoin), Ethyl cinnamate(storax) **3.Resin Alcohol** - The contents are the complex alcohols of high molecular weight.they are either in free state or as esters. e.g Peruresinotannol (peru balsam), Toluresinotannol(tolubalsam) **RESIN COMBINATION** **Definition:** Homogenous combinations of resins with other plant products like volatile oil ,gum etc. are known as resin combinations. **The different resin combinations are (1 mark for any 2 combinations)** **1.Oleo resin** –(volatile oil + resin) e.g Ginger,capsicum etc **2.Oleo gum resin** –(volatile oil + gum + resin) e.g. Asafoetida, Myrrh	**4M**

		3.Glycoresins (Sugar + resin) e.g jalap , ipomoea **4.Balsam-(**Benzoic acid +cinnamic acid) e.g Tolu balsam, Peru balsam	
5	**b)**	**Describe the method of preparation of cotton fibre.(4 Marks)** Fruits (capsules) are 3-5 celled,, which contain numerous seeds.. Seeds covered with hair, known as Balls. Balls are collected, dried & taken to ginning press, where in trichomes are separated from seeds. Raw cotton obtain from above is subjected to a process called combing. This saperates the long and short fibres .The long fibres are spun and woven as cloth and short fibres are called linters. This is used for manufacturing of absorbent cotton. Remove impurities (vegetable debries) from raw cotton To remove wax, fatty material & colouring matter, raw cotton is taken to the machine, cotton opener & followed by treatment with dil. Soda solution or soda ash solution under pressure for about 10-15 hrs. Washed with water & treated with suitable bleaching agent. Again washed, dried & make a flat sheet .Finally packed in paper wrappers & sterilized.	**4M**
5	**c)**	**Define with any two examples for each(½ mark for each definition and ½ mark for examples)** i) **Antitussives:** Antitussives are the agents which acts upon the pulmonary membranes that hasten or alter expectoration. **OR** These are the agents which relieves or suppreses the cough. **Example**- Vasaka, Tulsi, Tolu balsam. ii) **Diuretics:** Diuretics are the drugs which increase the flow of urine **Examples**- Gokhru, Punarnava **iii) Enzymes:** Enzymes are protein substances, which serve a role of catalyzing the biochemical reactions. **Example**s- Papaya, Diastase, Yeast. iv) **Vitamin:** Vitamins are the substances which are considered to be essential for the maintenance of normal metabolic functions, but are not synthesized by human body on its own, and hence to be supplied from outside sources.	**4M**

		Examples- Amla, Shark liver oil	
5	**d)**	**Assign the name of crude drug for following use with its chemical constituents.(any two)** **(1 Mark for drug name and 1 mark for chemical constituents)** **i) Antioxitocic and galactogogue** **Name of crude drug : Shatavari** **Chemical constituents:** Steroidal saponin glycosides i.e. Shatavarins I-IV. The aglycone moiety of shatavarin is sarsapogenin & glycon moieties are glucose & rhamnose. Shatavarin-I: 3 glucose &1 rhamnose moieties & in Shatavarin-IV: 2 glucose & 1 rhamnose moieties are attached to sarsapogenin. **ii) Brain tonic:** **Name of crude drug : Shankhpushpi** **Chemical constituents**: Alkaloid- Shankhpushpine Flavonoid- kampferol Also contain phytosterol, carbohydrates, xanthones & triterpenoides Also contain a bitter substance & an oleo resin. **iii) In the preparation of insect repellent coils and sticks.** **Name of crude drug : Pyrethrum** **Chemical constituents:** Active constituents are collectively known as pyrethrins, which are made up of carboxylic acid & keto-alcohols. Pyrethrin-I, cinerin-I, Jasmolin-I are esters of chrysanthemic acid, while Pyrethrin-II, cinerin-II, Jasmolin-II,are esters of pyrethric acid.	**4M**
5	**e)**	**Mention the different methods used for drug adulteration with examples.(½ mark for each method & ½ mark for example of that method)** **Methods of Adulteration: (Any Four Methods)** **1. Replacement by exhausted drugs:** Ex.1.Exhausted saffron is coloured artificially 2.Exhausted Ginger is mixed with starch & coloured. **2.Substitution with superficially similar but inferior drugs:** Ex.1. Adulteration of cloves by mother cloves. 2. Saffron with dried flower of carthamus tinctorius.	**4M**

		3.Substitution by artificially manufactured substituent: Ex.1. Paraffin wax is tinged yellow & substituted for yellow bees wax. 2. Artificial invert sugar is mixed with honey. **4.Substitution by sub- standard commercial varieties:** Ex.1. capsicum frutescens(capsicum minimum), substituted by capsicum annum. 2. Alexandrian senna with Arabian senna. 3. Strychnos nux-vomica adulterated with Strychnos nux-blanda/ S. potatorum seeds. **5. Presence of organic matter obtained from the same plant :** Ex.1. clove are mixed with clove stalks. 2. Caraway & Anethum fruits are mixed with other parts of inflorescence **6.Synthetic chemical:** Ex.1. Benzyl benzoate to balsam of peru. 2. Citral to oil of lemon grass. **7.Waste from market:** Ex.1. Limestone in asafoetida. 2. Pieces of amber coloured glass in colophony.	
6		**Explain chemical tests for the following crude drugs.(Any Four)(1 mark for each test)**	**12M**
6	**a)**	**<u>Asafoetida: (any 3 tests)</u>** i) When triturated with water, it forms yellowish orange emulsion. ii) On fractured surface of drug add sulphuric acid, red or reddish brown colour is observed. iii) Drug when treated with 50% nitric acid gives green colour. iv) Combined umbeliferone test - Triturate about 0.5 gm of drug with sand and 5 ml hydrochloric acid. To it add little quantity of water, filter. To the filtrate add equal volume of ammonia. A blue fluorescence is produced due to presence of umbeliferone.	**3M**
6	**b)**	**<u>Pale catechu: (any 3 tests)</u>** 1. Gambier fluorescin test.: Boil a little powdered drug with alcohol, filter and add sodium hydroxide solution to the filtrate, stir and add few ml of light petroleum. Petroleum layer shows green fluorescence. 2. Matchstick test: dip the wooden matchstick in the solution of drug and dry it over a flame.	**3M**

		Moisten the stick with hydrochloric acid and warm. Purple colour appears on the matchstick due to conversion of catechu into Phloroglucinol. 3. Vanilline hydrochloric acid test: Make solution containing vanilline 1ml, alcohol 10ml and dilute hydrochlororic acid 10ml ,it gives pink or red colour due to the formation of Phloroglucinol. 4. Heat about 0.5gm of powdered drug with 5 ml of chloroform in a dish and evaporate the filtrate on a water bath. A greenish yellow residue is left due to the presence of chlorophyll in the drug. 5. With ferric chloride it gives bluish black colour. 6. Lime water gives brown colour with aquous solution pale catechu.	
6	**c)**	**Tragacanth :(any 3 tests)** 1.When warm with NaOH solution gives a canary yellow colour 2.With iodine solution gives green colour 3.With ruthenium red particles does not acquire pink colour 4. Aquous solution of tragacanth produces a white precipitate with lead acetate solution. 5. Hydrolise the aquous solution of tragacanth with dil Hcl by boiling in water bath. Cool it add equal quantity of fehlings solution A and B, heat again,red precipitate is observed.	**3M**
6	**d)**	**Gelatin: (any 3 tests)** 1) Aqueous solution of gelatin gives precipitate with solution of trinitrophenol and solution of tannic acid. 2) On heating gelatin with soda lime solution, ammonia gas evolved. 3) Aqueous solution of gelatin precipitates mercuric nitrate solution forming white colour, which turns brick red on heating. 4) Formaldehyde makes gelatin hard and insoluble after drying.	**3M**

6	**e)**	**Benzoin: (any 3 tests)** 1) To a solution of benzoin in alcohol add water. Solution becomes milky & acidic to litmus 2) To the drug add solvent ether, decant ether layer & to it add 2/3 drops of H2SO4 A deep reddish brown colour in case of Sumatra Benzoin. A deep purplish-red colour in case of Siam Benzoin. 3) Heat Benzoin in a test tube with solution of KmnO4, it develops Strong odour of benzaldehyde. 4) To the alcoholic solution of Benzoin add FeCl3, Green colour develops in case of Sumatra Benzoin. 5) Heat small quantity of benzoin in dry test, cover the opening of test tube with clean dry glass slide, cool it and observe glass slide under microscope, cinnamic acid crystals are observed.	**3M**
6	**f)**	**Honey: (any 3 tests)** 1)Stir 10ml of honey with 5ml of solvent ether for 5-10 minutes, allow it separate and draw off 2ml of ethereal layer into a small petridish. Allow ethereal layer to evaporate, to the residue add1 drop of resorcinol in hydrochloric acid, Pure honey should not give cherry red colour. As artificial honey contains furfural it gives red colour. **2) Fehling's Test:** Take 2 ml of aqueous solution of honey and to it add Fehling's solution A and B .The reaction mixture is heated on a steam bath for 5-10 minutes .A brick red colour is produced due to presence of reducing sugars. **3) Benedict's Test**: To 1 ml of aqueous solution add 2 ml (10 drops) of Benedict's reagent (CuSO4).The solution is then heated in a boiling water bath for 3-5 minutes. Reddish precipitate is observed 4)**Molisch's Test**: To 2 ml of aqueous solution of honey add 5 drops of Molisch's reagent mix well and add 2ml of Conc. H2SO4 from the side of the test tube.Violet/purple ring is observed at the junction of two liquids. **5) Tommer's Test**: To 2 ml of aqueous solution of honey add tommers reagent (NaOH+CuSO4), boil for 2 minutes & cool. Red colour is observed. **6) Barfoed's Test:** To 2 ml of aqueous solution of honey add Barfoed's reagent, boil for 2 minutes & cool. Brick red precipitate is observed.	**3M**

MODEL ANSWER

WINTER -19 EXAMINATION

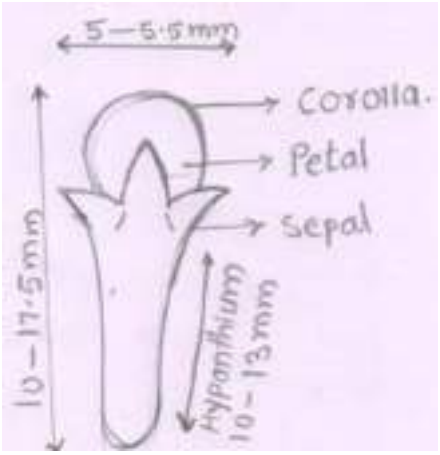
Subject Title: PHARMACOGNOSY **Subject Code:** 0807

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Attempt any Eight of the followings: (2marks each)**	**16 M**
1	**a)**	**Define the following (any two) (1 Mark for each definition)** **i) Laxatives:** Laxatives are the substances that loose stools and increase bowel movements. **ii) Pharmacognosy:** Pharmacognosy is defined as scientific and systematic study of physical, chemical, structural and biological characters of crude drugs along with their history, method of cultivation, collection and preparation for the market. **iii) Balsam:** Balsams are aromatic resinous substances of plant origin containing balsamic acids (benzoic and cinnamic acid).	**2M**
1	**b)**	**Write the role of 'Dioscoride' and 'Seydler' in the development of Pharmacognosy. (01 mark for each scientist's role)** **Dioscoride**: A Greek physician described several plants of medicinal importance along with some mineral and animal products in his famous drug treatise; **"De Materia Medica"**. **Seydler** : Seydler coined the term Pharmacognosy in 1815 in his work entitled as **"Analecta Pharmacognostica"** from combination of two Greek words viz, Pharmakon - a drug and gignosco - to acquire the knowledge of.	**2M**
1	**c)**	**State which part of the plant is used in case of (½ mark each)** **i) Belladona –** Dried leaves and other aerial parts **ii) Rauwolfia -** Roots	**2M**

		iii) Ipecac -Rhizomes and roots **iv) Colchicum-** Dried seeds / Corm	
1	**d)**	**Write example of Pharmaceutical aid obtained from: (1 mark each)** **i) Animal source :** Bees wax/ Lanolin (hydrous wool fat)/ Honey/ Gelatin **(any one)** **ii) Mineral source :** Kaolin / Talc/ Bentonite/ Chalk **(any one)**	**2M**
1	**e)**	**Mention synonym of the following crude drug: (½ mark each)** **i) Asafoetida :** Devil's dung/ Hing/ gum Asafoetida **(any one)** **ii) Liquorice:** Mulethi/ Liquorice root / Glycyrrhiza **(any one)** **iii) Aconite: B**achnag/Monkshood/ mithazahar/ Mouse bane /Wolf's bane/ Friar's cowl/Radix aconite **(any one)** **iv) Tulsi :** Holy basil/ sacred basil **(any one)**	**2M**
1	**f)**	**Explain Galenical pharmacy. Who discovered it? (1 mark for Galenical pharmacy and 1 mark for name of scientist)** **Galenical pharmacy:** Various methods of preparation containing active constituents of crude drugs, and even at present the branch dealing with the extraction of plant and animal drugs is known as galenical pharmacy. **Name of scientist :** Galen (A Greek physician)	**2M**

1	**g)**	**Give the name of the drug which passes the following chemical test. (½ mark each)** **i) Vitali morin test -** Datura **ii) Swelling factor test:** Ispagol **iii) Modified brontrager's test:** Aloe **iv) Fiehe's test :** Honey	**2M**
1	**h)**	**Describe morphological characters of clove with diagram. (1 Mark for diagram and 01 Mark for naming)**  **Corolla:** Dome shaped **Petal :** 4 membranous **Sepal:** 4 thick diversant **Shape:** Sub cylindrical slightly flattened	**2M**

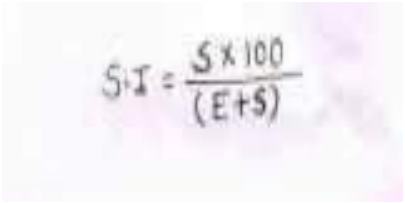
1	**i)**	**What is Garbling? (Description - 02 Marks)** **Garbling (Dressing):** Garbling is the final step in the preparation of a drug which consists of the removal of extraneous matter, such as other parts of the plant, dirt, and added adulterants.	**2M**
1	**j)**	**Name the drug having following microscopical characters (any two) (1 mark each)** **i) Lignified trichome:** Nux vomica **ii) Fibrovascular bundle:** Ginger **iii) Paracytic stomata:** Senna	**2M**
1	**k)**	**Write the name of the drug which has following use: (½ mark for each)** **i) Galactogogue -** Shatavari **ii) Dental analgesic** -Clove **iii) Diuretics-**Gokhru / Punarnava **iv) Brain tonic –** Shankhpushpi	**2M**
1	**l)**	**Write official requirements of surgical dressings. (½ mark each)** **Official requirements of surgical dressings are: (any 4 requirements)** 1. They should be sterile before use. 2. They should be stored in dry well ventilated place at a temperature not exceeding 25 ^{o}c. 3. They should not be dyed unless mentioned in the monograph. 4. They should not have any loose thread , fibres end in the dressing.	**2M**

		5. Adhesive products should not be allowed to freeze. 6. Permitted antiseptic should be used in prescribed concentration only.	
2		**Attempt any <u>THREE</u> of following (4 marks each)**	**12M**
2	**a)**	**Explain chemical method of classification of crude drug with its merit and demerits.** **Chemical method of classification of crude drug:** **(2 marks for any four classes with 1 example of each class, 1 mark each for merits and demerits)** This type of classification is based on type of chemicals present in the drugs.	**4M**

Class	**Examples**
1. Alkaloids	Aconite, cinchona, nux-vomica, vinca, ipecac, belladonna, opium , tea
2. Glycosides	Digitalis, senna, squill, aloe, dioscorea, liquorice, wild cherry.
3. Lipids	Castor oil. Peanut oil, mustard, wool fat, cod -liver oil.
4. Volatile oils	Peppermint, clove, eucalyptus, valerian.
5. Tannins	Myrobalan, kino, catechu, galls
6. Vitamins	cod –liver oil, shark-liver oil
7. Resin and resin combinations	Benzoin, balsamof tolu, storax, asafoetida, myrrh , colophony, guggul , shellac.
8.Carbohydrates and derived products	Yeast, Agar, honey, starch, tragacanth, acacia, Guar gum, sterculia.

		Merits: (any two) 1. This type of classification is applicable to crude drugs containing similar type of chemicals. 2. It is useful for phytochemical studies of crude drugs. 3. Combination of drugs can be done for more or better therapeutic action. **Demerits:** 1. It is difficult to categorise the drug when it contains two or more active chemical constituents 2. The drugs from various sources are grouped together.	
2	**b)**	**Define Glycosides. Classify it on the basis of Glycosidic linkage with example. (Definition 01 Mark and classification 03 Marks).** Glycosides are organic compounds of plant and animal origin which yield on either acidic or enzymatic hydrolysis, one or more sugars and non-sugar residue. **Classification on the basis of glycosidic linkage: (any 3 classes of the following with 1 example of each)** **i) O- glycosides: They** are very commonly in higher plants. They are hydrolysed by treatment of acid or alkali into aglycone and sugar. **e.g.** Senna, Rhubarb. **ii) C- glycosides:** They are not hydrolysed by heating with dilute acids or alkalies, but by oxidative hydrolysis with ferric chloride. e.g. Aloe, Cascara **iii) S- glycosides**: they are occurring only in isothiocyanate type of glycoside. They are formed by interaction of sulfhydryl group of aglycone and hydroxy group of glycone moiety. e.g. Black mustard. **iv) N- glycosides** : N- glycoside is nucleosides where amino group of base react with hydroxyl group of base ribose or deoxyribose and ultimately give N- glycosides form. e.g. Cinchona	**4M**

2	**c)**	**Write synonyms, biological source, chemical constituents of 'Gokhru' OR 'Gymnema'. (Synonyms 01-mark, biological source 1 ½ marks, chemical constituents1 ½ marks)** **Gokhru** **Synonyms: Puncture vine** **Biological source:** It consists of dried fully ripen fruits of the plant Tribulas terrestis. Family – Zygophyllaceae. **OR** It consists of dried fully ripen fruits of the plant Pedalium murex. Family – Pedaliaceae. **Chemical constituents:** alkaloids- Harman and harmine. Also contain saponins, which on hydrolysis yield steroidal sapogenins like diosgenin, chlorogenin, gitogenin, ruscogenin. Saponin, flavonoids, kaemferol, tribuloside and its derivatives have also been isolated from leaves and fruits. Other chemical constituents are fixed oil, resin, essential oil and nitrates. **OR** **Gymnema** **Synonyms:** Gudmar, madhunashini **Biological source:** It consists of leaves of the plant Gymnema sylvestre. Family-Asclepiadaceae. **Chemical constituents:** hentriacontane, pentriacontane, phytin, alpha and beta chlorophylls, resin, tartaric acid, formic acid, butyric acid, mucilage, inositol, gymnemic acid, anthraquinone derivative.	**4M**
2	**d)**	**d) Write method of cultivation and collection of 'Rauwolfia'.** **(method of Cultivation- 02 Marks and method of collection- 02 Marks)** **Cultivation:** Loamy soil with large amount of humus and good drainage are ideal for cultivation of Rauwolfia. The P^H of the soil should be acidic and around 4. The temperature range for cultivation is 10^0C to 38^0C. Rainfall should be in the range of 250 to 500 cm. It can be propagated by various methods, such as by seeds, roots, cutting, root stumps etc. The healthy seeds are sown into nursery beds. The rate of germination of seed is very low, hence sufficient quality of the seeds be sown. Sowing is done in the month of May or at break of mansoon. The seedlings are transplanted in the month of August at distance of 16 to 30 cm. the	**4M**

		plants are kept free from weed. The plants are fertilised with various chemical fertilizer and manure. **Collection:** Rauwolfia roots are harvested during autumn from 3-4 years old plants, as it consist of higher proportion of alkaloids during winter, when shrub is about 1 m in height with white or rose coloured flowers and purplish black fruits and plants are about 3-4 years, the roots which penetrate deeply are cut, washed properly so as to remove earthy matter and dried in air and packed in air tight container. Care is taken to keep the root bark intact as the bark has higher alkaloidal content.	
2	**e)**	**e) Explain with example (any two) (01 mark for Explanation and 01 mark for example of each)** **i) Stomatal index**: It is percentage in which number of stomata form to the total epidermal cells. Each stoma is being counted as one cell. It can be calculated by a formula:  I = Stomatal index S= number of stomata per unit area E= epidermal cells in the same area Stomatal index is constant and therefore, of diagnostic significance for given species. It is useful in differentiation of closely related species and also for detection of adulterants. **Example (any 1)** Species | Stomatal index Atropa belladonna | 20.2 to 23.0 Atropa acuminata | 16.2 to 18.3	**4M**

Indian senna	17.0 to 20.0
Alexandrian senna	10.8 to 12.6

ii) Optical rotation: Certain substances are found to have the property of rotating the plane of polarised light in pure state or in the solution, thus they are described to be optically active and this property is known as optical rotation. Plane of polarised light rotated towards right (dextrorotatory) or left (laevorotatory). Thus, this method is used to determine the purity of the substance.

Example (any 1)

Drug	**Optical rotation**
Clove oil	0^{o} to -1.5^{o}
Honey	$+3^{o}$ to -15^{o}
Caraway oil	$+70^{o}$ to $+80^{o}$
Castor oil	Not less than $+3.5^{o}$

iii) Organoleptic method of evaluation

Organoleptic evaluation refers to evaluation of drug by colour, odour, taste, size, shape and special features like touch, texture, sound etc.

Morphology of the crude drug is described in official books and is considered as guideline for their study. But morphology of the crude may vary by several factors like

1. When crude drugs are exposed to sunlight then colour of the crude drug may fade.

2. Size of the crude drug may vary depending upon adverse climatic condition and proper treatment during cultivation like irrigation, fertilizers etc.

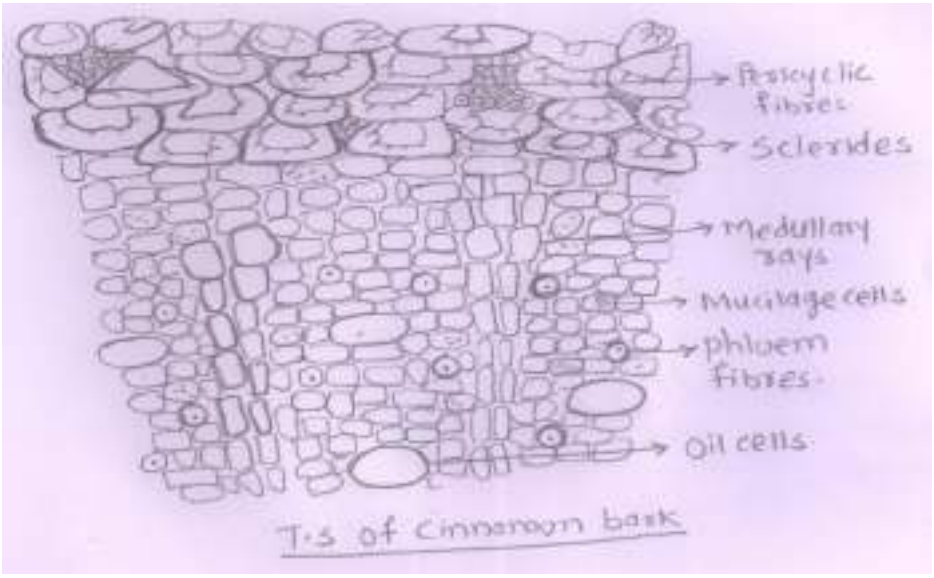
3. Shape of the crude drug may vary due to improper treatment of drying, storage, packing.

Examples

The fracture surface in Cinchona, Quillia, Cascara bark.

Wavy shape of Rauwolfia.

		Pungent taste of Capsicum, Ginger. Odour and taste of Asafoetida, Black pepper, Nutmeg, Caraway.	
3		**Attempt any <u>THREE</u> of following(4 marks each)**	**12M**
3	**a)**	**Describe the different techniques(any three) for isolation of volatile oils.(4 Marks)** **Methods of isolation of volatile oil:** **A) Distillation :** Most of the oils are obtained by distillation which are of following 3 types 1.Water distillation -is mostly applicable to such plant material, which is dried initially in air and the constituents are not degraded by boiling upto 1000C e.g Turpentine oil 2.Water and steam distillation – It is often suitable for such plant material whether fresh or dried the constituents of which undergo degradation by direct boiling e .g Clove oil 3.Direct steam distillation- it is invariably applicable to fresh drugs that is loaded with sufficient natural moisture and hence no maceration is required e.q. peppermint oil. **B) Solvent Extraction :** Extraction is done by using some organic solvents like ether, benzene, petroleum etc. **C) Ecuelle Method:** In this method the oil cells of the citrus fruits are ruptured mechanically using pointed projections and thus citrus oil is extracted. **D) Enfleurage Method:** It is used in the extraction of delicate perfumes. The fresh flower petals are spread on a fatty material. The spread petals are exhausted after sometime as the fatty material absorbs the oil. These exhausted petals are replaced by fresh petals and then the oil is collected from the fatty material.	**4M**

3	**b)**	**Draw a well labelled diagram of T. S. of cinnamon bark and describe any four microscopical characters.(2 Marks for labelled T. S. diagram & 2 Marks for any 4 microscopical characters)**  **Microscopy:** 1. Pericyclic fibre: Small group of about 6 to 15 pericyclic lignified fibres 2. Sclerides: 3 to4 layers of pitted sclerides, thickened lignified walls, isodiametric slight elongated tangentially (U-shaped thickening), with starch grains. 3. Secondary Phloem: Parenchyamatous: few cells contain acicular calcium oxalate crystals and starch grains 4. Medullary rays: Biseriate, narrow at inner sight, wider in the scleride band side, contain starch acicular raphides. 5. Phloem fibres: single, isolated, circular lignified with stratification 6. Mucilage cells: can be identified after staining with rheuthenium red 7. Oil cells: Big& isolated	**4M**
3	**c)**	**Write the chemical constituents and uses of the following drug-(any two) (1Mark each for Chemical constituents & uses of each drug)** **i) Cinchona:** **Chemical constituents:** Cinchona contains about 25 alkaloids in the range of 5 to 10%.. Out of 25 alkaloids , only four are therapeutically important and are named as quinine, quinidine, cinchonine and cinchinidine. Also contain cinchofulvic, cinchotannic acid and quinic acid. It	**4M**

		also contains red colouring matter known as cinchona red. Tannins, calcium oxalate and starch are also present. In addition to the alkaloids cinchona bark also contains bitter glycosides quinoin, **Uses:** Cinchona bark is used as- 1) Antimalarial 2)Antipyretic 3) Bitter tonic 4)Stomachic 5) Cinchonidine is used in rheumatism and neuralgia. 6) Quinidine is employed as cardiac depressant. ii) **Sandalwood oil:** **Chemical constituents:** The main product of sandal wood is the volatile oil (2.5%) called sandal wood oil. All the wood elements of this drug contain volatile oil. Sandal wood oil contains about 95% of two isomeric sesquiterpene alcohols, α- santalol and β – santalol. The oil also contains an aldehyde santalal, santene, santenone, teresantol. **Uses:** The oil is used for symptomatic treatment of dysuria and in diminishing the frequency of micturition marked in the tuberculosis of the bladder. The oil is mainly used as a perfume in cosmetic and incense sticks. **iii)Ephedra:** **Chemical constituents:** Contains about 1-1.5% Phenyl ethyl amine type of alkaloid-Ephedrine(30-90%). Other alkaloids are pseudo ephedrine, L- methyl ephedrine, Dimethyl ephedrine, Norephedrine. It also contain glucaric acid & leucodelphidine. **Uses:** Ephedrine is Sympathomimetic drug used as bronchodilator, CNS Stimulant,due to Vasoconstriction shows rise in B.P., diuretic, anti-inflammatory activity due to presence of oxazolidone.	
3	**d)**	**Explain with example of the following(any two)(1½ Marks for explanation & ½ Mark for Example)** **i) Latex:** The latex is a product contained in special secretory tissues of certain plants. It is usually, a white aqueous suspension, wherein microscopically small particles of oil globules are suspended. These natural suspension of milky consistency may contain proteins, sugars, minerals and alkaloidal salts in the true solution, whereas gums, starch and resins in the suspended form. e.g. Opium, Papain. **ii) Condensed tannin:** These are the true tannins, which on acid or enzyme treatment get decomposed into red insoluble compounds known as phlobaphenes. On dry distillation, they yield catechol tannin.	**4M**

		e.g. Pterocarpus (Kinotannic acid), Catechu (catechutannic acid) and Cinchona (cinchotannic acid) **iii) Characteristics of umbelliferous fruit** 1. Schizocarp (splitting fruits)- Dry fruits from syncarpus ovary that splits at maturity into two portions. 2. Mericarp- Each portion of Schizocarp (cremocarp) is called as mericarp. 3. Two mericarps are joined together by a thread like structure called as carpophore 4. Primary ridges are 5 or more runs from apex to base. 5. Each mericarp has a disc like structure at the apex called as stylopod. 6. Each mericarp has 2 surfaces i.e. a) Outer dorsal or curved surface b) Inner ventral or commissural surface. 7. Each mericarp contains 6 vittae- 4 on dorsal surface and 2 on commissural surface. 8. Each mericarp contains a single seed. The seed contains- 1. An apex 2. Endosperm 9. All umbelliferous fruits contain Volatile oil. **Example**-Fennel, Coriander, Ajowan	
3	**e)**	**Define bark. Describe the methods of collection of bark.(1 Mark for definition & 3 Mark for methods of collection of bark)** **Bark:** The secondary external tissues lying outside the cambium in stem or root of dicotyledonous plants are known as the bark. **Methods of collection:** 1.**Felling method:** The tree is cut at base and bark is peeled out. **2. Uprooting method:** The root of the plant is dug out of soil and bark is stripped off from root and branches. This method is applied for collection of root bark of cinchona in java. **3. Coppicing method**: In this method, plant is allowed to grow for a definite period and then it is cut off at specific distance from soil. The stumps, which remain in ground are allowed to send shoots, which develop further yielding aerial parts. These new parts are cut off and bark is collected from shoots.	**4M**

4		**Attempt any THREE of the following (4 marks each)**	**12M**
4	**a)**	**Explain the general chemical test for the identification of alkaloids(1 Mark for each test)** **Identification tests for alkaloids by precipitation method:** 1. Mayer's Reagent (Potassium mercuric iodide) Cream or pale yellow ppt. 2. Dragendorff's Reagent (Potassium bismuth iodide) Brown or reddish brown colour or ppt. 3. Wagner's Reagent (Iodine in Potassium iodide), Brown or reddish brown colour or ppt. 4. Hager's Reagent (Saturated solution of picric acid) Yellow ppt.	**4M**
4	**b)**	**Define the following with example.(1 mark for each)** i)**Oxytocics:** These are the drugs which have stimulant effect on the motility of the uterus. OR An agent that causes expulsion of the contents of uterus by contracting the uterine muscles. **Example**- Ergot **ii)Cardiotonic**: are the drugs which give strength or energy to the activity of the hearth. **OR** Cardiotonics increases the force of contraction of cardiac muscles and stimulates the overall activity of the heart. **Example:** Digitalis ,Arjuna **(any 1)** iii) **Antitussive**: are the agents which act upon the pulmonary membrane that hasten or alter expectoration. OR These are the agents which relieves or suppreses the cough. **Example-** Vasaka, Tulsi, Tolu balsam, **(any 1)**	**4M**

		iv)Astringents: Astringents are the agents which precipitate proteins and causes contraction of smooth muscles. **Example**: Black catechu , pale catechu , Amla ,Clove ,Cinnamon **(any 1)**	
4	**c)**	**Describe the method of preparation of fibre obtained from plant source.(4 marks for method of preparation)** **The fibre obtained from plant source is Cotton** Fruits (capsules) are 3-5 celled,, which contain numerous seeds. Seeds covered with hair, known as Balls. Balls are collected, dried & taken to ginning press, where in trichomes are separated from seeds. Raw cotton obtain from above is subjected to a process called combing. This separates the long and short fibres .The long fibres are spun and woven as cloth and short fibres are called linters. This is used for manufacturing of absorbent cotton. Remove impurities (vegetable debris) from raw cotton. To remove wax, fatty material & colouring matter, raw cotton is taken to the machine, cotton opener & followed by treatment with dil. Soda solution or soda ash solution under pressure for about 10-15 hrs. Washed with water & treated with suitable bleaching agent. Again washed, dried & make a flat sheet .Finally packed in paper wrappers & sterilized.	**4M**
4	**d)**	**Write the biological source, chemical constituents and uses of Garlic (1 mark for biological source, 1 ½ marks each for chemical constituents & for uses)** **Biological source:** It consist of bulbs of the plant Allium sativum, Family: Liliaceae **Chemical constituents:** Garlic bulbs contain 29%carbohydrates, 56%proteins (albumin), fat, mucilage and volatile oil. It also contains phosphorous, iron, and copper. Volatile oil of the drug is the chief active constituent, and contain allyl propyl disulphide, diallyl disulphide, alliin and allicin. Alliin by the action of enzyme allinylase, is converted into allicin. **Uses:** Garlic is used as carminative, aphrodiasiac, expectorant, stimulant, and disinfectant in the treatment of pulmonary condition. Use as condiment. Oil of garlic is used as anthelmintic and rubifacient. Allicin is antibacterial. Garlic oil is useful in high blood pressure and atherosclerosis. It is reported to possess cholesterol suppressing properties.	**4M**

4	**e)**	**Differentiate between Organised and unorganised crude drug.(4 Marks for any four points)**	**4M**

Organized crude drug	**Unorganized crude drug**
1. It is obtained from definite anatomic parts of the plants such as flowers, leaves, fruits etc.	1. It is obtained from plants or animals by means of physical process such as drying, incision, extraction such as juices, resins.
2. It is made up of definite tissue and cell.	2. It does not have cellular structure.
3. It is solid in nature	3. It is solid, semi-solid and liquid in nature.
4. Microscopical characters are used for identification.	4. Chemical tests and physical standards are used for identification.
5.Botanical and zoological terminology can be used to describe the drug	5. Botanical and zoological terminology is inadequate. To describe these drugs, physical characters such as solubility, optical rotation, refractive index are used.
6.Ex. Coriander , fennel, datura, etc	6. Ex. Aloe , bees wax, tragacanth, asafoetida etc.

5		**Attempt any THREE of following(4 marks each)**	**12M**
5	**a)**	**Define "Drug Adulteration". Describe any four methods of adulteration with suitable examples. (1 mark for definition and 3 marks for methods of adulteration with examples)**	**4M**

Definition: Adulteration is the debasement of an article.

Methods of Adulteration :

1. Replacement by exhausted drugs

Ex. a).Exhausted saffron is coloured artificially

b)Exhausted Ginger is mixed with starch & coloured.

		2.Substitution with superficially similar but inferior drugs Ex.a). Adulteration of cloves by mother cloves. b). Saffron with dried flower of carthamus tinctorius. **3.Substitution by artificially manufactured substituent** Ex.a) Paraffin wax is tinged yellow & substituted for yellow bees wax. b). Artificial invert sugar is mixed with honey. **4.Substitution by sub- standard commercial varieties** Ex. a) capsicum frutescens (capsicum minimum), substituted by capsicum annum. b) Alexandrian senna with Arabian senna. c) Strychnos nux-vomica adulterated with Strychnos nux-blanda/ S. potatorum seeds. **5. Presence of organic matter obtained from the same plant** Ex .a) clove are mixed with clove stalks. b) Caraway &Anethum fruits are mixed with other parts of inflorescence **6.Synthetic chemical** Ex. a) Benzyl benzoate to balsam of peru. a) Citral to oil of lemon grass. b) Camphor oil and eucalyptus oil in oil of rosemary. **7.Waste from market** Ex .a) Limestone in asafoetida. b) Pieces of amber coloured glass in colophony. c) White oil in oil of Coconut. d) Stearin or paraffin in cocoa butter.	
5	**b)**	**Name the adulterants and substitute of -** **i) <u>Nux- Vomica</u>** **Adulterants:(1 mark)** 1) Strychnos nuxblanda 2) Strychnos potatorum **Substituents:(1 mark)** 1) Strychnos wallichiana 2) Strychnos ignatii **ii) <u>Digitalis</u>** **Adulterants: (any 2 for 1 mark)**	**4M**

		1) Verbascum Thapsus 2) The Primrose leaves 3) Comfrey leaves **Substituents: (any 2 for 1 mark)** 1) Digitalis lanata 2) Digitalis lutea or straw foxglove 3) Digitalis thapsi or Spanish foxglove	
5	**c)**	**Enlist the Indigenous system of medicine .Describe the ' Siddha system of medicine'.** **The Indigenous systems of medicine are: (2 marks for any four of the following, i.e. ½ mark for each)** 1. Ayurveda 2. Siddha 3. Unani 4. Naturopathy and Yoga 5. Homeopathy **<u>' Siddha system of medicine': (2 marks)</u>** The term 'Siddha' means achievement and 'Siddhars' were saintly personalities, who attained proficiency in medicine through practice of Bhakti and Yoga. This is the system of pre -vedic period identified with Dravidian culture and it is largely therapeutics in nature. Like Ayurveda, this system believes that all objects in universe are made up of five basic elements namely, earth , water , sky , fire and air. The identification of causative factors of diseases is done through pulse reading, colour of body, study of voice, urine examination, status of digestive system and examination of tongue. The literature of siddha system is mostly in Tamil. Few natural drugs used in Siddha system of medicine are : Abini : (papaver – somniferum),	**4M**

		Alari : (Nerium – indicum), Ethi : (Strychnous –Nuxvomica) Gomathi : (Datura – Stramonium) Rotha Polam : (Aloe – barbadensis)	
5	**d)**	**Write any two examples of drug belonging to following family- (1 mark each)** (i) **Rubiaceae** – Cinchona,Ipecac (ii) **Apocynaceae** – Vinca , Rauwolfia (iii) **Burseraceae** – Guggul , Myrrh (iv) **Liliaceae -** Aloe , Colchicum , Garlic , Shatavari **(any 2)**	**4M**
5	**e)**	**Define Enzymes. Write biological source, chemical constituents and uses of Papaya.** **(Definition -1 mark, Biological source-1mark , Chemical constituents-1mark and uses – 1mark)** **Enzymes**- Enzymes are the protein substances which act as catalysts in various biochemical reactions **Papaya:** **Biological source:** It consist of dried latex obtained by giving incision on unripen fruit of Carica papaya Family: Caricaceae **Chemical constituents:** Papaya latex contain proteolytic enzymes i.e. Papain & chymopapain, which acts on polypeptides & amides. Several proteolytic enzymes such as peptidase-I, rennin like milk coagulating enzyme, amylolytic enzyme are also present **<u>USES (any two):</u>** 1. Papain is proteolytic enzyme that tenderises meat & acts as clarifying agent in food industry.	**4M**

		2. It is a common ingredient of brewery industry. 3. These are used to clean up dead tissue from some chronic wounds. 4. It is an ingredient in some toothpastes or mints as teeth – whitener 5. It is used for degumming of silk fabrics in textile industry and in leather industry for dehairing of skins and hides. 6. It is used in cheese manufacturing ,as a substitute of rennin.	
6		**Explain the chemical tests of any <u>FOUR</u> crude drugs. (1 mark for each test)**	**16M**
6	**a)**	**Silk : (any 4 tests)** 1) Silk is soluble in cuoxam, sulphuric acid (66%) and concentrated hydrochloric acid. 2) Silk does not contain sulphur containing amino acids hence the test with lead acetate & KOH solution does not form black precipitate. 3) Warm or boil in a test tube with picric acid solution , permanent yellow colour is produced. 4) On ignition ,brown gases which are alkaline to litmus are produced.There is foul smell (like burnt hair or flesh).It burns slowly giving beads followed by white ash.) 5) With N/50 iodine solution followed by 8% sulphuric acid , it gives yellow colour.	**4M**
6	**b)**	**Benzoin: (any 4 tests)** 1) To a solution of benzoin in alcohol add water. Solution becomes milky & acidic to litmus 2) To the drug add solvent ether, decant ether layer & to it add 2/3 drops of H_2SO_4 A deep reddish brown colour in case of Sumatra Benzoin. A deep purplish-red colour in case of Siam Benzoin. 3) Heat Benzoin in a test tube with solution of KmnO4, it develops Strong odour of benzaldehyde. 4) To the alcoholic solution of Benzoin add FeCl3, Green colour develops in case of Sumatra Benzoin. 5) Heat small quantity of benzoin in dry test, cover the opening of test tube with clean dry glass slide, cool it and observe glass slide under microscope, cinnamic acid crystals are observed.	**4M**

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>6</td><td>c)</td><td><u>Nux vomica</u> (any 4)

<table>
<tr><td>Test</td><td>Observation</td><td>Inference</td></tr>
<tr><td>T. S. of drug + ammonium vanadate + H_2SO_4</td><td>Endosperm stained purple</td><td>Strychnine present</td></tr>
<tr><td>T. S. of drug + Pot. Dichromate + H_2SO_4</td><td>Endosperm stained Violet color</td><td>Strychnine present</td></tr>
<tr><td>T. S. + Conc. HNO_3</td><td>Endosperm stained Yellow to Orange</td><td>Brucine present</td></tr>
<tr><td>T.S + Phloroglucinol + conc.HCL (1:1)</td><td>Pink</td><td>Lignified trichomes</td></tr>
</table></td><td>4M</td></tr>
<tr><td>6</td><td>d)</td><td>Shark liver oil: (2 marks for each test)

1. Dissolve 1gm of shark liver oil in 1ml of chloroform and treat with 0.5ml of sulphuric acid. It acquires light violet colour, changing to purple and finally to brown (due to Vitamin A).

