



MODEL ANSWER

SUMMER- 17 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 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.



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Q. No .	Sub Q. N.	Answer	Marking Scheme
1.		Answer any <u>FIVE</u> of the following:	5 x4=
	a)	Give synonyms and molecular formula for:	20 M
	Ans.	(i) Boric acid- Molecular formula- H_3BO_3 Synonym-Hydrogen borate or boracic acid or orthoboric acid or acidum boricum.	1 mark each
		(ii) Calcium hydroxide- Molecular formula- $Ca(OH)_2$ Synonym-Slaked lime	
	b)	Define and classify GI agents with example.	
	Ans.	Definition-Gastrointestinal agents are the drugs/agents which are used to treat gastrointestinal disorders. Various inorganic and organic compounds are used for specific actions. Classification of G.I Agents-	1 mark
		1) Products for altering gastric pH	
		a] Products used for achlorhydria (hypochlorhydria)i.e. acidifying agents. E.g. Dilute hydrochloric acid.	
		b] Products used for hyperchlorhydria i.e.hyperacidity.E.g. Antacids like Aluminium containing antacids, Magnesium containing antacids, Calcium containing antacids.	
		2) Protectives for intestinal inflammation. E.g. Bismuth compounds	
		3) Adsorbents for intestinal toxins. E.g. Bismuth compounds, kaolin	3 marks



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4) Cathartics or laxatives for constipation. E.g. Saline Cathartics like sodium potassium tartarate, magnesium sulphate etc.

OR

Classification :

1) Acidifying agents: Dilute Hydrochloric Acid

2) Antacids: Aluminum Hydroxide, Aluminum Phosphate, Basic aluminum carbonate, Magnesium carbonate, Magnesium oxide, Magnesium hydroxide, Magnesium trisilicate, Calcium carbonate, Calcium Phosphate, Sodium bi-carbonate etc.

3) Protectives and Adsorbents: Bismuth sub carbonate, Bismuth sub nitrate, kaolin, Milk of bismuth

4) Cathartics –it is also classified as

i) Stimulant ii) Bulk purgative iii) Lubricants iv) Saline cathartics

Eg – castor oil, Methyl cellulose, liquid paraffin, mineral oil, Senna, magnesium sulphate, isabgol, etc.

c) **Explain Lewis acid-base theory with examples.**

Ans.

- The Lewis definition defines a base (referred to as a *Lewis base*) to be a compound that can donate an electron pair, and an acid (a *Lewis acid*) to be a compound that can accept this electron pair.
- Thus, Lewis acids are electrophilic & bases are nucleophilic.
- An acid may not have a proton to donate & still called an acid provided it accepts electron pair. E.g. proton.
- All Bronsted acids & bases are Lewis acid & bases but vice-versa is not true.
- Some examples of Lewis acids are electron deficient compounds like boron chloride, aluminium chloride, ferric chloride & simple metal cations like Ag, Fe & Zn. These compounds & ions have the obvious feature of possessing at least one empty orbital

2 marks
explanation

2 marks
examples



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capable of accepting a pair of electrons.

- Other compounds which can be classified as Lewis acids are those which possess a central species capable of expanding the valence shell to accept a pair of electrons. E.g. silicon fluoride, stannous chloride & sulfur tetra fluoride.
- Water, ammonia & halide ions are Lewis bases.
- The reaction between a Lewis acid & Lewis base provides a product that is described as an adduct, acid-base complex or coordinated complex.

d) **Define different terminologies as antimicrobial agents.**

Ans.

- Antimicrobial is a broad terminology describing activity against microbes. Specific terminology describes exact mode or mechanism of action.
- **Antiseptics** are substances that kill or prevent the growth of microorganisms. This term is specific for preparations intended to be applied to living tissues.
- **Disinfectant** is an agent that prevents infection by the destruction of pathogenic microorganisms. It is generally used with reference to the substances applied to inanimate objects.
- **Germicide** in a broad sense describes agent which kills microorganisms. More specific terminology like '**bactericide**' (kills bacteria), '**fungicide**' (kills fungi), '**virucide**' (kills virus) etc. denotes exact action.
- **Bacteriostatic** is an agent which primarily functions by inhibiting the growth of bacteria. Thus, bacteriostatic drugs or agents do not kill but arrests the growth of bacteriae.

e)

Ans.

