



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.



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1		Attempt any FIVE of the following	20M (4x5)
1	a)	<p>Explain Arrhenius theory of acid and bases with example. Give its limitations.</p> <p>Ans- Acid or Base on dissolution in water dissociates forming ions and establishes equilibrium between ionized and unionized molecule.</p> <p>Acid is defined as a substance which when dissolved in water gives hydrogen ions. (H⁺)</p> <p>E.g. $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$</p> <p>$\text{CH}_3\text{COOH} \rightarrow \text{CH}_3\text{COO}^- + \text{H}^+$</p> <p>Base is defined as a substance which when dissolved in water gives hydroxyl ions. (OH⁻)</p> <p>E.g. $\text{NaOH} \rightarrow \text{Na}^+ + \text{OH}^-$</p> <p>$\text{NH}_4\text{OH} \rightarrow \text{NH}_4^+ + \text{OH}^-$</p> <p>The process of neutralization is the combination of hydrogen ions and hydroxide ion to forms neutral water molecule.</p> <p>Neutralization reaction:- $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$</p> <p>Limitations of Arrhenius Theory:</p> <ol style="list-style-type: none">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)	<p>Define antimicrobial agents. Explain mechanism of action of topical antimicrobials.</p> <p>Antimicrobials are the chemical agents used to destroy or inhibit the growth of pathogenic Microorganisms. Antimicrobial is a broad terminology describing activity against microbes.</p> <p>Mechanism of action:</p> <p>Inorganic compounds generally exhibit antimicrobial action by, either of the three mechanisms viz.</p> <p>(i) Oxidation</p> <p>(ii) Halogenation</p>	1M Def. 3 for Mech.



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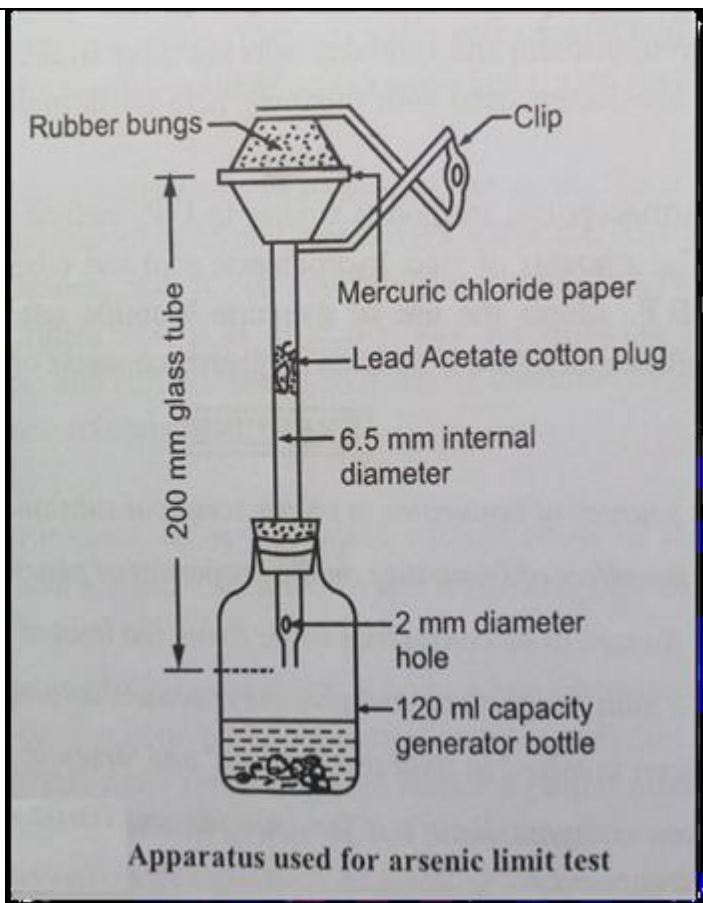
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		<p>(iii) Protein binding or precipitation.</p> <p>Oxidation Mechanism :</p> <p>Compounds acting by this mechanism belong to class of peroxide, peroxyacids, oxygen liberating Compounds like permanganate and certain oxo-halogen anions.</p> <p>They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