2. Dissolve 1ml of shark liver oil in 10 ml of chloroform and treat with saturated solution of antimony trichloride in chloroform. Shake it well. A blue colour is developed (due to Vitamin</td><td>4M</td></tr>
<tr><td>6</td><td>e)</td><td>Gelatin: (any 4 tests.)

1) Aqueous solution of drug gives precipitate with solution of trinitrophenol and solution of tannic acid.

2) On heating gelatin solution with soda lime, ammonia gas is evolved.

3) Aqueous solution of gelatin precipitates mercuric nitrate solution forming white colour, which turns black-red on heating.

4) Formaldehyde makes gelatin hard & insoluble after drying.</td><td>4M</td></tr>
</table>

		5) To aqueous solution of drug, add drop of picric acid or tannic acid solution, precipitate is produced.	
6	**f)**	**Starch: (any 4 tests)** 1) Boil 1 g of starch with 15 ml of water and cool. The translucent viscous jelly is produced. 2) The above jelly turns deep blue by the addition of solution of iodine. 3) The above blue colour disappears on warming and reappears on cooling. 4) Hydrolyse the starch solution with acid and then add Fehling's solution A and Fehling's solution B in equal quantity and heat it in water bath which gives brick red ppt. 5) To the solution Of starch add Molisch reagent and add H_2SO_4 from the side of test tube, violet ring is formed at the junction of two liquids.	**4M**

Subject Title: Biochemistry & Clinical Pathology **Subject Code:** 0808

Important Instructions to examiners:

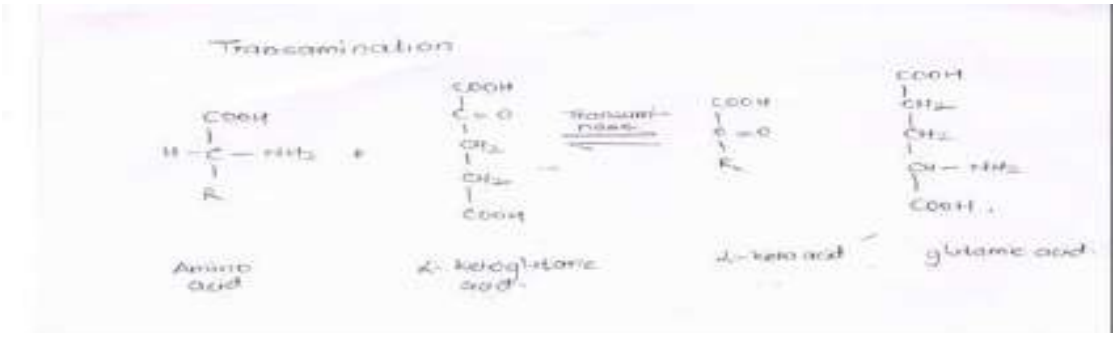
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

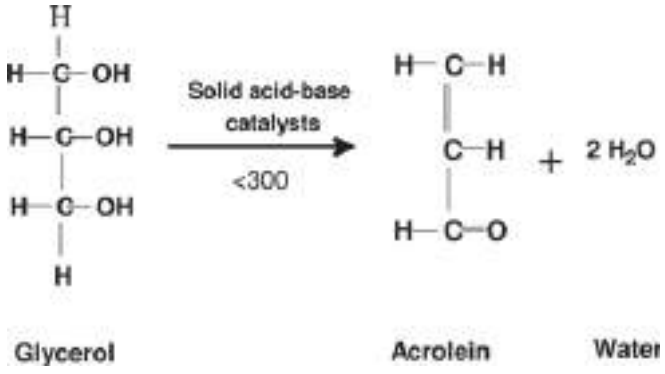
Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Attempt any FIVE of the following**	**5 X 4 = 20M**
1	a)	**Define the terms:** **(i) Marker enzymes** Some enzymes are very useful for the diagnosis of various diseases. In disease condition, level of these enzymes increases in blood or in other body fluids, hence we can identify the disease. They are called as 'Marker enzymes'. **(ii) Isoenzymes** The multiple form of same enzyme are called isoenzymes, e.g. lactate dehydrogenase exist in the blood in five different isoenzyme forms i.e. LDH1, LDH2, LDH3, LDH4, LDH5. **(iii) Metal contactor (Considering it as Metal Cofactor)** Some enzymes requires a non-protein metal group for catalytic activity which is called as Metal cofactors, e.g. Mg++, Mn++, Ca++. **(iv) Zwitterion** At Isoelectric pH , the amino acid carries equal number of positive and negative charges and net charge is zero, such ions are called as Zwitterion.	**1M each**
1	b)	**Name four important organelles of animal cell and write one function of each.** **Cell membrane**: 1. The membrane encloses the cell contents. 2. It maintains cell integrity. 3. It allows transport of certain substances in and out of the cell **Nucleus:** 1.It is involved in the synthesis of RNA.	**Any four** **½ M for name and ½ M for any 1 function**

		2. It is involved in the biogenesis of ribosomes. 3.Co-ordinates the activities of other cell organelle 4. Transfers Hereditary /genetic characters. **Mitochondria:** 1. Helps in Cellular respiration. 2. Generates and stores ATP so called as 'Power house' of a cell. 3. Mitochondria are engaged in oxidative metabolism 4. Are responsible for the transportation of chemical energy into biological energy, in the form of ATP **Endoplasmic reticulum**: 1. Give mechanical support, by forming skeletal network 2. Transports enzymes and other materials throughout the cell. 3. Rough ER is the site for protein synthesis 4. Smooth ER is the site for steroid synthesis. **Golgi apparatus**: 1. Synthesis and secretion of an enzymes. 2. Participates in transformation of membranes 3. Helps in formation of structure such as lysosome, acrosome. 4. Synthesize wall element like pectin, mucilage. **Lysosomes**: 1. Lysosomes are called "suicidal bags" as enzymes contained in them can digest the cell's own material when damaged or dead. 2. These are involved in digestion of cellular substances like proteins, lipids etc.	
1	**c)**	**Write short note on:** **(i) Essential fatty acids** The unsaturated fatty acids which are not synthesized in the body and are required to be supplied through diet for the normal growth of body are called as essential fatty acids. The Essential fatty acids are required for biological processes. Chemically they are polyunsaturated fatty acids. They are required for the membrane structure and function, formation of lipoprotein etc.	**2M Each**

		E.g. Arachidonic acid, linoleic acid, linolenic acid. Etc. **(ii) Nutritional edema** Results from long continued deprivation of proteins & usually occurs in famine areas. This protein deficiency occurs in adult but very rare. Symptoms: • Weight loss, General lethargy, Frequent loose stools, Delay in wound healing, Oedema Treatment: • Food items like soyabean, milk, eggs etc.	
1	**d)**	**Define and classify lipids** The lipids are a large and diverse group of naturally occurring organic compounds that are related by their solubility in nonpolar organic solvents (e.g. ether, chloroform, acetone & benzene) and general insolubility in water. These are esters of fatty acids OR Lipids are heterogeneous group of compound which are chemically esters of fatty acids. Classification: **1.Simple lipids:** Esters of fatty acids with alcohol. • **Fats & oils** : Castor oil • **Waxes** : Bees wax **2.Compound Lipid** **Phospholipids:** • Glycerophospholipids., • Sphingophospholipids, **Glycolipids:**. • Cerebrosides • Gangliosides **Lipoprotiens:** • HDL • LDL **Other complex lipids** • Sulpholipids • Aminolipids	**Def. 1M & 3M Class. with examples**

		3.Derived Lipids: • Eg: Alcohols, Glycerol, Fatty acids etc **4.Miscellaneous Lipids:** • Eg : Carotenoids, Squalene. **(Schematic classification can be considered.)**	
1	**e)**	**Explain the terms and treatment of:** **(i) Hyponatremia** Decrease level of sodium in blood. Symptoms:-Loss of appetite related to growth muscular cramps, headache, nausea, diarrhoea. Treatment: Intravenous (IV) fluids with a high-concentration of sodium, and/or diuretics to raise blood sodium levels. **(ii) Hypothyroidism** Hypothyroidism, also called underactive thyroid or low thyroid, is a disorder of the endocrine system in which the thyroid gland does not produce enough thyroid hormone. Signs & Symptoms: Fatigue, Dry, coarse skin, Feeling cold, Poor memory and concentration, Myxoedema, Constipation, dyspepsia, Hair loss, Weight gain with poor appetite, Slow pulse rate, Shortness of breath, Swelling of the limbs. Treatment: Treatment for hypothyroidism focuses on supplementing the thyroid hormone, Synthetic thyroxine, Iodine and nutrition.	**2M Each: (1M for Expl.+ 1M treatment)**
1	**f)**	**Write short note on:** **(i) Oxidative phosphorylation** Oxidative phosphorylation is a mechanism for ATP synthesis in both plant and animal cells. It involves in electron transport and ATP synthesis. Oxidative phosphorylation occurs in the mitochondria. The mitochondrion has two membranes: an inner membrane and an outer membrane. Oxidative phosphorylation takes place in the inner mitochondrial membrane, in contrast with most of the reactions of the citric acid cycle and fatty acid oxidation, which take place in the matrix. Oxidative phosphorylation is the process in which ATP is formed as a result of the transfer of electrons from	**2M Each**

		NADH or FADH 2 to O 2 by a series of electron carriers. This process is the major source of ATP in aerobic organisms **(ii) Transamination** In transamination, the NH2 group on one molecule is exchanged with the C =O group on the other molecule. The amino acid becomes a keto acid, and the keto acid becomes an amino acid  In this example alpha keto glutaric acid becomes glutamic acid, amino acid becomes keto acid. This reaction is reversible. **Importance**: It is important for redistribution of amino group and production of non-essential amino acid as per the required of the cell. It diverts excess amino acids towards energy generation	
1	**g)**	**Explain the terms:** **(i) Purpura** It's a condition of platelet / thrombocyte count less than normal.(Thrombocytopenia) There are red or purple discolorations on the skin. They are caused by bleeding underneath the skin & mucous membrane. Appearance of spots can be secondary to vasculitis or dietary deficiency of Vitamin C .Bleeding time is prolonged. **(ii) Polycythemia** Concentration of RBCs increase abnormally with corresponding increase in haemoglobin level • Relative Polycythemia: Decreased plasma volume due to vomiting, diarrhoea, dehydration • Absolute Polycythemia: Increased secretion of erythropoietin	**2M Each**

2		**Attempt any THREE of the following:**	**3×4=12M**
2	**a)**	**Define the terms:** (i) **Biochemistry-** The study dealing with the chemistry of living organism in its different phases of activity is called as biochemistry. (ii) **Pathology-** It's a significant field in medical diagnosis and medical research, concerned mainly with the causal study of disease, whether caused by pathogens or non-infectious physiological disorder. **(iii)Catabolism-** It's a degradative process concerned with the breakdown of complex molecules to simpler ones along with release of energy. **(iv)Anabolism-**It includes the biosynthetic reactions of formation of complex molecules from simple ones and requiring energy.	**Each for 1 M**
2	**b)**	**Write a note on:** **(i) Acrolein formation** When fats are treated with dehydrating agents like conc. H2SO4, KHSO4 etc. they are converted into a product having characteristic obnoxious odour. This is due to the presence of glycerol in fat or oil. Glycerol obtained after acidic hydrolysis is then dehydrated to give acrolein, having characteristic obnoxious odour. This test can be used to distinguish between fats and waxes. (As wax does not contain glycerol).  **(ii) Denaturation of proteins** The phenomenon of disorganization of native protein structure is known as denaturation.	**2M each**

		• It results in loss of secondary, tertiary & quaternary structure of proteins. • This involves change in physical, chemical & biological properties of protein molecules. Agents of denaturation: • Physical: Heat, violent shaking, X-rays, UV radiation. • Chemical: acids, alkalis, organic solvents, heavy metal salts etc. Characteristics of denaturation: • Helical structure is lost • Primary structure with peptide linkages remains intact.(Peptide bonds are not hydrolysed) • Biological activity of protein is lost • Denatured protein is insoluble	
2	**c)**	**What is vitamin C? Explain its biochemical role. Mention deficiency condition and its symptoms.** **Vitamin C** is water soluble vitamin, also known as L-ascorbic acid. **Biochemical role:** Vitamin C plays important role in: □ Collagen formation □ Bone formation □ Iron & haemoglobin metabolism □ Tryptophan, Tyrosine, & Folic acid metabolism □ Synthesis of immunoglobulins (antibodies) □ Synthesis of peptide hormone & corticosteroid hormones □ Reduces risk of cataract formation □ As an antioxidant reduces risk of cancer, coronary heart disease. **Deficiency conditions:** Deficiency of vitamin causes **Scurvy** **Symptoms**: Weakness, pain in bones and joints , loosening of teeth, poor healing of wound, internal hemorrhage, swelling of long bone, Easy factorability of bones.	**0.5 M + 2 M role (any 4 pts.)+ 0.5 M +1M**

		Scurvy leads to the formation of spots on the skin, spongy gums, and bleeding from all mucous membranes. The spots are most abundant on the thighs and legs, and a person with the ailment looks pale, feels depressed, and is partially immobilized .	
2	**d)**	**Explain the identification test for:** **(i) Carbohydrates** **Molisch Test-** Principle-Step I : Formation of furfural compound STEP II: Furfural compound reacts with alpha napthol present in molisch reagent to give violet ring at junction of two liquids and Conc. H_2SO_4 acts as a dehydrating agent. Molisch test: - Sugar solution + Molisch reagent + Conc H_2SO_4 from the side of test tube – gives Violet ring at the junction of two liquids. **(ii) Proteins** **Biuret test:** Principle –this test is positive for all compounds containing more than one peptide linkage. The peptide linkage of protein reacts with copper ions to form a complex of violet colour. Procedure : Biuret Test: General test for proteins: 3 ml of protein solution + 3 ml of 5% Sodium hydroxide + 3 to 4 drops of 1% Copper sulphate. Purple or pinkish purple colour is developed. Proteins are present.(i.e. presence of peptide bond)	**Each for 2M**
2	**e)**	**Define unit of enzyme activity. Mention four important factors that affect enzyme activity. Explain effect of temperature.** **Unit of Enzyme activity** : The unit of enzyme's catalytic activity or 1 U (µmol/min) is defined as the amount of the enzyme that catalyses the conversion of one micromole of substrate per minute under the specified conditions of the assay method **Factors affecting enzyme activity** • Hydrogen ion concentration • Concentration of enzymes	**Def.1 M+ List of any 4 factors 1M + Effect of Temp 1M and dig. 1M**

- Concentration of substrate
- Temperature
- Time
- Products of reaction
- Effect of light & other physical factors
- Allosteric factors
- Effect of hormones & other biochemical agents

Effect of temperature:

• Optimum temperature is usually reached at around 37°C—45°C for animal enzymes.

• Velocity of reaction is increased from 1.1 to 3 times for every 10° C rise in temperature.

• Above the optimum temperature, rate decreases.

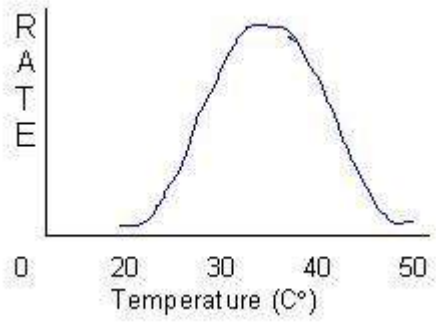
• The enzyme gets denatured at a rate faster than the increase in reaction.

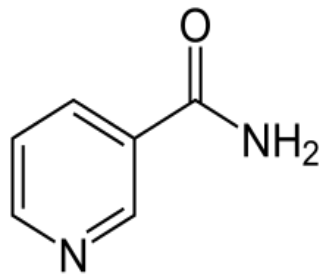
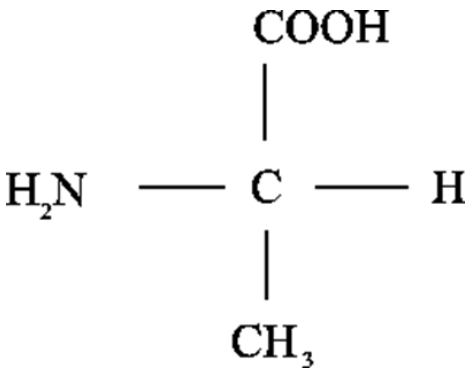
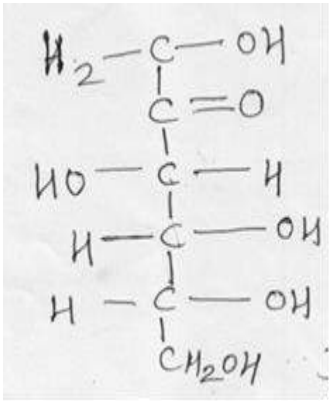
• Most of the enzymes get denatured above 50°C.

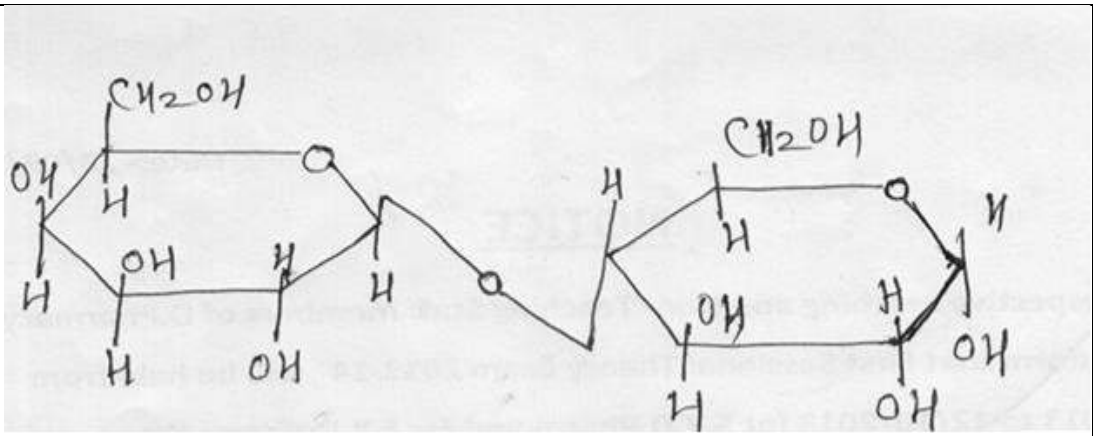
• The time of exposure is also important factor. An enzyme may withstand higher temperatures for short periods of time.

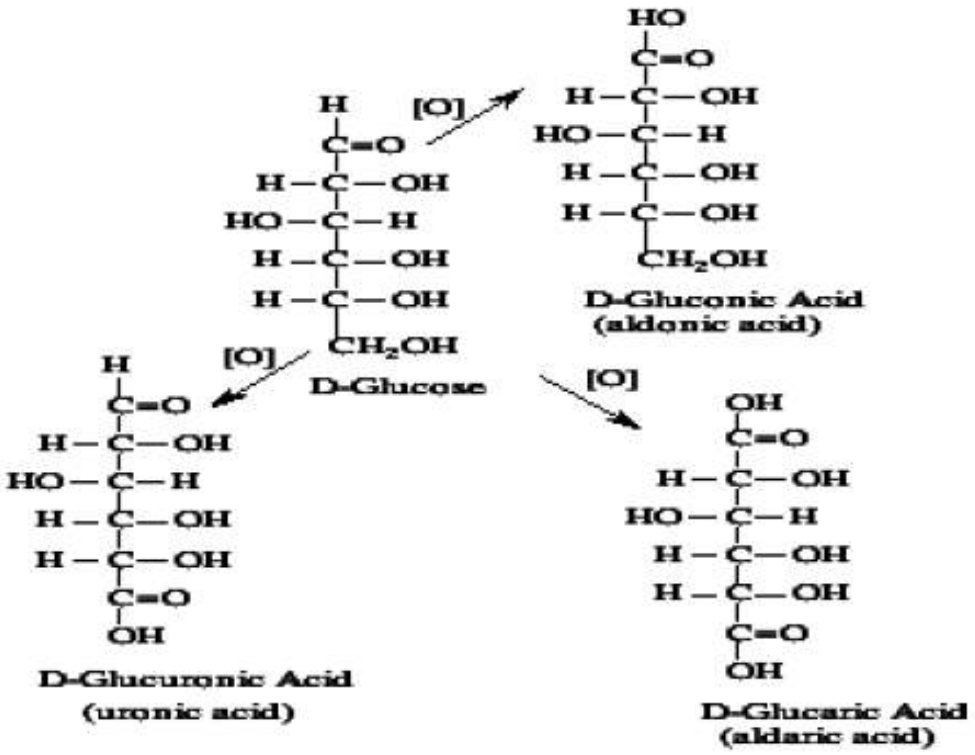
• Optimum temperature has meaning only if the time of reaction is also stipulated. Enzyme activity is maximum at optimum temperature.

Digram :

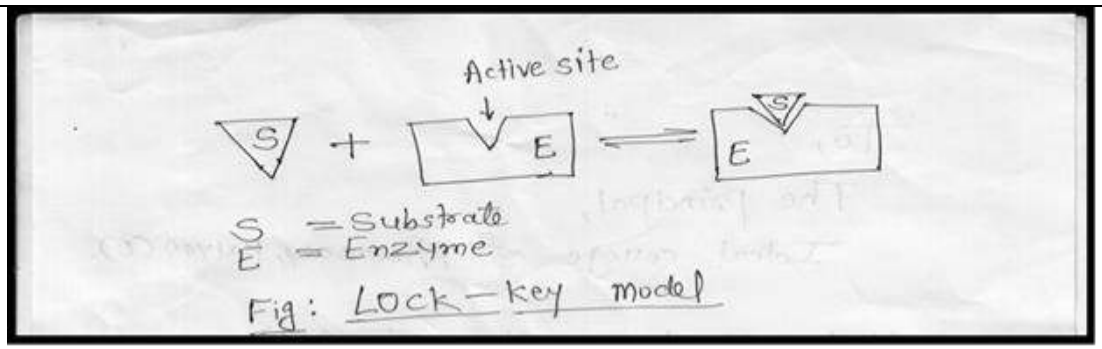


3		**Attempt any Three of the followings**	**3×4 =12M**
3	**a)**	Write structure of: i) Nicotinamide  ii) Alanine  iii) D-Fructose  iv) Lactose	**1 M each**

			
3	**b)**	**Define Proteins. Explain the role of proteins in human body.** **Proteins** are most abundant organic biomolecules, consisting of one or more long chains of amino acid residues. **Role of proteins in human body** 1] Some proteins act as hormones and hence regulate various metabolic process e.g. insulin is responsible for maintaining blood sugar level. 2] Some proteins act as catalyst for biological reaction. 3] Some proteins act as biological structural materials viz collagen in connective tissue, keratin in hair. 4] Haemoglobin acts as a oxygen carrier in mammals. 5] Some blood proteins help to form antibodies which provide resistance to disease so called as antibodies or defence proteins. 6] Nucleoproteins act as carrier of genetic characters. 7] Proteins which are required to carry out mechanical work are called muscle proteins.	**Defn.1M, Expln 3M any 6 points**

3	**c)**	**Explain oxidation of glucose with different oxidising agents with reactions.** Glucose gives acid on oxidation. Different oxidising agents give different products. • with bromine gives Gluconic acid . • With platinum it gives Glucouronic acid. • With nitric acid it gives Glucosaccharic acid  	**4 M**
3	**d)**	**Explain biochemical role of potassium & chlorine in our body.** **Potassium:** Plays important role in Regulating osmotic pressure of cell Acid base balance & water balance Gaseous transport Transmission of nerve impulse Protein biosynthesis by ribosomes Helps in enzymatic transfer of phosphate from ATP to pyruvic acid	**2 M each** **Any 4 points each**

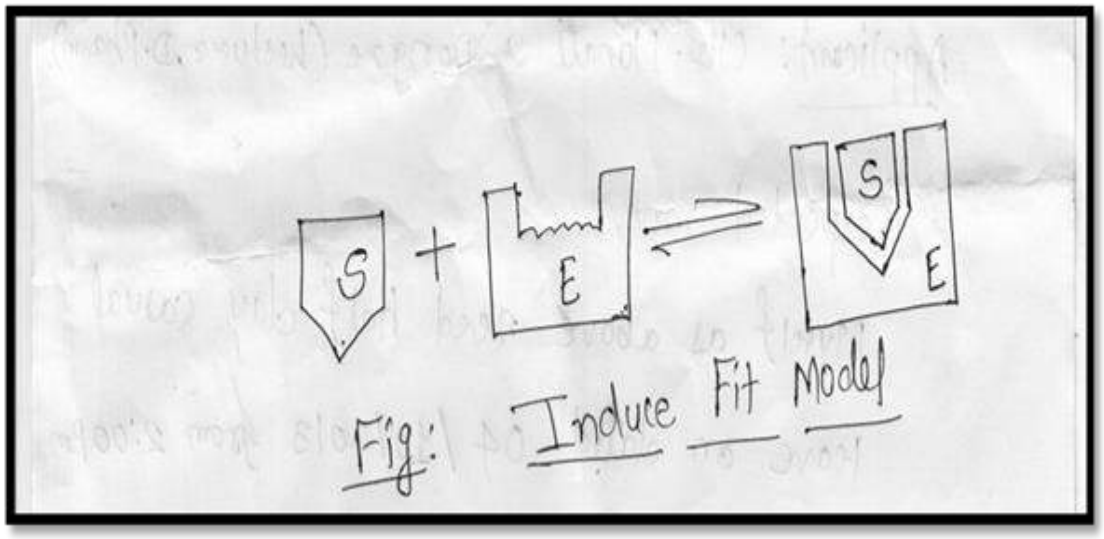
		Chlorine: Plays important role in : Osmotic pressure regulation Acid base balance & fluid balance The enzyme salivary amylase is activated by chloride Important factor in production of HCl in gastric juice	
3	**e)**	What are oils? Explain the role of antioxidant in preservation of oil. **Oils** are Simple lipids; they are esters of fatty acids with glycerol & liquid at room temperature. **Antioxidants** are the substances which can prevent the occurrence of oxidative rancidity. Rancidity occurs when oils are exposed to air, moisture, light, bacteria. It results in deterioration of oils & thereby formation of unpleasant products. Such rancid oils are unsuitable for human consumption. Trace amounts of antioxidants like tocopherol, alpha-napthol, hydroquinone, Gallic acid etc. are added in commercial preparations of oils or in food products to prevent rancidity.	**Defn 1 M** **Expn 3M**
4		**Attempt any Three of the followings**	**3×4 =12M**
4	**a)**	**Define the term 'Enzyme'. Explain binding of substrate with an enzyme at the active site.** Highly specific proteinous substances that are synthesized in a living cell & catalyze or speed up the thermodynamically possible reactions necessary for their existence. Binding of substrate is explained by 2 models: Lock & key model Induce fit model	**1M Defn** **Expln. With diagram 1.5 M each**



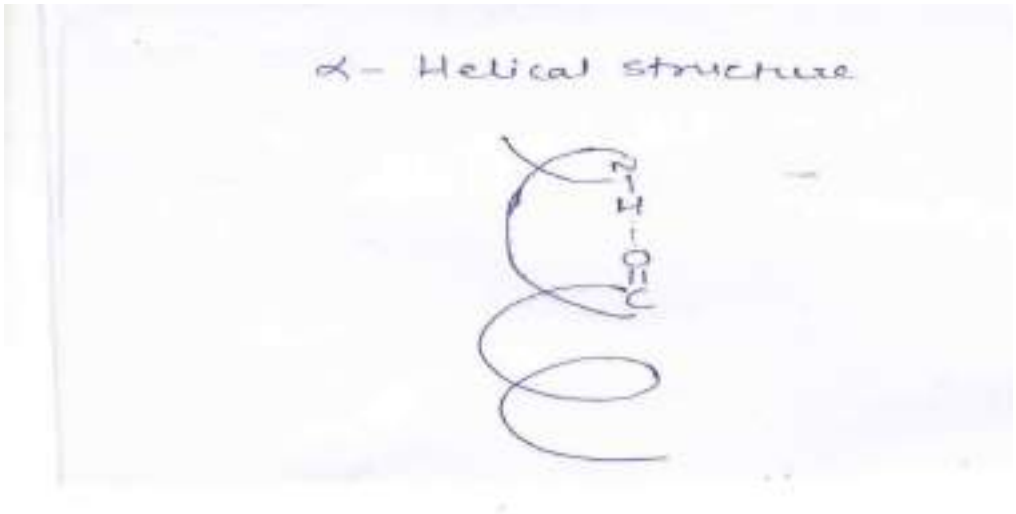
In this case the shape of active site of an enzyme and that of substrate is complementary to each other.

The substrate molecule fits into the active site of enzyme just as key fits into a lock. Hence called Lock & Key model.

The shape of active site is rigid and complementary to the shape of substrate complex

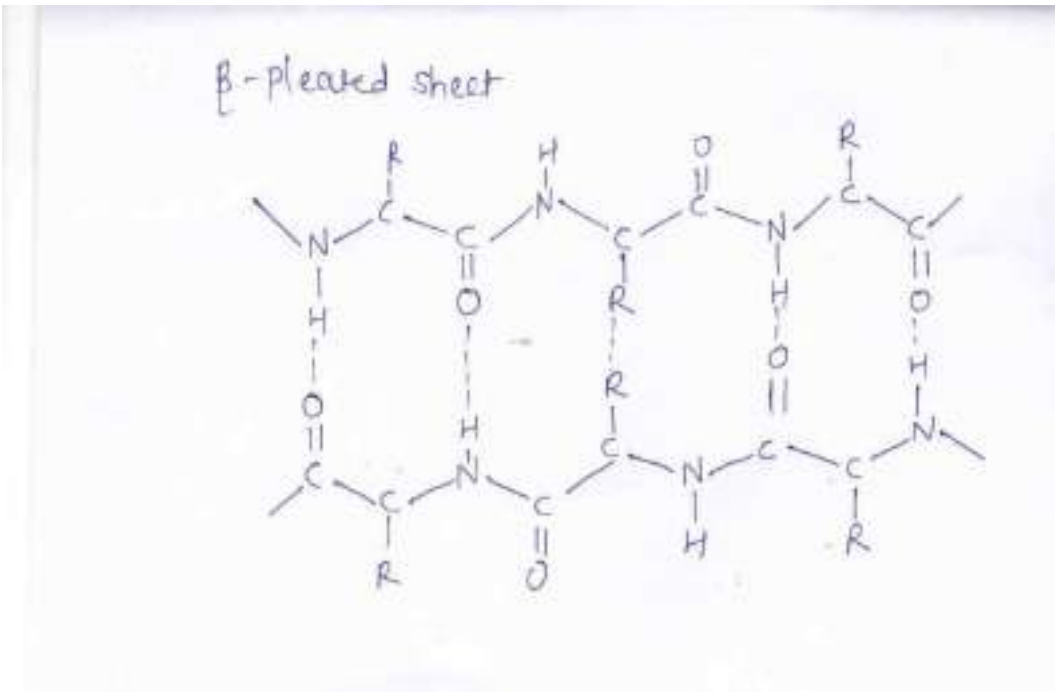


In this case the shape of active site of an enzyme is flexible so as to accommodate wide variety of substrate molecules.
The shape of active site of enzyme is made complementary to the substrate molecule.

4	**b)**	**Explain secondary structure of proteins.** The conformation of polypeptide chain by twisting or folding is referred to as Secondary structure of protein: The folding of the chain is mainly due to the presence of hydrogen bond between amino groups and carboxyl groups of the peptide bond. Two types of secondary structure are likely: (i) α- helix (ii) β-pleated sheet i) α- helix (α- helical) The α helical is the most common spiral structure of protein. It has a rigid arrangement of polypeptide chain. The α - helical structure depends on the intramolecular hydrogen bonding between NH and **C=0**group of peptide bond, in the α - helix the polypeptide is folded in such a way that the C=O of each amino acid residue is hydrogen bonded to the NH of 4th amino acid residue along the chain.  (ii) β-pleated sheet: It is another form of secondary structure, this result from hydrogen bonding between two peptide chains. It may occur in two types a) Parallel pleated sheet: In this type of structure the polypeptide chain is side by side and in the same direction so that N-terminal residues are on the same end. This pleated sheet confirmation is stabilized by hydrogen bonding, here bonds are formed between NH group of a peptide in one chain and C=O group of a neighboring chain.	

b) anti- parallel pleated sheet-

In this type of structure the polypeptide chain lie in opposite direction so that N-terminal end of one and C- terminal of the other, face each other. In this structure the polypeptide chains are held together by hydrogen bonds, so as to give a sheet like structure and hence are called as β – pleated sheet confirmation.



4	c)	**What is pathological urine?Mention abnormal costituents of urine & their significance**.	**Defn1M** **Constituents 3M**

Pathological urine- Urine that contains substances essential to the body or tissues (like sugar, bile salts, albumin etc.), in addition to normal organic & inorganic substances, is called as pathological or abnormal urine. Such urine indicates some disease or disorder.

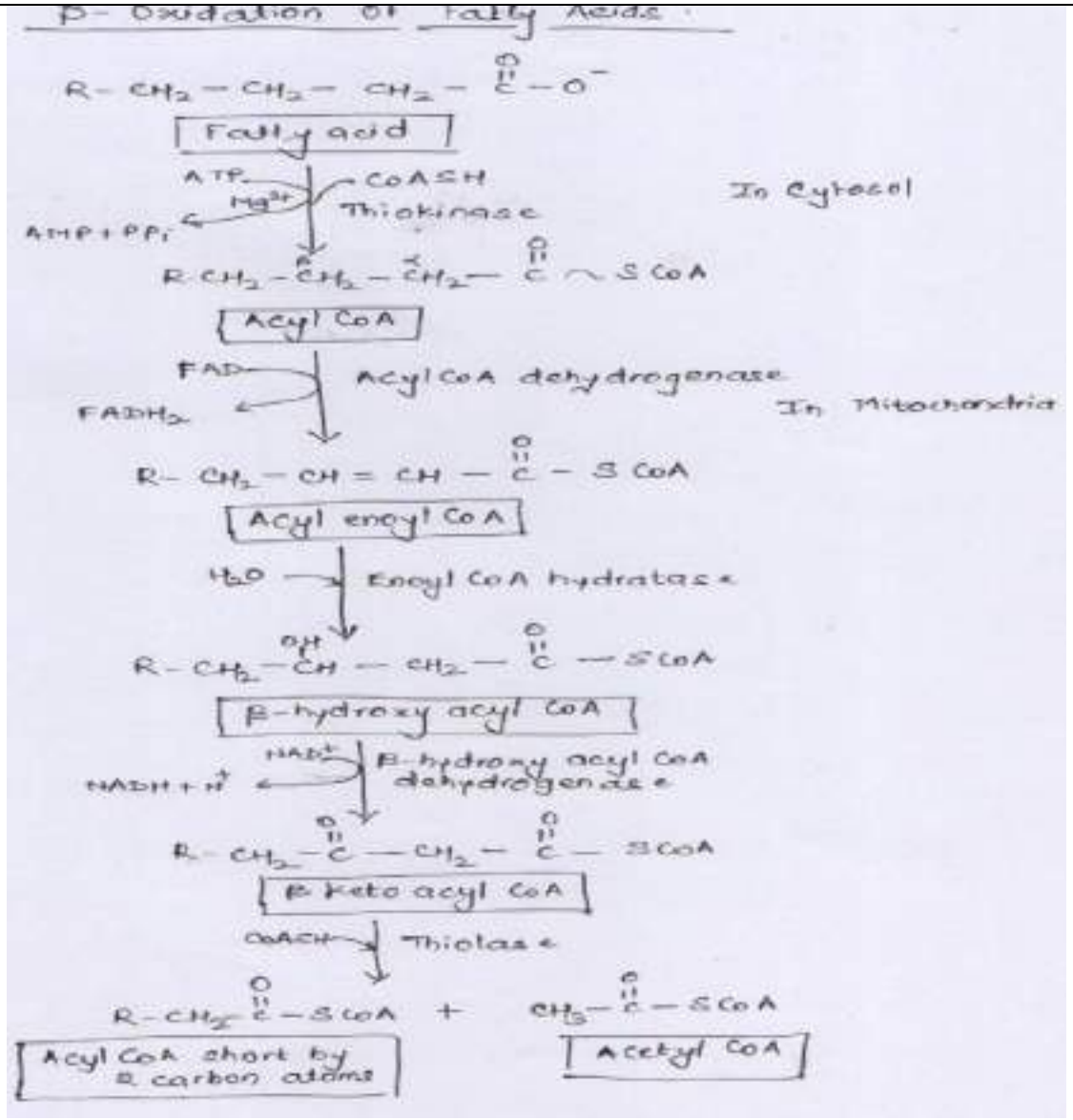
Abnormal constituents	**Associated ailment**
Sugar (glucose)	Glycosuria- Diabetes mellitus
Ketone bodies	Ketonuria-Diabetes mellitus, Pregnancy, Carbohydrate starvation

		Albumin	Proteinuria / Albuminuria, Pregnancy, severe exercise, high protein meal, Nephritis	
		Bile pigments / salts	Jaundice /Hepatitis	
		Blood	Haematuria- Acute inflammation of urinary organs, T.B., Cancer, Haemolytic jaundice etc.	
		Pus	Pyuria- Inflammation of urinary bladder, urethra, kidney	
4	**d)**	**Explain the importance of water in our body. Mention the routes of excretion of water from the body.** Water is the major body constituent. Adult human contains about 60-70% water. Water provides the aqueous medium to the body which is essential for various biochemical reactions. Water directly participates as reactant in several metabolic reactions. It serves as vehicle for transport of solutes. It is closely associated with the regulation of body temperature. **Routes of excretion of water from the body:** Kidney-urine Skin Lungs Faeces		**Imp. 2 M** **Routes 2M**

<table>
<tr><td></td><td></td><td></td><td></td></tr>
<tr><td>4</td><td>e)</td><td>What are coenzymes? Give full names of six vitamins & their respective coenzymes.
Co-enzymes are the organic molecules often derived from vitamin B complex group that participate directly in enzymatic reaction. Or Many enzymes catalyse the reactions only in presence of specific non protein organic molecules called the co-enzyme.

<table><tr><td>Vitamin B1- Thiamine</td><td>Thiamine pyrophosphate</td></tr><tr><td>Vitamin B2- Riboflavin</td><td>FAM (Flavin adenine mononucleotide),
FAD (Flavin adenine dinucleotide)</td></tr><tr><td>Vitamin B3- Niacin</td><td>NAD(Nicotinamide adenine dinucleotide),
NADP(Nicotinamide adenine dinucleotide phosphate)</td></tr><tr><td>Vitamin B5- Pantothenic acid</td><td>Coenzyme-A</td></tr><tr><td>Vitamin B6- Pyridoxine</td><td>Pyridoxal phosphate</td></tr><tr><td>Vitamin B7- Biotin</td><td>Biotin</td></tr><tr><td>Vitamin B9- Folic acid</td><td>Tetrahydrofolate</td></tr><tr><td>Vitamin B12- Cyanocobalamin</td><td>Deoxyadenosine cobalamin</td></tr><tr><td>Vitamin C (Ascorbic acid)</td><td>Ascorbic acid</td></tr></table></td><td>Defn 1M
3M for List of any 6</td></tr>
<tr><td>5</td><td></td><td>Attempt any THREE of the followings</td><td>4×3=12M</td></tr>
<tr><td>5</td><td>a)</td><td>Discuss in brief the reactions involved in β-oxidation of fatty acids.
(Detailed diagrammatic representation can be considered for full marks)
Beta oxidation is the main pathway used to liberate energy by oxidation of fatty acid It takes place in the beta carbon of fatty acid with removal of 2 carbons at a time from the carboxyl end of the molecule. The process repeats itself until the fatty acid with</td><td>4M</td></tr>
</table>

		even number of carbon is completely converted to acetate molecules. Fatty acid containing even & odd number of carbon atoms as well as unsaturated fatty acids are oxidised by beta oxidation. It takes place in 5 steps in mitochondria of liver. 1. Activation of fatty acid. Long chain fatty acid gets activated to fatty acyl CoA in presence of CoASH, Thiokinase &ATP 2. Fatty acylCoA undergoes dehydrogenation in presence of acyl CoA dehydrogenase &FAD to give alpha,beta unsaturated fatty acyl CoA 3. Addition of water molecule across the double bond results into formation of Beta hydroxy acyl CoA in presence of Enoyl CoA dehydratase 4. Hydroxyl group of Beta hydroxy acyl CoA gets oxidised to keto group forming Beta keto acyl CoA in presence of Beta hydroxy acyl CoA dehydrogenase & NAD+ 5. Thiolytic cleavage of acyl CoA takes place in presence of Beta keto acyl CoA Thiolase & CoASH. Acyl CoA thus formed contains 2 Carbons less than original acyl CoA which undergoes further oxidation by Beta-oxidation. Acetyl CoA is also formed which enters TCA cycle.	