Discuss importance of Radioisotopes in pharmacy.

Radioisotopes are widely used in medicines & surgery. There are various uses of radioisotopes

1 mark
for each



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in pharmacy-

1. Diagnostic applications: By using radioisotopes, size & morphology of an organ can be detected. Radiations have sufficient energy to pass through tissue.

e.g. ^{32}P - used for diagnosis of eyes, brain & skin cancer,

^{51}Cr - used to determine volume of RBC.

^{57}Co , ^{58}Co - used for diagnosis of pernicious anemia.

2. Radiotherapy: Radioisotopes are helpful in destroying diseased tissue without affecting normal cells. Gamma radiations have high penetrating power, hence it destroys deep seated tumor.

e.g. ^{60}Co - Treatment of cancer of cervix, vagina, bladder, mouth, uterus

^{131}I - Treatment of thyroid carcinoma, thyrotoxicosis,

^{32}P - Treatment of polycythemia (rise in RBCs)

3. Sterilization: Some radioisotopes are used for sterilization of heat labile drugs.

e.g. ^{60}Co –used for sterilization of hormones, vitamins, antibiotics, surgical dressings, disposable syringes etc.

4. Research applications: In biochemical research, radioisotopes are used in the determination of reaction mechanism.

E.g. ^{13}C - used to label organic compounds.

^{131}I - used to determine effective renal plasma flow.

5. Analytical chemistry: Radioisotopes have applications in analytical chemistry mainly when dealing with very dilute solutions.

6. They are widely used in various diverse fields- e.g. Industry, hydrology, agriculture, pollution control, pest control, food preservation etc.

f) **Enlist four official antioxidants.**

Ans 1) Sodium thiosulphate

2) Sodium nitrite

4 marks

1 mark
for each



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3) Sodium metabisulphite

4) Sodium bisulphite

5) Hypophosphorus acid

6) Sulfur dioxide

7) Nitrogen

g) **Define buffer. Explain importance of Pharmaceutical buffer.**

Ans.

Buffers - Buffers are solutions or systems that resist a sudden change in pH upon addition of small quantities of acids & bases.

Importance of buffer in pharmacy:

- **Stability of certain compounds-** Certain compounds are stable in specific pH. Citric acid is used for stabilizing milk of magnesia. Adrenaline is rapidly oxidized by dissolved oxygen to adrenochrome in an alkaline media. Hence its pH is stabilized by using a buffer of pH range 2.5 to 3.0. Penicillin preparations are stabilized by addition of calcium carbonate, sodium citrate or aluminum hydroxide.
- **Structural stability-** Some compounds are structurally unstable within certain pH range, usually due to auto oxidation. Sulfonamide preparations are stabilized by NaHCO₃, sodium acetate or sodium citrate.
- **Colour** – Colour of many natural dyes, present in fluid extracts or of certain synthetic drugs has been found to be pH dependent. E.g. red colour of cherry & raspberry syrups is maintained at acidic pH which becomes pale yellow to nearly colourless at alkaline pH.
- **For patient comfort-** Injectables & preparations for internal or external use become irritating if their pH is different greatly from that for the particular tissues involved. An extremely acid or alkaline pH must be avoided as it can cause tissue damage.
- **Optimum pH** conditions for activity of certain medicinal compounds have to be maintained. E.g. buffering methenamine with phosphate buffer.
- **In analysis** – Buffers of known pH are required as standards in analytical laboratories.

1 mark definition,

3 marks for importance

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Eg calibration of pH meter etc.