Name of apparatus :Gutzeit apparatus

1	<p>d) Define antioxidants. Enlist the criteria for selection of antioxidant.</p> <p>Antioxidants are the agents which prevent oxidation and deterioration when added to pharmaceutical preparations.</p> <p>Antioxidants are selected based on their property-</p> <ul style="list-style-type: none"> 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. 	<p>1M</p> <p>Def.</p> <p>3M</p> <p>Criteria</p> <p>a</p>
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1	e)	<p>Define “Achlorhydria”. Write a short monograph of drug used for it.</p> <p>Achlorhydria- Is defined as the condition in which there is absence or no secretion of hydrochloric acid in stomach.</p> <p>Or When due to some reasons, there is no secretion of hydrochloric acid in gastric secretion; the condition is called as achlorhydria.</p> <p>Example- Dilute Hydrochloric acid</p> <p>Molecular Formula -HCl</p> <p>Properties of Hydrochloric acid:-</p> <ol style="list-style-type: none">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. <p>Storage of Hydrochloric acid: It is stored in glass-stoppered containers at a temperature not exceeding 30°C.</p> <p>Uses Hydrochloric acid:-</p> <ol style="list-style-type: none">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 Monog raph
1	f)	<p>Enlist properties for an ideal antacids. Why antacids are preferred in combination.</p> <p>Ideal requirements of an antacid-</p> <ol style="list-style-type: none">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



	<p>4. It should buffer in pH 4-6.</p> <p>5. It should not produce large volume of gas.</p> <p>6. It should be palatable & inexpensive.</p> <p>7. It should probably inhibit pepsin.</p> <p>8. It should be insoluble in water & have fine particle size.</p> <p>9. It should not have side effects.</p> <p>Why antacids are preferred in combination.</p> <p>Any single antacid does not meet the ideal requirements of antacid. So combination antacid preparations are formulated. The objectives of combination antacids are –</p> <ul style="list-style-type: none">• 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. <p>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.</p>	
1	<p>g) Elaborate the role of iron and calcium in human physiology.</p> <p>Role of Iron:</p> <ol style="list-style-type: none">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



	<p>enzyme cofactor etc.</p> <p>5. It is required during growth, Menstrual cycle, pregnancy, pathological bleeding</p> <p>6. Involved in cellular respiration</p> <p>7. Production of ATP</p> <p>8. It is an essential element of several nucleoproteins.</p> <p>9. Externally used as astringent.</p> <p>Role of calcium:</p> <p>1. Calcium is essential for normal functioning of autonomic nervous system & voluntary Systems.</p> <p>2. For normal cardiac function.</p> <p>3. It is important in coagulation of blood</p> <p>4. Formation of certain tissues & bones.</p> <p>5. Muscle contraction.</p> <p>6. Cell membrane permeability.</p>	
1	<p>h) Explain physiological acid-base balance.</p> <p>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</p> <p>1. Buffering system :- Three major system of buffering occurring in the body –</p> <p>i) Carbonic acid / bicarbonate which mainly occur in plasma and kidney.</p> <p>ii) Monohydrogen phosphate / dihydrogen phosphate found in cells and kidney</p> <p>iii) Protein buffer system.</p> <p>All above buffer system maintain the pH of blood in different organs and prevent drastic changes in pH of body fluids.</p> <p>2. Respiratory Mechanism: When respiration is decreased, there is an accumulation of CO₂ 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 CO₂, the condition of alkalosis may develop? Thus acidity and CO₂ increases are the powerful stimulants of</p>	4M



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		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) <ul style="list-style-type: none">• 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 $\text{OX} + e^- \rightarrow \text{Red}$• 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: <ol style="list-style-type: none">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



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		$2 \text{H}_2\text{O}_2 \rightarrow 2 \text{H}_2\text{O} + \text{O}_2$ <p>4) It acts as an oxidizing or reducing agent depending upon the chemical environment.</p> <p>Uses-</p> <ol style="list-style-type: none">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)	<p>Write molecular formula and uses of ammonium chloride and sodium bicarbonate.</p> <p>Molecular formula :- NH_4Cl</p> <p>Properties of Ammonium chloride:</p> <ol style="list-style-type: none">1. It occurs as white crystals, odorless, cooling or saline taste2. 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. <p>Uses of Ammonium chloride:</p> <ol style="list-style-type: none">1. Expectorant2. Replaces chloride lost during vomiting3. Systemic acidifier (treatment of metabolic alkalosis)4. It is also used in the treatment of urinary tract infections.5. Sodium bicarbonate <p>Molecular formula-NaHCO_3</p> <p>Uses of Sodium bicarbonate:</p> <ol style="list-style-type: none">1. It is used as Antacid.2. It is used as systemic antacid in treatment of systemic acidosis.	2M EACH