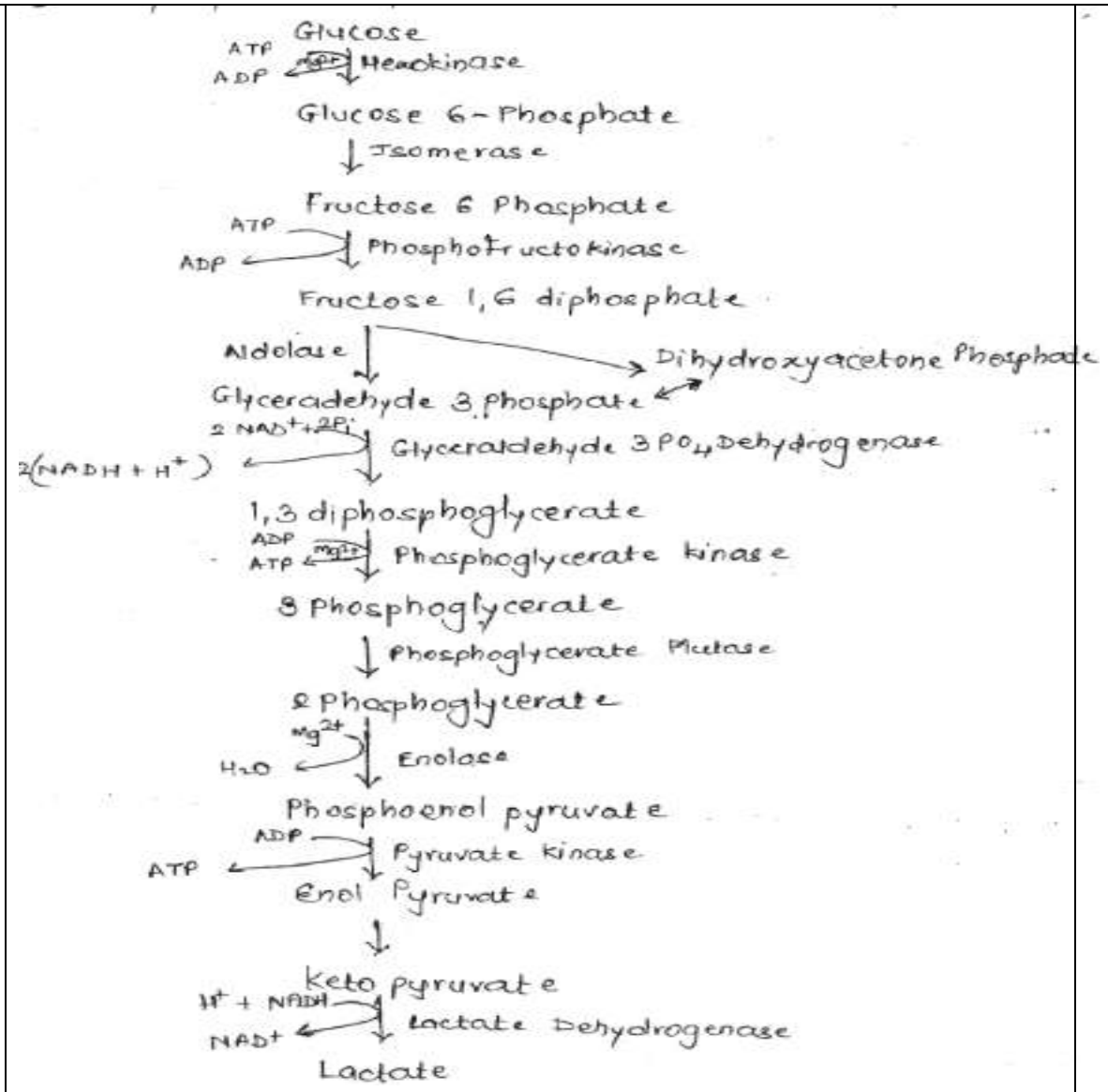
			
5	**b)**	**Explain in short :** i. **Acid value**- It is the number of milligrams of KOH required to neutralize the free fatty acids present in 1 gram of fat or oil. Free fatty acids increase due to decomposition ii. **Acetyl Number**- It is the number of milligrams of KOH required to neutralize the acetic acid obtained by saponifying 1 gram of an acetylated fat or oil. By	**4M** **(Each explanation 1M)**

		this method the hydroxyl groups are measured. iii. **Phospholipids**- the Compound lipids containing phosphorus are called as phospholipids. Phospholipid contains phosphoric acid, fatty acids, alcohol and generally a nitrogenous base. E.g .Glycerophospholipids Sphingophospholipids. iv. **Iodine Number** -It is the number of grams of iodine absorbed by 100g of fat or oil. It is the measure of the amount of unsaturated fatty acid present in total fat or oil.	
5	**c)**	**Explain the biochemical role of calcium. Mention its deficiency manifestations and remedy.** • **Biochemical role of Calcium- (any four can be considered)** i. It is required for formation and development of bones and teeth. ii. It is required for blood coagulation process. iii. It is required for regulation of muscle contraction. iv. It is necessary for transmission of nerve impulses. v. Calcium influences the membrane structure (i.e. maintains the membrane integrity) and helps in transport of water and several ions (i.e membrane permeability). vi. It is needed for the direct activation of enzymes like lipase, ATPase and succinate dehydrogenase. vii. It is responsible for release of hormones like insulin, PTH, calcitonin from the endocrine gland. viii. Calcium acts an intracellular messenger for certain hormones like epinephrine and ADH. ix. Cell to cell contact & adhesion of cells in a tissue	**4M (Role-2M, deficiency-1M and remedy -1M)**

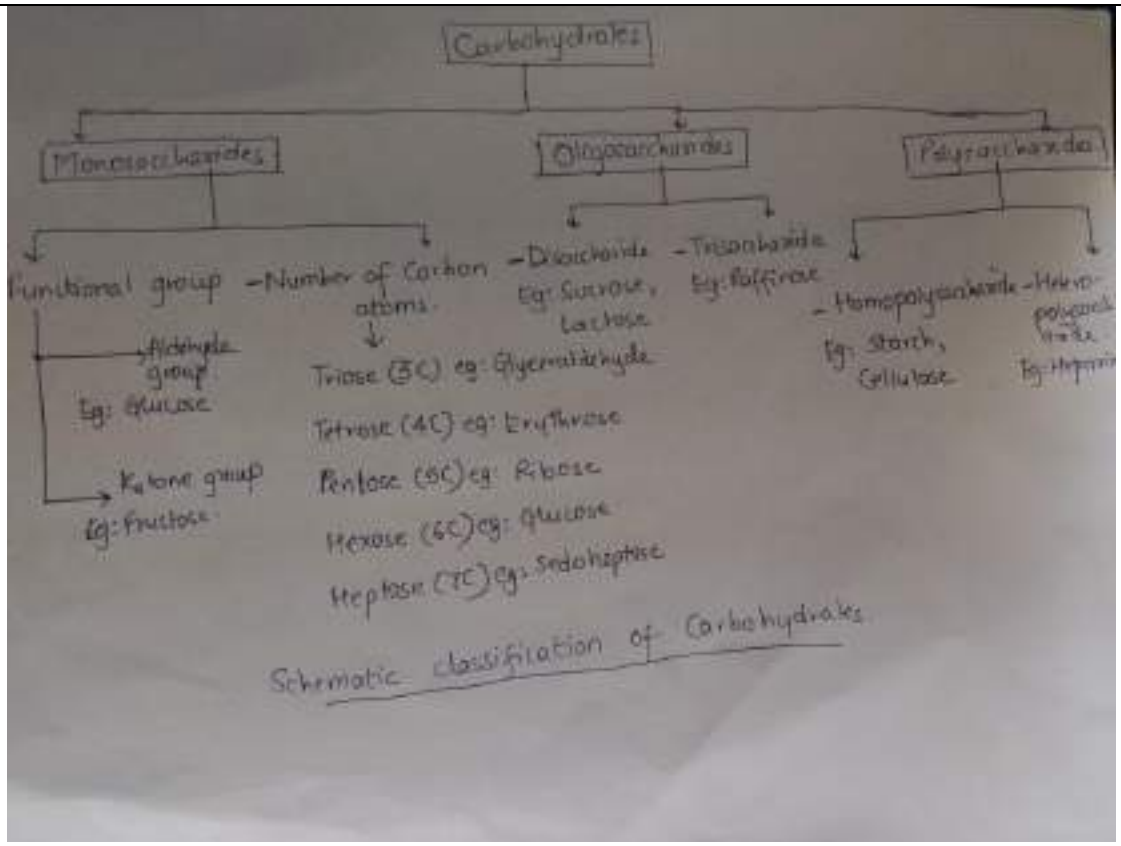
		x. Calcium acts on myocardium & prolongs systole. • **Deficiency** of calcium causes hypocalcemia (tetany), hypoparathyrodism rickets , osteoporosis. • **Remedy-** i. Higher dietary intake of calcium ii. Calcium supplements.	
5	**d)**	**Write Short Note on:** i. **Arteriosclerosis-** is a complex disease characterised by thickening or hardening of arteries due to accumulation of lipids (particularly cholesterol, free and esterified) collagen, fibrous tissue, proteoglycans, calcium deposit etc in the inner arterial wall. Arteriosclerosis is a progressive disorder that narrows and ultimately blocks the arteries. Coronary arteries-the arteries supplying blood to the heart are the most commonly affected leading to myocardial infarction or heart attacks. The development of arteriosclerosis & risk of coronary heart disease (CHD) is directly correlated with plasma cholesterol and LDL (bad cholesterol). On the other hand, plasma HDL is inversely correlated with CHD. Certain diseases which are associated with arteriosclerosis include diabetes mellitus, hypothyroidism, hyperlipoproteinaemia. Obesity, excessive smoking, lack of exercise, hypertension, stress and high consumption of saturated fats etc. may lead to arteriosclerosis. ii. **Hyperammonemia**- is a metabolic defect associated with enzymes of urea cycle which lead to a build-up of ammonia in blood. Such condition in which there is rise in ammonia levels in blood is termed as hyperammonemia.It may be due to hepatitis ,alcoholism etc.	**4M** **(Each short note 2M)**

		Types – Hyperammonemia Type I -It is caused due to deficiency of carbamoyl phosphate synthetase. Hyperammonemia Type II- It is caused due to deficiency of ornithine transcarboxylase. Both disorders exhibit hyperammonemia with elevated glutamine levels in blood, CSF and urine.	
5	**e)**	**What is enzyme inhibition? Explain competitive inhibition with one example** Compounds or agents which inactivate the enzymes, & thus adversely affect the rate of enzyme catalysed reaction are called as inhibitors & this process is known as enzyme inhibition. **Competitive inhibition:** In Competitive inhibition structure of inhibitor (I) closely resembles with that of the substrate (S). The inhibitor thus competes with the substrate to combine with an enzyme (E) forming the enzyme inhibitor complex (EI) rather than (ES) complex. The degree of inhibition depends upon the relative concentration of the substrate & the Inhibitor. Thus, by increasing the substrate concentration & keeping the inhibitor concentration constant the amount of inhibition decreases & decrease in substrate concentration result in increased enzyme inhibition. In this type of inhibition, enzyme can either bind with substrate (ES) or inhibitor (EI) but not both. V_{max} is unchanged K_M is increased. Example: Sulpha drugs when given as antibacterial agent compete with para-amino benzoic acid (PABA) and folic acid synthesis gets inhibited. **Consider any other correct example**	**4M (definition-1M, explanation 2M, eg-1M)**
6		**Attempt any TWO of the followings**	**6×2=12**
6	**a)**	**Explain Glycolysis cycle** Schematic representation and explanation both to be considered.	**6M**

		It's a main pathway for glucose oxidation 1. Phosphorylation of glucose to glucose 6 phosphate in presence of enzyme hexokinase & ATP & Mg 2. Isomerisation of Glucose 6 phosphate to fructose 6 phosphate in presence of phosphohexo isomerase 3. Phosphorylation of fructose 6 phosphate to fructose 1,6 diphosphate in presence of phosphor-fructokinase, ATP& Mg 4. Cleavage of fructose 1,6 diphosphate to dihydroxy acetone phosphate & glyceraldehyde 3 phosphate in presence of aldolase. These 2 products are interconvertible in presence of triose phosphate isomerase 5. Glyceraldehyde 3 phosphate further undergoes oxidation to 1,3 diphosphoglycerate in presence of glyceraldehyde 3 phosphate dehydrogenase & NAD+ 6. Transformation of 1,3 diphosphoglycerate to 3- phosphoglycerate in presence of phosphoglycerate kinase, Mg & ADP 7. 3- phosphoglycerate changes to 2-phosphoglycerate in presence of phosphoglycerate mutase 8. Loss of water molecule from 2-phosphoglycerate results into formation of phosphoenol pyruvic acid in presence of enolase 9. Loss of phosphate from phosphoenol pyruvic acid results into formation of Enol pyruvic acid in presence of pyruvate kinase, Mg & ADP 10. Enol pyruvic acid gets converted to keto form of pyruvic acid in presence of pyruvate kinase 11. Keto pyruvic acid under aerobic conditions enter TCA cycle in mitochondria. Pyruvic acid forms main end product of glycolysis in those tissues which are supplied with sufficient Oxygen. 12. But tissues where oxygen is not supplied, lactic acid is formed as an end product of glycolysis by reduction in presence of lactate dehydrogenase & NADH. Net reaction for glycolysis is: Glucose + 2NAD+ + 2 ADP + 2 Pi $\rightarrow$ 2 Pyruvate + 2 ATP + 2 NADH + 2 H_2O	

			
6	**b)**	**Explain:** i. **Phenylketonuria (PKU)** - It is the most common disorder in amino acid metabolism. The incidence of PKU is 1 in 10000 births. It is due to the deficiency of hepatic enzyme, phenylalanine hydroxylase. Phenylalanine metabolism in PKU -Phenylketonuria primarily causes the accumulation of phenylalanine in the tissues and blood, and results in increased excretion in urine. Due to the disturbances in the routine	**6M** **(Each explanation 3M each)**

		metabolism, phenylalanine is diverted to the alternate pathways, resulting in the excessive production of phenylpyruvate, phenylacetate, phenyllactate and phenylglutamine. All these metabolites are excreted in urine in high concentration in PKU. Clinical manifestations of PKU: Mental retardation, failure to walk or talk, failure of growth, seizures and tremors are observed Treatment of PKU: the maintenance of plasma phenylalanine concentration within the normal range is done by selecting foods with the low phenylalanine content and or feeding synthetic amino acid preparation, low in phenylalanine. ii. **Ketosis**- Normally acetyl CoA formed from pyruvate, beta oxidation & amino acids gets condensed with oxaloacetate & oxidised to carbon dioxide & water. During impaired carbohydrate metabolism or low carbohydrate intake, fate of acetyl CoA changes if oxaloacetate is available in limited supply or large quantity of fatty acid is oxidised to Acetyl CoA. Excess acetyl CoA is diverted for production of ketone bodies. When the rate of synthesis of ketone bodies does not cope with the rate of utilisation in extrahepatic tissues, the concentration in the blood increases this is known as ketonemia followed by the increase urinary excretion known as ketonuria & the overall condition together is called as Ketosis. Conditions associated with Ketosis- Starvation, high fat diet, Diabetes mellitus and impaired carbohydrate metabolism. Acetone, Aceto acetic acid and Beta hydroxybutyric acid are the ketone bodies that are excreted in ketosis.	
6	**c)**	**Give schematic representation of classification of carbohydrates. Explain each class with examples**.	**6M (Scheme 2M, Explanation 2M and egs 2M)**



Classification of carbohydrates: Carbohydrates are classified into two groups based on the number of sugar units-

I) Monosaccharides are the simplest group of carbohydrates and are often referred to as simple sugars. They have general formula CnH2nOn and they cannot be further hydrolysed. they are further classified as-

- On basis of functional groups-

i. Aldoses: when the functional group of monosaccharides is an aldehyde they are known as aldoses

E.g. Glyceraldehyde, glucose.

ii. Ketoses: when the functional group of monosaccharides is a ketone they are known as ketoses

- On basis of number of carbon atoms-

Trioses -three carbon atom e.g.- glyceraldehyde, dihydroxyacetone.

Tetroses- four carbon atom e.g. Erythrose, erythrulose.

		Pentoses- five carbon atom e.g. Ribose, ribulose. Hexoses- six carbon atom e.g. Glucose, fructose, galactose, mannose, etc. Heptoses- seven carbon atom e.g. Sedoheptose, sedoheptulose. II) Oligosaccharides contain two to ten monosaccharide molecules. Based on the number of monosaccharide units present, the oligosaccharides are further subdivided into- i. Disaccharide- class of oligosaccharide consisting of two monosaccharide units. eg. Sucrose (glucose+ fructose), lactose (galactose+ glucose) , maltose (glucose + glucose). ii. Trisaccharide- class of oligosaccharide consisting of three monosaccharide units. E.g. Raffinose (three galactose sugar units), maltotriose (three glucose sugar units). III) Polysaccharides are the polymers of monosaccharide units with higher molecular weight held together by glyosidic bonds Polysaccharides are of two types- i) Homopolysaccharide - these on hydrolysis yield only a single type of monosaccharide unit. E.g.- Starch, cellulose, glycogen etc ii) Heteropolysaccharide - these on hydrolysis yield mixture of few monosaccharides or their derivatives unit. E.g.- Hyaluronic acid, heparin, chondroitin sulphate etc **Carbohydrates classification can also be shown under the heading of Sugars and Non-Sugars**	

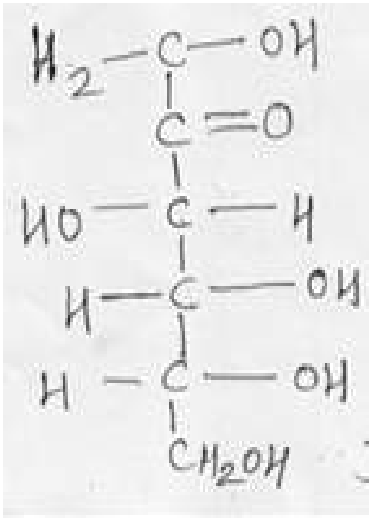
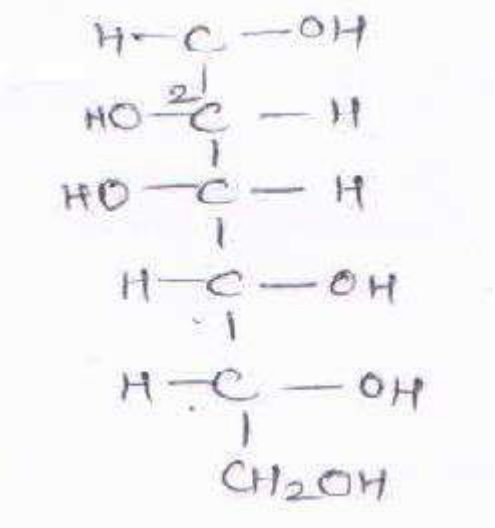
WINTER – 19 EXAMINATION

Subject Name: Biochemistry & Clinical Pathology **Model Answer** Subject Code : 0808

Important Instructions to examiners:

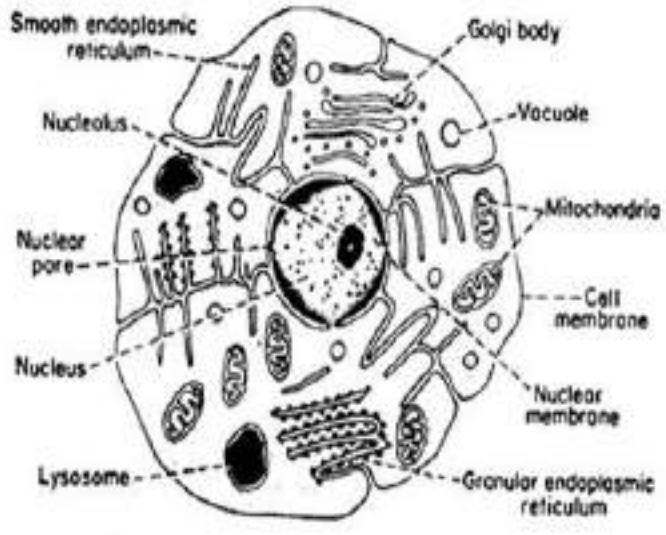
1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for any equivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

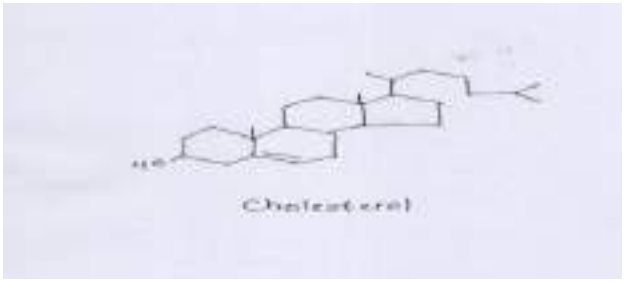
Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Attempt any Eight of the followings:**	**8×2=16M**
1	a)	**Define the terms biochemistry and biomolecules.** **Biochemistry-** The study dealing with the chemistry of living organism in its different phases of activity is called as biochemistry. **Biomolecules-** Biomolecules are molecules and ions present in organisms that are essential to one or more biological processes, such as cell division, development etc. Biomolecules include large macromolecules (or polyanions) such as proteins, carbohydrates, lipids, and nucleic acids, as well as small molecules such as primary metabolites, secondary metabolites, and natural products.	**1M each**
	b)	**Define enzyme inhibition. Give its types.** Compounds or agents which inactivate the enzymes, & thus adversely affect the rate of enzyme catalysed reactions are called as inhibitors & this process is known as enzyme inhibition. **Types:**	**1 M DEF.** **1 M Types** **Any 2**

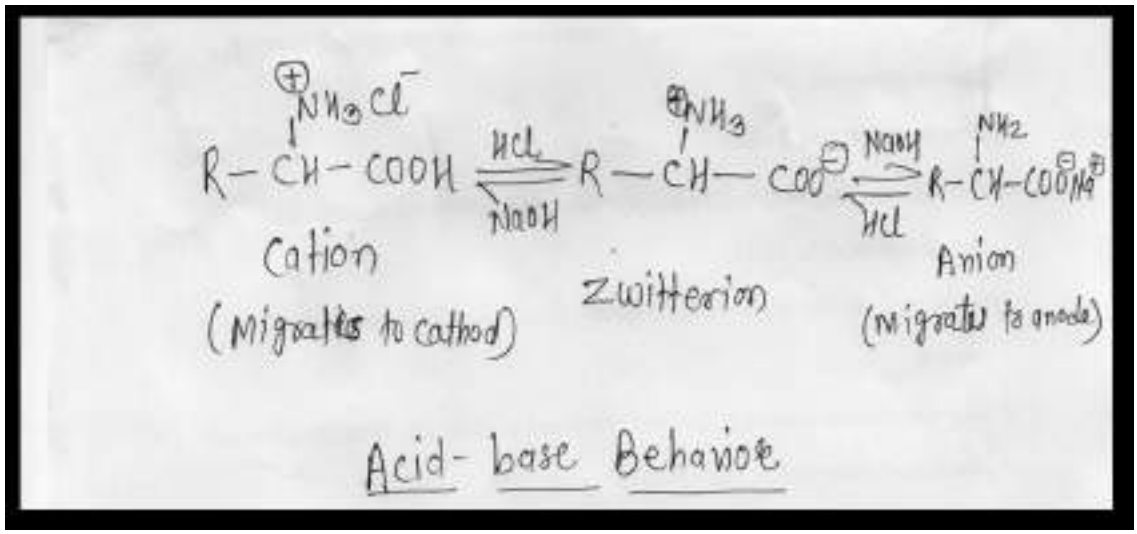
		1.Reversible inhibition **2.Irreversible inhibition** **3.Allosteric Inhibition**	
	c)	**Give physiological role of sodium in body** o To maintain acid base balance. o Required for maintenance of osmotic pressure & fluid balance o Required for normal muscle irritability & cell permeability o Required for initiating & maintaining heart beat	**2M**
	d)	**Define the terms Thrombocythemia and Lymphocytosis** Thrombocythemia: Increase in numbers of platelets above the normal range. Having too many platelets makes it hard for our blood to clot normally. It may be due to anaemia, malignancy. Lymphocytosis: Increase in number of lymphocytes count above normal range in blood & is observed in viral infection like Hepatitis A, Bordetella pertussis.	**1M each**
	e)	**Draw structures of fructose and Mannose** **Fructose** **Mannose**  	**1Meach**

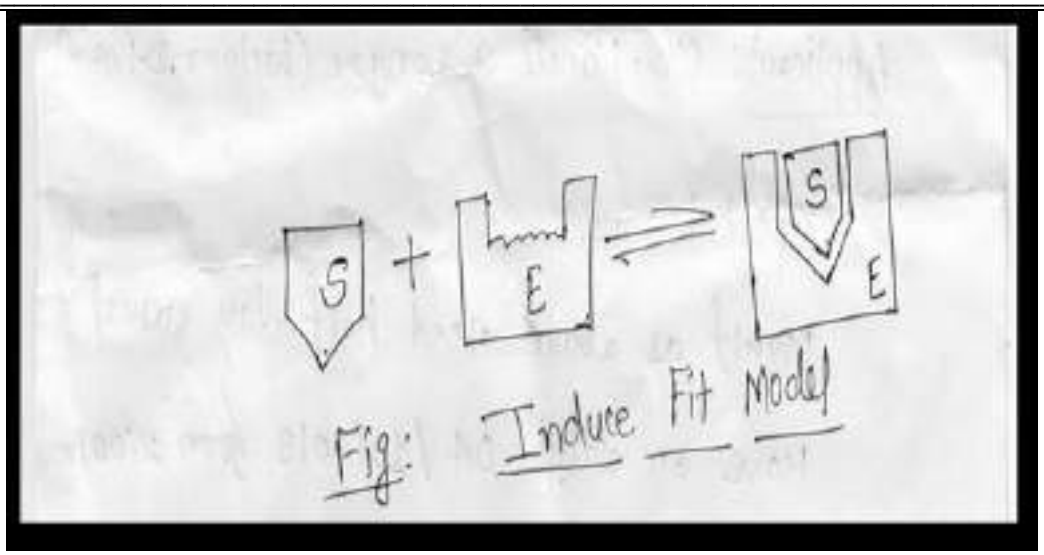
	f)	**Write tests for detection of Glucose in urine** i) Benedict's test: 5ml urine+ 5ml Benedict's reagent boil for 2 minutes &cool Green/ yellow/ red ppt obtained indicates presence of sugar according to concentration ii) Fehling's test: 2ml Fehling's A+ 2ml Fehling's B, boil for few minutes, add 2-3 ml of urine ,boil again. red/ yellow ppt obtained indicates presence of sugar.	**2M**
	g)	**Define essential fatty acids? Draw structures of any one.** The unsaturated fatty acids which are not synthesized in the body and are required to be supplied through diet for the normal growth of body are called as essential fatty acids. The Essential fatty acids are required for biological processes. Chemically they are polyunsaturated fatty acids. E.g. Arachidonic acid, linoleic acid, linolenic acid. Etc. Structure: Linoleic acid  Arachidonic acid  (**Any other structure can also be considered)**	**1M Def.** **1M for any 1 stru.**
	h)	**Define Ketonemia. How it occurs?** The presence of high ketone bodies in blood is called as Ketonemia. In starvation, degradation of fatty acid increases to meet the energy need of the body. This	**0.5M def.** **1.5M expl.**

		causes an overproduction of acetyl CoA which cannot be fully handled by citric acid cycle. TCA cycle is also impaired due to deficiency of oxaloacetate, since most of it is diverted for glucose synthesis to meet the essential requirements for tissues like brain. This results in accumulation of acetyl CoA, its diversion for over production of ketone bodies and thereby increased level of ketone bodies in blood.	
	i)	**Name deficiency disorder of Niacin and give its signs and symptoms.** **Pellagra** is a vitamin deficiency disease caused by dietary lack of niacin **The signs & symptoms of pellagra include:** • Dermatitis: found in areas of the skin exposed to sunlight, oedema ,Red skin lesions, inflammation of skin • Dementia is associated with degeneration of nervous tissue. Symptoms include anxiety, irritability, poor memory, insomnia etc. Diarrhoea: in the form of loose stools, often with blood and mucus. **The main results of pellagra can easily be remembered as "the three D's": diarrhoea, dermatitis and dementia.**	**0.5M name** **1.5M sym.**
	j)	**Define Isoelectric point of amino acids** At the isoelectric pH, the amino acid exists as Zwitter ion or dipolar ion which carries equal number of positive and negative charges and net charge becomes zero, this point of pH is called as isoelectric point of amino acids.	**2M**
	k)	**Define Holoenzymes and Multienzymes.** **Holoenzymes:** The apoenzymes in combination with its prosthetic group constitute holoenyzme. **Multienzyme:** Composed of or involving two or more enzymes that function together in a biosynthetic pathway OR **It** is a group of different enzymes.	**1M each**
	l)	**Draw a well labelled diagram of a typical animal cell.**	**2M**

			
2		**Attempt any FOUR of the following:**	**4×3=12M**
2	**a)**	**Define and classify carbohydrates with example of each class.** Carbohydrates- They are large group of organic compounds which are polyhydroxy aldehydes or ketones which on hydrolysis give these derivatives. **Classification-** 1) Sugars (saccharides) 2) Non sugars (poly saccharides) 1) Sugars (saccharides)- a) Monosaccharides Depending upon number of carbon atoms, they are subdivided in following types: i) trioses-e.g. D-Glycerose ii) tetroses-e.g. D-erythrose iii) pentoses-e.g. D-ribose iv) hexoses- e.g. glucose, fructose Depending on functional group : i) aldoses : Glucose ii) ketoses : Fructose b) Disaccharides- e.g. lactose, maltose, sucrose. c) Oligosaccharides- e.g. raffinose, maltotriose. 2) Non sugars (poly saccharides)-	**1M def. 1M classes, 1M e.g.**

		a) Homopolysaccharides-e.g. starch, cellulose. b) Heteropolysaccharides e. g. hyaluronic acid	
2	**b)**	**Draw structure of cholesterol and give its colour reactions.**  **1) Liebermann-Burchard test:** When chloroform solution of cholesterol is treated with acetic anhydride & concentrated sulphuric acid, green colour is formed. **2) Salkowaski test:** When chloroform solution of cholesterol is treated with concentrated sulphuric acid, upper layer gives red colour and H_2SO_4 layer gives green colour. **3) Formaldehyde-H_2SO_4 Test:** To a solution of cholesterol in chloroform in dry test tube If 2ml of formaldehyde-sulphuric acid solution is added, cherry colour develops.	**1M stru, 2M for any 2 tests**
2	**c)**	**Describe acid base properties of amino acids.** i. Amino acids are amphoteric in nature ii. The amino group (NH2) can accept proton (H+) and form cation (NH3). iii. The carboxyl group can donate H+ and form anion (COO-). iv. At acidic pH the amino acids are positively charged. v. At basic pH they are negatively charged. vi. At intermediate pH, the charge is zero; it carries both positive and negative charges.	**1M reaction 2M properties**

		vii. This pH is called isoelectric pH. At the isoelectric pH , the amino acid exists as Zwitter ion which carries equal number of positive and negative charges and net charge becomes zero. viii. At the Isoelectric pH, that amino acid becomes insoluble and precipitates out. E.g. Aspartic acid 2.77 and alanine 6.02 (consider any example)  	
2	**d)**	**Explain Koshland theory of enzyme action.** **Induced fit model is called as Koshland theory of enzyme action.** In this case the shape of active site of an enzyme is flexible so as to accommodate with wide variety of substrate molecules. In this, interaction of the substrate with the enzyme induces a fit or conformation change in the enzyme, resulting in the formation of a strong substrate binding site. The shape of active site of enzyme is made complementary to the substrate molecule.	**1M dig,** **2M expl.**

			
2	**e)**	**Write functions of blood and briefly describe its composition.** 1) Blood transports oxygen from lungs to tissues, carbon dioxide from tissue to lungs. 2) Blood acts as vehicle for transportation of hormones, vitamins, and other essential chemicals. 3) It maintains water balance of body 4) It maintains acid base balance of body 5) It maintains the ion balance between the cells and surrounding fluids. 6) Blood regulate the body temperature. 7) Blood acts as defensive system by producing WBC and various antibodies. 8) Blood regulate the blood pressure by changing its volume and viscosity. 9) It transports the cellular waste products to excretory organs which are kidney, lungs. **Composition:** Plasma : watery fluid portion of blood .55% Blood cells:45%	**2M Fun. Any 4, 1M compositio n**

1) RBC: Red blood cells (RBCs), also called erythrocytes, carry oxygen throughout the body.

2) WBC **:** White blood cells (WBCs), also called leukocytes or leucocytes, are the cells of the immune system that are involved in protecting the body against both infectious disease and foreign invaders.

3) PLATELETS: Platelets are tiny blood cells that help your body form clots to stop bleeding.

2 f) Enlist abnormal constituents of urine and give their significance. **3M**

Abnormal constituents	**Significance**
Sugar/ Glucose	Glycosuria, diabetes mellitus
Ketone bodies	Ketonuria- Diabetes mellitus, Pregnancy, Carbohydrate starvation
Protein/ albumin	Proteinuria- Pregnancy, severe exercise, high protein meal, Nephritis
Bile pigments	Jaundice /Hepatitis
Blood	Haematuria- Acute inflammation of urinary organs, T.B., Cancer, Haemolytic jaundice etc
Pus	Pyuria- Inflammation of urinary bladder, urethra, kidney

3 Attempt any FOUR of the following: **4×3=12M**

3 a) Define and classify minerals with examples. **3M**

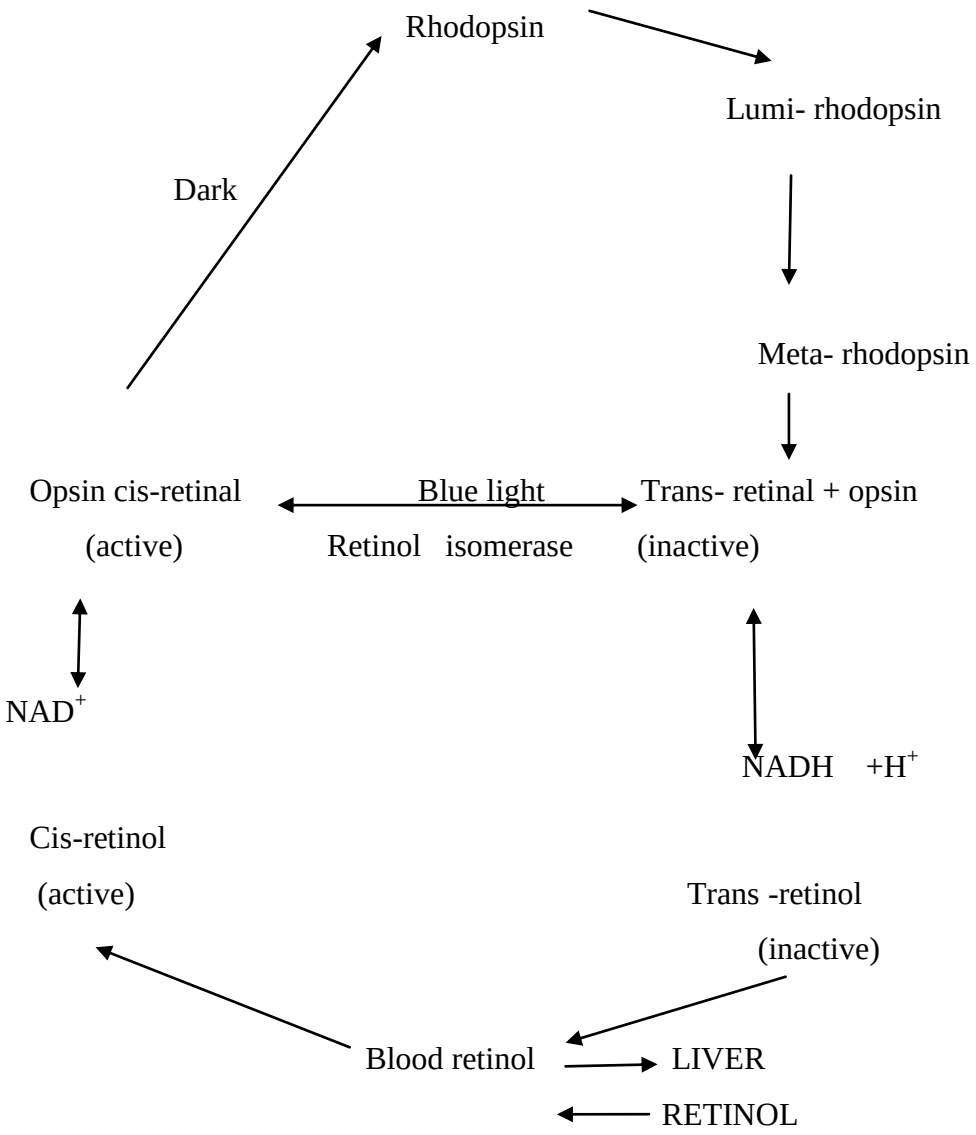
Definition-These are inorganic homogenous substances which must be supplied by the diet to perform various physiological functions.

Classification- The minerals are classified as principal and trace elements.