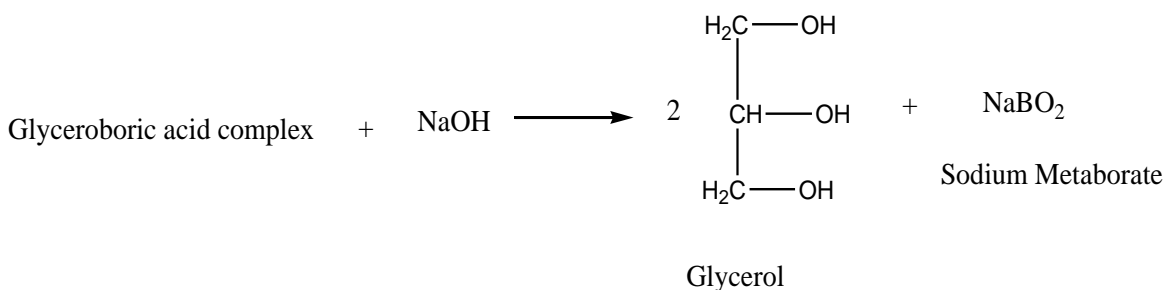
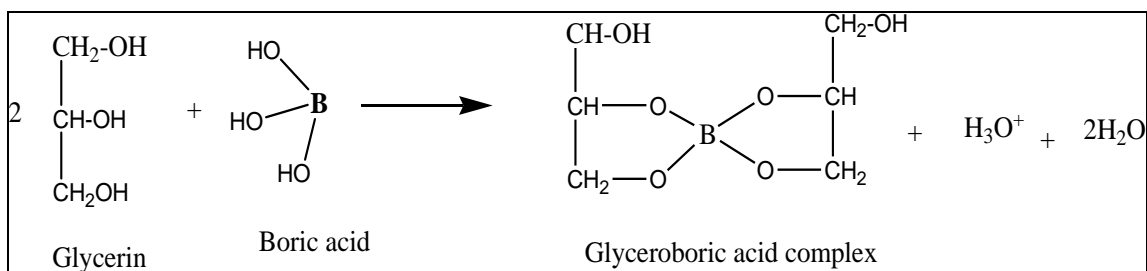
- **Solubility**- Solubility of compounds is controlled by providing a medium of suitable pH. Eg Iron salts, phosphates, borates are soluble in acidic medium but precipitate in alkaline medium.

Why glycerin is used in assay of boric acid? Explain with reactions.

h)

Ans

- 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 the 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).



2 marks
explanation

2 marks
Reaction



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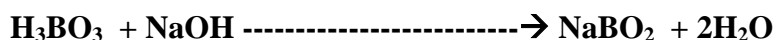
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Net reaction:

Glycerine



2. Answer any **THREE** of the following:

3x4=12

a) **Define and classify antidotes.**

Ans.

- Antidotes are the agents which are used to reverse, stop or counteract the action of poisons.
- Antidotes can be classified on the basis of their mechanism of action as follows:
 - (1) Physiological antidote: 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. It converts hemoglobin into methaemoglobin in order to bind cyanide poison.
 - (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. It converts the toxic cyanide ion to non-toxic thiocyanate ion.
 - (3) Mechanical antidotes: These usually act by adsorption of poison & thus preventing its absorption in the body or expelling out the poison by emesis or elimination through urine. E.g. Activated charcoal.

1 mark

Define

3 marks

Classify

b) **Give mechanism of action of antioxidants and mention the properties and uses of sodium thiosulphate.**

Ans.

- 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
$$\text{Ox} + \text{e}^- \rightarrow \text{Red}$$
- When a substance acts as antioxidant (it being a reducing agent) it gets oxidised itself and prevents the oxidation of the active pharmaceutical species.
- If the active pharmaceutical species is already oxidized, then the antioxidant will reduce

2marks

Mechanism



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it back to its original reduced form.

- Certain antioxidants like inert nitrogen gas can act as antioxidant by preventing pharmaceutical preparations to come in contact with oxygen.
- A strong antioxidant will protect the material when used in small amount and for longer period.

Properties of sodium thiosulphate-

- Sodium thiosulphate occurs as transparent, colourless, monoclinic prisms, or as a crystalline powder.
- It has a cooling, bitter taste.
- It effloresces in dry air and deliquesces in moist air.
- It is soluble in water but insoluble in alcohol.
- The aqueous solution decomposes on boiling because of reduction to sulphide and oxidation to sulphate.