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		<p>3. It is used as electrolyte replenisher.</p> <p>4. 3 to5% solution in warm water is used as eye lotion.</p> <p>5. It is used as an ingredient of compound NaHCO₃ tablets.</p>	
2	c)	<p>Define quality control and give its importance in pharmacy.</p> <p>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.</p> <p>Importance of Quality control in pharmaceutical industry:</p> <p>The term Quality control is most important parameter in Pharmaceutical field. The good quality product should be available to the patient which must be –</p> <p>i) For a genuine quality and of nature ii) Physically and chemically pure iii) Retains quality in terms of shelf life</p> <p>The responsibility of Pharmaceutical industry and Pharmacist has increased considerably to maintain the Good Manufacturing Practices.</p> <p>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.</p> <p>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.</p>	<p>1M</p> <p>Def.</p> <p>3M</p> <p>Imp.</p>
2	d)	<p>Write properties and uses of sodium thiosulphate and sodium nitrite.</p> <p>Properties of sodium thiosulphate-</p> <ol style="list-style-type: none">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.	<p>2M for</p> <p>EACH</p>



		<p>Uses of sodium thiosulphate-</p> <ol style="list-style-type: none">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. <p>Sodium nitrite-</p> <p>Properties-</p> <ol style="list-style-type: none">1. It occurs in the form of white granular powder or white crystals with saline taste2. 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. <p>Uses-</p> <ol style="list-style-type: none">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)	<p>Give uses, storage condition and labelling of carbon dioxide gas.</p> <p>Carbon dioxide:</p> <p>Uses –</p> <ol style="list-style-type: none">1. Regulation of acid-base balance2. Rarely used as respiratory stimulant3. Along with oxygen it is used in the treatment of Carbon monoxide poisoning.4. Liq. CO₂ promote the absorption of liquid by mucous membrane5. Frozen CO₂/ dry ice is used in the treatment of eczema, acne, psoriasis and also used in minor surgical operation for destroying tissue.	<p>2M for uses 1M storage 1M Labelin g</p>



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		<p>6.It is widely used in beverages industry for preparation of cold drinks</p> <p>7. It is also used to replace air in some pharmaceutical preparations.</p> <p>8. .It is used in treatment of drug addiction.</p> <p>Storage and labeling: The gas is stored in metal cylinders under pressure & at a temperature not exceeding 31⁰C. The cylinder is painted GREY & carries a label stating the name of gas & symbol CO₂ stencilled in paint on the shoulder of the cylinder and clearly and indelibly stamped on the cylinder valve.</p>	
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



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- iii) Cross contamination
- iv) Microbial contamination
- v) Packing errors

b) **Elaborate ORS mixture. Give its composition according to WHO.**

2M for EACH

Oral rehydration salt mixtures:

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 losses 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 NaHCO₃ 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	---



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	<p>c) Write a note on cyanide poisoning.</p> <ol style="list-style-type: none">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, death3. Death may occur within minute of inhalation of hydrogen cyanide4. Effect of Cyanide poisoning: Cyanide stops cellular respiration and oxidation-reduction reactions. <p>Treatment:</p> <ol style="list-style-type: none">1. Sodium nitrite and Sodium thiosulphate is useful in the treatment of cyanide poisoning2. 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	<p>d) Explain metabolic acidosis & metabolic alkalosis. Name one compound in metabolic acidosis & metabolic alkalosis</p> <p>Metabolic acidosis:</p> <ol style="list-style-type: none">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



		<p>3. This can be overcome by respiratory & renal mechanism. E.g. lungs increase CO₂ elimination.</p> <p>4. It is treated by using drugs like Sodium bicarbonate, Sodium acetate, Potassium acetate, Sodium citrate, Potassium citrate, Sodium lactate etc.</p> <p>Metabolic alkalosis:</p> <p>1. Metabolic alkalosis occurs due to disturbance in acid-base balance in which alkali (HCO₃⁻) concentration increases in blood & body fluid</p> <p>2. It occurs due to retention of base or bicarbonate (HCO₃⁻) or decrease in acid load. Reasons are excess use of bicarbonates, loss of H⁺, vomiting, use of diuretics etc.</p> <p>3. Excess alkali retention occurs due to renal failure or excess administration of alkaline drugs like Sodium acetate, Potassium acetate.</p> <p>4. This can be overcome by respiratory & renal mechanism. E.g. lungs decrease CO₂ elimination.</p> <p>5. It is treated by using acidifying drugs like ammonium chloride & ammonium chloride injection.</p>	
3	e)	<p>Give medicinal uses of</p> <p>i) Zinc oxide :</p> <p>1) Mild astringent</p> <p>2) Weak antimicrobial & topical antacid</p> <p>3) It is also used in some bandages & adhesives</p> <p>ii) Titanium dioxide</p> <p>1) It is used to prevent sunburn in the form of suntan preparations</p> <p>2) It is used as a white pigment in lotions & cosmetic preparations</p> <p>3) As a skin protective & for the relief of pruritus</p> <p>4) For application to the exudative dermatoses.</p> <p>iii) Talc</p> <p>1) As a skin protective dusting powder</p>	1M EACH