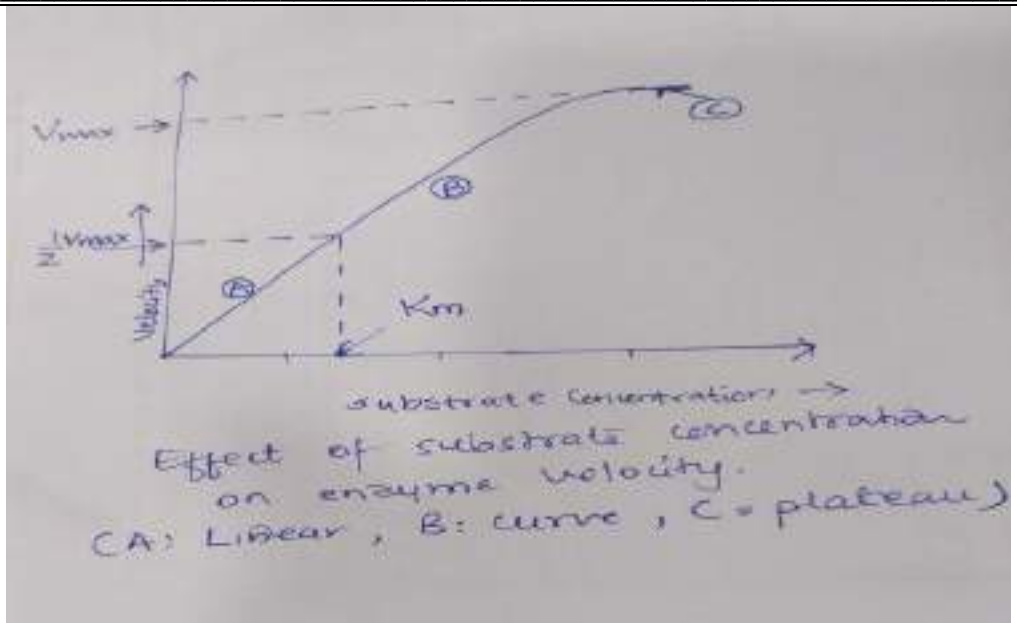
(Definition-1M and Classification -1 M

		1. Principal trace elements- (macro elements) They are required in amounts greater than 100mg/day. E.g. calcium, phosphorus, magnesium, sodium, potassium, chloride, sulphur. 2. The trace elements (microelements) are required in amounts less than 100mg/day. They are subdivided into three categories- i. Essential trace elements: These are the elements which are not synthesized in the body but are required for performing biochemical functions in the body in trace amounts only. E.g.- iron, copper, iodine, manganese, zinc, molybdenum, cobalt, fluorine, selenium, chromium. ii. Possibly essential trace elements: e.g. Nickel, vanadium, cadmium, chromium iii. Non-essential trace elements: e.g.-aluminium, lead, mercury, boron, silver, bismuth.	**and Examples 1M)**
3	**b)**	**Explain water balance of normal individual.** (Balance may be given for 2500ml/2800ml) Water is very essential for living system. There is no life without water. Total body water accounts for 70%of body weight. However, a loss of 10% of water in our body is serious and a loss of 20% is fatal. Therefore, a balance should be maintained between water intake and output. **Water intake source -** 1) Drinking water -1500ml 2) Solid food -1000ml 3) Oxidation of carbohydrates, fats and protein- 300ml **Water loss from body -** Water is lost continuously from the body in the following ways. 1) via kidney as urine -1500ml 2) via skin -800ml 3) via lungs in expired air -400ml 4) via faeces -100 ml	**3M (1.5M Explanation and 1.5M Table)**

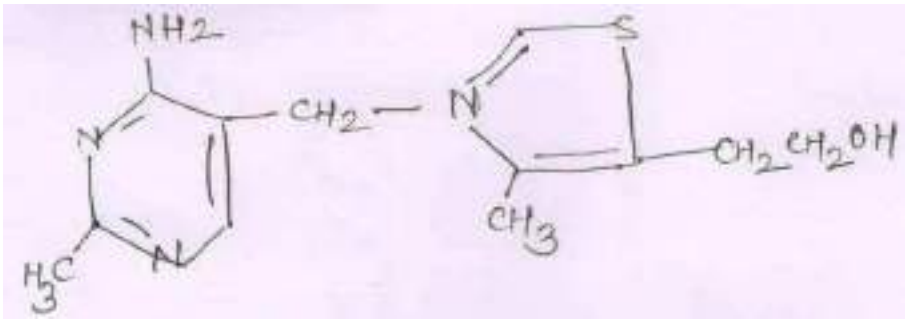
			Water Intake	**ml**	**Water Loss**	**ml**	
			Drinking water	1500	Urine	1500	
			Solid food	1000	Faces	100	
			Oxidation of Carbohydrates, Fats and Proteins	300	Skin	800	
					Lungs	400	
			Total	**2800**	**Total**	**2800**	
3	**c)**	**Describe the role of Vitamin A in vision cycle** The retina of the eye contains two types of receptor cells, Rod cells which are responsible for dim light vision & the cones, responsible for bright light vision. Cones are also responsible for colour perception. The deficiency of cone pigments makes the individual colour blind. In retinal pigments, the rod cells contain rhodopsin. Under the influence of light, rhodopsin is converted to lumirhodopsin which is further converted into metarhodopsin. Then hydrolysed to protein opsin & trans retinal. Trans-Retinal (trans-retinene) is inactive in the synthesis of rhodopsin; it must be converted to the active cis-isomer. In the eye, the trans-retinal is reduced to trans-retinol by the enzyme retinal reductase & NADH. The trans retinol which is too inactive in rhodopsin synthesis is passed into blood stream, and then carried to liver. It is then converted to cis isomer. In dim light active cis-retinol from the blood enters the retina where it is oxidized to cis-retinal by reverse action of retinal reductase in the presence of NAD+. Finally, the cis-retinal combines with protein opsin to give back rhodopsin and thus cycle is repeated.					**3M (1.5M Explanation and 1.5M Diagram)**

		DIAGRAM:  	
3	**d)**	**Briefly describe denaturation of proteins.** Denaturation of proteins involves the disruption and possible destruction of both the secondary and tertiary structures. Since denaturation reactions are not strong enough to break the peptide bonds, the primary structure remains the same after a denaturation process. Agents causing denaturation • Physical agents: Temperature, Cooling • Chemical agents: Acetic acid, Sulfosalicylic acid, X ray. Changes after denaturation: - • Loss of biological activity	**3M**

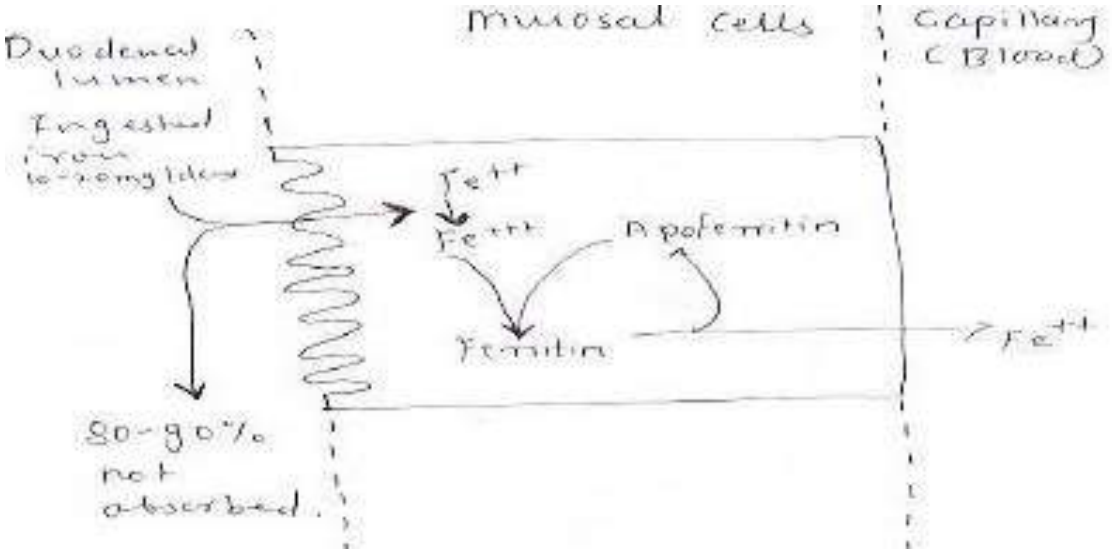
		• Change in surface tension • Changes in solubility • Destruction of secondary and tertiary structures E.g. Boiled eggs become hard, skin formed on curdled milk.	
3	**e)**	**Enlist the factors affecting the rate of enzyme catalysed reaction and explain effect of substrate concentration on the rate.** Factors that affect velocity of enzyme catalysed reaction are- • Hydrogen ion concentration • Concentration of enzymes • Concentration of substrate • Temperature • Time • Products of reaction • Effect of light & other physical factors • Allosteric factors • Effect of hormones & other biochemical agents. **Effect of Substrate concentration-** Increase in the substrate concentration gradually increases the velocity of enzyme reaction within the limited range of substrate levels. A rectangular hyperbola is obtained when velocity is plotted against the substrate concentration. Three distinct phases of the reaction are observed in the graph, first in linear fashion, later the curve flattens and becomes plateau. Thus, by increasing the concentration of the substrate indefinitely, the velocity of the reaction cannot be increased beyond a certain stage. The rate of the enzyme reaction is independent of the concentration of substrate and enzyme. Diagram of graph –	**3M (1M Enlist 1M explanation 1M graph)**

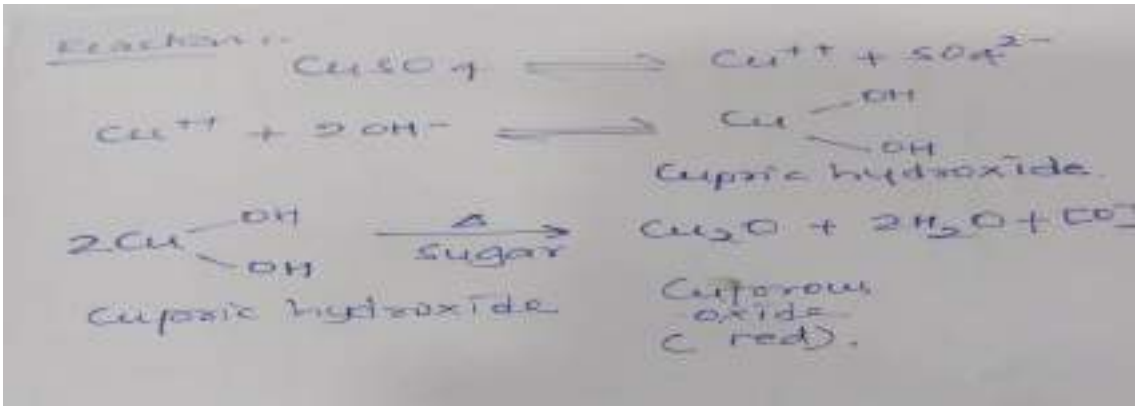


Effect of substrate concentration on enzyme velocity.
(A: Linear, B: curve, C = plateau)

3	f)	**Give structure, physiological functions and deficiency disorders of Thiamine** Structure-  **Physiological functions-** 1- The coenzyme , thiamine pyrophosphate (TPP) or cocarboxylase is intimately connected with the energy releasing reactions in the carbohydrate metabolism • The enzyme pyruvate dehydrogenase catalyses the irreversible conversion of pyruvate to acetyl CoA. This reaction is dependent on TPP. • α -Ketoglutarate dehydrogenase is an enzyme of citric acid cycle. This enzyme is comparable with pyruvate dehydrogenase and requires TPP. • Transketolase reaction in HMP pathway is dependent on TPP. 2- TPP plays a major role in the transmission of nerve impulses and muscle contraction.	**1M Struc.** **1 M any 2 functions** **1 M disorder**

		Deficiency disorders- 1- The deficiency of thiamine results in condition called Beri-Beri. The symptoms include loss of appetite, weakness, constipation, nausea, mental depression, irritability, etc. 2- Carbohydrate metabolism is impaired. There is accumulation of pyruvate in the tissues and excreted in urine.	
4		**Attempt any FOUR of the following:**	**4×3=12M**
4	**a)**	**Define and classify proteins with examples.** Proteins are the naturally occurring highly complex compounds of amino acids joined together with peptide linkage (-CONH-). Classification -Based on chemical nature & solubility • Simple: Composed of only amino acid residues. • Conjugated: besides amino acid residues they contain nonprotein moiety known as prosthetic group or conjugating group. • Derived: They are denatured or degraded products of simple or conjugated proteins. PROTEINS Simple: Globular : • Albumins • Globulins; Scleroproteins: • Elastins • Keratins Conjugated: Nucleoproteins, Glycoproteins, Lipoproteis, Phosphproteins Derived: Primary: Coagulated p. Proteans; Secondary: Peptones Peptides Classification Based on the functions that they carry out OR Classification Based on nutritional value can also be considered.	**1 M Define** **1 M Class.** **1M Egs**

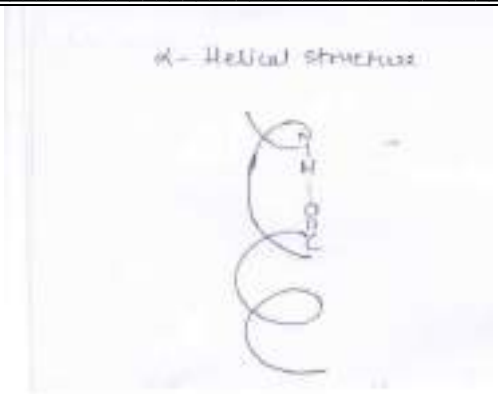
4	b)	**Describe mucosal block theory of iron absorption.** Mucosal block theory of iron absorption: - Ferrous Fe2+ forms chelate with ascorbic acid, sugar& amino acids & remain soluble, so absorption is enhanced. It is possible that mucosal receptors in upper small intestine (apoferritin) control absorption of iron. Whenever there is need of iron, it is removed from intestinal mucosa cell receptor & increased absorption of food iron occurs to replace it. This continues until body's stores of iron especially that of intestinal mucosal cells are replenished. The iron saturated mucosal receptor then once again refuses to absorb available iron.  	**3M (1.5M Explanation & 1.5M Diagram)**
4	c)	**Explain the term Acid value and Iodine number of lipids with their significance** **Acid value:** It is the number of milligrams of KOH required to neutralize the free fatty acids present in 1 gram of fat or oil. During storage fats may become rancid as a result of peroxide formation at the double bonds by atmospheric oxygen and hydrolysis by microbial growth with the liberation of free acids. **Significance**: It indicates degree of the rancidity.	**3M (Each explanation 1.5M)**

		Iodine value: It is the number of grams of iodine required to saturate or absorbed by 100gms of fat. **Significance**: It helps to determine level of unsaturated fatty acids present in total fat or oil.	
4	**d)**	**Write barfoed's test and give its significance and principle.** **Barfoed's test:** 2-3 drops of Barfoed's reagent is added to 1 ml of given sample in a test tube and boiled for 30 seconds and then allowed to cool. If a red precipitate occurs, a monosaccharide is present.. It is based on the reduction of copper (II) sulphate to copper (I) oxide (Cu_2O), which forms a brick-red precipitate. If a red precipitate occurs, a monosaccharide is present. Disaccharides may also react, but the reaction is much slower. OR Reaction-  Principle- Reducing sugars form enediol in alkaline medium. The enediol forms or sugars reduce cupric ions (Cu^{2+}) of copper sulphate to form cuprous ions Cu^{+}, which form a yellow precipitate of cuprous hydroxide or a red precipitate of cuprous oxide. Significance- the reduction is much more efficient in alkaline medium. Mainly strong reducing sugars (monosaccharides) give this test positive. Barfoed's test serves as a key reaction to distinguish monosaccharides from disaccharides.	**3M (test, significance and principle carry equal marks)**
4	**e)**	**Briefly describe diagnostic application of enzymes.** Enzymes are very useful for the diagnosis of various diseases. Enzymes are normally confined within the cell**.** The little amount is present in body fluids like blood & C.S.F. etc.	**3M**

		such enzymes are called 'marker enzyme'. These are used as markers to detect cellular damage which ultimately helps in the diagnosis of disease. Enzymes in the circulation are divided into two groups. 1. Plasma specific or plasma functional enzymes: Certain enzymes are normally present in the plasma and they have specific functions to perform. These enzymes activities are highest in plasma than in tissues. They are synthesised in the liver and enter the circulation for e.g. lipoprotein lipase, plasmin thrombin, choline esterase etc. Impairment in the liver function or genetic disorders often lead to fall in the activities of plasma functional enzymes e.g. deficiency of ceruloplasmin in Wilson's disease. 2. Non-plasma specific or plasma non-functional enzymes: The enzymes are either totally absent or present at a low concentration in plasma compared to their levels found in the tissues. The digestive enzymes of the GIT e.g. amylase, pepsin, trypsin, present in the plasma are called as secretory enzymes. Estimation of the activities of non-plasma specific enzymes is very important for the diagnosis and prognosis of diseases. In disease condition, level of these enzymes increases in blood or in other body fluids, hence we can identify the disease. E.g.- i) The level of SGOT rises rapidly after a heart attack. ii) The level of SGPT increases in infectious hepatitis iii) Activity of Creatine phosphokinase increases in the plasma, during infection in cardiac muscle. iv) The level of Amylase increases in acute pancreatitis. v) The level of alkaline phosphatase increases in rickets, obstructive jaundice, etc.	
4	**f)**	**Define Mutaroation. Explain how it occurs.** Definition- Change in specific rotation on standing of aqueous solution of sugar is known as mutarotation. Explanation-When monosaccharide (glucose) is dissolved in water, its optical rotation gradually changes until it reaches a constant value.	**3M** **(definition-1M and explanation 2M)**

		For e.g. Freshly prepared solution of alpha D-glucose has a specific rotation of $+112^0$ and on standing specific rotation falls to $+52.5^0$ and remains constant at this value. This final stage can be obtained more quickly either by heating or by adding some catalyst like acid or alkali. This change in specific rotation is called as mutarotation. On other hand fresh solution of beta D-glucose has rotation value of $+19^0$ which on standing also changes to 52.5^0 For example: α—D—Glucose ⟶ D—Glucose ⟶ β—D—Glucose. ($+112^0$) ($+52.5^0$) ($+19^0$)	
5		**Attempt any FOUR of the following:**	**4×3=12M**
5	**a)**	**Define and Classify Enzymes.** Highly specific proteinous substances that are synthesized in a living cell & catalyze or speed up the thermodynamically possible reactions necessary for their existence. **Classification Of Enzymes: On the basis of site of action:** **Exoenzymes / Extracellular enzymes**: • Secreted outside the cell Decompose complex organic matter like proteins ,fats, cellulose .E.g..: proteoses, lipases. **Endoenzymes / Intracellular enzymes**: • Present inside the cell E.g..: synthetases, phosphorylases **Constitutive Enzymes:** • Produced in absence of substrate. Eg.: Enzymes of glycolytic series. **Induced Enzymes:** • Produced in presence of substrate. Eg.: hepatic microsomal enzymes. **Zymogens / Proenzymes:** • Produced naturally in an inactive form which can be activated when required. Enzymes like pepsin are created in the form of pepsinogen, an inactive zymogen. Pepsinogen is activated when Chief cells release it into HCl which partially activates it. **OR** **Classification of Enzymes: on the basis of reactions they catalyze:** **• Oxidoreductases :** They bring about biological oxidation & reduction between two substrates.	**1M defn** **2M** **Classfn.**

		e.g ; Dehydrogenases, Oxidases, Hydroperoxidases, Oxygenases, Hydroxylases • **Transferases :** Catalyse transfer of some group or radical from one molecule to another. E.g.Transaminases, Transphosphorylases, Transglycosidases • **Hydrolases:** Bring about hydrolysis or condensation of substrate by addition or removal of water. Eg. Esterases, Peptidases **Lysases:** • Catalyse removal of groups from larger substrates by mechanisms other than hydrolysis, leaving double bonds. e.g. Carboxylysases, Aldehydelysases **Isomerases:** Catalyze interconversion of isomers. eg. Dextrose isomerase **Ligases/ Synthatases:** • Catalyse the linking or synthesizing together of 2 compounds. Forming C-S bonds, C-N bonds, C-C bonds. E.g: Lysases, Isomerases, Ligases / Synthatases .	
5	**b)**	**Describe secondary structure of Proteins.** The conformation of polypeptide chain by twisting or folding is referred to as secondary structure . Two types of secondary structures are possible: i) α- helix (α- helical) : α helical is the most common spiral structure of protein. It has a rigid arrangement of polypeptide chain. The α - helical structure depends on the intramolecular hydrogen bonding between NH and C=0group of peptide bond, in the α - helix the polypeptide is folded in such a way that the C=O of each amino acid residue is hydrogen bonded to the NH of 4th amino acid residue along the chain.	**3M**



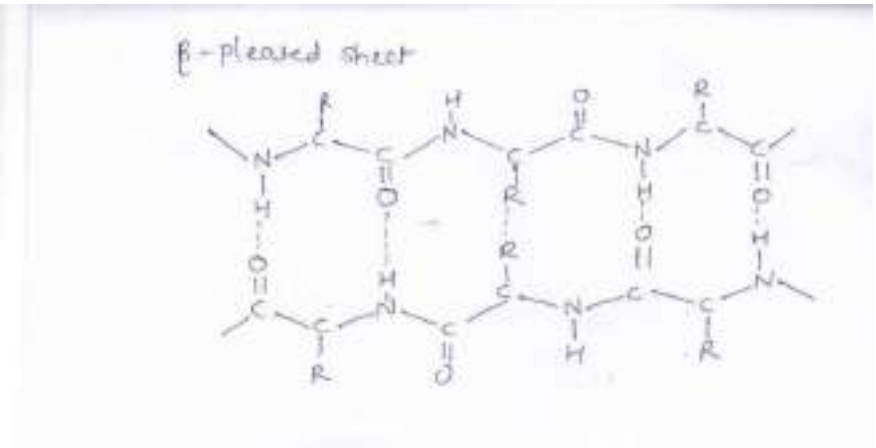
(ii) β-pleated sheet: It is another form of secondary structure, this result from hydrogen bonding between two peptide chains.

It may occur in two types

a) Parallel pleated sheet:

In this type of structure the polypeptide chain is side by side and in the same direction so that N-terminal residues are on the same end. This pleated sheet confirmation is stabilized by hydrogen bonding, here bonds are formed between NH group of a peptide in one chain and C=O group of a neighboring chain.

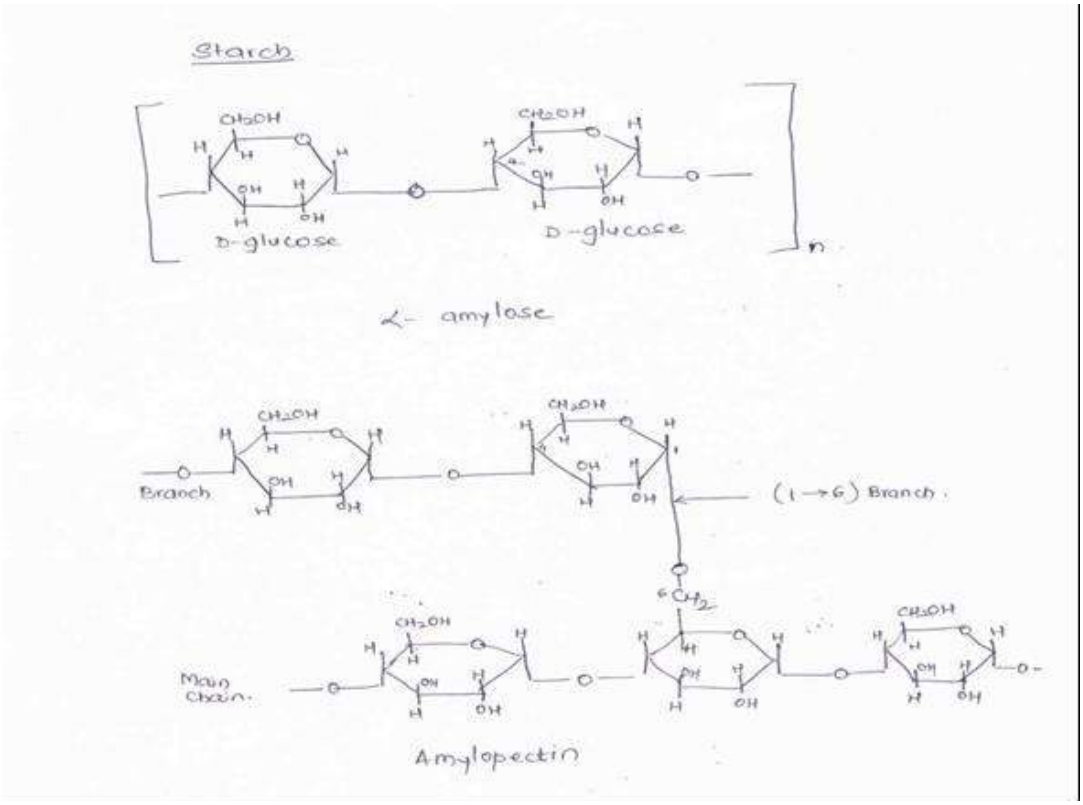
b) anti- parallel pleated sheet-



In this type of structure the polypeptide chain lie in opposite direction so that N-terminal end of one and C- terminal of the other, face each other. In this structure the polypeptide chains are held together by hydrogen bonds, so as to give a sheet like structure and hence are called as β – pleated sheet confirmation.

Other correct representation can also be considered.

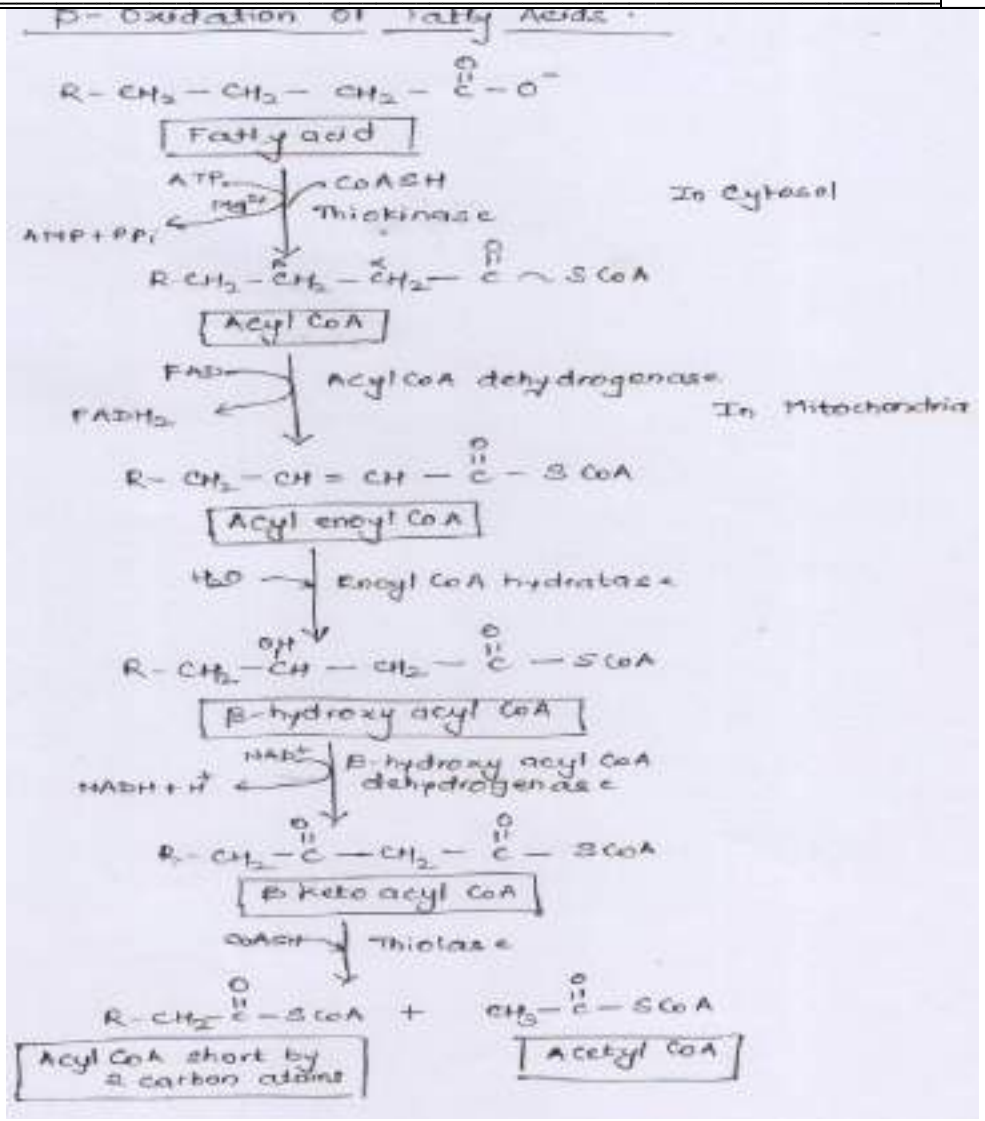
5	c)	**Write biological role of calcium and give its deficiency disorders** Calcium is involved in: □ Formation & development of bones &teeth □ Muscle contraction □ Blood clotting □ Growth of children □ Transmission of nerve impulse □ Activation of enzymes □ Regulation of permeability of membranes □ Release of hormones □ Cell to cell contact & adhesion of cells in a tissue □ Calcium acts on myocardium & prolongs systole. **Deficiency of Calcium** 1. Hypocalcemia:- When the plasma conc. Of calcium is below normal is called Hypocalcemia. 2. Rickets :- it is due to faulty calcification of bones in children 3. Osteomalacia:- Due to the inadequate diet and limited exposure to sunlight. This disease found in adults 4. Renal Rickets :- Reabsorption of calcium and activation of vit D does not take place. 5. Osteoporosis:- Decalcification of bones	**2M for any 4 functions + 1M any 2 deficiency disorders**
5	d)	**Explain structure of Starch.** Explanation: Starch is homopolysaccharide of D-glucose, it is widely distributed throughout the vegetable kingdom occurring in grains, fruits and tubers. On complete hydrolysis yields glucose. The two major constituents of starch granule, amylose and amylopectin differ in molecular structure. Amylose is linear or unbranched chain of d – glucose molecules, while amylopectin is branched.in partial structure. The glucose units are joined by the alpha 1- 4 linkages. Only the alpha 1- 4 linkages are present in amylose whereas in addition to the alpha 1- 4 linkages, the alpha 1- 6 linkages are also seen in amylopectin. (Partial structure can also considered for few marks). Amyloses are water soluble and amylopectin are water	**Expl. 1 M + Struct. 2M**

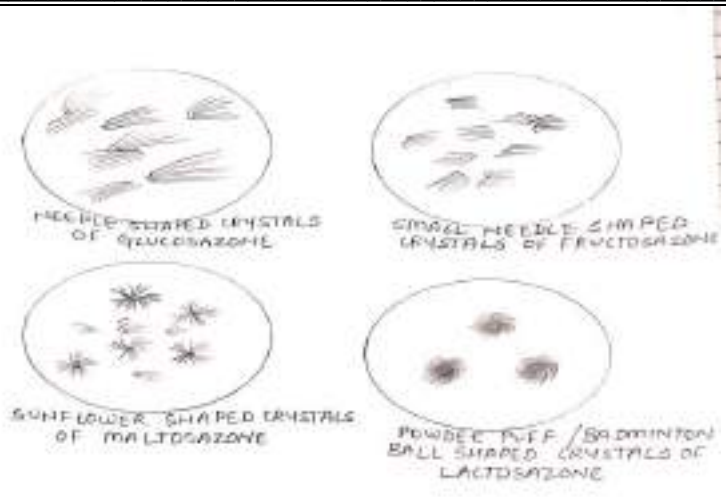
		insoluble. 	
5	e)	**What is Anemia? Give its types and explain Megaloblastic anemia** **Anemia** occurs when the number of healthy red blood cells (RBCs) decreases in the body. Red cells carry oxygen to all the body's tissues, so a low red blood cell count indicates that the amount of oxygen in the blood is lower than normal. **Types of anaemia:** Pernicious anaemia Megaloblastic anaemia Sickle cell anaemia: Iron deficiency anaemia: Aplastic anemia: Haemorrhagic anaemia: Haemolytic anaemia:	**1M for Def.** **1 M Types** **Expl. 1M**

		Megaloblastic Anemia- Megaloblastic anemia is a blood disorder having unusually large, structurally abnormal, immature red blood cells .These red blood cells do not function like healthy red blood cells. Causes: Deficiencies of folic acid, or vitamin B12. Alcohol abuse, chemotherapy, certain medications, and some genetic conditions. Symptoms : Fatigue, muscle weakness ,loss of appetite/weight loss, tingling in hands and feet, numbness in extremities Treatment for Megaloblastic anemia • Vitamin B_{12} &/or Folic acid supplements • Diet with more vitamin B_{12}.,Folic acid	
5	**f)**	**Name protein deficiency disorders? Explain any two** The protein deficiency diseases are:- Kwashiorkar Marasmus Nutritional edema Kwashiorkar-It is predominantly found in children between 1-5 yrs. It is due to insufficient intake of proteins as the diet of a weaning child consists of carbohydrate. Symptoms: Stunted growth, Edema on legs & hands, Diarrhoea , Discoloration of hair, skin, Anemia , Apathy, Moon face, Decreased plasma albumin concentration. Treatment: Protein rich food. Marasmus- Occurs in children below 1 yr age. Symptoms: Growth retardation, Muscle wasting, Anaemia , Weakness, No edema ,No decreased concentration of plasma albumin Treatment: Mother's milk. Nutritional Edema- Results from long continued deprivation of proteins & usually occurs in	**1M for Names + expl. of any two, each 1M**

		famine areas. This Protein deficiency in adults is very rare. Symptoms: Weight loss, General lethargy, Frequent loose stools, Delay in wound healing, Edema Treatment: Food items like soyabean, milk, eggs.	
6		**Attempt any FOUR of the following:**	**4×4=16M**
6	**a)**	**Define Lipids and give classification of lipids** The lipids are a large and diverse group of naturally occurring organic compounds that are related by their solubility in non-polar organic solvents (e.g. ether, chloroform, acetone & benzene) and general insolubility in water. These are esters of fatty acids OR Lipids are heterogeneous group of compounds which are chemically esters of fatty acids. **Classification:** **Simple lipids:** Esters of fatty acids with alcohol. • Fats & oils: Castor oil • Waxes: Bees wax **Compound Lipid** • Glycerophospholipids., Sphingophospholipids, Glycolipids:. • Lipoprotiens: Contain protiens • Sulpholipids • Aminolipids **Derived Lipids:** • Eg: Alcohols, Glycerol, Fatty acids etc **Miscellaneous Lipids:** • Eg : Carotenoids, Squalene. **Neutral Lipids:** • They are mono, di, triacyl glycerols, cholesterol, cholesteryl esters. (Schematic classification can be considered.)	**1 M Def.+ 3M for Class.**

6	b)	**Explain B- oxidation of unsaturated fatty acids.** Explain in brief reactions involved in "β-oxidation of fatty acids". (Detailed diagrammatic representation can be considered for full marks) Beta oxidation is the main pathway used to liberate energy by oxidation of fatty acid It takes place in the beta carbon of fatty acid with removal of 2 carbons at a time from the carboxyl end of the molecule. The process repeats itself until the fatty acid with even number of carbon is completely converted to acetate molecules. Fatty acid containing even & odd number of carbon atoms as well as unsaturated fatty acids are oxidised by beta oxidation. It takes place in 5 steps in mitochondria of liver. 1. Activation of fatty acid. Long chain fatty acid gets activated to fatty acyl CoA in presence of CoASH,thiokinase&ATP 2. Fatty acylCoA undergoes dehydrogenation in presence of acyl CoA dehydrogenase &FAD to give alpha,beta unsaturated fatty acyl CoA 3. Addition of water molecule across the double bond results into formation of Beta hydroxy acyl CoA in presence of Enoyl CoA dehydratase 4. Hydroxyl group of Beta hydroxy acyl CoA gets oxidised to keto group forming Beta keto acyl CoA in presence of Beta hydroxy acyl CoA dehydrogenase & NAD+ 5. Thiolytic cleavage of acyl CoA takes place in presence of Beta keto acyl CoA Thiolase&CoASH. Acyl CoA thus formed contains 2 Carbons less than original acyl CoA which undergoes further oxidation by Beta-oxidation. Acetyl CoA is also formed which enters TCA cycle. **OR**	**4M**

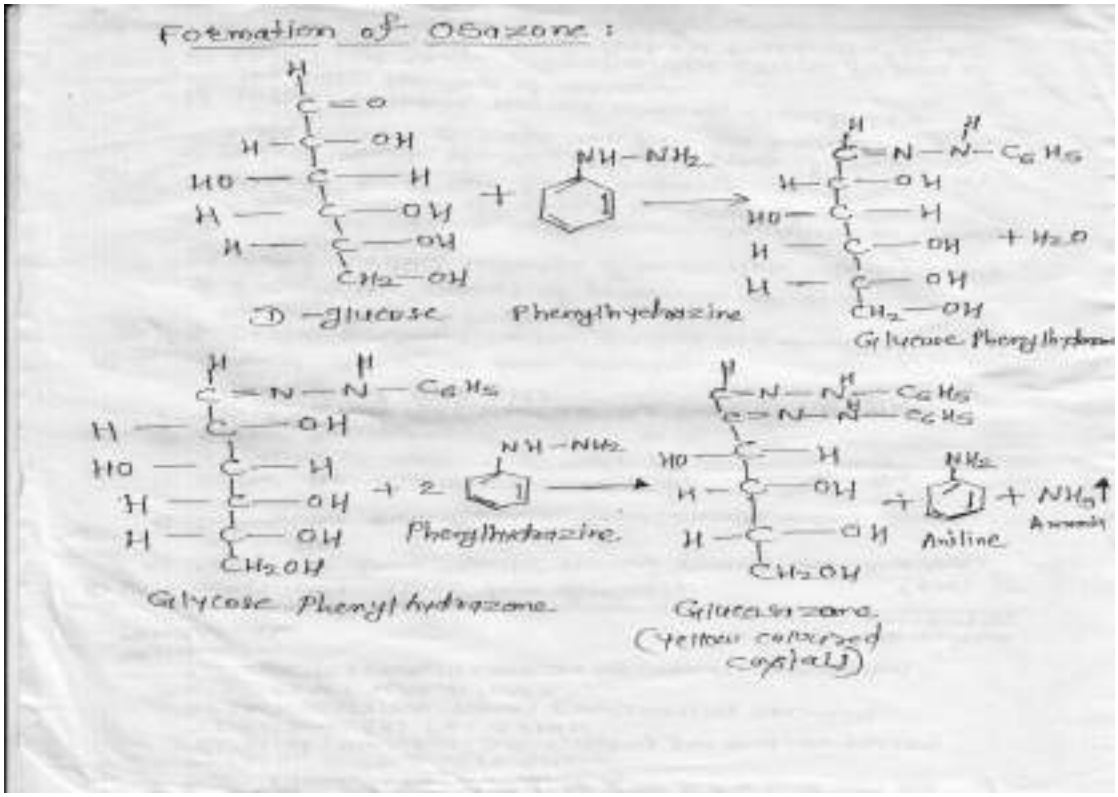
			
6	**c)**	**Draw shapes of various osazones of Carbohydrates and write reaction involved in Osazone formation of Glucose.** **Shapes of various Osazones of Carbohydrates**	**2 M for Shapes + 2M Osazone Reaction**



Reaction involved in Osazone formation of Glucose.

i. When reducing sugar (glucose) is treated with phenyl hydrazine, it gives reaction product (glucose) phenylhydrazone.

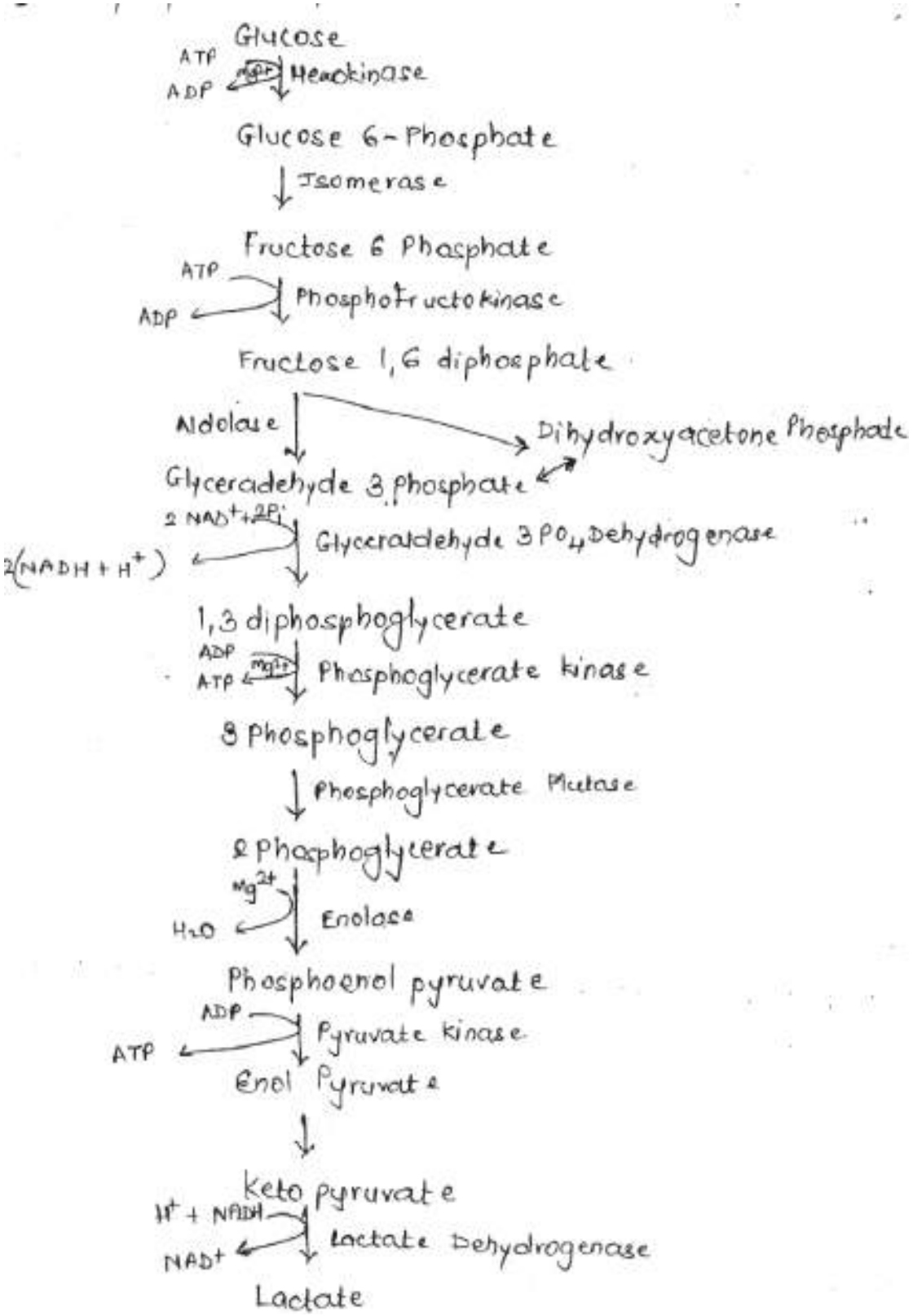
ii. Two molecules of phenyl hydrazine are heated again with (glucose) phenylhydrazone, it gives products like ammonia, aniline, (glucosazone) osazone.