Uses of sodium thiosulphate-

- It is used as an antioxidant.
- It is considered useful in parasitic skin diseases.
- It is used in controlling the infection of athlete's foot.
- It is effective in cyanide poisoning as an antidote.
- Sodium thiosulphate when used in large doses causes cathartic action.

c) **Explain the reaction and principle behind limit test for chloride.**

Ans.

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

1 mark

1 mark

3 marks

Principle



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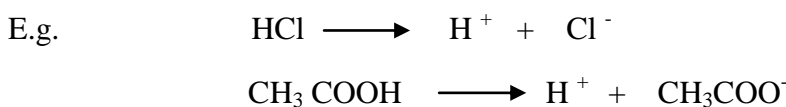
substance under test).

- This opalescence is compared with the standard opalescence produced by the addition of silver nitrate, to the known amount of chloride ion (sodium chloride) solution.
- If the test solution shows less opalescence than the standard the sample complies the test.

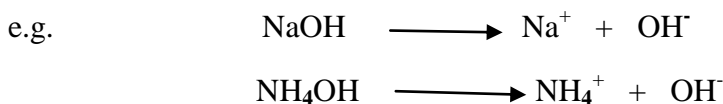


Discuss Arrhenius acid-base theory with example and list limitations for it.

d) Ans. Acid is defined as a substance which when dissolved in water gives hydrogen ions. (H^+)



Base is defined as a substance which when dissolved in water gives hydroxyl ions. (OH^-)



Acid or Base on dissolution in water dissociates forming ions and establishes equilibrium between ionized and unionized molecule.

Limitations of Arrhenius Theory:

- 1) The definition of acid and base are only in term of aqueous solution & not in terms 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 do not contain hydroxide ion is not explained by the theory.

e) Ans. **Explain the role of sodium ions as major extra cellular electrolyte.**

- Major cation component of the extracellular fluid is sodium ions.
- It is associated with chloride and bicarbonate in regulating the acid-base equilibrium.

1 mark

2marks

Theory
&
exampl
e

2marks

Limitati
ons

4 marks



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- Another important function served by sodium is maintenance of osmotic pressure of various body fluids and thus protecting the body against excessive fluid loss.
- It plays an important role in preserving normal irritability of muscle and the permeability of cell.
- Also plays an important role in transmission of nerve impulses in the nerve fibers.
- The condition in which there is low serum sodium is known as hyponatremia. This may be due to conditions like diabetes insipidus, metabolic acidosis, diarrhoea, vomiting and Addison's disease. Administration of sodium salts are advised in this.
- Hyponatremia is the condition in which there is high serum sodium level. This occurs in severe dehydration, hyperadrenalism, certain types of brain damage and excessive treatment with sodium salts.

3.

ANSWER ANY THREE OF THE FOLLOWING.

3x4=12

a) **“Antacids are preferred in combination therapy” Why?**

Ans.

Because no single antacid meets all the criteria for an ideal antacid, several products are in the market containing mixtures of antacids. Most of these combination products are an attempt to-

4marks

- Balance the constipative effect of calcium & aluminium with the laxative effect of magnesium (to counter each others' side effect).
- Certain products are a mixture of an antacid with rapid onset of action and one with a longer duration of action.
- In another type, the antacids are combined with simethicone type of compounds which has antifatulent action as they are antifoaming agents & causes dispersion of gases.

Some preparations which are mixtures of two antacids are as follows:

- **Aluminium hydroxide gel: Magnesium hydroxide combinations:** The USP prescribes two dosage forms suspensions & tablets.