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		<p>2) As a base for medicated dusting powder</p> <p>3) Used as a lubricating agent in the tablet manufacturing 4) Also used as a filtering aid</p> <p>iv) Kaolin:</p> <p>1) Light kaolin is used as an intestinal adsorbent in various enteritis</p> <p>2) It is used in the symptomatic treatment of gastrointestinal conditions associated with diarrhoea</p> <p>3) It is also used as a clarifying agent.</p>	
4		<p>Answer any THREE of the following</p>	<p>12M (3X4)</p>
4	a)	<p>Write formula & uses of ferrous sulphate & calcium gluconate</p> <p>Ferrous sulphate :</p> <p>Formula: $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$</p> <p>Uses : 1) It is used as Haematinic (treatment of anaemia caused by iron deficiency)</p> <p>2. It is used to dye fabrics & cloths</p> <p>3. Manufacturing of ink</p> <p>4. It has also applications in photography</p> <p>5. It has disinfectant properties</p> <p>6. Ferrous sulphate is used as colouring agent in paint</p> <p>Calcium gluconate :</p> <p>Formula : $\text{C}_{12}\text{H}_{22} \text{Ca O}_{14} \cdot \text{H}_2\text{O}$</p> <p>Uses :</p> <p>1) It is used as a Calcium replenisher.</p> <p>2) It is used in the treatment of hypocalcaemia tetany and calcium deficiency disorders such as dental caries, fractures, rickets, spasmophilia, pregnancy and lactation, hyperthyroidism, haemorrhage.</p>	<p>2M EACH</p>



		<p>3) Also used in the hypocalcaemia</p> <p>4) Used as a substitute for calcium lactate because it is less irritant to the tissue.</p>	
4	b)	<p>Explain radio opaque contrast media. Give properties and uses of any one compound used for it</p> <p>Radio opaque contrast media:</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>Compound used for radio opaque contrast media :</p> <p>Ex.: Barium sulphate</p> <p>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</p> <p>Uses:</p> <p>i) Barium sulphate is used as a contrast medium for X ray examination of the alimentary tract.</p>	<p>2M</p> <p>Explain</p> <p>ation</p> <p>1M</p> <p>Prop.</p> <p>1M Use</p>



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		<p>ii) Barium sulphate is ingested for use in GIT.in the form of a suspension usually with flavouring and sweetening agents.</p> <p>iii) Barium sulphate is given for X ray examination of colon by enema in a dose of 400 to 750g rectally.</p>	
4	c)	<p>Define the the tems:</p> <p>i) Desensitizers:</p> <p>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.</p> <p>ii) Emetics :</p> <p>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</p> <p style="text-align: center;">OR</p> <p>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.</p> <p>iii) Expectorant:</p> <p>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.</p>	1M EACH



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	<p>iv) Laxatives :</p> <p>Laxatives are substances that loosen stools and increase bowel movements. They are used to treat and prevent constipation.</p> <p>Ex. Isabgol, agar-agar, methyl cellulose, sodium carboxy methyl cellulose, liq.paraffine.</p>	
4	<p>d) Explain the principle involved in limit test for iron with reactions.</p> <p>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.</p> <p>Role of Thioglycolic acid-</p> <ol style="list-style-type: none">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. <p>Role of Citric acid- It prevent precipitation of iron (ferrous) with ammonia by forming ammonium citrate buffer.</p> <p>Role of Ammonia- To maintain alkaline condition.</p> <p>Reactions:</p> $\text{i) } 2\text{Fe}^{3+} + 2\text{CH}_2\text{SH}\cdot\text{COOH} \longrightarrow 2\text{Fe}^{2+} + \text{S}\cdot\text{CH}_2\cdot\text{COOH} + 2\text{H}^+$ <p style="text-align: center;">$\text{S}\cdot\text{CH}_2\cdot\text{COOH}$ $\text{S}\cdot\text{CH}_2\cdot\text{COOH}$</p> <p style="text-align: center;">ferric iron Thioglycolic acid Ferrous iron</p>	<p>2M</p> <p>Principle</p> <p>2M</p> <p>reaction</p>