(Explaination or Digramatic representation can be considered)

6	d)	**Describe the steps involved in Glycolysis and give its energetic.** (Detailed diagrammatic representation can be considered for 3 marks) It's a main pathway for glucose oxidation 1. Phosphorylation of glucose to glucose 6 phospate in preseceofenzyme hexokinase & ATP & Mg 2. Isomerisation of Glucose 6 phosphate to fructose 6 phosphate in presence of phosphohexo isomerase 3. Phosphorylation of fructose 6 phosphate to fructose 1,6 diphosphate in presence of phosphofructokinase,ATP& Mg 4. Cleavage of fructose 1,6 diphosphate to dihydroxy acetone phosphate & glyceraldehyde 3 phosphate in presence of aldolase. These 2 products are interconvertible in presence of triose phosphate isomerase 5. Glyceraldehyde 3 phosphate further undergoes oxidation to 1,3 diphosphoglycerate in presence of glyceraldehyde 3 phosphate dehydrogenase & NAD+ 6. Transformation of 1,3 diphosphoglycerate to 3- phosphoglycerate in presence of phosphoglycerate kinase, Mg & ADP 7. 3- phosphoglycerate changes to 2-phosphoglycerate in presence of phosphoglycerate mutase 8. Loss of water molecule from 2-phosphoglycerate results into formation of phosphoenol pyruvic acid in presence of enolase 9. Loss of phosphate from phosphoenol pyruvic acid results into formation of Enol pyruvic acid in presence of pyruvate kinase, Mg & ADP 10. Enol pyruvic acid gets converted to keto form of pyruvic acid in presence of pyruvate kinase 11. Keto pyruvic acid under aerobic conditions enter TCA cycle in mitochondria. Pyruvic acid forms main end product of glycolysis in those tissues which are supplied with sufficient Oxygen. 12. But tissues where oxygen is not supplied ,lactic acid is formed as an end product of glycolysis by reduction in presence of lactate dehydrogenase & NADH. Net reaction for glycolysis is: Glucose + 2NAD+ + 2 ADP + 2 Pi → 2 Pyruvate + 2 ATP + 2 NADH + 2 H2O	**3M Cycle + 1M Energetics**

OR


Glucose
ATP
ADP
Mg2+
Hexokinase
Glucose 6-Phosphate
Isomerase
Fructose 6 Phosphate
ATP
ADP
Phosphofructokinase
Fructose 1,6 diphosphate
Aldolase
Dihydroxyacetone Phosphate
Glyceradehyde 3 phosphate
2 NAD+ + 2Pi
2(NADH + H+)
Glyceraldehyde 3 PO4 Dehydrogenase
1,3 diphosphoglycerate
ADP
ATP
Mg2+
Phosphoglycerate kinase
3 Phosphoglycerate
Phosphoglycerate Mutase
2 Phosphoglycerate
Mg2+
H2O
Enolase
Phosphoenol pyruvate
ADP
ATP
Pyruvate kinase
Enol Pyruvate
Keto pyruvate
H+ + NADH
NAD+
Lactate Dehydrogenase
Lactate

Energetics of Glycolysis

Reaction	No. of ATP formed
Glucose → Glucose -6- Phosphate	-1
Fructose-6-Phosphate → Fructose 1,6-Diphosphate	-1
2 (Glyceraldehyde -3-Phosphate) → 2 (1,3 Diphosphoglycerate)	+6 (2×3)
2 (1,3 Diphosphoglycerate) → 2 (3 Phosphoglycerate)	+2
2 (Phosphoenol pyruvate) → 2 (Pyruvate)	+2
TOTAL ATP formation in Aerobic Glycolysis	08 ATP
2 (Pyruvate) → Lactate	-6 (2×3)
TOTAL ATP formation in Anaerobic Glycolysis	02 ATP

6 e) Describe biological role and deficiency disorder of Riboflavin and Folic acid — **Each 2M (2Pts. Of each functions & defic.)**

Riboflavin

A) Biological Function:-

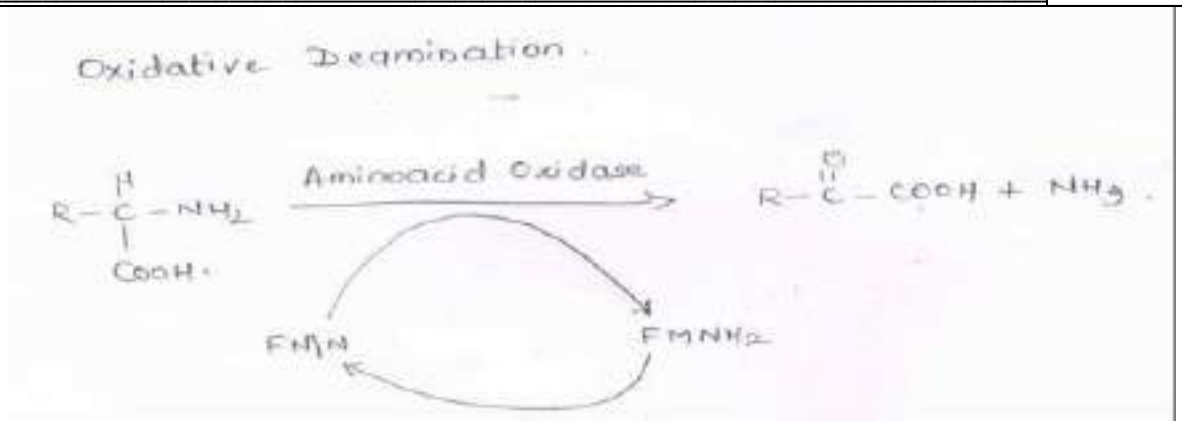
- Coenzyme-FMN (Flavin mononucleotide) & FAD (Flavin Adinine Dinucleotide), participate in redox reactions.
- They are involved in carbohydrate, lipid & protein metabolism
- Succinate dehydrogenase require FAD for its action
- Amino acid oxidase require FMN for deamination of amino acid

B) Deficiancies:-

CHEILOSIS- skin become rough dry & scaly, lips become bright red in colour & swollen

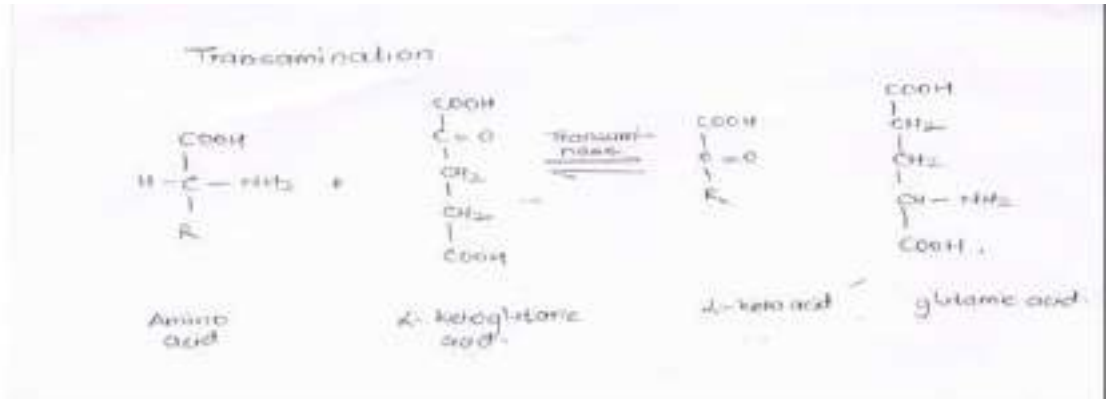
ANGULAR STOMATITIS corner of the lip are swollen & CRACKED

		GLOSSISTIS –tongue become enlarged & magenta in colour **Folic Acid** Biological Functions: Folic acid is used in the treatment of anaemia due to folic acid deficiency. □ Tetrahydrofolate, coenzyme of folic acid is involved in one carbon group transfer reactions. □ It is involved in biosynthesis of nucleic acid. □ It is involved in synthesis of amino acids like methionine, serine □ It is essential for growing & multiplying cells. □ Folic acid is required for synthesis of RBC in bone marrow. Deficiency: Its deficiency causes destruction of Intestinal bacteria. Macrocytic Anaemia Megaloblastic Anaemia Retarded growth Infertility Inadequate Lactation in Female	
6	**f)**	**Explain "oxidative deamination" and transamination of Amino acids.** **Oxidative deamination** An amino acid is converted into the corresponding keto acid by the removal of the amine functional group as ammonia and the amine functional group is replaced by the ketone group. The ammonia eventually goes into the urea cycle. The main sites for this reaction are liver and kidney. The reaction is catalyzed by amino acid oxidase enzymes. Importance: It provides ammonia for urea synthesis and alpha keto acid for variety of reactions including energy generation. Reaction:	**1M for Explanation or Reaction 1M Importa**



Transamination of Amino acids:

In transamination, the NH2 group on one molecule is exchanged with the C =O group on the other molecule. The amino acid becomes a keto acid, and the keto acid becomes an amino acid



In this example alpha keto glutaric acid becomes glutamic acid, amino acid becomes keto acid.

This reaction is reversible.

Importance: It is important for redistribution of amino group and production of non-essential amino acid as per the required of the cell.

It diverts excess amino acids towards energy generation

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2005 Certified)

MODEL ANSWER

SUMMER - 19 EXAMINATION

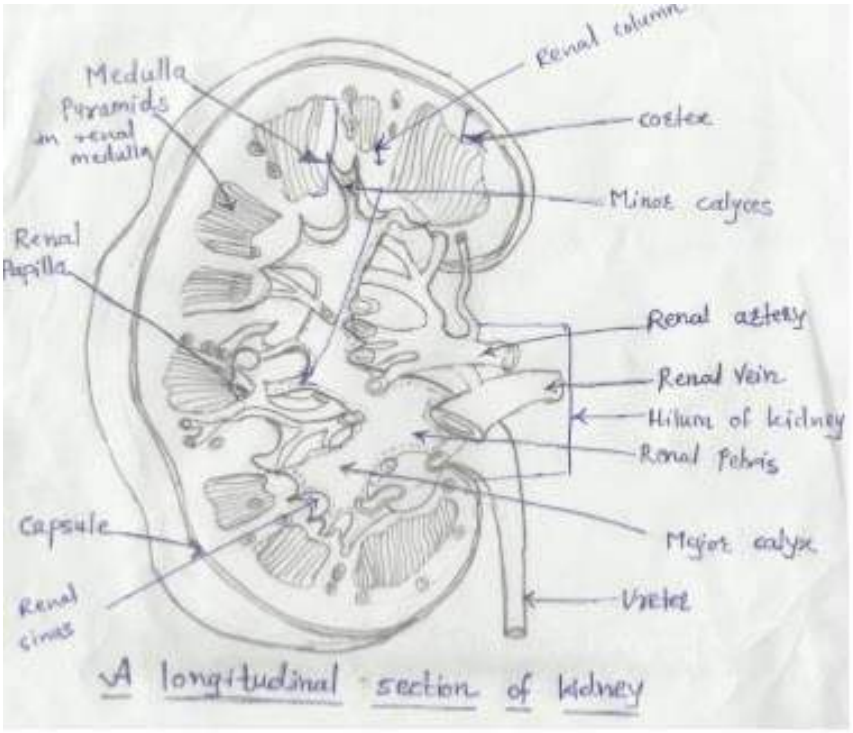
Subject Title: Human Anatomy & Physiology Subject Code: 0809

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Subject Title: Human Anatomy & Physiology Subject Code: 0809

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Solve any EIGHT of the following: (2marks each)**	**16M**
1	**a)**	**Define tissue. Name fundamental tissues of the body. (1 + 1)** Groups of cells which have the same physical characteristics and perform similar functions are termed as tissues. Fundamental tissues of body are:- 1) Epithelial tissue/Epithelium 2) Connective tissue 3) Muscular tissue 4) Nervous tissue	**2M**
1	**b)**	**State the functions of plasma proteins.** **Albumin** maintains the osmotic pressure of blood & also acts as carrier molecule for lipids & steroid hormones & some drugs. **Globulin:** immunoglobulins are produced by lymphocytes act as antibodies and is a part of immunity & transports some hormones and mineral salts. **Clotting factors**: The most abundant clotting factor is Fibrinogen, it is essential for blood clotting.	**2M**
1	**c)**	**Give functions of skeleton. (any 4 functions, 0.5 marks each)** Functions of skeleton: 1 It forms the supporting framework of the body. 2. Gives attachments to muscles & bones. 3. Forms the joint and hence helps in the movement of the body. 4. Forms the boundaries of the cranial, thoracic & pelvic cavities. 5. Heamopoiesis takes place due to presence of bone marrow. 6. They act as store house of calcium phosphate & other minerals salts.	**2M**

1	d)	**Name the arteries supplying blood to liver, intestine, diaphragm and kidneys. (0.5 mark each)** Arteries supplying blood to- **Liver:** hepatic artery **Kidney**: Left and right Renal arteries **Diaphragm**: Phrenic arteries **Intestine**: Superior & inferior mesenteric artery	**2M**
1	e)	**Draw a neat labelled diagram of L.S. of Kidney.** 	**2M**

Subject Title: Human Anatomy & Physiology Subject Code: 0809

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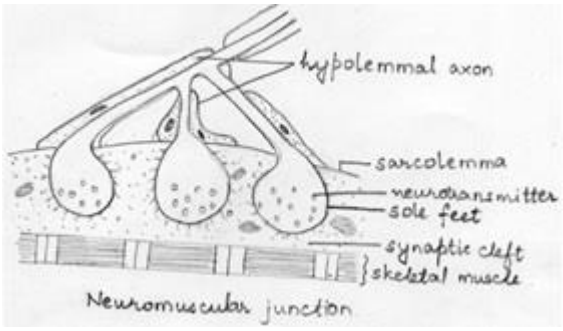
1 f) Compare the anatomy of sympathetic nervous system with that of parasympathetic nervous system. (any 4 points, 0.5 marks each) **2M**

Sr. No.	Sympathetic nervous system	Parasympathetic nervous system
1	This system enables the individual to adjust to exciting and stressful conditions (fight or flight)	This system acts as a peacemaker for the body allowing restoration processes to occur quietly and peacefully.
2	It is also called thoraco lumbar outflow.	It is also called cranio sacral outflow.
3	The preganglionic nerve fibre is short while the post ganglionic fibre which ends in effector organ is long.	The preganglionic nerve fibre is long while the post ganglionic fibre is short.
4	The post ganglionic nerve fibre secretes neurotransmitter called adrenaline or noradrenaline	The post ganglionic nerve fibre secretes neurotransmitter called acetylcholine.
5	It is also known as called adrenergic nervous system	It is also known as called cholinergic nervous system,
6	It has Alfa & beta receptors	It has muscarinic & nicotinic receptors
7	It is involved in expenditure of energy	It deals with restoration of body energy

1 g) Give functions of bile. (1 mark each) **2M**

Functions of bile:

1. Bile salts emulsify the fatty food which helps in further digestion of it.
2. Bile salts make cholesterol & fatty acids soluble & helps in absorption from small intestine.

		3. Bilirubin present in the bile is passed to the intestine where it gets converted to urobilin & stercobilin .Urobilin is excreted in the urine & stercobilin is excreted in the faeces.	
1	**h)**	**Why pituitary gland is known as master gland.** The pituitary gland secrets important hormones like growth hormone, prolactin, anti-diuretic hormone and oxytocin which directly act on the body and control important functions. It also secretes trophic hormones like TSH, gonadotrophic hormone, ACTH, which control secretion of other endocrine glands. Hence, it is called as master gland.	**2M**
1	**i)**	**Name different organs of respiratory system.** Nose, pharynx, Larynx, trachea, Bronchi (Two), bronchioles, alveoli, two lungs covered with pleura. Muscles of respiration- intercostal muscles & diaphragm.	**2M**
1	**j)**	**Describe Neuro-muscular junction in short.(2 marks for structure/ physiology)** **Neuromuscular junction**: The neuromuscular junction is the synapse between a large myelinated nerve and skeletal muscle fibre.  **Structure:** 1) Nerve fibre passes through muscle fibre called sarcolemma 2) The nerve fibre then spread to form many branches known as hypolemmal axon. 3) This hypolemmal axon is expanded into tube like feet called sole feet (synaptic knob) 4) The entire nerve ending is called as motor end plate 5) The space between sole feet and muscle fibre is called as synaptic cleft **Physiology of neuromuscular junction**:. Near the termination in the muscle, the axon branches into tiny fibres that form the motor end plate near the muscle fibre. When a nerve impulse reaches neuromuscular junction, the neuro transmitter released is	**2M**

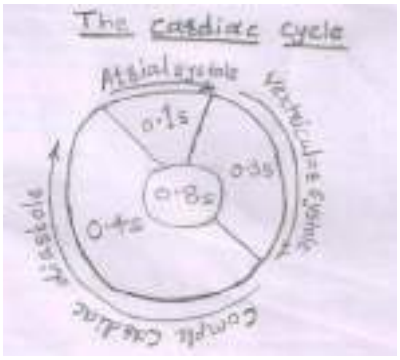
		sodium & calcium ions; as a result the muscle becomes depolarized. This causes muscle contraction. The acetyl choline is hydrolyzed by enzyme acetylcholine esterase .The calcium ion concentration is decreased in the muscle which causes repolarization which leads to relaxation of muscle.	
1	**k)**	**Explain how skin helps in maintain body temperature.** The center controlling temperature is situated in hypothalamus which is called heat regulating center. The vasomotor center in medulla oblongata also helps in regulating the body temperature. The amount of heat loss from the skin depends on the blood in the vessels which lie in the dermis. As the amount of heat in body increases, the vasomotor center is stimulated which causes vasodilatation of blood vessels in skin. Due to this, more amount of blood is passed through the skin which increases temperature of skin. As a result, sweat glands are stimulated by nerve impulses from the heat regulating center. Due to this more sweating occurs which gets evaporated to atmosphere, thus cooling the body. If the external temperature is low, or heat production is less, the vasomotor center causes vasoconstriction. Due to vasoconstriction, amount of blood flowing to the skin decreases which decreases the temperature of the skin and finally prevents heat loss from the body.	**2M**
1	**l)**	**Define Anatomy & Physiology. (1 + 1)** **Anatomy** -It is the study of structure of the body & its individual parts & their relation to one another. **Physiology** - It is the study of the functions of various parts and how they are integrated to produce a coordinated action of the whole body.	**2M**

2		**Solve any FOUR of the following: (3marks each)**	**12M**
2	**a)**	**Discuss physiology of menstrual cycle.** **Menstrual Cycle** -Series of events occurring regularly in females every 26-30 days, during reproductive years. Consists of series of changes that take place simultaneously in ovaries & uterine walls, stimulated by changes in blood level of hormones. Days of cycle are numbered from beginning of Menstruation (4), Proliferative phase (10), and Secretory phase (14). **Menstruation** Decrease level of progesterone & Estrogens stimulate release of PGs, causes constriction of arterioles in endometrium, leads to death of cells of stratum functionalis. Entire stratum functionalis sloughs off. Menstruation, only stratum basalis remains. Menstrual flow consists of 50-150ml of blood, tissue fluid, mucus & epithelial cells. Lasts for 4-5 days. **Proliferative phase** One of the follicles from both ovaries, develop and become dominant follicle, starts secreting estrogens. This follicle matures into Graafian follicle (diameter more than 20 mm). Estrogens stimulate repair of endometrium. Cells of stratum basalis undergo mitosis & produce new stratum functionalis. Thickness of endometrium doubles:5-10mm. LH causes rupture of mature follicle & ovulation. That is end of this phase. **Secretory phase** Under influence of LH ruptured follicle transforms into corpus luteum that secretes progesterone, estrogens. Promotes growth and coiling of endometrial glands, vascularisation of superficial endometrium & thickening of endometrium to 12 -18 mm. Under influence of progesterone secretory glands produce large amount of mucus. There is similar increase in secretion of watery mucus by glands of uterine tubes& cervical glands of vagina. If oocyte is not fertilised, degeneration of corpus luteum within 2 weeks into corpus albicans. Levels of progesterone & estrogens decrease, that causes menstruation & cycle continues. This phase is most constant part of cycle lasts for 14 days i.e. from 15 to 28 days.	**3 M**
2	**b)**	**Define endocrine gland. Enlist endocrine glands of human body. (1 + 2)** Endocrine glands are ductless glands which release their secretions (hormones) directly	**3M**

		into the blood. Endocrine glands: Pituitary gland, thymus gland, thyroid gland, parathyroid glands, pancreas (islets of Langerhans), adrenal glands, pineal gland, testes in male and ovaries in female.	
2	**c)**	**Describe composition and functions of gastric juice. (1 + 2)** Composition of Gastric juice- water, mineral salts, mucus, hydrochloric acid, Enzymes such as pepsinogen, and the intrinsic factor. Functions of Gastric Juice: 1. Water liquefies the food. 2. HCl acidifies the food & stops the action of salivary amylase. 3. HCl kills the microbes 4. Pepsinogen is activated to pepsin by HCl, This digests protein to peptones and peptides. 5. Intrinsic factor helps in absorption of vit. B12 from small intestine. 6. Mucus prevents mechanical injury to the stomach wall.	**3M**
2	**d)**	**What is Hypothalamus? Give its functions. (1 + 2)** **Hypothalamus:** The hypothalamus is composed of a number of groups of nerve cells. It is situated below and in front of the thalamus, immediately above the pituitary gland. The hypothalamus is linked to the posterior lobe of the pituitary gland by nerve fibers and to the anterior lobe by a complex system of blood vessels. Through these connections, the hypothalamus controls the output of hormones from both lobes of the gland. Following are functions of hypothalamus: 1) It controls Autonomic nervous system 2) It controls appetite & satiety 3) Regulation of thirst 4) Maintenance of emotional behavior, personality and social behavior. 5) Regulation of body temperature	**3M**

		6) It regulates and controls release of hormones from pituitary gland. 7) It regulates biological clock 8) It controls sexual behavior	
2	**e)**	**Discuss physiology of muscular contraction.** The motor pathway from the brain to the muscles involves two neurons. The upper motor neuron & the lower motor neuron. The axon of this neuron reaches the muscle. Near the termination in the muscle, the axon branches into tiny fibres that form the motor end plate near the muscle fibre. When a nerve impulse reaches neuromuscular junction, the neurotransmitter released is Acetyl choline at this junction. This changes the permeability of the cell membrane to sodium & calcium ions. As a result the muscle becomes depolarized. This causes muscle contraction. The acetyl choline is hydrolysed by enzyme acetylcholine esterase .The calcium ion concentration is decreased in the muscle which causes repolarization which leads to relaxation of muscle.	**3M**
2.	**f)**	**Explain the process of urine formation.** The Urine formation by kidney takes place in 3 steps:- 1) Glomerular Filtration 2) Selective reabsorption 3) Tubular secretion **1) Glomerular filtration: -** The glomerular filtering membranes acts as an ultrafilters. The particles like colloidal, soluble and cell free substances, smaller than endothelial pores are filtered. However big particles like plasma proteins are not filtered. The filtration takes place with the pressure of 35 mm of Hg. This pressure results from different forces involved in glomerular filtration. The GFR i.e. glomerular filtration rate is 120 ml/min, thus producing 170-180 litres of filtrate in a day. **2) Selective reabsorption:-** Out of 170-180 litres of filtrate, about 99% is reabsorbed, resulting in formation of 1-1.5 litre of urine per day. The filtrate contain major amount of water, which is reabsorbed to the extent of 99%. Depending upon the extent to which various substances are reabsorbed they are classified as: **a)High threshold substances:** They get absorbed completely eg. Glucose and potassium(100%), water (99%), calcium and sodium chloride (98-99%).	**3M**

		b) Low threshold substances: Absorbed to some extent eg. Urea , uric acid, phosphate. **c) No threshold substances:** These are not required by the body at all.eg. Creatinine, sulphates**.** **3) Tubular secretion:** The substances not required by body and not filtered in glomerular filtration are secreted by the tubules. Depending upon extent to which sodium ions are reabsorbed, potassium, & hydrogen ions are secreted, thus maintaining electrolyte balance of the body. Some metabolized substances like ammonia are also excreted. Thus the final filtrate of urine, is carried by collecting tubule to duct to the pelvis of kidney to ureter. The ureter opens in to urinary bladder where it is stored and finally excreted out.	
3		**Solve any FOUR of the following : (3 marks each)**	**12M**
3	**a)**	**Describe physiology of respiration**. The term respiration means exchange of gases between body cells & the environment. This involves two main processes. **–Breathing & exchange of gases**. The normal human has 12-15 breath per min. Each breath consists of inspiration, expiration & pause. **Inspiration** The simultaneous contraction of intercostal muscles & diaphragm increases the capacity of thoracic cavity. This reduces the pressure in the lungs. To equalise the pressure the air from atmosphere enters the lungs. The process of inspiration is active as it needs energy for muscle contraction.it lasts for 2 sec. **Expiration** Relaxation of intercostal muscles & diaphragm results in decrease in the space in the lungs. As a result, the pressure inside the lungs increases as compared to atmospheric pressure. The air from the lungs is expelled from the lungs. This process is passive as does not require energy. The expiration lasts for 3 sec. After expiration there is **pause** & then the next cycle begins. **Exchange of gases** The exchange of gases take place between blood & air (external respiration) & between blood & cells (internal respiration).	**3M**

		Internal respiration- This is the exchange of gases bet blood & the body cells. The blood arriving at the tissues is saturated with O_2 & therefore has a higher PO_2 & lower PCO_2 than tissues. This creates concentration gradient bet capillary blood & the tissues& gaseous exchange takes place.O_2 diffuses from the blood into the tissues, & CO_2 diffuses from the cells into the venous end of the blood.	
3	**b)**	**Describe in brief the cardiac cycle.** **Cardiac cycle:** The events which occur in the heart during the circulation of blood during each heart beat is called cardiac cycle OR The series of events during one heart beat is known as cardiac cycle.  Events in cardiac cycle: (i) Atrial systole (0.1 sec) (ii) Ventricular systole (0.3 sec) (iii) Complete cardiac diastole (0.4 sec) Total 0.8 sec Description of cardiac cycle The superior & inferior vena cava transports the deoxygenated blood into right atrium. At the same time four pulmonary veins transport oxygenated blood into the left atrium. The heart action starts in the special cells of myocardium called SA node or sinoatrial node. It is situated near the opening of superior vena cava in the right atrium. These impulses from the SA node spreads over the atria, atria contracts, the AV valves open	**3M**

		and & blood flows to ventricles. (Atrial systole-0.1 sec) When the wave of contraction reaches AV node, it is stimulated & emits impulses which spread over AV bundle, bundle branches & Purkinje fibres resulting in contraction of ventricles pumping the blood into pulmonary artery & the aorta. (ventricular systole 0.3 sec). After the contraction of the ventricles there is complete cardiac diastole (0.4 sec) when both atria & ventricles relax. After this the next cycle begins.	
3	**c)**	**What are lymph nodes. (1M) Give their functions. (2M)** A lymph node or lymph gland is an oval or bean-shaped organ of the lymphatic system**,** that lie often in groups along the length of lymph vessels. **Functions** **a) Filtering & phagocytosis** Lymph is filtered by the reticular & lymphatic tissue as it passes through lymph nodes. The particulate matter may include bacteria, microbes, cells from malignant tumors, worn out & damaged tissue cells & inhaled particles. **b) Proliferation of lymphocytes** Activated T and B lymphocytes multiply in lymph nodes.	**3M**
3	**d)**	**Discuss in brief the process of coagulation of blood.(3M)** When the blood vessel is damaged, loss of blood is stopped by the following way. 1) Vasoconstriction: - When platelets come in contact with a damaged blood vessel they adhere to it. Serotonin is released which constricts the blood vessel. 2) Platelet plug formation: - The adhered platelets attract more platelets which form platelet plug. This forms temporary seal. 3) Coagulation- (blood clotting): The thromboplastin (prothrombinase) released by damaged tissue cells by extrinsic or intrinsic pathway. In presence of calcium ions it converts prothrombin to thrombin. Thrombin acts on fibrinogen & converts it to insoluble fibrin. The fibrin mesh traps blood cells. This is known as clotting.	**3M**

		Prothrombin+ Calcium+ Thromboplastin → Thrombin (inactive) (from damaged tissue) (active) Thrombin acts on ↓ Fibrinogen → Fibrin (soluble) (insoluble) Fibrin + Blood Cells → Clot	
3	**e)**	**Name any six cranial nerves with their functions.(0.5×6)**	**3M**

Name and No. of Cranial Nerve	**Function**
1. Olfactory (sensory)	Sense of smell
II. Optic (sensory)	Sense of sight Balance & posture of body
III. Oculomotor(motor)	Moving the eyeball ciliary muscle which alters the lens changing the refractive power(Focusing), circular muscle of iris causing constriction of pupil
IV. Trochlear(motor)	Movement of the eyeball
V. Trigeminal(mixed)	Chewing Sensation from the face
VI. Abducent(motor)	Movement of the eye
VII. Facial (mixed)	Sense of taste facial expression
VIII. Vestibulocochlear(sensory)	
a) Vestibular	Maintenance of balance
(b) Cochlear	Sense of hearing

		IX. Glossopharyngeal (mixed)	Secretion of saliva Sense of taste Movement of pharynx, swallowing	
		X. Vagus (mixed)	Movement and secretion of parts of respiratory & digestive system	
		XI. Accessory(motor)	Movement of the head, shoulders, pharynx and larynx	
		XII. Hypoglossal(motor)	Swallowing & speech (Movement of tongue)	
3	**f)**	**Give composition (1M) & functions of saliva.(2M)**		**3M**

Composition of saliva-P^H 5.8 -7.4

water

mineral salts

salivary amylase

mucus

lysosomes

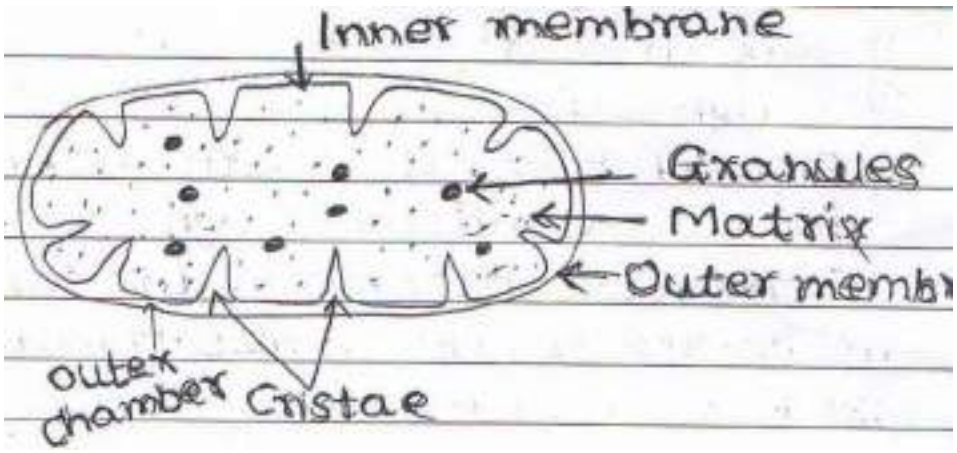
immunoglobulin

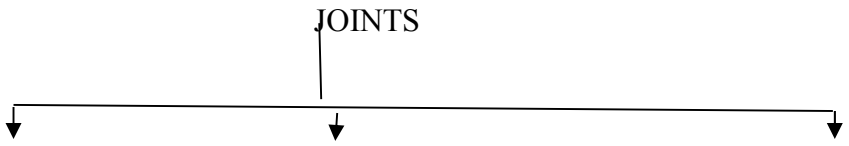
blood clotting factor

Functions of saliva-

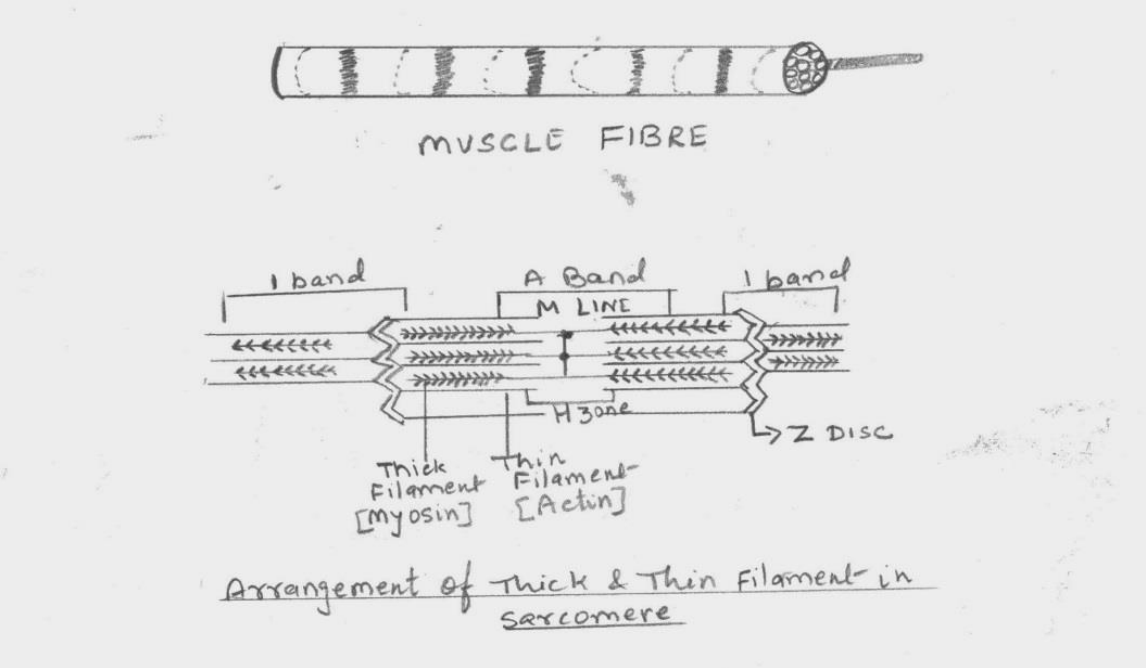
1. Chemical digestion of polysaccharides- the salivary amylase acts on the starch & reduces them to disaccharides.
2. Lubrication of food.
3. Cleaning & lubricating the mouth.
4. Nonspecific defense mech. due to lysosomes & immunoglobulin.
5. Sense of Taste by lubrication of food.

Subject Title: Human Anatomy & Physiology Subject Code: 0809

4		**Solve any FOUR of the following: (3marks each)**	**12M**
4	**a)**	**Describe the structure (1.5M) & function of mitochondria. (1.5M)**  **Structure**: They are sausage shaped str. in cytoplasm. It has a double unit membrane where the inner membrane contains folds known as cristae, forms shelves on which oxidative enzymes are present. The fluid filled cavity is known as matrix. They contain a special type of DNA, which is self-replicative. **Function:** It is known as power house of cell. They are involved in cellular respiration, the process by which chemical energy is made available in the cell. When nutrients and oxygen come in contact with the enzyme, they combine to form CO_2,water & energy, this is in the form of ATP. (aerobic oxidation) This ATP is used by the cell to do cellular functions	**3M**
4	**b)**	**Write functions (2M) & classification of WBC's.(1M)** WBCs are of two types based on the presence of granules in the cytoplasm as granulocytes and agranulocytes. They are further classified as - Granulocytes Agranulocytes 1. Neutrophils 1. Monocytes 2. Eosinophils 2. Lymphocytes 3.Basophils	**3M**

		Functions of Leukocytes • Neutrophils: Phagocytosis: destruction of bacteria & also remove the cell debris. • Eosinophils:-Phagocytize antigen-antibody complex, parasitic invasion; overcomes effects of histamine involved in inflammation during allergic reactions. • Basophils:-liberate heparin, histamine & serotonin at inflammation site in allergic reactions, that intensify overall inflammatory response • Lymphocytes: These are T & B cells. T cells provide cell mediated immunity & B cells produce antibodies & provide antibody mediated immunity. • Monocytes: Phagocytosis. Also produce interleukin 1 which act on hypothalamus & increase body temp. associated with microbial infection. Stimulates production of globulin by the liver & activated T lymphocytes.	
4	**c)**	**Classify joints with example of each class.(1M each)** A joint is a site at which any two or more bones articulate or come together.  FIBROUS JOINTS — e.g. Sutures of skull, Joint between tooth and alveolar socket CARTILAGINOUS JOINTS — e.g. Pubis symphysis, Joints between vertebrae (intervertebral discs) SYNOVIAL JOINTS **Synovial joints**: Classified into 6 types- 1.Ball and Socket joint e.g. Shoulder joint, Hip joint 2. Hinge joint e.g. Elbow joint, Knee joint, Ankle joint, interphalangeal joints.	**3M**

		3.Gliding joint e.g. Joint between carpals, joint between tarsals,joints bet. Spinal vertebrae. 4.Pivot joint e.g. Joint between atlas and axis, Radioulnar joints 5. Condyloid joint e.g temporomandibular, metacarpophalangeal and metatarsophalangeal joints. 6. Saddle joint e.g. Joint between trapezium & first metacarpal bone.	
4	**d)**	**Describe the terms Angina pectoris (1.5M) & stenosis.(1.5M)** **(ii) Angina pectoris:** Angina pectoris is the medical term for chest pain or discomfort due to coronary heart disease. Angina is a symptom of a condition called myocardial ischemia. It occurs when the myocardium doesn't get sufficient blood (hence as much oxygen) as it needs, because one or more of the coronary arteries is narrowed. The symptoms are typical pain radiating from neck, left shoulder, left arm& left finger. **ii)Stenosis:** An abnormal narrowing in a blood vessel or other tubular organ or structure.	**3M**
4	**e)**	**Discuss different functions of kidneys.(0.5×6M)** **1. Formation of urine:** Each kidney consists of a functional unit called as nephron. Thus kidney filter waste product from blood plasma & secrete it in the form of urine. The waste products are urea, uric acid, creatinine, ammonium ions etc. **2. Maintenance of water balance and urine output:** Anti-Diuretic Hormone increases the reabsorption of water from the distal convoluted tubule & collecting tubule of the kidneys reduce urine output. **3. Maintenance of electrolyte balance:** Aldosteron, calcitonin& parathhormone help kidney to maintain electrolyte balance. **4. Maintenance of pH balance (Acid-base balance):** Excretion of H^+ ions by tubular cells & reabsorption of sodium & bicarbonate ions in the blood & maintain alkalinity of blood. If H^+ ions are required by blood, potassium ions may be secreted or excreted for exchange& chloride ions are reabsorbed to regulate acid base balance. Here maintaining the acidity of blood by HCl formation. **5. Maintenance of blood pressure:** Kidney maintains the blood pressure by Renin	**3M**

		Angiotensin Aldosterone system. **6. Formation of erythropoietin hormone for erythropoiesis.**	
4	**f)**	**Give the microscopic structure of skeletal muscles.** (3M) The fibres (cell) are cylindrical and has many nuclei. A muscle consists of no. of muscle fibres.It shows series of dark & light filaments. Each muscle fibre contains several hundred to several thousand myofibril. These myofibril contains two structural proteins known as actin & myosin filaments lining side by side. Each muscle fibre contains 1500 myosin filaments & 3000 actin filaments. The thick filaments are myosin & thin filaments are actin. The myofibril have alternate light & dark bands because light band contains only actin filaments whereas dark band contains myosin filaments along with end of actin filaments. The actin filament is attached to dense stripe called as Z line or Z disc ,which is made up of filamentous proteins. The portion of myofibril lying between two successive Z disc called sarcomere. Several sarcomere build up the myofiril. Several thousands of myofibril grouped together to form muscle fibre. Several muscle fibre group together to form muscle.  Arrangement of Thick & Thin Filament in sarcomere	**3M**

5		**Solve any FOUR of the following :(3marks each)**	**12M**
5	**a)**	**Name different organs of male reproductive system with their functions.**	**3M**

The male reproductive system consists of the following organs:

Testes 2 } Scrotum

Epididymides 2 }

Deferent ducts 2

Spermatic cords 2

Seminal vesicles 2

Ejaculatory ducts 2

Prostate gland 1

Penis 1

Scrotum : It is a pouch of deeply pigmented skin, fibrous and connective tissue and smooth muscle. It is divided into two compartments each of which contains one testis, one epididymis and testicular end of spermatic cord. It maintains optimal temperature for spermatogenesis

Testis: Spermatogenesis, secrete male hormone testosterone

Epididymides : It is the site of sperm maturation

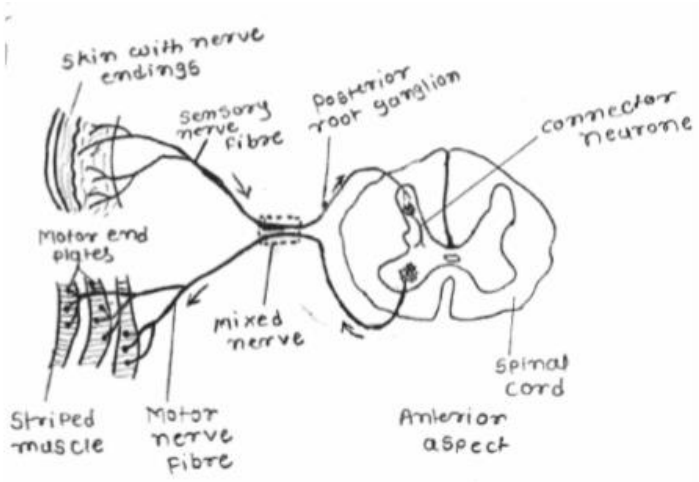
Deferent ducts (Vas deferens): Storage of sperms and also conveys sperms from epididymis to urethra

Spermatic cords : Suspends the testis in the scrotum

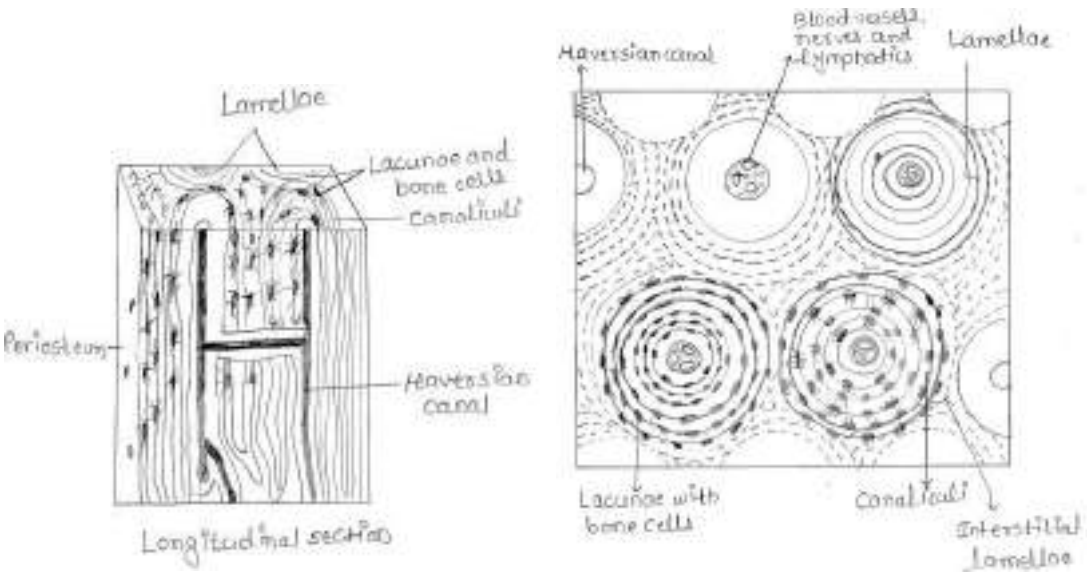
Seminal vesicles: Accessory gland which secretes seminal fluid

Ejaculatory ducts: Eject spermatozoa & seminal fluid into prostatic urethra prior to ejaculation

Prostate gland: It secrets prostatic fluid

5	b)	**What is reflex action? (1M) Draw a neat labelled structure of Reflex arc.(2M)** A reflex action is an involuntary & immediate motor response to a sensory stimulus.  	3M
5	c)	**Explain the terms- vital capacity, tidal volume and residual volume (each 1 mark)** **Vital capacity:** This is the maximum volume of air which can be moved into & out of the lungs during forceful breathing. Normal value is about 3-5 lit. VC=Tidal volume + IRV + ERV **Tidal volume:** It is the volume of air moved in & out of lungs during each cycle of normal breathing. Normal value is 500 ml at rest **Residual volume:** It is the volume of air remaining in lungs after forced expiration. Normal value is 1.2 L in males and 1.1 L in females	3M
5	d)	**Describe digestion of carbohydrates** Digestion of carbohydrate involves formation of monosaccharides from carbohydrates by action of enzymes. In mouth- salivary amylase converts polysaccharides present in the food to disaccharides. In small intestines- further as the chyme reaches the small intestine, pancreatic amylase converts polysaccharides to disaccharides. The disaccharides are acted upon brush border enzymes and convert into monosaccharides. Sucrase converts sucrose to glucose	3M

		and fructose. Maltase converts maltose to glucose. Lactase converts lactose to glucose and galactose and alpha dextrinaze convert alpha dextrin into glucose.	
5	**e)**	**Explain the terms universal donor and universal recipient** Blood group "O" is called as Universal donor and Blood group "AB" is called as Universal recipient. Individuals have different antigens on the surface of their RBCs. These antigens determine their blood groups. Blood group 'O' has neither A nor B antigen on their cell membrane. There will be no agglutination and thus blood can be safely transfused into A, B, AB and O. but can receive from only O.Therefore, blood group O is called universal donor. Whereas blood group AB has neither antiA nor antiB antibodies. Transfusion of any group into these individuals is safe since there are no antibodies to react with them. But can donate only to AB. Hence it is called as universal recipient.	**3M**
5	**f)**	**Describe different layers of stomach** The wall of the stomach is composed of four layers. i) Serosa ii) Muscularis iii) Submucosa iv) Mucosa **Serosa:** Outermost covering of the stomach and made up of serous membrane lining known as peritoneum. **Muscularis:** Located below serosa and is composed of three smooth muscle layer An outer layer of longitudinal fibres A middle layer of circular fibres An inner layer of oblique fibres Muscles of these layers helps in churning motion characteristic of gastric activity as well as peristaltic movement. Circular muscle is strongest in pylorus and pyloric sphincter **Submucosa:** Made up of areolar connective tissue containing collagen and some elastic fibres which bines the muscle layer to the mucosa.it contains blood vessels, nerves, lymph vessels and lymphoid tissue. **Mucosa:** innermost layer of the stomach wall. It consist of three layers of tissue mainly mucus membrane, lamina propria and muscularis mucosa. Numerous gastric glands are	**3M**

		present below the surface in the mucus membrane.	
6		**Solve any FOUR of the following :(4 marks each)**	**16M**
6	**a)**	**Describe microscopic structure of the bone** There are two types of bone tissues: **Compact bone:** It consist of large number of units called haversian systems(osteon) which have well defined characteristics i) A central haversion canal runs longitudinally and contains blood, lymph, capillaries and nerves. The matrix is solid and hard. It contain calcium and phosphorus mineral salts giving hardness to bone. ii) The canals are surrounded by concentric plates of bones known as lamellae. Lamellae consist of mineral salts giving hardness to bone. iii) Between the lamella, there are spaces called lacunae containing lymph and bone cells called osteocytes iv) The haversion canals and the lacunae are linked with fine channels called canaliculi. v) In the spaces between the haversian system there are interstitial lamellae **Cancellous bone:** It looks like a sponge. It does not contain osteons. There are fewer lamellae as compare to compact bone. Red bone marrow is always present in cancellous tissue  	**4M**

6	b)	**Explain role of haemoglobin in the process of respiration** To carry out oxygen from lung to tissue and carbon dioxide from tissue to lung.During transport of oxygen from lung Hb combine with oxygen to form oxyhaemoglobin which is transported to tissue. The oxyhaemoglobin in tissue is dissociated into oxygen and free Hb..This free Hb is combine with carbon dioxide in tissue to form carboxyhaemoglobin which is carried to lung and get dissociated into free carbon dioxide and Hb in lung, where free carbon dioxide is exhaled throughout the body. Thus Hb is involved in transport of waste product carbon dioxide through excretory organ like lungs.	**4M**
6	c)	**Name the abnormal constituents of urine with name of disease they signify** Following are the abnormal constituents and their related diseases. Proteins, sugar, ketone bodies, bile pigments and blood are the abnormal constituents of urine. These abnormal constituents appear in urine in different pathological conditions. **Proteins:** proteinurea for example in glomerulonephritis The presence of albumin and globulin in urine is called albuminurea. It results from Nephritis, renel tuberculosis, bacterial infection of kidney, mercury poisoning etc. **Sugar:** Glycosuria is a condition in which sugar appears in the urine in different pathological conditions such as Diabetes mellitus **Ketone bodies:** presence of ketone bodies in urine is ketonuria due to starvation and diabetes mellitus **Blood:** Presence of blood in urine is haematuria due to inflammation of glomeruli **Bile pigments and salts:** Its presence in urine is known as billirubin urea. It indicates pathological condition such as liver failure.	**4M**
6	d)	**Discuss choroid, ciliary body and iris of eye** **Choroid:** It is the middle vascular layer. It is very rich in blood vessels and is deep chocolate brown in colour. Light enters the eye through the pupil, stimulates the sensory receptors in the retina and is then absorbed by the choroid. **Ciliary body:** It is the anterior continuation of the choroid consists of ciliary muscles and secretory epithelial cells. The lens is attaché to ciliary body by radiating suspensory	**4M**

these ligaments control the shape of the lens. The epithelial cell secretes the aqueous fluid into the anterior segment of the eye. Ciliary body is supplied by parasympathetic branches of the oculomotor nerve. Stimulation causes contraction of the ciliary muscle and accommodation of the eye

Iris: it is visible colour part of the eye and extends anteriorly from the ciliary body, lying behind the cornea and in front of the lens. It divides anterior portion of the eye into anterior and posterior chambers which contain aqueous fluid secreted by the ciliary body. It is circular body composed of pigment cells and two layers of smooth muscle fibres, one circular and other radiating. In the centre is an aperture called pupil.