1) Suspensions: Alumina & magnesia oral suspension



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2) Tablets: Alumina & magnesia tablets

- **Aluminium hydroxide gel: Magnesium trisilicate combinations:** Alumina Magnesium trisilicate oral suspension potency is expressed in terms of aluminium oxide & magnesium oxide.
- **Calcium carbonate containing antacid mixture:** Calcium carbonate with aluminium hydroxide gel gives a product which has rapid onset with the prolonged action. Calcium carbonate can also be combined with magnesium containing antacid to balance constipating effect of calcium with the laxative effect of Magnesium.
- **Alginic acid-Sodium bicarbonate combination:** It provides symptomatic relief from reflux esophagitis
- **Simethicone-containing antacid:** Simethicone is an activated dimethicone or activated polymethylsiloxane. It has an antifoaming activity so can be combined with some of the antacids.
- **Magaldrate:** It is hydrated magnesium aluminate.
- **Aluminium hydroxide gel-Kaolin combinations :** Kaolin as adsorbent property so can be combined with aluminium hydroxide gel

Define achlorhydria. Explain acidifying agent with its formula and uses.

Achlorhydria- Is defined as the condition in which there is no secretion of HCl in stomach.

Acidifying agents- The agents/drugs which increases the acidity in the stomach are known as acidifying agents. These can be used either systemically or locally in stomach.

Example- Dilute Hydrochloric acid

Molecular Formula -HCl

It contains 10% w/w of HCl and is prepared by using dilute HCl.

Uses-

- It is employed as an acidifying agent in the stomach in 5ml dose after diluting with 200ml of cold water. It is administered with the help of straw in order to protect its

b)
Ans.

1 mark
Each



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abrasive action on teeth.

- It is used in the management of metabolic alkalosis. It is given by infusion diluted with water or in infusion fluids.

Enlist four official compounds of Iron.

c)
Ans.

Official compounds of Iron-

- Ferrous sulphate.
- Ferrous Gluconate.
- Ferrous Fumarate.
- Ferrous Succinate.
- Ferric Ammonium citrate.
- Dried Ferrous sulphate.
- Ferric chloride
- Iron phosphate
- Iron dextran injection
- Iron sorbitol injection

1 mark
each

Discuss any four different sources of impurities in pharmaceuticals.

d)
Ans.

Sources of Impurities:

1. Raw material
2. Reagents used in manufacturing process
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. Atmospheric contamination during manufacturing process
8. Defective storage of final products
9. Adulteration

1 mark
each



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1. Raw Materials- When substances or chemicals are manufactured; the raw materials from which these are prepared may contain impurities which get incorporated into final product. Example- sodium chloride prepared from rock salt contains traces of Ca & Mg compounds.

2. Reagents used in manufacturing process: Synthesis of drugs involves many chemical reactions like nitration, halogenation, oxidation and hydrolysis. Different chemicals & solvents are used in these chemical processes. When chemical reactions are carried out in reaction vessel, the material of these vessels (Iron, tin, copper, aluminium etc.) is reacted upon by the solvents, chemicals & reaction products are formed. These reaction products then occur as impurities in the final product. Thus impurities of iron, lead, and heavy metals, copper are due to the above mentioned reasons.

3. Defects in the manufacturing process: Defects such as imperfect mixing, incompleteness of reaction, non-adherence to proper temperature, pressure, pH or reaction condition etc. may result in the production of chemical compounds with impurities in them.

4. Storage condition- The chemical when prepared is stored in different types of containers. Various types of materials are used for storage purpose. Reaction of substance with material of the storage vessel may take place. The reaction may take place directly or leaching out effect on the storage vessel. This acts as impurity. Also, rodents & insects may add impurities to the products.

5. Solvents: Water is the solvent easily available & cheap and is used in the manufacture of inorganic chemicals. This can give rise to trace impurities such as sodium, calcium, magnesium, carbonate & sulphate ions.

6. Decomposition- Decomposition is caused by light, air, oxygen & causes contamination of final product. A number of organic substances get spoiled because of decomposition on exposure to the atmosphere. E.g. amines, phenol, potent drugs.

7. Atmospheric contaminants: Atmospheric contamination may take place through dust, sulphur dioxide, hydrogen sulphide & arsenic. Carbon dioxide & water vapour are possible contaminants of substances which are affected by their action.