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		<p>ii) $Fe^{++} + 2(CH_2 \cdot SH \cdot COOH) \rightarrow$</p> <p>Ferrous thioglycollate.</p>	
4	e)	<p>Define respiratory stimulants .Give properties and uses of ammonium carbonate</p> <p>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..</p> <p>Ex: Gaseous ammonia, Dilute Ammonia solution, Ammonium carbonate etc.</p> <p>Ammonium carbonate:</p> <p>Properties :</p> <ol style="list-style-type: none">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 60⁰ C.5) Ammonium carbonate is readily soluble in water and sparingly soluble in alcohol. <p>Uses:</p> <ol style="list-style-type: none">1) It is used as a respiratory stimulant2) It is also used as a reflex stimulant for the medullary respiratory & vasomotor centres.3) It has been also used as an expectorant	<p>1M</p> <p>Def.</p> <p>1.5M</p> <p>Propert</p> <p>ies</p> <p>1.5M</p> <p>Uses</p>



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5		Answer any THREE of the following	12M (3X4)
5	a)	<p>What are inhalants? Give properties and uses of nitrous oxide.</p> <p>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.</p> <p>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.</p> <p>Properties –</p> <ul style="list-style-type: none">• 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. <p>Uses-</p> <ul style="list-style-type: none">• It is safe general anaesthetic with strong analgesic properties.• It is used in dental and obstetric field for producing anaesthetic and analgesic effect.• 50% N₂O with O₂ 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 Propert ies 1.5M for uses
5	b)	<p>Define Antidote and classify it.</p> <p>Definition- Antidote is a chemical agent which counteracts or reverses or stops the action of poison.</p>	1M def. 3M classify



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		<p>Classification: Depending on their mechanism of antidote action they are classified as-</p> <p>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)</p> <p>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</p> <p>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</p>	
5	c)	<p>Enlist various intra and Extra cellular electrolytes. Give properties and uses of Sodium Chloride.</p> <p>Intra cellular Electrolytes-</p> <ul style="list-style-type: none">• Potassium• Phosphate• Magnesium <p>Extra cellular Electrolytes-</p> <ul style="list-style-type: none">• Chlorides• Sodium• Calcium• Bicarbonates. <p>Properties of Sodium Chloride-</p> <ol style="list-style-type: none">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. <p>Uses of Sodium Chloride-</p> <ol style="list-style-type: none">1. It is source of both sodium and chloride ions.	1M EACH



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	<p>2.0.9% w/v solution used as wet dressing and irrigating body cavities or tissues</p> <p>3. Its injection and infusion alone or in combination is used as electrolyte replenisher.</p> <p>4. Hypertonic solution is given orally to induce vomiting for the case of poisoning as a first aid.</p> <p>5. It is used as taste enhancer in common food.</p> <p>6. It is used in Iodine deficiency in the form of iodised salt.</p> <p>7. is major ingredient of ORS, hence is used in electrolyte replacement therapy.</p>	
5	<p>d) Explain Anti caries agent giving examples</p> <p>Definition-</p> <p>The agents which prevent the formation of dental caries are called anticaries agents. E.g.: Sodium Fluoride, Stannous fluoride, ammoniated tooth pastes etc.</p> <p>In order to prevent dental caries and to maintain clean and healthy teeth use of fluoride and their salts is well accepted.</p> <p>Role of fluoride:</p> <ul style="list-style-type: none">• 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



	<ul style="list-style-type: none">• 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. <p>Besides fluoride inorganic phosphate salts have been considered to be useful in reducing dental caries.</p>	
5	<p>e) Define and classify gastro intestinal agents with example.</p> <p>Definition- Gastrointestinal agents are the drugs which are used to treat gastrointestinal disorders like achlorhydria, hyperacidity, constipation and diarrhoea.</p> <p>Classification :</p> <ol style="list-style-type: none">1. Gastric acidifier-Dilute Hydrochloric acid2. Antacids<ol style="list-style-type: none">A) Systemic/ Absorbable antacids- Sodium BicarbonateB) Non systemic/ Non absorbable antacids<ol style="list-style-type: none">a) Aluminium containing antacids- Aluminium Hydroxide, Aluminium Phosphate, Basic aluminium carbonateb) Calcium containing antacids- Calcium carbonate, Calcium Phosphatec) Magnesium containing antacids- Magnesium carbonate, Magnesium oxide, Magnesium	<p>1M Def. 3M classify</p>