The iris supplied by parasympathetic and sympathetic nerves. Parasympathetic stimulation constrict the pupil and sympathetic stimulation dilate the pupil.

6 e) Discuss structural and functional differences between artery and vein **4M**

Sr. No	Artery	Vein
1	Arteries are the blood vessels which carry the blood away from the heart.	Veins are the blood vessels which bring the blood towards the heart
2	All arteries except pulmonary artery carry oxygenated blood.	veins except pulmonary veins bring deoxygenated blood.
3	Arteries are thick walled. In artery tunica media is thick.	Veins are thin walled. In veins tunica media is thin.
4	Arteries are elastic	Veins are less elastic.
5	Lumen of the artery is smaller as compared to vein.	Lumen of the vein is larger as compared to artery.
6	Arteries are branched into arterioles	Venules reunite to form veins.
7	They are reddish in colour	They are bluish in colour
8	They do not contain valves	They contain valves

6	f)	**Explain in short, factors affecting on Heart rate** **Autonomic nervous system:** A balance between sympathetic and parasympathetic activity is the most important factor in determining the heart rate **Circulating chemicals:** adrenaline and noradrenaline secreted by the adrenal medulla increases the heart rate. Thyroxin increases the heart rate. Hypoxia and elevated carbon dioxide levels stimulate heart rate. Electrolyte imbalances like increase in the potassium and calcium level decreases the heart rate. Some drugs such as beta receptor antagonist increases the heart rate. **Position:** when the person is upright, the heart rate is usually faster than when lying down. **Exercise:** active muscles need more blood than resting muscles and this is achieved by an increased heart rate and selective vasodilation. **Emotional states:** During excitement, fear and anxiety heart rate is increased. **Gender:** the heart rate is faster in women than men **Age:** in babies and small children the heart rate is more rapid than in older children and adults. **Temperature:** the heart rate rises and falls with body temperature **Baroreceptor reflex:** these are the nerve endings sensitive to pressure changes within the vessel, situated in aorta and in carotid sinuses. Rise in BP in arteries stimulates baroreceptors increasing their input to the CVC. The CVC responds by increasing parasympathetic nerve activity to the heart, this slows the heart down. At the same time sympathetic stimulation to the blood vessels is inhibited, causing vasodilation. The net result is systemic fall in BP. Conversely if the pressure within the arteries falls then rate of baroreceptor discharge also falls. The CVC respond by increasing sympathetic drive to the heart to speed it up. Sympathetic activity in blood pressure also increased and leads to vasoconstriction.	**4M**

MAHARASHTRA STATE BOARD OF TECHNICAL EDUCATION
(Autonomous)
(ISO/IEC - 27001 - 2005 Certified)

MODEL ANSWER

SUMMER - 19 EXAMINATION

Subject Title: Human Anatomy & Physiology Subject Code: 0809

MODEL ANSWER

WINTER– 19 EXAMINATION

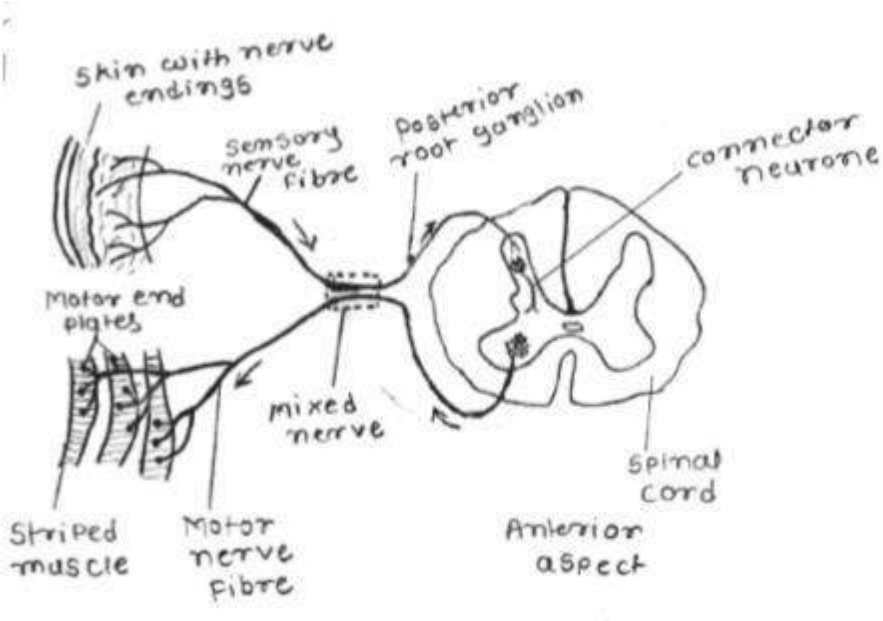
Subject Title: Human Anatomy & Physiology Subject Code: 0809

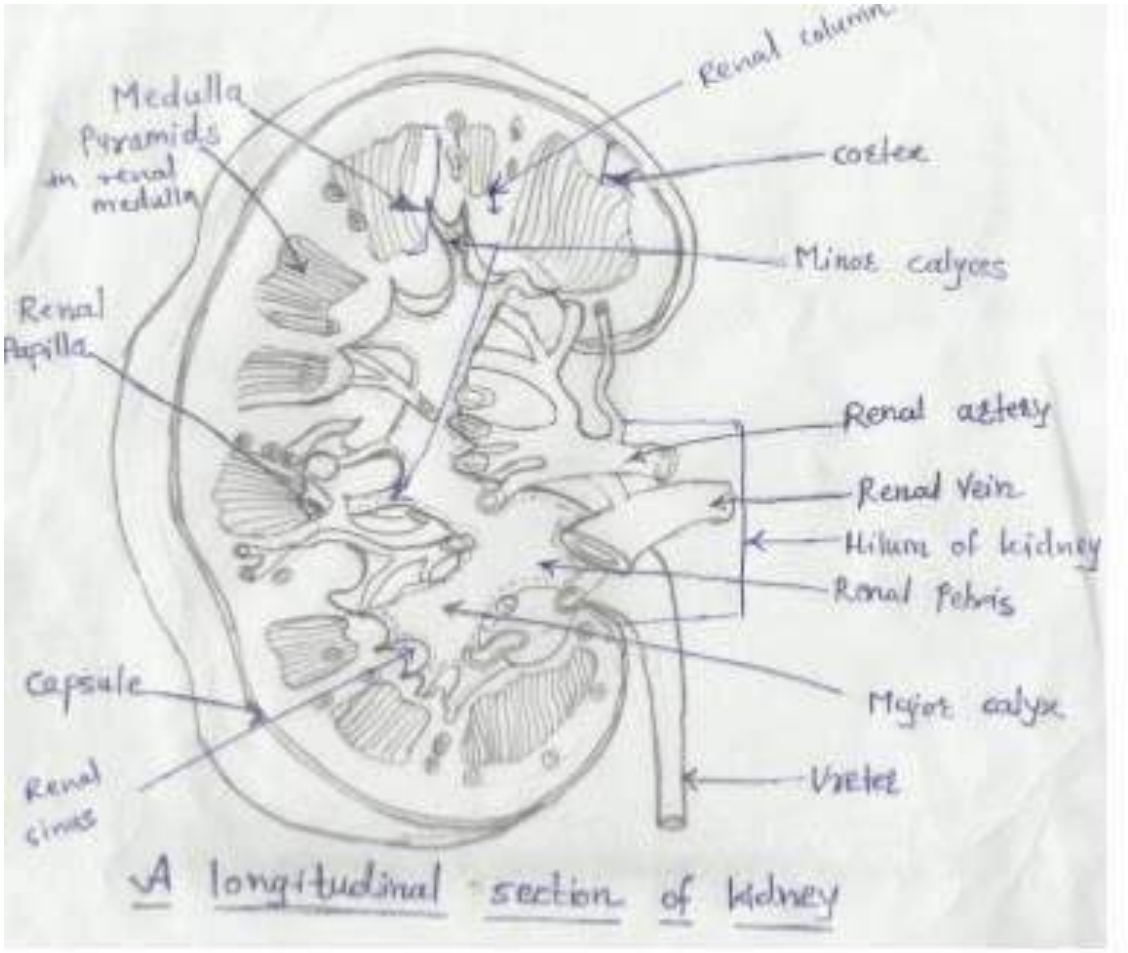
Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

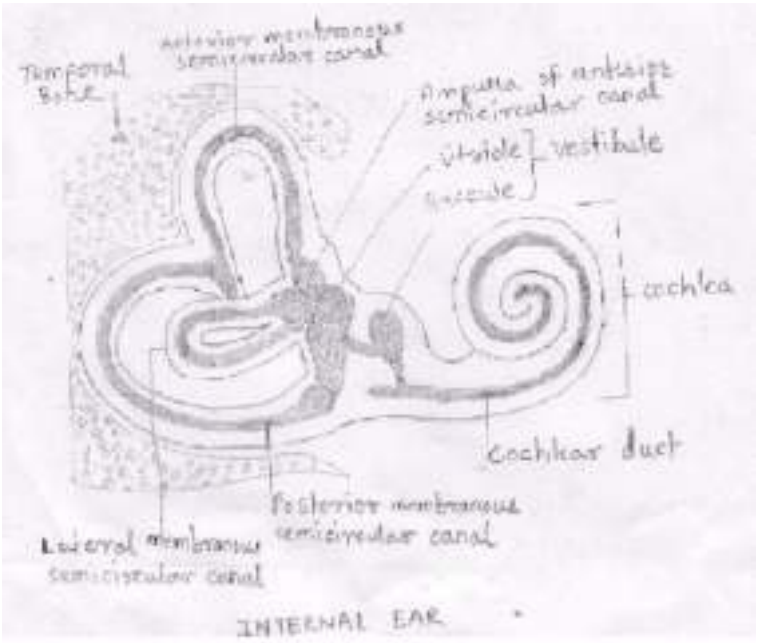
Q. No	Sub Q. N.	Answer	Marking Scheme
1		**Answer any Eight of the followings:**	**16M**
1	**a)**	**Define Anatomy & Physiology. (1 mark each definition)** **Anatomy** -It is the study of structure of the body & its individual parts & their relation to one another. **Physiology** - It is the study of the functions of various parts and how they are integrated to produce a coordinated action of the whole body.	**2M**
1	**b)**	**Name fundamental tissues of the body. (0.5 mark for each tissue)** The four main types of tissues are- Epithelial tissue Connective tissue Muscle tissue Nervous tissue	**2M**
1	**c)**	**What is serum?** Serum is plasma without blood clotting factors. It is clear sticky fluid that consists of plasma from which clotting factors have been removed.	**2M**
1	**d)**	**Explain true and false ribs. (1 mark each)** **True ribs** – The first seven pairs of ribs anteriorly articulate directly through costal cartilages with the sternum and are known as true ribs. **False ribs –** The rest five of the ribs are false ribs**.** The 8th, 9th and 10th pair of ribs are indirectly attached to the sternum anteriorly i.e. cartilages of these ribs join immediately with costal cartilage of 7th pair of ribs. The eleventh & twelve ribs are not attached anteriorly. These are called false ribs.	**2M**
1	**e)**	**Name the bones of shoulder joint. (1 mark for each bone)** Scapula & humerus. The glenoid cavity of scapula & ball of the humerus form shoulder joint.	**2M**

1	**f)**	**Define the term Dyspnea.** Ventilation of the lungs becomes severely impaired, causing breathlessness known as **Dyspnea**. PO_2 quantity get reduces in blood and PCO_2 increases in blood. OR Difficulty or shortness of breathing is known as dyspnea.	**2M**
1	**g)**	**Define cell. Enlist its components. . (1M for definition & 1M for components)** A cell is a smallest functional unit of an organism. It is the basic unit of all body tissues. The components are, Mitochondria, lysosomes, Nucleus, Microfilaments & Microtubules, Endoplasmic reticulum, Golgi apparatus, Centriole, Ribosomes.	**2M**
1	**h)**	**Define erythropoiesis.** It is the process of formation of red blood cells from stem cells. It takes about 7 days.	**2M**
1	**i)**	**Give the names of four cranial nerves. (0.5 marks each)** I- Olfactory II- Optic III - Oculomotor IV- Trochlear V- Trigeminal VI- Abducent VII - Facial VIII- Vestibulocochlear IX- Glossopharyngeal X -Vagus XI- Accessory XII- Hypoglossal	**2M**
1	**j)**	**Explain the terms fossa and foramen (1 mark each)** **Fossa**- A hollow or depression **Foramen-** A hole in a structure	**2M**
1	**k)**	**Define Saliva? Enlist salivary glands. (1 mark for definition and 1 mark for glands)** Saliva is the secretions of the salivary glands. There are three pairs of salivary glands - parotid, submandibular, sublingual.	**2M**
1	**l)**	**Name the hormones secreted by Adrenal glands. (Each 1 mark)** **Adrenal cortex** secretes 3 hormones: Mineralocorticoids (Aldosterone), Glucocorticoids (Cortisol) and Sex hormones	**2M**

		(Androgens). **Adrenal medulla-** It produces adrenaline & non adrenaline.	
2		**Attempt any FOUR of the followings**	**12M**
2	**a)**	**What is reflex action? (1M) Explain structure of Reflex arc. (Diagram with explanation 2M)** A reflex action is an involuntary & immediate motor response to a sensory stimulus.  **Reflex arc:** It consists of structures which are involved in the production of a reflex action. These structures are **A sensory organ** like skin which receives the sensory impulses. **A sensory nerve** which transmits sensory impulses from sensory organ to posterior root of spinal cord. **A connector neurone** which receives sensory impulses, interprets it and generate motor impulses. **A motor nerve** which transmits motor impulses to motor organ. **A motor organ** like muscle which receives motor impulses, get excited and shows response to the impulses.	**3M**

2	**b)**	**Enlist the hormones secreted by posterior pituitary gland (1M) and explain their effects (2M).** Hormone secreted by Posterior lobe: 1. Oxytocin 2. Antidiuretic hormone (ADH) /Vasopressin **Oxytocin** • It stimulates uterine smooth muscle during labour to bring childbirth (parturition) • It stimulates the muscle cells of the lactating breast for ejection of milk. **Anti-diuretic hormone (ADH) /Vasopressin** • It decreases urine output by increasing tubular reabsorption of water in the kidney. • It increases blood pressure by constricting capillaries and arterioles.	**3M**
2	**c)**	**Draw & label diagram L.S. of Kidney.**  	**3M**

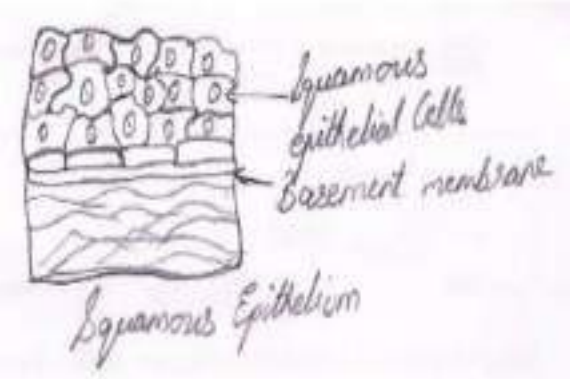
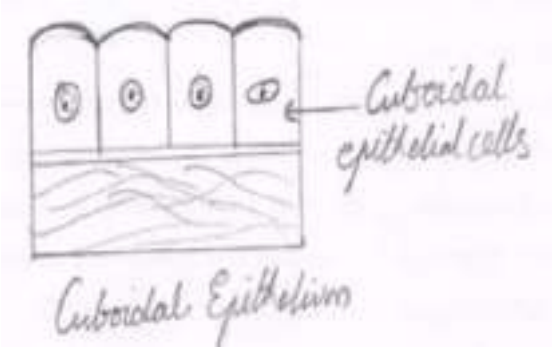
2	d)	**Define lymph.(1M) Give functions of lymphatic system.(2M)** Lymph is a fluid connective tissue. All the body tissues are bathed in tissue fluid, some tissue fluid diffuses through the lymph capillaries forming lymph. **Functions of Lymphatic System:** 1) It collects and returns tissue fluids from the intercellular spaces to the blood. 2) It plays an important role in returning plasma proteins to the blood. 3) Lymphatic node produces & transports lymphocytes to the circulatory system. (antibodies formation by lymph node to protect body against infection.) 4) It absorbs and transport fatty acids and fats from the digestive system. 5) Lymph nodes play an important role in defense mechanism by way of filtration of lymph & trapping microorganism.	**3M**
2	e)	**Explain the terms Atherosclerosis and Myocardial Infarction (1.5 mark each)** **Atherosclerosis:** It refers to the deposition of fats, cholesterol and other substances (plaques), in the tunica intima of mid-size and large artery, which can restrict blood flow due to narrowing or complete blocking of artery. **Myocardial Infarction** Death of myocardial muscle due to lack of blood supply, due to complete blockage of coronary artery.	**3M**
2	f)	**What will be the effect of sympathetic nervous stimulation on: -** **(i) Salivary gland (1Mark) (ii) Blood vessels (1 Mark) (iii) Bronchi (1 Mark)** **i) Salivary gland :** Decreases the secretion of saliva, making the mouth dry and swallowing difficult. **ii) Blood Vessels:** Dilation of coronary artery, Dilation of skeletal blood vessels, Constriction of all other blood vessels. **iii) Bronchi:** Bronchodilation.	**3M**

3		**Attempt any FOUR of the followings**	**12M**
3	**a)**	**Draw well labelled diagram of internal Ear**  	**3M**
3	**b)**	**Explain the term Hypothalamus (1M) with its functions.(0.5 M for each function)** **Hypothalamus:** The hypothalamus is composed of a members of groups of nerve cells. It is situated below and in front of the thalamus, immediately above the pituitary gland. **Following are functions of hypothalamus:** 1) It controls Autonomic nervous system. 2) It controls appetite & satiety. 3) Regulation of thirst. 4) Maintenance of emotional behaviour, personality and social behaviour. 5) Regulation of body temperature 6) It regulates and controls release of hormones from pituitary gland. 7) It regulates biological clock.	**3M**
3	**c)**	**Define the term portal circulation? Give its significance** **The portal circulation(2 marks)**	**3M**

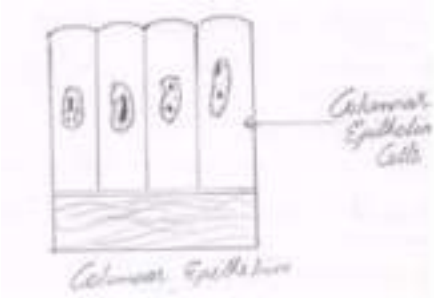
		In all parts of the body, the venous blood passes from the tissues to the heart by the direct route. But, in the portal circulation, venous blood from the capillary bed of the abdominal parts, the spleen & the pancreas passes to the liver via the portal vein. The portal vein is formed by union of gastric vein, superior& inferior mesenteric veins, splenic vein & cystic vein. The blood passes through the second capillary bed, the hepatic sinusoid in the liver before entering the general circulation via the inferior vena cava. **Importance of portal circulation (1 mark)** Blood with the high concentration of nutrients absorbed from the stomach & intestine goes to liver first. In the liver certain modifications takes place including the blood nutrient level. The venous blood then leave sliver via hepatic vein & joins the inferior vena cava.	
3	**d)**	**Explain Physiology of muscle contraction** The motor pathway from the brain to the muscles involves two neurons. The upper motor neuron & the lower motor neuron. The axon of this neuron reaches the muscle. Near the termination in the muscle, the axon branches into tiny fibres that form the motor end plate near the muscle fibre. When a nerve impulse reaches neuromuscular junction, The neuro transmitter released is Acetyl choline at this junction. This changes the permeability of the cell membrane to sodium & calcium ions .As a result the muscle becomes depolarized. This causes muscle contraction. The acetyl choline is hydrolysed by enzyme acetylecholine esterase .The calcium ion concentration is decreased in the muscle which causes repolarization which leads to relaxation of muscle.	**3M**
3	**e)**	**Describe composition (1M)and function of Gastric juice (2M)** **Composition:** water, mineral salts, mucus, hydrochloric acid, Enzymes such as pepsinogen, gastric renin and the intrinsic factor. **Function:** 1. Water liquefies the food. 2. HCl acidifies the food & stops the action of salivary amylase. 3. HCl kills the microbes, 4. Pepsinogen is activated to pepsin by HCl, This digests protein to peptones and peptides.	**3M**

		5. Intrinsic factor helps in absorption of vit. B12 from small intestine. 6. Mucus prevents mechanical injury to the stomach wall.	
3	**f)**	**Explain role of kidney in maintenance of water balance of body.** Kidney controls urine output & maintain water balance by 3 ways. **1. ANTI-DIURETIC HORMONE** Increased blood osmotic pressure ⟶ Osmoreceptors in hypothalamus ⟶ Stimulation of post.Pituitary ⟶ Release of ADH ⟶ promotes Reabsorption of water ⟶ Reduces loss of water in urine (reduced blood osmotic pressure) **2. ALDOSTERONE** Decrease in blood volume & pressure⟶ Secretion of Renin by Kidneys ⟶ Angiotensinogen ⟶ Angiotensin I ⟶ Angiotensin II ⟶ Stimulation of Adrenal Cortex release of aldosterone ⟶ Promotes urinary reabsorption of Na+ & Cl- ⟶ simultaneously increases water reabsorption via osmosis ⟶ Reduces loss of water in urine. **3.ATRIAL NATRIURETIC PEPTIDE** Increased blood volume ⟶ Secretion of ANP by atria of heart ⟶ Reduces Reabsorption of Na+, Cl- by Kidneys ⟶ Promotes natriuresis, increased urinary ⟶ excretion of Na+, Cl- ⟶ Increases loss of water in urine via osmosis	**3M**
4		**Attempt any FOUR of the followings**	**12M**
4	**a)**	**Explain the term anemia.(1M) Enlist its types (1M)and explain megaloblastic anemia (1M)** **Definition:** In anaemia, there is not enough haemoglobin available to carry sufficient O_2 from lungs to the tissues. i.e. a condition in which the oxygen carrying capacity of blood is reduced. **Classification based on the cause** **1 Impaired erythrocyte production –**	**3M**

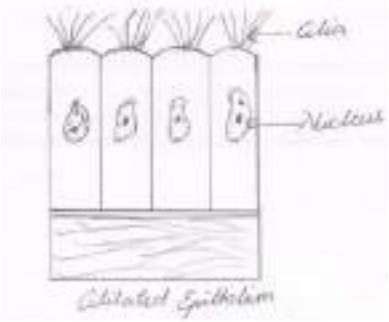
		iron deficiency anaemia megaloblastic anaemia hypo plastic anaemia **2 Increased erythrocyte loss-** Haemolytic anaemia hemorrhagic anaemia **megaloblastic anaemia (macrocytic)** This is due to deficiency of folic acid or vit.B12. Abnormally large RBCs are found in the blood (megaloblasts) as maturation does not take place. The cells are immature, nucleated and fragile with life span of 40-50 days. Folic acid & vit.B_{12} deficiency is due to less intake Or no absorption from jejunum.	
4	**b)**	**Name the cartilages of larynx? (2M)Give functions of larynx(1M for any two fun))** It is made up of following cartilages: 1-thyroid cartilage. 1- cricoid cartilage.(ring shaped) 1-epiglottis.-elastic cartilage 2-arytenoid cartilages(ladle shaped) 2-cuneiform cartilages (wedge shaped)& 2-corniculate cartilages (horn shaped) Functions: 1) Production of sound 2) Speech 3) Protection of lower respiratory tract 4) Passageway for air	**3M**

		5) Humidifying, filtering and warming processes continue as inspired air travels through the larynx	
4	**c)**	**Classify Epithelial tissues** Epithelial tissues can be classified in two type:- 1) **Simple epithelium**-i) Squamous/pavement epithelium ii) Cuboidal epithelium, iii) Columnar epithelium, iv) Ciliated columnar epithelium. 2) **Compound epithelium**:- i) Stratified epithelium and ii) Transitional epithelium. **i) Squamous/pavement epithelium;-** Composed of single layer of flattened cells, fit like flat stones and forms a smooth membrane. This tissue provides a thin smooth, inactive lining for heart, blood vessels, alveoli of lungs and lymph vessels.  **ii) Cuboidal epithelium**:-Composed of cube shaped cells and forms the basement membrane. Involved in secretion and absorption. Present in some simple secretive glands. Forms basement membrane in tubules of kidney.  	**3M**

iii) Columnar epithelium:-Formed by single layer of tiny cylindrical columns and situated on a basement membrane .Found lining the organs of alimentary tract and special columnar cells called 'goblet cells', in GIT secretes sticky substances called mucous. Function-absorption

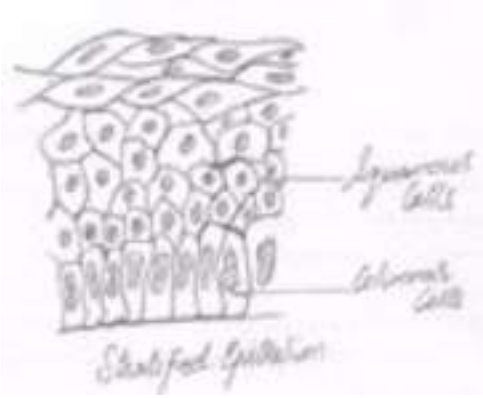
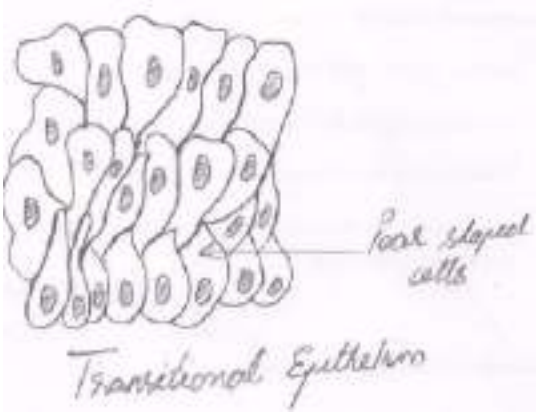


iv)Ciliated epithelium:-This is formed by columnar cells with fine hair like protoplasmic processes called cilia, capable of wave like movements. They move the contents in a particular direction. Found lining most of the respiratory passages and uterine tubes.In respiratory passages, it propels mucous towards throat and in the uterine tube, it propels ova towards the uterus

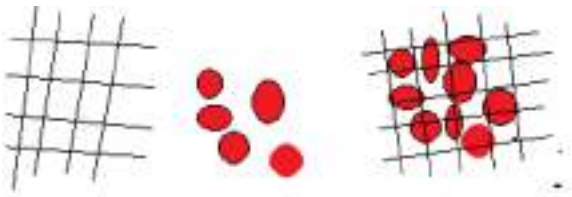


3) **Compound epithelium**:-Consists of number of layers of cells,protecting underlying layers of cells.

i) Stratified epithelium:-Deepest layer of columnar cells which becomes flattened at the surface due to constant migration of cells from deep layer to the surface. At the surface the cells die and lose their nuclei. Such cells form a hard substance called 'keratin'. Such keratinized epithelium is found on dry surfaces like skin, hair and nails, whereas

		nonkaeratinized epithelium is found on wet surfaces lining mouth, pharynx, esophagus and conjunctiva of eyes.  **ii) Transitional epithelium**:- Composed of several layers of pear shaped cells ,a stage between simple and stratified epithelium hence called transitional epithelium .Superficial layer of oval shaped cells held together by intercellular cement, slimy and allows the cells to slip on one another. Found lining accessory structures of ureters, urinary bladder and urethra.  	
4	**d)**	**Explain the term thrombosis (1.5M) and embolism (1.5M)** **Thrombosis:** Thrombosis is the formation of a blood clot, known as a thrombus, within a blood vessel. It prevents blood from flowing normally through the circulatory system. The risk of thrombus developing within a blood vessel is increased by any condition that slows blood flow, damages the smooth lining of blood vessels or increases blood	**3M**

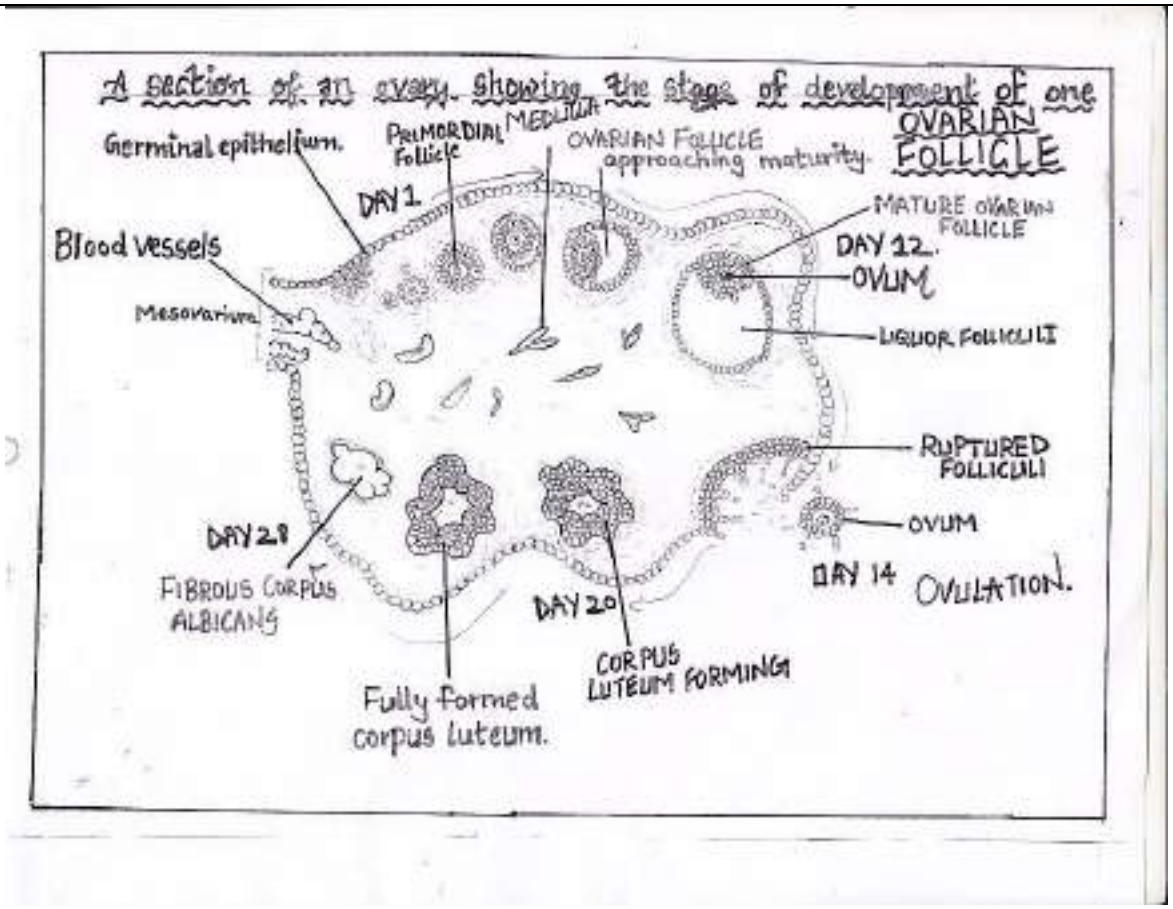
		coagulability. **Embolism:** Embolus is a mass of any material like blood clot, tumor fragment, pus or fragment of athermanous plaque carried in the blood. Embolism occurs when this material blocks the blood vessel	
4	**e)**	**Explain properties of skeletal muscle tissue (any 3 properties,1M for each)** Skeletal muscle possesses four essential properties: • **Excitability**: this refers to muscle tissue being able to react to nervous stimulation. • **Extensibility**: this refers to the ability of muscle tissue to lengthen when contracting and provide the effort required to move the lever system (the bones and joints), producing coordinated movement. • **Elasticity**: this refers to the ability of muscle tissue to return to its normal resting length once it has been stretched. • **Contractility**: this refers to the capacity of a muscle to contract or shorten forcibly when stimulated by nerves and hormones (excitability).	**3M**
4	**f)**	**Describe the mechanism of coagulation of blood** When the blood vessel is damaged, loss of blood is stopped by the following way. 1**) Vasoconstriction**: - When platelets come in contact with a damaged blood vessel they adhere to it. Serotonin is released which constricts the blood vessel. 2) **Platelet plug formation:** - The adhered platelets attract more platelets which form platelet plug. This forms temporary seal. 3) C**oagulation- (blood clotting)**: The thromboplastin (prothrombinase) released by damaged tissue cells by extrinsic or intrinsic pathway. In presence of calcium ions it converts prothrombin to thrombin. Thrombin acts on fibrinogen & converts it to insoluble fibrin. The fibrin mesh traps blood cells. This is known as clotting.	**3M**

		Prothrombin+ Calcium+ Thromboplastin → Thrombin (inactive) (from damaged tissue) (active) Thrombin acts on ↓ Fibrinogen → Fibrin (soluble) (insoluble) Fibrin + Blood Cells → Clot 	
5		**Attempt any FOUR of the followings**	**12M**
5	**a)**	**Define Glomerular filtration (1.5M) and Glomerular filtration rate. (1.5M)** **Glomerular filtration:** It is a process of filtration through the semipermeable walls of the glomerulus & the glomerular capsule. The filtration takes place due to the difference in the pressure bet. the glomerulus & capsule. Water & other small molecule pass through it. Blood cells plasma protein & other larger molecules do not pass through it. **Glomerular filtration rate:** The volume of the filtrate formed by both kidneys each min. is called the glomerular filtration rate. (GFR). GFR – 125 ml / min in male and 105 ml / min in female.	**3M**
5	**b)**	**Explain Physiology of Respiration**. **Physiology of respiration- (cycle of breathing)**The normal human has 12-15 breath per min. Each breath consists of inspiration, expiration & pause. **Inspiration** When diaphargm contracts, then central tendon is pulled downwards. During inspiration, the simultaneous contraction of intercostal muscles & diaphragm increases the capacity of thoracic cavity. This reduces the pressure in the lungs. To equalise the pressure the air from atmosphere enters the lungs. The process of inspiration is active as it needs energy for muscle contraction.it lasts for 2 sec.	**3M**

		Expiration When diaphargm relaxes, then central tendon is pushed upwards. Relaxation of intercostal muscles & diaphragm results in decrease in the size of thoracic cavity. As a result, the pressure inside the lungs increases as compared to atmospheric pressure. The air from the lungs is expelled from the lungs. This process is passive as does not require energy. The expiration lasts for 3 sec. After expiration there is **pause** & then the next cycle begins. **Internal respiration** This is the exchange of gases bet blood & the body cells. The blood arriving at the tissues is saturated with O_2 & therefore has a higher PO_2 & lower PCO_2 than tissues. This creates concentration gradient bet capillary blood & the tissues& gaseous exchange takes place.O_2 diffuses from the blood into the tissues, & CO_2 diffuses from the cells into the venous end of the blood.	
5	**c)**	**Explain the terms odema (1.5M) & Nephritis**.(1.5M) **Odema** : Oedema is fluid retention. Oedema means abnormal accumulation of tissue fluid leading to swelling. **Nephritis :(glomerulonephritis) i**s an inflammatory conditions of the glomerulus .The immune complexes formed by an antigen antibody complexes lodges on the glomeruli & cause inflammation of the glomeruli.	**3M**
5	**d)**	**Define & give normal values of (i) Vital Capacity (ii) Tidal Volume (iii) Residual Volume** **(i)** **Vital Capacity** This is the maximum volume of air which can be moved into & out of the lungs during forceful breathing. Normal value 3-5 liters. **(ii)** **Tidal Volume** This is the volume of air passing into & out of lungs during each cycle of quiet (normal) breathing. Normal value-500ml (iii) **Residual Volume** This is the volume of air remaining in the lungs after forceful expiration. Normal Value: male- 1.2 liters, female 1.1 liters	**3M**

<table>
<tr><td>5</td><td>e)</td><td>Compare Autonomic Nervous system (ANS) with Central nervous system. (CNS) (any 3 points)
<table>
<tr><th>ANS</th><th>CNS</th></tr>
<tr><td>It consists of sympathetic & parasympathetic division.</td><td>It Consists of brain & spinal cord</td></tr>
<tr><td>It involves only efferent pathway.</td><td>It involves both afferent and efferent pathways.</td></tr>
<tr><td>Unconscious signals originates in hypothalamus, brain stem and spinal cord and activates target neurons.</td><td>Efferent signals originate at the cerebral cortex as a conscious decision and activates neurons in the brain stem or spinal cord.</td></tr>
<tr><td>It performs motor activities.</td><td>It performs mental, sensory and motor activities.</td></tr>
</table></td><td>3M</td></tr>
<tr><td>5</td><td>f)</td><td>State various types of Synovial Joints with examples.(0.5 for each)
<u>Types of synovial joints</u> They are classified according to the types of movement possible or shape of the part of the bones involved.
1 Ball & socket joint The head of one bone is ball shaped which fits into cup shaped socket of another bone. This allows range of movement. E.g. shoulder joint, hip joint.
2 Hinge joint The articulating ends form an arrangement similar to hinge on the door. The movement is restricted. e.g. elbow joint, knee joint, ankle joint .
3 Gliding joint The articulating surfaces glide over each bet carpals (inter carpel bones), tarsal bones (inter tarsal bones).
4 Pivot joint this joint allows the joint to rotate. e.g. the joint formed by axis & atlas allows the head to rotate & proximal & distal radio ulnar joint.
5 Condyloid joint A condyle is a smooth projection of bone which fits on the depression of another bone. e.g. joint between Mandible & temporal bone, joint bet metatarsal & phalanges & joint between metacarpal & phalanges.
6 Saddle joint The bones fit like man sitting on a saddle. e.g. the joint between first metacarpal and trapezium of wrist.</td><td>3M</td></tr>
</table>

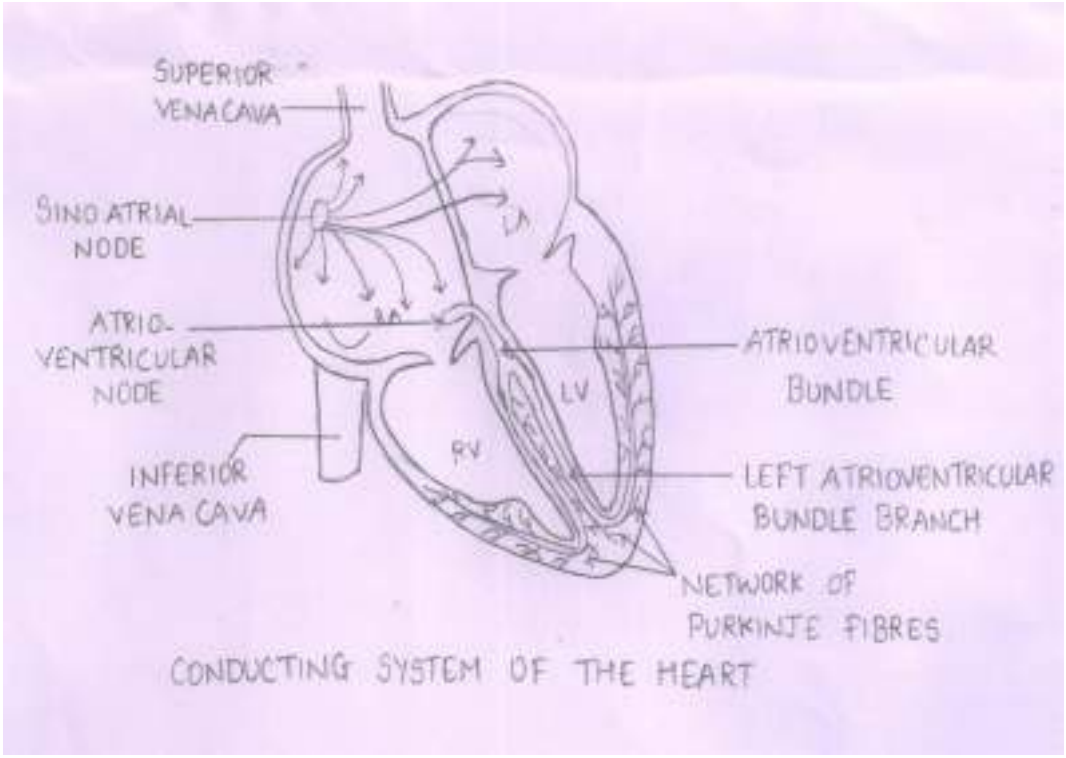
6		**Attempt any FOUR of the followings**	**16M**
6	**a)**	**Explain the structure (2M) & function of ovaries. (2M)** **Ovaries-** They are the female gonads. it is made of two layers of tissues- The cortex & the medulla **Structure** The germinal epithelium is a layer of simple epi. That covers the surface of the ovaries. The tunica albuginea is a whitish capsule of dense connective tissue located deep to the germinal epi. **Cortex-**it surrounds the medulla It contains ovarian follicles in various stages of maturity each contain an ovum. Before puberty, the ovaries are inactive but it contains immature follicles(primordial follicles), which the female has from birth.During the childbearing years, (after puberty), one ovarian follicle matures (Graafian follicle) & ruptures & releases ovum in to the peritoneal cavity. . This is called ovulation. & occurs during each menstrual cycle. The ruptured follicle develops into the corpus luteum which in turn will leave a small permanent scar of fibrous tissue called corpus albicans. The corpus leutium secretes oestrogen & progesterone. **Medulla It** lies in the center & consists of fibrous tissues, blood vessels & nerves.	**4M**



Functions of ovaries-

1. Maturation of the follicle is stimulated by FSH from anterior pituitary, and oestrogen is secreted by the follicle lining cells.
2. Ovulation is triggered by LH by anterior pituitary.
3. After ovulation the follicle lining cells develop into corpus luteum (yellow body) under the influence of LH.
4. The corpus leutium produces progesterone & some oestrogen.