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	<p>e) Ans.</p>	<p>Explain Radio-opaque contrast media. Give properties and uses of barium sulphate.</p> <p>Radio-opaque contrast media- are the chemical compounds which have the ability to absorb X-rays & block the passage 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. They are capable of passing through most soft tissues since they are made of elements of low atomic no like carbon, hydrogen, oxygen, nitrogen. The X rays darken the photographic film or photosensitive plate. The darkening is proportional to the number of X rays that pass through the patient's body. Bones & teeth containing elements like calcium & phosphorus having high atomic number are the only type of tissues which appear light on the exposed X ray film. This helps in diagnosis of fractures. X ray contrast media are used as diagnostic aids in radiology for malfunctions in the GIT.</p> <p>Properties:</p> <ul style="list-style-type: none"> • It is a fine, white, odourless, tasteless & bulky powder that is free from grittiness. • The salt is insoluble in water, organic solvents & dilute acid & alkalis. • It is soluble in concentrated H₂SO₄ BaSO₄ + H₂SO₄ → Ba(HSO₄)₂ • It can be solubilized with sulphuric acid or by fusing it with alkali carbonates. Once it is converted to carbonates, it reacts with acids easily. <p>Uses:</p> <p>It is used for preparation of barium sulphate compound powder & also as a contrast medium for x-rays examination of the alimentary tract. It is administered orally or in the form of enema. Barium sulphate is ingested for use in GIT, in the form of a suspension usually with flavouring & suspending agents (200-300g orally). It is given by enema in a dose of 400 - 750 g rectally for the examination of colon.</p>	<p>2 marks explain</p> <p>1mark Prop.</p> <p>1mark uses</p> <p>3x4=12</p>
<p>4.</p>	<p>a)</p>	<p>ANSWER ANY <u>THREE</u> OF THE FOLLOWING.</p> <p>Name and draw well labeled diagram of apparatus used in limit test for Arsenic.</p>	

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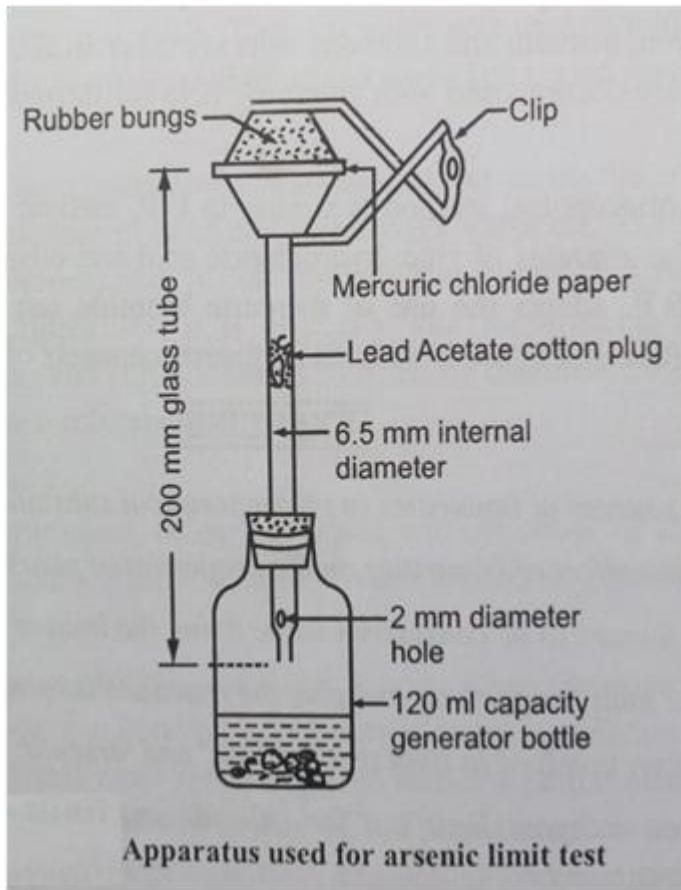
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Ans.

Apparatus used for limit test for Arsenic - **Gutzeit Apparatus.**

Diagram



1 mark
name

3 marks
diagram
& label.

b) **Define cathartics and mention different types of cathartics with example.**

Ans.

Cathartics: Cathartics are the agents used to promote defecation or to relieve constipation. Laxatives are mild cathartic and Purgatives are strong cathartics.