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	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- <ul style="list-style-type: none">• 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:-• $Hb + O_2 \rightarrow HbO_2$ where in Hb = deoxyhemoglobin and HbO_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 Propert ies 1M Uses



	<ul style="list-style-type: none">Under physiological conditions, the action of electrolyte and CO₂ on the liberation of oxygen from oxyhemoglobin is important. <p>Properties-</p> <ol style="list-style-type: none">It is colourless, odourless, tasteless gas.It is heavier than air with density 1.105Oxygen dissolves in about 32 volumes of water, 36 volumes of alcohol.Oxygen readily dissolves in some molten metals like silver.It is a paramagnetic in nature.Oxygen supports combustion.Chemically oxygen is strong oxidizing agent. <p>Uses :</p> <ol style="list-style-type: none">Oxygen is widely used in the treatment of hypoxia & anoxia.It is also used in treatment of carbon monoxide poisoning.In industry oxygen is used in oxy acetylene flame required for welding or cutting metals.Liquid oxygen is used as a fuel in rocket technology.Used as Inhalant during anaesthesia and for post-operative pulmonary conditions.Oxygen mixed with 5-7% CO₂ is used as respiratory stimulant.It is used in treatment of cardiac failure.	
6	<p>b) Define Radiopharmaceuticals. Enlist its various applications.</p> <p>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.</p> <p>Applications-</p> <ul style="list-style-type: none">Diagnostic applicationRadiotherapySterilization techniquesResearch application	<p>1M Def. 3M applica tion</p>



		<ul style="list-style-type: none">Analytical application	
6	c)	<p>Write two Identification tests for-</p> <p>i) Calcium</p> <p>ii) Chlorides</p> <p>i) Calcium :-</p> <p>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.</p> $\text{Ca}^{++} + \text{CO}_3^{--} \longrightarrow \text{CaCO}_3$ <p>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.</p> $\text{Ca}^{++} + \text{C}_2\text{O}_4 \longrightarrow \text{CaC}_2\text{O}_4 \longrightarrow \text{CaCl}_2 + \text{H}_2\text{C}_2\text{O}_4$ <p>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</p> $\text{Ca} + 2\text{CrO}_4^- \longrightarrow 2\text{CaCrO}_4$ <p>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.</p> $\text{Ca}^{++} + 2\text{K}^+ + \text{Fe}(\text{CN})_6^{--} \longrightarrow \text{CaK}_2(\text{Fe}(\text{CN})_6) \longrightarrow \text{CaNH}_4\text{KFe}(\text{CN})_6$ <p>ii) Chloride-</p> <p>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</p>	2M EACH



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		<p>dil. nitric acid.</p> $\text{NaCl} + \text{AgNO}_3 \longrightarrow \text{AgCl} + \text{NaNO}_3$ <p>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.</p> <p>3) Chloride when heated with manganese dioxide & sulphuric acid, chlorine gas liberated.</p> $\text{NaCl} + 2\text{H}_2\text{SO}_4 + \text{MnO}_2 \longrightarrow \text{MnSO}_4 + \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O} + \text{Cl}_2 \uparrow$	
6	d)	<p>Explain with examples:</p> <p>i) Haematinics</p> <p>ii) Systemic Alkaliser</p> <p>i)Haematinics-</p> <p>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.</p> <p>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.</p> <p>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.</p> <p>3) Some of the Iron preparations are used parentally</p> <p>e.g.- Iron and Dextran injection and Iron sorbitol injection. These are alternatives to oral preparations.</p> <p>ii) Systemic Alkaliser-</p> <p>These are the agents which counteract or neutralize acidity. / These are the agents which are used in treatment of systemic acidosis.</p> <p>e.g.- i) Sodium bicarbonate is a systemic alkaliser. It reacts with HCl and forms salt and water</p>	2M EACH



e)	<p>with evolution of CO₂.</p> <p>ii) Sodium acetate, Potassium acetate, Sodium citrate, potassium citrate etc.</p> <p>Define topical agents. Discuss the uses of astringent with examples.</p> <p>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.</p> <p>Astringent uses :</p> <ol style="list-style-type: none">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. <p>e.g. Alum and Zinc Sulphate.</p>	<p>1M Def. 3M For Uses</p>
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