6	**b)**	**Draw diagram of conducting system of heart. (2M)Explain cardiac cycle**. (2M)	**4M**



The cardiac cycle

The series of events during one heart beat is known as cardiac cycle. It consists of atrial systole, ventricular systole & complete cardiac diastole.

During each beat or cardiac cycle, the heart contracts (systole) & relaxes (diastole).

Stages of cardiac cycle

Normally the no. of cardiac cycle is 60-80.

If we take 72 ,each cycle is of 0.8 sec. and consists of

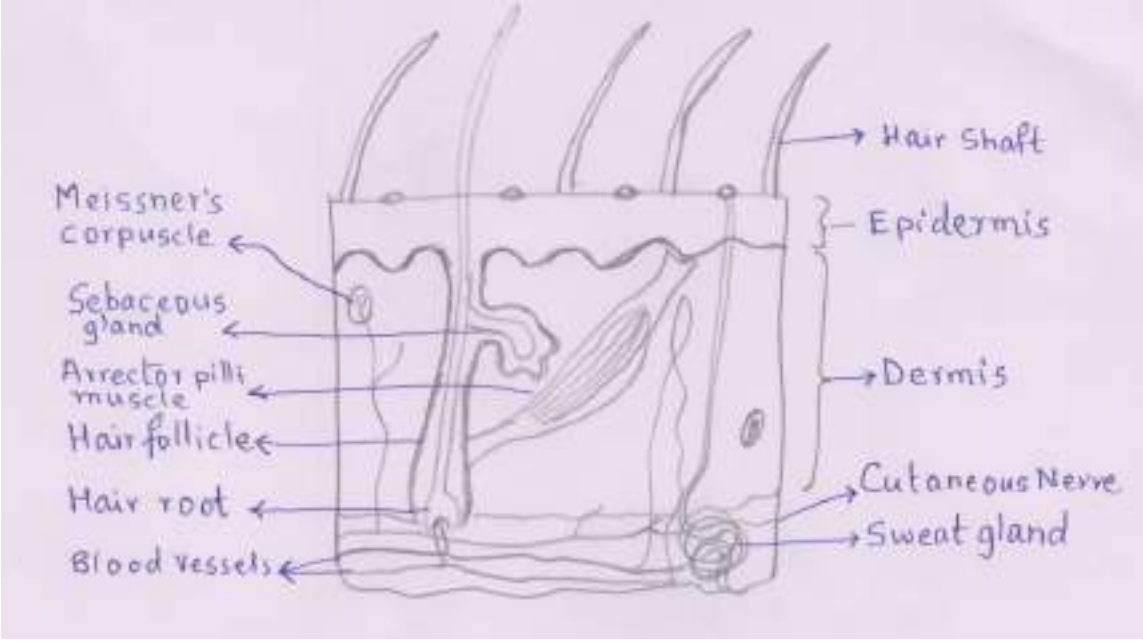
A**trial systole (0.1 sec)**

Ventricular systole (0.3 sec)

Complete cardiac diastole(0.4 sec)

The superior & inferior vena cava transport the deoxygenated blood into right atrium at the same time four pulmonary veins transport oxygenated blood into the left atrium during atrial diastole.

The impulses from the SA node spreads over the atria, atria contracts, the AV

		valves open and & blood flows to ventricles.(atrial systole-0.1 sec) When the wave of contraction reaches AV node, it is stimulated & emits impulses which spreads over AV bundle, bundle branches & purkinje fibres resulting in contraction of ventricles pumping the blood into pulmonary artery & the aorta. (ventricular systole 0.3 sec). After the contraction of the ventricles there is complete cardiac diastole(0.4 sec) when both atria & ventricles relax. After this the next cycle begins.	
6	**c)**	**Draw V.S. of skin.(2M) Explain role of skin in maintenance of body temperature. (2M)**  The active tissues like muscles liver etc. produce heat. Most of the heat loss from the body occurs through the skin by the process of evaporation of sweat, radiation & conduction. The skin helps to maintain constant body temperature by the following way. The center controlling temperature is situated in hypothalamus which is called heat regulating center. The vasomotor center in medulla oblongata also helps in regulating the body temperature. The amount of heat loss from the skin depends on the blood in the vessels which lie in the dermis. As the amount of heat in body increases, the vasomotor center is stimulated	**4M**

		which causes vasodilatation of blood vessels in skin. Due to this, more amount of blood is passed through the skin which increases temperature of skin. As a result, sweat glands are stimulated by nerve impulses from the heat regulating center. Due to this more sweating occurs which gets evaporated to atmosphere, thus cooling the body. If the external temperature is low, or heat production is less, the vasomotor center causes vasoconstriction. Due to vasoconstriction, amount of blood flowing to the skin decreases which decreases the temperature of the skin and finally prevents heat loss from the body.	
6	**d)**	**Explain the term menstruation. (1M)Describe in details the phases of Menstrual Cycle. (3M)** **Menstruation**: This is the series of events occurring regularly in females every 26-30 days throughout the child bearing age. The cycle consists of menstrual phase, for 4 days proliferative phase for 10 days & secretary phase for 14 days. **Menstrual phase-** If the ovum is not fertilised corpus luteum degenerates, oestogen & progesterone levels fall, the endometrium sheds. The menstrual flow consists of endometrial cells, secretion from endometrial glands & blood from broken capillaries. If pregnancy occurs high levels of oestrogen & progesterone prevents release of FSH & LH & this prevents the maturation & release of another ovum. **Proliferative phase-**FSH stimulates the ovarian follicle to mature, producing oestrogen which stimulates the proliferation of the endometrium. It thickens, becomes more vascular& rich in mucus secreting glands. LH triggers ovulation. This phase ends with ovulation &oestrogen production declines. **Secretory phase-** After ovulation, corpus luteum produces oestogen &progesterone. Progesterone makes the endometrial walls thick & stimulates the endometrial glands to produce watery secretion to facilitate fertilisation.If the ovum is not fertilized, the corpus luteum degenerates, progesterone levels decline . functional lining of uterus shedds. & menstruation occurs & a new cycle begins.	**4M**

6	**e)**	**Give the composition of bile (2M)and its functions.(2M)** **composition of bile-** Water, mineral salts, mucus, bile pigments bilirubin, bile salts Cholesterol. **Functions of bile** 1. Bile salts emulsify the fat. 2. Bilirubin the waste product of RBC breakdown is passed to the intestine where it gets converted to urobilin & stercobilin . Urobilin is excreted in the urine & stercobilin is excreted in the faeces. 3. Bile salts help in the absorption of vit. K & digested fat.	**4M**
6	**f)**	**Describe: (i) Hyperthyroidism (2M) (ii) Hypothyroidism (2M)** **(i)Hyperthyroidism** This is also known as thyrotoxicosis. The most common form is Grave's disease (Exophthalmic goiter) which is auto immune disease where antibodies acts like TSH hormone. This continuously stimulates the thyroid gland to grow & produce thyroid hormones. The patients have oedema behind the eyes which cause eyes to protrude. Hyperthyroidism leads to excitability, intolerance to heat, increased sweating, weight loss, muscle weakness, nervousness. **(ii) Hypothyroidism** This is due to deficiency of iodine. 1-**Cretinism in children**- (congenital hypothyroidism) This causes severe mental retardation & stunted bone growth. 2-**Myxodema in adults** The symptoms is oedema (because of accumulation of mucopolysaccharides) that causes the facial tissues to swell & look puffy. 3 **Hashimotos diesease**- Autoimmune disease .Antibody react with thyroglobulin & prevent the release of thyroid hormone.	4M

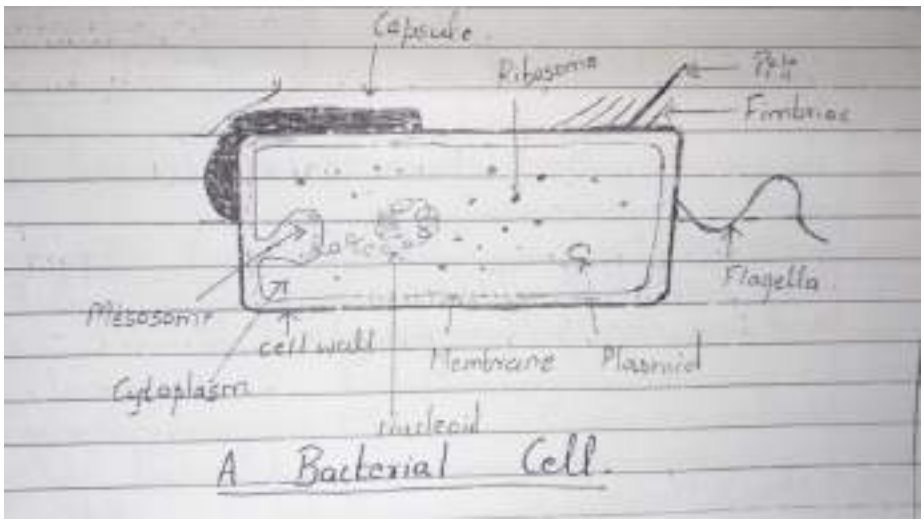
Subject Title: HEALH EDUCATION AND COMMUNITY PHARMACY Subject Code: 0810

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q.N.	Answer	Marking Scheme
1		**Answer any Eight of the followings:**	**16 M (8X2=16 M)**
1	**a)**	**Define the terms:** **a) Physical Health** Physical health is the perfect functioning of the body i.e. a state in which every cell and every organ is functioning at optimum capacity and in perfect harmony with the rest of the body. **b) Mental Health** It is defined as a state of balance between the individual and surrounding with self-confidence, self-control and has respect for others. **OR** A state of harmony between one self and others, coexistence between the realities of the self and that of other people and that of the environment	**2M (1+1=2)**
1	**b)**	**Name the disease caused by: (any two)** (i) *Salmonella typhi*- Typhoid (ii) *Wuchereria bancrofti*- Filiriasis (iii) Lyssa virus type -1 - Rabies	**2M (1x2=2)**
1	**c)**	**Write object of first aid.** i. To prevent any danger to life. ii. To prevent further injury and deterioration of the condition of the patient. iii. To give relief from pain. iv. To make medical care available at the earliest.	**2M (0.5×4=2)**
1	**d)**	**Give the long forms of the following abbreviation:** i. HIV-Human Immunodeficiency Virus	**2M (0.5×4=2)**

		ii. CHD-Coronary Heart Disease iii. STD- Sexually Transmitted Diseases iv. UTI- Urinary Tract Infection	
1	**e)**	**Write the role of 'Pharmacist in promoting family planning?** The pharmacist can play role in promoting family welfare/planning by following ways: **(Any 4 points of the following)** 1. Explain importance of small family norm. 2. Tell about proper spacing of children. 3. Guide the community about contraceptive devices. 4. Guide in general about health care and proper nutrition of "would be mother". 5. Guide about bad effects of population explosion the country is facing and so the importance of population control.	**2M** **(0.5×4=2)**
1	**f)**	**Define Kwashiorkar disease. Give its symptoms.** **Definition:(1 mark)** It is protein deficiency disease seen in children of group 1 to 4 years. **Symptoms: (1 mark)** Edema, depigmentation of hair and hair loss, GI disturbances as anorexia and diarrhoea, hepatomegaly, mental changes, sometime muscle wasting, apathy, etc.	**2M** **(1+1=2)**
1	**g)**	**Define Zoonotic disease. Classify them.** **Definition:(1 mark)** These are the diseases which are transmitted from animals to human beings. **Classification :(1 mark for any 4 classes)** i. Bacterial Zoonoses- e.g. Plague, anthrax, Brucellosis, etc. ii. Viral Zoonoses- e. g .rabies, yellow fever, influenza, etc . iii. Ricketssial Zoonoses-e.g. murine typhus,tick typhus , scrub typhus,etc. iv. Protozoal Zoonoses-eg. Toxoplasmosis, leishmaniasis, trypanosomiasis. v. Helminthic Zoonoses- eg. Echinococcosis, taeniasis,	**2M** **(1+1)**

		schistosomiasis,etc vi. Fungal Zoonoses – eg. deep mycosis – histoplasmosis,cryptococcosis. vii. Ectoparasites- eg. Myiasis, scabies.	
1	**h)**	**Name the disease caused due to deficiency of :** i. Vitamin A- Night blindness, Bitot's Spot, Conjunctival Xerosis, Xerophthalmia. ii. Vitamin B- Beri- Beri, Pellagra. iii. Vitamin C- Scurvy iv. Vitamin B12- Pernicious anemia	**2M** **(0.5×4=2)**
1	**i)**	**What is composition of Oral Rehydration Salt [ORS]?** Following is the Composition of ORS: 1. Sodium chloride – 3.5 gm/L 2. Sodium bicarbonate – 2.5 gm/L 3. Potassium chloride – 1.5 gm/L 4. Glucose – 20 gm /L.	**2M**
1	**j)**	**Draw a well labelled diagram of Bacterial Cell** 	**2M**

1	**k)**	**Write immunization schedule for children**. Each country has its own immunization schedule based on their local needs. Indian schedule gives protection for children against six vaccines preventable diseases. i.e. Diphtheria, whooping cough, tetanus, polio, TB, measles.	**2M**

Beneficiaries	**Age**	**Vaccine**	**No.of doses and Route of administration.**
Children	16 to 24 months	DPT (I booster)	1 intramuscular
		Polio (I booster)	1 oral
	5-6 years	DT (II booster)	1 intramuscular, (Two doses if not immunized previously)
		Typhoid	2 subcutaneous.
	10 years	Tetanus toxoid	1 intramuscular
		Typhoid	1 subcutaneous
	16 years	Tetanus toxoid	1 intramuscular
		Typhoid	1 subcutaneous

1	**l)**	**Differentiate between Communicable Diseases and Non-Communicable Diseases.(Any 4 points of differentiation)**	**2M (0.5×4=2)**

Communicable Disease	**Non-communicable Disease**
It is caused due to some infectious agent.	It is caused due to multiple causes but not due to Infectious agent.
It can be transmitted from one person to another directly or indirectly.	It cannot be transmitted from person to person directly or indirectly
It can be transmitted by any as air, water, soil, dust ,food,	It cannot be transmitted by any agency

			sputum etc.	
			It possesses definite onset and Incubation Period.	These do not possess definite onset& may possess very long latent period
			These are not genetic in origin	These can be genetic in origin e g. Diabetes or certain heart diseases
			Eliminating infectious agents can control these diseases.	Avoiding risk factors as smoking, alcohol consumption, stress, etc. are some ways to control these diseases.
			Examples: Rabies, chicken pox, Tuberculosis etc.	Examples: Cancer, Blindness etc.
2		**Attempt any FOUR of the followings**		**12M** **4X3=12**
2	**a)**	**Discuss methods of solid waste disposal. :(Any 3 methods 1 mark each)** **Solid waste is disposed of by using following methods.** 1. **Dumping:** dry refuse is mainly dumped in low lying areas which help not only in disposal but also in reclamation of land. By the action of bacteria, the volume of the refuse decreases considerably in volume and is converted gradually into humus. It is not an ideal method. 2. **Controlled tipping or sanitary landfill:** this is the most satisfactory method of refuse disposal. In this method a trench is dug. The refuse is compactly dumped in these pits and at the end of each working day is covered with earth, when the trench is full; again it is covered with earth and is compacted. In this method the chemical and bacteriological processes decompose the refuse into simple substances with generation of heat.		**3M** **(1 +1+1)**

		3. **Burning:** Refuse can be disposed of hygienically by burning. Hospital refuse which is particularly dangerous is best disposed of by burning. 4. **Composting:** it is a method of combined disposal of refuse and night soil. The basic principle is, when the refuse and night soil (excreta) are dumped in a pit and covered with earth there is anaerobic decomposition. The heat produced during decomposition kills the organisms and ultimately we get compost, which is used as manure. 5. **Burial:** it is useful for small scale disposal like camps. In a small trench or pit the refuse is collected and at the end of each day it is covered with 20-30 cm of earth. The contents of the pit may be taken out after 4-6 months and used on the fields.	
2	**b)**	**Write sources, functions & deficiency diseases of Vitamin A.** **(1 mark each for Sources, functions, deficiency diseases)** **Sources:** Milk and milk products, eggs, fish, green and orange /yellow vegetables. **Functions:** Maintains healthy epithelial tissues, maintains normal vision **Deficiency diseases:** Night blindness, Keratinization, Xerophthalmia.	**3M** **(1+1+1)**
2	**c)**	**Define demography. Explain stages of Demographic cycle.** **Definition: (0.5 M)** Demography is the scientific study of human population. **Demographic Cycle : (2.5 M i.e 0.5 mark for each stage)** It comprises of following 5 stages – **i) First Stage:** It is "High Stationary Stage ". The feature of this phase is both natality i.e. birth rate and mortality i.e. death rate are very high. Both cancel each other keeping population steady. India was in this phase till 1920. **ii) Second Stage:** It is "Early Expanding Stage ". Here mortality starts falling down but birth rate remains same i.e. higher. As a result population starts increasing.	**3M** **(0.5+2.5)**

		At present African and South Asian countries are in this phase. **iii) Third Stage:** It is "Late Expanding Stage ". Her mortality continues to fall but birth rate also started decreasing. But yet birth rate remains higher than death rate. So population continues to increase. China, India, Singapore are at this stage. **iv) Fourth Stage:** It is "Low Stationary Stage ". It is also called Zero Growth stage as birth rate equals death rate and both are lowered. So net population growth is zero. Many developed countries have reached this stage in last 20 years. **v) Fifth Stage:** It is "Negative Growth Stage". Here death rate is higher than birth rate. So there is decline in population size. Reasons behind are advancement in medical science and facing problems of population increase. Germany and Hungary are presently at this stage.	
2	**d)**	**Write Symptoms and first aid treatment for shock.** **Symptoms: (1 mark for any 4 symptoms)** 1. Weakness, dizziness, nausea, fainting. 2. Pallor and sweating 3. Fast and weak pulse-slow or irregular 4. Skin becomes pale and cold. 5. Pupils dilated, vision- blurred. 6. Difficulty in breathing. 7. Temporary loss of consciousness. **8.** Patient feels thirsty; sometimes the patient may be alert but suddenly may collapse. **First-Aid treatment for shock: (2 marks)** 1. Reassure the patient 2. Loosen the clothes of victim 3. Raise the level of legs	**3M** **(1+2)**

		4. Keep the patient warm with blanket 5. Start CPR if pulse is absent and/or breathing is weak.	
2	**e)**	**Enlist various determinants of health & discuss any one.** **Determinants of health:(2 marks for enlisting any 4 of the following)** (i) Heredity (ii) Life style (iii) Environment (iv) Socioeconomic conditions (v) Health and Family welfare services **(1 mark for discussing any 1 determinant of the following)** **i) Heredity:** The genetic makeup of an individual is unique and it cannot be changed. A number of diseases are of genetic origin. eg. Hemophilia, **(ii)Life style**: It is the way people live. It reflects the social values, attitudes and activities of an individual. It is composed of cultural and behavioural patterns and lifelong personal habits like smoking, alcoholism etc. Health requires healthy lifestyles. Many diseases are associated with lifestyles. e.g. Obesity, heart diseases. **(iii) Environment:** Health of a person depends on the Internal environment and External environment. Internal environment refers to the coordinated, harmonious functions of every component (system) of the body, which is known as homeostasis in the body. External environment refers to all the things in the surrounding of the individual to which he is exposed. Environment has direct impact on the physical, mental and social well-being of those living in it. The environmental factors range from housing, water supply, family structure, stress etc. **(iv) Socioeconomic conditions:** Health status is significantly determined by the Socioeconomic levels which are primarily determined by, Economic status, Education, Occupation and Political system. **(v) Health and Family welfare services:** These services cover a wide spectrum of personal and community services for treatment of disease, prevention of illness and promotion of health. The purpose of health services is to improve the health status of population. e.g. (1) Immunization, general screening programmes for infectious	**3M** **(2+1)**

		diseases. Family planning programmes. (2) Adequate supply of safe drinking water, proper sanitation.	
2	**f)**	**Write importance and procedure for Gram Staining** **Importance: (1 mark)** It's a differential stating procedure and helps to identify different types of bacteria. The Gram stain is commonly used differential staining technique for bacteria. **Procedure: (2 marks)** Prepare the smear and the follow the steps. i) Flood the slide with crystal violet solution for up to one minute. Wash off briefly with tap water (not over 5 seconds). Drain. ii) Flood slide with Gram's Iodine solution, and allow to act for about one minute. Wash off with tap water. Drain. iii) Remove excess water from slide and blot, so that alcohol used for decolourization is not diluted. Flood slide with 95% alcohol for 10 seconds and wash off with tap water. Drain the slide. iv) Counter stain with safranin solution for 30 seconds. Wash off with tap water. Drain and blot dry. v) All slides of bacteria must be examined under the oil immersion lens.	**3M** **(1+2)**
3		**Attempt any FOUR of the followings**	**12M** **(4X3=12)**
3	**a)**	**Discuss in detail Noise Pollution.** **Definition: (1 mark)** It is defined as unacceptable sound i.e. the sound not pleasant to hear. **OR** It is defined as wrong sound at wrong place at wrong time. **Effects of Noise: (1 mark)** **A) Auditory Effects:** i) Whistling and buzzing sounds in ears.	**3M** **(1+1+1)**

		iii) Temporary hearing loss which may lead to deafness. **B) Non-auditory Effects:** i) Difficulty in concentration ii) Feeling of fatigue. iii) Annoyance iv) Decreased efficiency vi) Physiological changes as – Headache, hypertension, increased heart rate, sweating, nausea, giddiness, sleep disturbances etc. **Noise control measures: (1 mark for any 2 measures)** a) Control of noise at source: It can be achieved by segregating noisy machines and by using mufflers or other noise reducers to machines. b) Control of transmission: This can be achieved by building enclosures and covering walls with sound absorbing material. c) Protection of exposed persons: It is recommended for all workers who are consistently exposed to noise louder than 85 dB in the frequency band above 150 HZ. Periodical audiogram check-ups, use of ear plugs, ear muffs is also essential. d) Education: Education of people through available media is required to highlight the importance of noise as a community hazards.	
3	**b)**	**Define blindness. Write causes, prevention and control of blindness.** **Definition: (1 mark)** Blindness is defined as ' visual acuity of less than 3/60 (Snellen) or its equivalent. **Causes: (1 Mark for any 2 points of the following)** 1. Vitamin A deficiency due to malnutrition and disease like measles can extremely weaken the vision. 2. Cataract, glaucoma, trachoma and other eye infections are common causes. 3. Congenital disease, tumour of eye, retinal detachment, diabetes, hypertension, and diseases of nervous system. 4. Persons working in industries and mines as occupation gets eye injuries often.	**3M** **(1+1+1)**

		5. Use of infected kajal and treatment by quacks can also lead to blindness. **Prevention and control: (1 Mark for any 2 points)** i. Improving nutrition particularly related to Vitamin A intake. ii. Proper and timely treatment of infectious diseases of eye. iii. Improving safety measures and working conditions at occupation places. iv. Regular eye check-up of children in schools followed by health education helps to prevent blindness	
3	**c)**	**Write sources of air pollution. Write its effect on health.** **Sources of air-pollution: (2 Marks for any 4 sources)** 1. Combustion of fuels: coal, wood, petrol, diesel, etc. causes tar and gaseous pollution by oxides of sulphur and oxides of carbon. 2. Automobiles: Automobiles smoke causes pollution by carbon monoxide, nitrogen oxide and oxides of sulphur 3. Industries: Chemical, cotton, cement, asbestos industry may cause pollution by tar i.e. particulate material or by gases like carbon dioxide, carbon monoxide 4. Human and animal respiration 5. Use of insecticides and pesticides 6. Decomposition of vegetables and animal matters **Effects of air-pollution on health : (1 Mark)** 1. Respiratory disorders such as bronchitis, asthma, lung cancer etc. 2. Ill effects on organs such as heart, kidney, liver, skin, eyes etc.	**3M** **(2+1)**

3	**d)**	**Write about hormonal contraceptives.** **Hormonal contraceptives methods:** **1. Oral pills:** • Combined pills with oestrogen and progesterone such as Mala- N and Mala-D. • Progestogen only pill with small amount of Norethisterone or Levonorgestrel. • Post-coital pill or emergency contraceptive pills **2. Depot (slow release) formulations :** • Injectable • subcutaneous implants • vaginal rings. **Mechanism of action of hormonal contraceptives:** 1. Inhibition of ovulation: 2. Preventing implantation by altering endometrium so that it is not conducive for implantation **Advantages :** 1.Very effective reversible method 2.Method is safe and easy to use 3. Does not interfere with sexual pleasure. 4. Regulates menstrual cycle and decreases menstrual blood loss. 5. Protects women from anaemia by minimizing blood loss. **Disadvantages:** 1.Headache 2. Depression (sometimes severe) and mood changes. 3.Nausea and vomiting 4. No protection against Sexually Transmitted Diseases. 5.Weight gain	**3M**

3	**e)**	**Define medical entomology. Discuss in detail about insect control.** **Definition: (1 mark)** Medical entomology: It is defined as the study of medically important insects (those which transmit diseases) OR A study of arthropod which transmit disease in environment is known as medical entomology **General principles of insect control:(2 Marks)** 1.**Environmental control:** It includes: a) Elimination of breeding places. b) Filling and drainage operation. c)Carefully planned water management d) Proper disposal of refuse. 2) **Chemical control:** In this various insecticides such as organochlorine, organophosphorus etc are used. 3) **Biological control:** For these living organisms are used to control environmental pollution.eg. Fish (Gumbusia) is used to control mosquito. 4) **Genetic control:** Techniques such as cytoplasm incompatibility, chromosomal translocation etc. are used in genetic control of insects.	**3M** **(1+2)**
3	**f)**	**Write about types, prevention and control of diabetes mellitus.** **Types of Diabetes mellitus: (1 Mark)** a) IDDM type 1 i.e. Insulin Dependent Diabetes Mellitus or Juvenile diabetes b) NIDDM type 2 i.e. Non-insulin Dependent Diabetes Mellitus or Maturity onset c) GDM i.e. Gestational Diabetes Mellitus	**3M** **(1+2)**

		Prevention and Control: (2 Marks for any 4 points) 1. Maintenance of normal body weight. 2. Physical exercise and dietary control. 3. Regular check-up of blood sugar level 4. Avoiding bad habits like smoking and alcohol consumption. 5. Treatment with insulin and oral anti- diabetic agents.	
4		**Attempt any FOUR of the followings**	**12M** **(4X3=12)**
4	**a)**	**Define the term fertility. Explain various factors affecting fertility.** **Definition : (1 mark)** Fertility means the ability to produce off springs or children. **Factors affecting fertility : (2 marks for any 4 factors)** **1. Age at marriage:** The fertility data on national scale reveals that females who marry before the age of 18 gave birth to larger number of children than those who married later. Early marriage is a common and long established custom in India. But according to the child Marriage Restraint Act — 1978, the legal age at the time of marriage should be, 18 years for girls and 21 years for boys **2**. **Duration of married life:** It has been observed that 10-25 % of all births occur within 1-5 years of married life, 50-55 % of all births within 5-15 years of married life, but after 25 years of married life it is very low. This data suggests that family planning efforts should be concentrated in the first few years of married life. **3. Spacing of children:** spacing of children significantly declines the fertility rate. **4. Education:** Literacy helps to decline the fertility rate. It has been observed that the total fertility rate is more among illiterate than among the literate. **5. Economic status:** There is inverse relationship between economic status and fertility rate. More the per capita income of the family less is the birth rate. The world population conference in fact stressed that "Economic development is the best contraceptive." **6. Religion and caste:** Muslims have higher fertility rate than Hindus and Hindus	**3M** **(1+2)**

		have higher fertility rate than Christians. Amongst Hindus, lower castes seem to have a higher fertility rate than higher castes. **7. Nutrition:** The economic status and nutrition are directly related to each other. But there is indirect effect of nutrition on fertility rate. All well fed societies have low fertility and poorly fed societies high fertility rate. **8. Family planning :**Family planning is an important and key factor in reducing the fertility	
4	**b)**	**Classify food. Write functions of carbohydrates and proteins.** **Classification of food: (1 mark for any 2 types of classification)** **I) By origin** A) Vegetable origin :- Green leafy vegetables, fruits B) Animal origin: - Meat, Milk, fish, eggs. **II) Classification by function :** a) Energy giving food :- cereals, dried fruits, sugars, roots, tubers b) Body building food :- milk, meat, fish poultry, eggs c) Protective food: - Green leafy vegetable, fruits, milk, eggs, liver. **III) Classification by chemical composition:** Carbohydrates, fats, proteins, vitamins, minerals **Functions of Carbohydrate : (1 mark for any two functions)** 1. They are main constituents of diet 2. They are the main source of energy (4 k cals per gram.) 3. They are essential for the oxidation of fats. 4. They are required for the synthesis of some non-essential amino acids. **Functions of Proteins: (1 mark for any two functions)** 1. Body building, repair and maintenance of tissues.	**3M** **(1+1+1)**

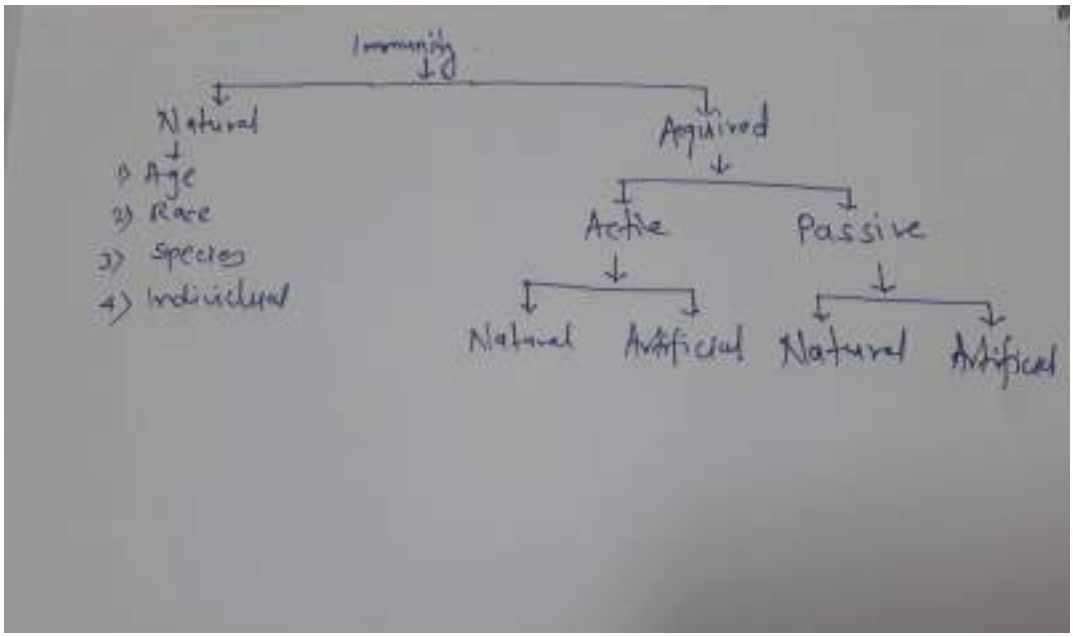
		2. Maintenance of osmotic pressure. 3. Synthesis of antibodies, plasma proteins and haemoglobin 4. Provision of energy: Spare amount of proteins can be used for the production of heat and energy.	
4	**c)**	**Define the term Immunization. Write the immunization schedule.(1 mark for definition and 2 marks for schedule)** **Definition:** Immunization is the process of protecting large number of population by producing immunity or resistance in the body by means of immunological agents (vaccines).	**3M (1+2)**

Beneficiaries	**Age**	**Vaccine**	**No.of doses and Route of administration.**
Infants	6 weeks to 9 months	DPT	3 intramuscular
		Polio (OPV) BCG	3 oral 1 intradermal
	9 to 12 months	Measles	Subcutaneous
Children	16 to 24 months	DPT (I booster)	1 intramuscular
		Polio (I booster)	1 oral
	5-6 years	DT (II booster)	1 intramuscular, (2 doses if not immunized previously)
		Typhoid	2 subcutaneous.
	10 years	Tetanus toxoid	1 intramuscular
		Typhoid	1 subcutaneous
	16 years	Tetanus toxoid	1 intramuscular
		Typhoid	1 subcutaneous
Pregnant women	16 to 36 weeks of pregnancy	Tetanus toxoid	2 intramuscular.

4	**d)**	**Classify contraceptive methods with examples.** **A. Temporary Methods** **1. Barrier methods** (a) Physical methods : i) Condom ii) Diaphragm iii) Vaginal sponge (b) Chemical methods : i) Foams ii) Creams iii) Suppositories iv) Soluble films **2.Intra – uterine device (IUDs)** (a) Non-medicated IUDs : Loops as Lippes loop (b) Medicated IUDs : i)Metal containing IUDs : Copper- 7, Copper T – 200, T.Cu- 380 A or Ag ii)Hormone containing IUDs : Progestasert **3.Hormonal methods:** (a) Hormonal pills : i) Combined pill : Mala –N , Mala –D ii) Progestogen only pill iii) Post coital pill: Tab. Unwanted 72, Tab. I pill 72 iv) Once a month pill v) Male pill (b) Slow release preparations i) Injectables : DMPA and NET-EN ii) Subcutaneous implants : Norplant iii) Vaginal rings **4.Post conception methods**	**3M**

		(a) Menstrual regulation (b) Menstrual induction **5.Miscellaneous methods** (a) Abstinence (b) Coitus interruptus (c) Safe period use method (d) Natural family planning method (e) Breast feeding method (f) Birth control vaccine **B) Permanent Methods** 1. Male sterilization (Vasectomy) 2. Female Sterilization (Tubectomy)	
4	**e)**	**Discuss Cardio-pulmonary Resuscitation (CPR).** CPR is most important lifesaving first aid procedure in patients whose spontaneous respiration has stopped and/or pulse is absent. CPR can be done by ABC Formula – where – A – stands for Airway Clearance B - stands for Breathing C – stands for Circulation or Cardiac Massage **1) Airway Clearance:** i)First of all the air passage should be opened and cleaned to make free passage of air. For this wrap a handkerchief of clean cloth on first two fingers of hand together and clean victims mouth carefully by turning the mouth of the patient to one side. to remove debris, impurities or secretions so as to prevent blocking airway. ii) Tilt the head back and lift the chin to bring it forward which prevents obstruction of the airway by the tongue. **2) Breathing:** i) If breathing is stopped, mouth to mouth respiration i.e. artificial respiration is	**3M**

		given, after cleaning mouth. ii) First aider should pinch nose of patient tightly by one hand, breath in lungful of air and breath out entire air forcefully in patients' airway by tightly sealing mouth on patients' mouth. iii) Expansion of chest of patient by 2-5cm should be observed that confirms air entering in to victim's lungs. iv) For adult patient such 12 mouth to mouth breathing are given per minute. v) In case if victims' mouth cannot be opened due to any reason, mouth to nose artificial respirations should be given by placing mouth on victims' nose. **3) Circulation or Cardiac Massage:** i) If patient's pulse is missing, to revive working of the heart, chest massage is given. ii) It is performed by pressing hard with both hands on victims' chest, two fingers above the lower end of sternum. iii) First aider should exert pressure by heel of hands keeping hands exactly perpendicular to patients' chest i.e. area of compression. iv) Pressure applied should be sufficient so that chest gets pressed by 1.5 to 4 cm. v) Such chest massage is given 60-80 times per minute continuously.	
4	**f)**	**Define Immunity. Classify it.** **Definition: (1 mark)** Immunity is defined as "ability to produce and possess specific protective antibodies or the cellular mechanism, as a result of previous infection or immunization or body conditioned so by such previous experience as to respond sufficiently to prevent infection or clinical illness or both, after exposure to a specific infectious agent". OR The power of the body to resist the effects of invasion of pathogens is known as immunity	**3M** **(1+2)**

		Classification of immunity: (2 marks)  	
5		**Attempt any FOUR of the followings**	**12M**
5	**a)**	**Discuss various methods of small scale purification of water (Any 3 methods to be discussed)** **Small scale purification of water :** Four different methods are generally available; these Methods can be used alone or in combinations. **a) Boiling:** Boiling the water for 5 to10 min is satisfactory method for purifying water for household purposes. It kills bacteria, spores, cyst, ova and yields sterilized water .It also removes temporary hardness. Water should be boiled preferably in same container, in which it is to be stored to avoid contamination during storage. **b) Chemical Disinfection:** Bleaching powder OR Chlorinated lime:It has 33 percent of available chlorine. It is used to Disinfect water.The principle of chlorination is to ensure a“free” residual chlorine of 0.5mg/liter at the end of one hour contact.	**3 M**

		Other agents used: chlorinated solution, chlorine tablets (halozone), high test hypochlorite(HTH) which is calcium compound called as perchloron, containing 60-70%available Chlorine, Iodine, Potassium permanganate: **c) Filtration:** Household water can be purified with the help of ceramic filters like Pasteur Chamber land filter , Berkefeld filter and Katadyn filter .These filter candles usually remove bacteria found in drinking water but not viruses. Apart from candle filters, on-line filters with bacteria retentive capacity are available which may be incorporated in water line or fitted to tap. **d) Disinfection of wells:** Wells are the main source of water supply in rural areas. The most effective and cheapest way of disinfecting well is by bleaching powder .	
5	**b)**	**Write Disinfection procedure for** **i) Room: (1.5 marks)** The floors and hard surfaces of the rooms can be disinfected with chemical agents like phenol , formalin bleaching powder etc., **ii) Sputum Disinfection: (1.5 marks)** a. Sputum is collected in paper cups and disinfected by burning in case when amount is small. b. Sputum in large amount is disinfected by boiling under pressure 20 lbs for one or one and ½ hrs and then is buried. c. Readymade paper cups can be given carrying 5% cresol solution to spit sputum in to it and after 2hrs.contact period and then cups are buried. or disposed by burning.	**3M** **(1.5+ 1.5)**
5	**c)**	Write function and deficiency disease of: **(i) Calcium** :**(1 mark for any two functions and 0.5 mark for deficiency)** **Functions** 1.It is necessary for growth of bones and teeth. 2.It is required for the clotting of blood. 3.It regulates the contraction of muscles.	**1.5 + 1.5**

		4.It is required for cardiac action production. 6.It forms a component of several enzyme. **Deficiency** of calcium leads to Rickets in children and Osteomalacia in adults. It also leads to delayed blood clotting **(ii) Iron:(1 mark for two functions and 0.5 mark for deficiency)** **Functions** 1.It is necessary for synthesis of hemoglobin. 2.It is essential for the formation of various enzymes. 3.It is required for brain development and muscle activity . 4.It is needed for the regulation of body temperature. 5.It has central function in oxygen transport and cell respiration. **Deficiency** of iron leads to iron deficiency anemia,and decreased immunity.	

5	**d)**	**What are hospital acquired infections? Write prevention and control of noscomial infection.** **Hospital Acquired Infections: (1 mark)** Hospital-acquired infection or noscomial infection are used for infections developing in hospitalized patients, which were neither present nor under incubation at the time of their admission. **Control and Prevention: (2 marks for any 4 points)** To achieve this, a committee needs to be appointed in the hospital and they need to monitor following aspects on regular basis : i)Cleanliness in the hospital ii)Proper sterilization of instruments and maintaining aseptic conditions wherever required iii)Controlling overuse of antibiotics iv)Maintaining Health and hygiene of hospital staff v)Avoiding water ,food contamination vi)Proper isolation of infectious patients	**3 M** **(1+2)**
5	**e)**	**Name type of fracture and First Aid Treatment for fracture.** **Types of fractures: (1 mark)** a) Simple Fracture (Closed Fracture) b) Compound Fracture(Open Fracture) c) Complicated Fracture	**3M** **(1+ 2)**

		d) Comminuted fracture **First Aid Treatment for fracture: : (2 marks)** i .Control bleeding if any by applying pressure bandage. ii .Cover all wounds with sterile dressings. iii .Immobilize the fracture parts immediately by using bandages or splints.(It is a support for a broken bone like wooden plank, Cardboard, Metal etc.) iv .Immobilization is important to prevent pain,further damage, to support to tissues which are ordinarily supported by that bone and to accelerate rapid healing of that bone. v .During immobilization of broken bone use adequate padding in the natural hollows	
5	**f)**	**Give advantages and disadvantages of condoms** **Advantages of condom: (Any three)** 1) It is safe, cheap and effective method 2) It possesses minimal or no side effects. 3) Condom use does not require medical supervision 4) It prevents transmission of STDs,including that of HIV infection to the sexual partner . 5) easily available **Disadvantages of condom: (Any three)** 1) It may tear or slip off during sexual intercourse. 2)It may cause leakage problem leaving semen in vagina 3)It may interfere in sexual pleasure during intercourse 4)It is to be used regularly which requires constant motivation. 5) It may cause allergic reactions in some individuals having latex allergy	**3M** **(1.5+1.5)**

6		**Attempt any FOUR of the followings:(1 mark each for causative agent, mode of transmission, symptoms and control)**	**16M (4x4=16)**
6	**a)**	**TUBERCULOSIS** **Causative agent**: bacteria called *Mycobacterium tuberculosis*. **Modes of Transmission**: Air borne infection transmitted by droplet from sputum of Patient through coughing, sneezing and talking of the patient. **Symptoms:** 1.Cough for more than 2 weeks 2.Fever 3.Weakness 4.Loss of weight 5.Loss of appetite 6.Chest pain 7.Blood in sputum. **Control :** 1. Early detection of cases by identifying symptoms and by carrying out i)Sputum test ii)chest x-ray , iii) Mantoux test or other tests as per symptoms. 2. Preventive treatment with INH or INH plus ethambutol . 3. Combination treatment for complete duration. 4. Isolation 5.Immunization with B. C.G vaccine 6.Balanced diet and health education.	**(1+1+ 1+1)**
6	**b)**	**AIDS** **Causative agent :** Virus known as Human Immunodeficiency Virus (HIV). **Mode of transmission:** 1) Sexual contact 2)Transfusion of the infected blood 3) Through contaminated needles and syringes. 4)Trans-placental or vertical transmission i.e from infected mother to foetus	**(1+1+ 1+1)**

		Symptoms: i .Weight loss ii .Chronic diarrhea iii .Prolonged fever iv .Persistent cough v .Generalized pruritic dermatitis. vi .Recurrent herpes zoster infection. vii .Oropharyngeal candidiasis. viii .Generalized lymphodenopathy viii) Kaposi ' ssarcoma ,meningitis **Control :** 1.Screening of blood before transfusion 2. Screening of high risk groups like prostitutes and drug addicts. 3. Use of disposable syringes for injection. 4. Avoid indulgence in multiple sex partners, avoid oral , anal sex. 5. Use of condom. 6. Health Education.	
6	**c)**	**Cholera** **Causative Agent**: Vibrio cholerae. **Mode of Transmission**: 1. Spread is mainly by contaminated food,water,milk. 2. Human being is the only reservoir of cholera infection. 3. Immediate source of infection is the stools and vomitus of cases and carriers. **Symptoms:** Acute diarrhoea,vomiting,nausea,dehydration,weakness **Control:** 1.Early detection of suspected cases and bacteriological examination of stools for confirmation 2.Notification to the local health authority 3.Rehydration using ORS ,zinc and if required antibiotics 4.Disinfection of stools, Vomitus, clothes, bedding, rooms and utensils	**(1+1+ 1+1)**

		5.Sanitary measures like water control fly control and disposal of excreta 6. Prevention by cholera vaccine especially during fairs and festivals. 7. Health education stressing the importance of food hygiene personal hygiene and water hygiene. 8. Water and milk should be consumed only after boiling. 9. Fruits, vegetables should be thoroughly cleaned before use.	
6	**d)**	**Leprosy** **Causative agent**: Bacteria Mycobacterium leprae. **Mode of Transmission**: 1. Leprosy is mainly transmitted by direct or indirect contact of an infected patient. 2. Sometimes it is transmitted by droplet infection through nasal and oral secretion of the patient. 3. Through breast milk of lepromatous mother , **Symptoms:** Skin patches (lesions), partial or total loss of cutaneous sensation in the affected area, thickening of nerve, deformities of toes, fingers ,nose etc, cough and fever **Control :** 1.Detection of cases of leprosy and tracing the contacts especially children 2.Multidrug therapy for control and cure. 3.Prevention of contact between the patient and other normal persons, especially children. 4.Selective isolation or hospitalization of the patient showing acute reactions 5.Health education	**(1+1+ 1+1)**
6	**e)**	**Plague** **Causative Agent** : bacteria Yersinia pestis **Mode of Transmission:** Through infected rat fleas and .In later stage through droplet infection from infected patients **Symptoms:**	**(1+1+ 1+1)**

		Fever, chills,hedache, inflammation of lymphatic glands, Large bubos develop in groin,often in axilla or neck. Septicemia **Control :** 1. Early diagnosis and immediate isolation. 2.Notification 3. Proper disinfection and disposal of sputum of patient. 4.Use of antibiotic such as Tetracycline 5. Rodent control by DDT, BHC etc. 6.Vaccination	
6	**f)**	**Trachoma** **Causative Agent**: Chlamydia trachomatis **Mode of Transmission:** 1. direct or indirect contact of infected persons or through fomites like Infected finger, towel, kajal & surma. 2. Discharge of eye secreations 3.Swimming pool where water can get contaminated 4.Overcrowding spreads transmission **Symptoms:** Trachoma produces inflammation and scarring of the conjunctiva. This lead to inward deviation of eye lashes and lid margin. The eyelashes produce abrasion of the cornea This results in corneal ulcer. Ultimately it leads to blindness. **Control:** 1. Early diagnosis and treatment of cases. 2.Surgicalcorrectionofeyeliddeformities 3. Common use of eye cosmetics like should be done with precautions. 4.Health education and community hygiene plays an important role in prevention and Control of trachoma 5. Treatment with Tetracycline, Erythromycin.	**(1+1+ 1+1)**

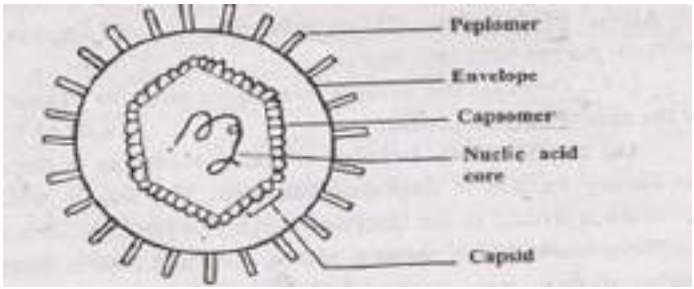
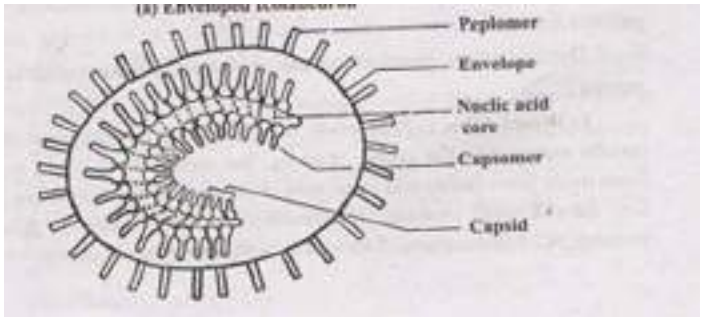
Subject Title: HEALH EDUCATION AND COMMUNITY PHARMACY **Subject Code:** 0810

Important Instructions to examiners:

1) The answers should be examined by key words and not as word-to-word as given in the model answer scheme.
2) The model answer and the answer written by candidate may vary but the examiner may try to assess the understanding level of the candidate.
3) The language errors such as grammatical, spelling errors should not be given more Importance (Not applicable for subject English and Communication Skills.
4) While assessing figures, examiner may give credit for principal components indicated in the figure. The figures drawn by candidate and model answer may vary. The examiner may give credit for anyequivalent figure drawn.
5) Credits may be given step wise for numerical problems. In some cases, the assumed constant values may vary and there may be some difference in the candidate's answers and model answer.
6) In case of some questions credit may be given by judgement on part of examiner of relevant answer based on candidate's understanding.
7) For programming language papers, credit may be given to any other program based on equivalent concept.

Q. No.	Sub Q. N.	Answer	Marking Scheme
1		**Answer any Eight of the followings:**	**16M (8X2)**
1	a)	**Define Health.** Health is a state of complete physical, mental and social wellbeing and not only an absence of disease or infirmity.	**2M**
1	b)	**Name the deficiency disease of following nutrients:** (i) Vit.C-Scurvy (ii) Iron-Microcytic /Iron deficiency Anaemia (iii) Vit.B_{12}-Pernicious anemia, Megaloblastic anemia (iv) Calcium-Oesteomalacia , Osteoporosis	**2M (0.5 X 4)**
1	c)	**Write one advantage and disadvantage of terminal method of family planning.** **Advantages :** 1. Failure rate is very less. 2. Available for both sexes. 3. Very highly effective., no side effects 4. Convenient surgical methods. **Disadvantages:** 1. No reversal is possible as it is permanent method of contraception. 2. Method adoption requires trained surgeon.	**2M (1+1)**
1	d)	**Write scope of first aid.** Emergency and immediate treatment given at the spot to the accident victim or a patient of sudden illness till the medical help becomes available. 1. Preserve life 2. Prevent complications and 3. Minimize sufferings	**2M**
1	e)	**Write causes of air pollution.** 1. Respiration of human beings and animals. 2. Combustion of coal, gas, oil etc.	**2M (0.5 X 4)**

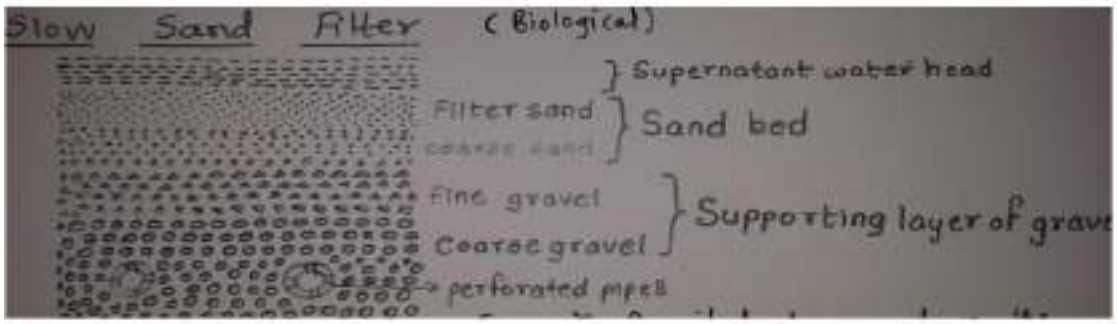
		3. Decomposition of organic matter. 4. Traffic, industries - which give off dust, fumes, vapours, harmful gases. 5. Industrial and domestic combustion of coal, oil and other fuel is the source of smoke, dust, and sulphur dioxide. 6. Chemical industries, textile industries, oil refineries, fertilizer factories etc. contribute to air pollution. 7. Automobiles like heavy and light vehicles, aircrafts, trains and other forms of transport.	
1	**f)**	**Define Microbiology.** It is the study of microorganisms with respect to their cytology, physiology, reproduction and useful activities or harms caused. **OR** Microbiology is the study of microscopic organisms It is derived from three greek words - mikros ("small"), bios ("life") and logos (science")	**2M**
1	**g)**	**Give long form of following abbreviations:** (i) AIDS-Acquired Immuno Deficiency Syndrome (ii) BMI-Body Mass Index (iii)DT- Diphtheria & Tetanus (iv)OPV-Oral Polio Vaccine	**2M** **(0.5 X 4)**
1	**h)**	**Define Stroke.** A **stroke** is a medical condition in which rupture of blood vessels or blockade in blood vessels causes poor blood flow to the brain resulting in cell death which may lead to sudden weakness, unconsciousness, paralysis etc	**2M**
1	**i)**	**Differentiate between Natural immunity and Artificial immunity.** Natural immunity is the immunity which is by birth or developed in body after exposure to the infectious agents. Artificial immunity is developed by the body in response to the use of vaccination.	**2M**
1	**j)**	**Classify Protozoa.** • Flagellates, or Mastigophora- e.g. *Giardia lamblia* • Amoebae or Sarcodina-e.g. *Entamoeba histolytica*	**2M**

		• Sporozoans, or Sporozoa-e.g. *Plasmodium knowlesi* • Ciliates, or Ciliophora e.g. *Balantidium coli*	
1	**k)**	**Draw well labelled diagram of virus.**  **OR**  	**2M**
1	**l)**	**Name any one disease transmitted by following :** **(1) Mosquito –** Malaria, Dengue fever, yellow fever, chickenguniya etc. **(2) Rat-** Plague , Tularaemia , Salmonellosis , Lassa fever, Haemorrhagic fever , Scrub typhus , Murine typhus , Amoebiasis , Leishmaniasis , Rat bite fever , Leptospirosis	**2M** **(1+1)**
2		**Answer any FOUR of the following:**	**12M** **(4X3)**
2	**a)**	**Explain levels of prevention of disease.** **Concept of Prevention of diseases:** Prevention of disease is defined as ways/methods to promote and preserve health, restore it when it is impaired and to minimize the sufferings. Prevention can be done at 3 levels: I) **Primary prevention:** It can be defined as "action taken prior to the onset of	**3M** **(1+1+1)**

		disease, which removes the possibility that a disease will ever occur". This involves: 1) Primordial prevention 2) Population or mass strategy 3) High risk strategy II) **Secondary prevention:** It can be defined as the "action which halts the progress of a disease at its incipient stages and prevent complications." This involves early detection and treatment of the disease. III) **Tertiary prevention:** It is taking the steps when disease has already progressed i.e. late pathogenesis phase. It includes measures to reduce or limit impairments and disabilities, minimizes sufferings caused by diseases and to promote the patient's adjustment to untreatable conditions. Rehabilitation is the main mode of intervention.	
2	**b)**	**Write sources, functions and deficiency diseases of Iodine.** **Sources :** Sea food as fishes, sea salt, sea weeds, cod liver oil, milk, meat, vegetables etc. **Functions-** Required for synthesis of Thyroid hormones which helps regulate growth, development, and metabolism. **Deficiency diseases:** Simple goiter (most common), hypothyroidism, cretinism, myxoedema.	**3M** **(1+1+1)**
2	**c)**	**Define the term Demography. Explain demographic cycle.** **Definition:** Demography is the scientific study of human population. **Demographic Cycle :** It comprises of following 5 stages – **i) First Stage:** It is "High Stationary Stage ". The feature of this phase is both natality i.e. birth rate and mortality i.e. death rate are very high. Both cancel each other keeping population steady. India was in this phase till 1920.	**3M** **(0.5+2.5)**

		ii) Second Stage: It is "Early Expanding Stage ". Here mortality starts falling down but birth rate remains same i.e. higher. As a result population starts increasing. At present African and South Asian countries are in this phase. **iii) Third Stage:** It is "Late Expanding Stage ". Her mortality continues to fall but birth rate also started decreasing. But yet birth rate remains higher than death rate. So population continues to increase. China, India, Singapore are at this stage. **iv) Fourth Stage:** It is "Low Stationary Stage ". It is also called Zero Growth stage as birth rate equals death rate and both are lowered. So net population growth is zero. Many developed countries have reached this stage in last 20 years. **v) Fifth Stage:** It is "Negative Growth Stage". Here death rate is higher than birth rate. So there is decline in population size. Reasons behind are advancement in medical science and facing problems of population increase. Germany and Hungary are presently at this stage.	
2	**d)**	**What are burns? Write symptoms and first aid for burns.** **Definition:** Burns are defined as injuries caused by dry heat such as flame, fire or hot metal; or by chemicals as strong acids or strong bases, or by electricity or radiation. **Or** A type of injury to skin, or other tissues, caused by heat, cold, electricity, chemicals, friction, or radiation is known as burns. **Symptoms:** The symptoms of burns depend on the cause and type of burn. They can include: • Blisters • Pain (The degree of pain is not related to the severity of the burn, as the most serious burns can be painless.) • Peeling skin	**3M** **(1+1+1)**

		• Red skin • Shock (Symptoms of shock may include pale and clammy skin, weakness, bluish lips and fingernails, and a drop in alertness.) • Swelling • White or charred skin **First aid for burns:** 1) Assure casualty of life being saved, casualty if conscious. 2) Burnt area should be cooled by putting plenty of water or cloth soaked in cold water. 3) Remove clothing of casualty by cutting around, if possible. 4) Keep casualty in lie down position. 5) Do not disturb blisters. 6) Cover burnt area by large dressings or clean bed sheet. 7) Antiseptic lotion, ink, oil, flour, baking soda, etc. should not be applied on burnt area. In fact burnt area should not be touched unless it is most necessary. 8) Ornaments, belt, shoes, etc. should be removed immediately from body of casualty, since if limbs swell, such articles may cause gangrene. 9) If conscious, give to the casualty frequent sips of water. 10) In case of chemical affected burns, to wash-off all chemical wash affected area with plenty of water. 11) If there is delay in hospitalization, normal saline or Ringer lactate solution may be given by IV route. This prevents patient from shock. Suitable analgesic may be given by IV route.	
2	**e)**	**Name any two water borne diseases. Write about slow sand filter.** **Water borne disease:** Amoebiasis, Shigellosis, Cholera, Typhoid, Polio, Hepatitis A, Giardia etc.	**3M** **(1+2)**



Schematic representation of the slow sand filter bed

Slow sand filtration is a method which uses supernatant raw water, a bed of graded sand, an under drainage system and filter control valves. Under ideal conditions, the filter reduces bacterial count by 99.9 percent.

The steps of a slow sand filter are as follows:

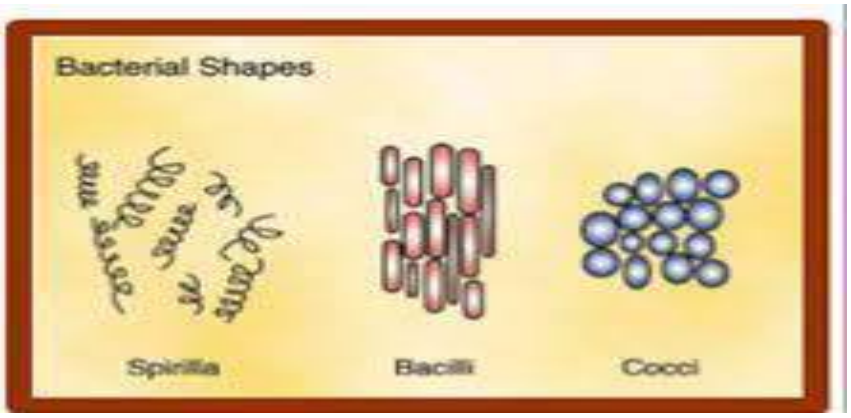
1. Supernatant raw water: The supernatant water above the sand bed measures in depth 1-1.5 metres. It provides an opportunity for natural purification by oxidation and sedimentation, secondly water is forced by the gravity downwards to facilitate filtration.

2. Graded sand bed: The sand bed is the most important component as this is filtering the water. This consists of sand of different particle sizes and the thickness .The finest sand is on the top and comparatively coarse sand is below that. Water percolates through the beds very slowly and during this is subjected to mechanical straining, sedimentation, adsorption, oxidation and bacterial action. This filter is called as biological filter because the surface of the sand gets covered with slimy growth (vital layer or biological layer), which consists of thread like algae and numerous forms of life including plankton, diatoms and bacteria. This vital layer removes organic matter, holds back bacteria and oxidizes ammoniacal nitrogen into nitrogen and helps in yielding bacteria free water.

3. Gravel support: Below the sand bed is the layer of gravel which supports the sand bed. The upper part consists of fine gravel and in the lower part is coarse gravel.

4. Under drainage system: Just below the coarse gravel there is a network of porous or perforated pipes.

5. A system of filter control valves: All the above components are placed inside a box

		called as a filter box. The walls of the box are made of stones, bricks or cement. The whole filtration process is controlled by filter control valves so that filtered water is available at a desirable rate.	
2	**f)**	**Classify bacteria depending upon their shape.** Bacteria depending upon their shape are classified as- **(i) Cocci-** Bacteria spherical or round in shape **(ii) Bacilli-** Rod shaped bacteria **(iii) Spirilla –** Rigid spiral or spring shaped bacteria **(iv) Vibrios-** Comma shaped bacteria **(v) Actinomycetes –** Branching filamentous bacteria **(vi) Mycoplasmas –** Round or oval bodies as they lack cell wall. So shape is not fixed. 	**3M**
3		**Answer any FOUR of the following:**	**12M** **(4x3)**
3	**a)**	**Give causes prevention and control of Blindness.** **Causes:** i) Vitamin A deficiency due to malnutrition and disease like measles can extremely weaken the vision. ii) Cataract, glaucoma, trachoma and other eye infections are common causes. iii) Congenital disease, tumour of eye, retinal detachment, diabetes, hypertension, and diseases of nervous system. iv) Persons working in industries and mines as occupation gets eye injuries often.	**3M** **(1+2)**

		v) Use of infected kajal and treatment by quacks can also lead to blindness. **Prevention and control:** i) Improving nutrition particularly related to Vitamin A intake. ii)Proper and timely treatment of infectious diseases of eye. iii)Improving safety measures and working conditions at occupation places. iv. Regular eye check-up of children in schools followed by health education helps to prevent blindness.	
3	**b)**	**Nosocomial infections. Write prevention and control of Nosocomial infections.** **Nosocomial Infections or Hospital Acquired infections:** **Hospital acquired or nosocomial infections** are the infections acquired by the patients after they have been admitted to the hospital and prior to the hospital admission, the patient do not have the said infection. Common nosocomial infections include infections of urinary tract, respiratory tract, alimentary tracts, wound infections, skin infection, septicaemia etc. **Control and Prevention:** To achieve this, a committee needs to be appointed in the hospital and they need to monitor following aspects on regular basis i) Cleanliness in the hospital ii) Proper sterilization of instruments and maintaining aseptic conditions wherever required iii) Controlling overuse of antibiotics iv) Maintaining Health and hygiene of hospital staff v) Avoiding water, food contamination vi) Proper isolation of infectious patients	**3M** **(1+2)**
3	**c)**	**What is disease agent? Classify them with examples.** The disease agent is defined as a substance living or non living, or a force tangible or nontangible, the excessive presence or lack of which may initiate or perpetuate a disease process. **Classification with examples:**	**3M** **(1+2)**

		1. Biological Agents: The living agents like viruses, fungi, bacteria, protozoa, rickettsiae are the biological agents responsible for causation of disease. **2. Nutrient Agents:** These can be proteins, fats, carbohydrates, vitamins, minerals and water. Excess or deficient intake of these leads to nutritional disorders like anemia, obesity, night blindness, beriberi, scurvy, dehydration, and edema. Etc. **3. Physical Agents:** Exposure to excessive heat, cold, humidity, pressure, radiation, electricity, sound results in illness. **4. Chemical Agents**: Certain chemical substances produced in excess by the body because of derangement of metabolic functions lead to diseases. These are the Endogenous agents causing the disease. Eg. Excess of bilirubin leads to Jaundice. a. Excess of uric acid leads to Gout. b. Excess of calcium carbonate forms kidney stones. **5. Exogenous agents** are acquired by the body from the environment by inhalation, ingestion or inoculation; cause various acute or chronic diseases. Various exogenous chemical agents are allergens, metals, fumes, dusts, insecticides etc. **6. Mechanical Agents**: Exposure to frequent or chronic friction and other mechanical forces result in tearing, sprains, dislocation etc. **7. Social Agents:** Poverty, smoking, drug abuse, unhealthy life styles, social isolation and maternal deprivation can act as causative factors for the development of disease.	
3	**d)**	**Give source and functions of Vitamin D** **Sources:** Egg yolks, liver, fatty fish, fortified milk, fortified margarine. When exposed to sunlight, the skin can make vitamin D. **Functions:** Needed for proper absorption of calcium; stored in bones	**3M** **(1.5+1.5)**
3	**e)**	**What are Intra uterine devices? Classify them.** Intrauterine devices are the contraceptive devices used by women, being fitted in uterus, which prevent conception either by affecting sperm survival or conditions unfavourable for gametes or making conditions unsuitable for embryo implantation. Intrauterine devices (IUDs) can be classified as: (a) Non-medicated IUDs : Loops as Lippes loop	**3M** **(1+2)**

		(b) Medicated IUDs : i) Metal containing IUDs : Copper- 7, Copper T – 200, T.Cu- 380 A or Ag ii) Hormone containing IUDs : Progestasert	
3	**f)**	**Write a note on 'cold chain storage of vaccines.'** Vaccines are biological products and can lose their potency if not stored appropriately. The vaccines should be stored at low temperature starting from the manufacturer to the point of use. The maintenance of temperature throughout the transportation, storage and up to administration is called the cold chain. The cold chain maintenance is necessary because on exposure to high temperature vaccines lose potency and their life is shortened. Also toxic products may be produced. All the vaccines have different heat sensitivities. Oral polio vaccine is the most sensitive to heat; next in order are measles, BCG, DPT, DT and TT. If polio and measles vaccines are to be stored for a longer period as in the State or district storage centre, it can be kept at a temperature below 0°C or in the freezer compartment of the refrigerator, but it should not be repeatedly frozen and melted. DPT, DT, TT and BCG should not be frozen. No vaccine should be exposed to direct sunlight. Devices used to maintain cold chain: Refrigerators, Walk in coolers, ice bags, thermocol Boxes, freezers etc.	**3M**
4		**Answer any FOUR of the following:**	**12M** **(4x3)**
4	**a)**	**Define Noise. What are ill effects of Noise pollution?** **Definition:** Noise is defined as wrong sound at wrong place at wrong time. **Major ill effects of noise:** **Auditory Effects:** 1. Auditory fatigue, decreased hearing ability 2. Deafness which may be temporary or permanent. **Non-auditory effects:** 1. Speech interferences due to noise produced by air traffic, industry etc 2. Anger, irritability which is a psychological response.	**3M** **(1+2)**

		3. Lack of mental concentration, decreased efficiency 4. Physiological changes like rise in blood pressure heart rate, respiratory rate. 5. Headache, Giddiness, nausea, fatigue, insomnia	
4	**b)**	**Write a note on Gram staining** Gram staining: This is widely used differential techniques for bacteria. Technique: **Procedure:** i) Smear (thin microbial film) is prepared on clean glass slide. ii) Smear is air dried and fixed by gentle heating. iii) Crystal violet solution is applied on smear as primary stain for about 1 to 2 min. iv) Potassium iodide solution (grams iodine solution) is applied on smear for 1 to 2 min v) Slide is gently washed with water. vi) Alcohol (95% soln.) now is applied on smear as decolouriser. vii)The secondary stain as counter stain like eosin or saffranin is applied on smear for 20 to 30 sec. vii) Finally slide is washed with water, air dried and observed under oil-immersion lens of microscope. **Observation:** Gram positive bacterial cells appear violet colour, while Gram negative bacterial cells appear pink colour.	**3M** **(1+2)**
4	**c)**	**Write about types and risk factors of Diabetes Mellitus** **Types of Diabetes mellitus are as follows:** **a) IDDM type 1 i.e.** Insulin Dependent Diabetes Mellitus or Juvenile diabetes **b)NIDDM type 2 i.e.** Non-insulin Dependent Diabetes Mellitus or Maturity onset **c) GDM i.e.** Gestational Diabetes Mellitus- Diabetes during pregnancy. **Risk factors of Diabetes mellitus are as follows:** Some of the risk factors are: 1. Pancreatic diseases, defect in the synthesis of insulin or decrease in the number of beta cells. 2. Heredity 3. Sedentary life style and lack of exercise. 4. Diet rich in carbohydrates and fats.	**3M** **(1+2)**

		5. Obesity 6. Infections with viruses like rubella and mumps.	
4	**d)**	**Give disinfection procedure for following:** **(i) Sputum:** a. Sputum is collected in paper cups and disinfected by burning in case when amount is small. b. Sputum in large amount is disinfected by boiling under pressure 20 lbs. For 1 or 1 and ½ hrs and then is buried. c. Readymade paper cups can be given carrying 5% cresol solution to spit sputum into it and after 2 hrs. Contact period and then cups are buried .or disposed by burning. **ii) Room:** The floors and hard surfaces of the rooms can be disinfected with chemical agents like phenol, formalin bleaching powder etc.,	**3M** **(1.5+1.5)**
4	**e)**	**Enumerate different determinants of health. Explain any one** **Health determinants are:** (i) Heredity (ii) Life style, (iii) Environment (iv) Socioeconomic conditions (v) Health and Family welfare services **i) Heredity:** The genetic makeup of an individual is unique and it cannot be changed. A number of diseases are of genetic origin. eg. Mental retardation, Diabetes. haemophilia **(ii)Life style:** It is the way people live. It reflects the social values, attitudes and activities of an individual. It is composed of cultural and behavioural patterns and lifelong personal habits like smoking, alcoholism etc. Health requires healthy lifestyles. Many diseases are associated with lifestyles. eg. Obesity, heart diseases,diabetes **(iii) Environment:** Health of a person depends on the Internal environment and External environment. Internal environment refers to the coordinated, harmonious functions of every component (system) of the body, which is known as homeostasis in the body. External environment refers to all the things in the surrounding of the individual to which he is exposed. Environment has direct impact on the physical, mental and social well-being of those living in it. The environmental factors range from housing, water supply, family structure, stress etc.	**3M** **(1+2)**

		(iv) Socioeconomic conditions: Health status is significantly determined by the socioeconomic levels which are primarily determined by, Economic status, Education, Occupation and Political system. **(v) Health and Family welfare services:** These services cover a wide spectrum of personal and community services for treatment of disease, prevention of illness and promotion of health. The purpose of health services is to improve the health status of population. eg. (1) Immunization, general screening programmes for infectious diseases. Family planning programmes. (2) Adequate supply of safe drinking water, proper sanitation.	
4	**f)**	**Name nutrient causing following disease:** **i) Colour blindness:** Colour blindness is a genetic condition caused by a difference in how one or more of the light-sensitive cells found in the retina of the eye respond to certain colors. These cells, called cones, sense wavelengths of light, and enable the retina to distinguish between colors. This difference in sensitivity in one or more cones can make a person color blind. **Vitamin** A **deficiency** may also cause colour **blindness**. **ii) Blood clotting disorder:** Vitamin K **ii) Wilson's disease (**Inherited Copper Toxicity**):** Wilson disease is caused by an excess of copper metabolities.	**3M**
5		**Answer any FOUR of the following:**	**12M** **(4x3)**
5	**a)**	**Give advantage and disadvantages of condom.** **Advantages:** 1) It is safe, cheap and effective method 2) It possesses very less side effects. 3) Condom use does not require medical supervision 4) It prevents transmission of STDs, including that of HIV infection to the sexual partner. **Disadvantages:** 1) It may tear or slip off during sexual intercourse. 2) It may cause leakage problem leaving semen in vagina	**3M** **(1.5+1.5)**

		3) It may interfere in sexual pleasure during intercourse 4) It is to be used regularly which requires constant motivation.	
5	**b)**	**What is Angina Pectoris? What are risk factors for it?** Angina pectoris is chest pain due to an inadequate supply of oxygen to the heart. It is a symptom of coronary artery disease. **Risk factors:** 1. Tobacco chewing and drinking of alcohol. 2. Diabetes. 3. High blood pressure. 4. High blood cholesterol or triglyceride levels. 5. Lack of exercise. 6. Family history of heart disease. 7. Obesity. 8. Older age.	**3M** **(1+2)**
5	**c)**	**What are health hazards due to improper solid waste disposal? Define sewage.** **Health hazards** due to improper solid waste disposal: Improper disposal leads to bad smell and ugly look, it attracts and helps breeding of many insects and rodents,pollution of water,soil and can cause various diseases.Its a public health issue. **For example:** • Intestinal infections like Hepatitis, Diarrhoea, Cholera etc. • Malaria ,leptospirosis • Skin diseases **Sewage:** Sewage is waste water which contains decomposable organic matter and pathogenic microorganisms.	**3M** **(2+1)**
5	**d)**	**Write a short note on fungal infection.** Fungal Infections are called as Mycoses. 1. Superficial Fungal Infections: these are common infections on skin, nails hair etc E.g.: Ringworm and tinea infections. Causative agents are dermatophytes, candida	**3M**

		albicans etc 2. Deep seated fungal infections: (Systemic mycoses) these infections vary in severity ranging from asymptomatic infections to fatal diseases. Causative agents are actinomycetes, Histoplasma etc 3. Opportunistic fungal infections: These infections occur in patients suffering from diseases such as Cancer, AIDS etc. 4. Cleanliness and hygienic habits are important to avoid fungal infections 5. Antifungal agents used commonly are griseofulvin, clotrimazole etc	
5	**e)**	**Write symptoms & prevention of Hypertension** **Symptoms:** 1. Severe headache 2. Fatigue or confusion 3. Vision problems 4. Chest pain 5. Difficulty breathing 6. Irregular heartbeat 7. Blood in the urine 8. Pounding in your chest, neck, or ears **Prevention and control:** 1. Reduction in consumption of salt, saturated fats in the diet (Balanced diet). 2. Reduction of weight and taking regular exercise. 3. Avoid smoking and alcohol. 4. Avoid stress and strain in life. Meditate and do yogas. 5. Detected cases of hypertension can be treated with various antihypertensive drugs.	**3M** **(1.5+1.5)**
5	**f)**	**Write note on National Immunization Schedule** Each country has its own immunization schedule based on their local needs. The Indian version of National Immunization Schedule to protect the children against six vaccine-preventable diseases -Diphtheria, Whooping Cough, Tetanus, Polio, Tuberculosis, Measles.	**3M** **(1+2)**

			Beneficiaries	**Age**	**Vaccine**	**No. of doses and route of administration.**
			Infants	6 weeks to	DPT	3 intramuscular
				9 months	Polio (OPV) BCG	3 oral 1 intradermal
				9 to 12 months	Measles	subcutaneous
			Children	16 to 24 months	DPT (I booster) Polio (I booster)	1 intramuscular 1 oral
				5-6 years	DT (II booster) Typhoid	1 intramuscular, (Two doses if not immunized previously) 2 subcutaneous.
				10 years	Tetanus toxoid Typhoid	1 intramuscular 1 subcutaneous
				16 years	Tetanus toxoid Typhoid	1 Intramuscular 1 subcutaneous.
			Pregnant women	16 to 36 weeks of pregnancy	Tetanus toxoid	2 intramuscular.
6		**Write Causative agent, mode of transmission and symptoms of following:** **(Any FOUR)**				**16M** **(4x4)**
6	**a)**	**Leprosy** **Causative agent:** Bacteria Mycobacterium leprae. **Mode of Transmission:** 1. Leprosy is mainly transmitted by direct or indirect contact of an infected patient. 2. Sometimes it is transmitted by droplet infection through nasal and oral secretion of				**4M** **(1+1.5+1.5)**

		the patient. 3. Through breast milk of lepromatous mother , **Symptoms:** Skin patches (lesions), partial or total loss of cutaneous sensation in the affected area, thickening of nerve, deformities of toes, fingers ,nose etc, cough and fever.	
6	**b)**	**Hepatitis-A** **Causative agent:** It is also known as infectious hepatitis. It is caused by hepatitis A virus. **Mode of Transmission:** 1. Faeco-oralroute is the major route of transmission, 2. Contaminated food, water, milk. **Symptoms:** Fever, chills, headache, weakness and jaundice.	**4M** **(1+1.5+1.5)**
6	**c)**	**Rabies** **Causative Agent :** Lyssa virus type 1(Family Rhabdovirideae) **Modes of Transmission :** 1. Bite of rabied dog or cat, as saliva of such animals carry the virus. 2. Transmission by droplet of patient or carrier, saliva of affected animal or human carries virus in large number. Licks on abraded skin or mucosa can transmit disease. **Symptoms :** These include headache, malaise, sore throat, slight fever, pain and tingling at the bite site, hydrophobia, intolerance to bright light, noise, aerophobia.	**4M** **(1+1.5+1.5)**
6	**d)**	**Filariasis** **Causative agent:** Infection with filarial parasites- W. Bancrofti, B. Malayi, **Mode of Transmission:** By bite of infected mosquito	**4M** **(1+1.5+1.5)**

		Symptoms: Lymphangitis, elephantiasis of scrotum, legs and arms, pulmonary eosinophilia, filarial arthritis.	
6	**e)**	**Hookworm infection** **Causative agent:** Ancyclostoma duodenale or Necator americanus. **Mode of Transmission:** 1. When a person walks bare foot on the contaminated soil, the infective larvae penetrate the skin and the body of a healthy person. From skin it enters the blood stream and then into the lungs. From lungs it ascends to trachea and then pharynx. 2. From pharynx they are swallowed and get entry into the stomach and finally reach the small intestine. Here these larvae develop into sexually mature form and start laying eggs in about six weeks which appear in faeces. The adult worms attach themselves to the mucus membrane of the intestine. **Symptoms:** Symptoms start with itchiness and a small rash followed by diarrhea with other symptoms like abdominal pain, colic, or cramping and excessive crying in infants, intestinal cramps, nausea, a fever, blood in your stool, a loss of appetite, itchy rash.	**4M** **(1+1.5+1.5)**
6	**f)**	**Chicken pox** **Causative agent:** Varicella Zoster Virus **Mode of Transmission:** 1. Droplet infection 2. discharge from the ruptured lesion of the skin **Symptoms-** Fever, Appearance of rash on trunk, face, limbs, pustular (filled with pus) lesions	**4M** **(1+1.5+1.5)**