Types of Cathartics:

1. Laxatives

A) Bulk producing drugs- Isapgol, agar-agar, methyl cellulose, sodium carboxy methyl cellulose.

B) Stool softeners (Emollient) - liquid Paraffin

1 mark
define

3 marks
types
with ex.



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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

(iii) Sulfur as cathartic

(iv) Non official Cathartics- Sodium Sulphate, Potassium Phosphate.

c) **Define topical agents. Discuss mechanism of action of topical antimicrobials.**

Ans.

Definition- These are the substances which are applied on body surfaces and mucous membrane including application within the body cavities like oral, vaginal and rectal cavities.

Mechanism of action of topical antimicrobials-

Inorganic compounds generally exhibit antimicrobial action by any of the three mechanisms viz.

(i) Oxidation

(ii) Halogenation

(iii) Protein binding or precipitation

i) Oxidation: Microorganisms require protein for their growth. They act on proteins containing sulfhydryl group and oxidizes free sulfhydryl to disulphide Bridge and inactivate its function. Hence change in molecular shape of protein leads to destruction of protein.

E.g: Hydrogen peroxide, Potassium permanganate, non-metals act by this mechanism.

ii) Halogenation:

Proteins are made up of different amino acids and it contains peptide linkage or peptide chain. Some antimicrobial agents like hypochlorites or compounds containing or liberating chlorine or iodine causes chlorination or iodination at peptide linkage of primary & secondary structures present in protein, leading to change in molecular shape of protein, and destruction of microbial protein.

E.g. Iodine & iodine preparations, Chlorinated lime, Sodium Hypochlorite

1 mark
define

3 marks
Mechanism.



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iii) Protein Precipitation:

Protein structure contains many polar groups & groups having lone pair of electrons. Some antimicrobial agents containing metal ions form complexes with the polar groups or groups having lone pair of electrons of the microbial protein.

e.g. Silver nitrate, Mild silver protein, Mercury & Mercury compounds like Yellow Mercuric oxide, Ammoniated mercury, Boric acid, Borax, IB, IIB group metals- Cu(II), Ag(I), Zn(II), Hg(II) etc.

Give properties and uses of :

d)

Ans.

i) Sodium nitrite

ii) Aluminium hydroxide gel

Sodium nitrite-

Properties-

- It occurs in the form of white granular powder or white crystals with saline taste
- When exposed to atmosphere it deliquesces and gets oxidised to sodium nitrate.
- It is very soluble in water and sparingly soluble in alcohol.
- Its aqueous solution is alkaline to litmus.

Uses-

- It is used as food preservative.
- It is used as effective antidote in cyanide poisoning.
- It is used as an antioxidant.
- Due to its vasodilation action, it is considered effective in angina pectoris.

2) Aluminium hydroxide gel-

Properties-

- It is an aqueous white viscous suspension of hydrated aluminium oxide with varying quantities of aluminium carbonate and bicarbonate.
- It's pH is 5.5 to 8.

2 marks
each



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- It consist of sodium benzoate as preservative, oil of mentha or peppermint oil as flavouring agent and sucrose or sorbitol as sweetening agent.

Uses-

- It is non systemic or non absorbable antacid.
- Externally, it is used as mild astringent and demulcent.
- Used in the treatment of diarrhoea and cholera.

e) **Give chemical formula for-(any 2)**

Ans.

i) Hypophosphorus acid

ii) Calcium carbonate

iii) Sodium hydroxide

iv) Nitrous oxide

Name	Chemical formula
Hypophosphorus acid	H_3PO_2
Calcium carbonate	$CaCO_3$
Sodium hydroxide	$NaOH$
Nitrous Oxide	N_2O

2 marks
each

5.

Answer any THREE of the following:

What is oral rehydration salt (ORS)? Give details of formulations of it.

a) **Oral rehydration salt:**

Ans.

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.

3x4=12

2 marks
each



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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 ORS recommended by WHO and UNICEF.

Ingredients	Formula I	FormulaII	Formula III
Sodium chloride	1.0 gm	3.5 gm	3.5 gm
Sodium bicarbonate	1.5 gm	2.5gm	-----
Sodium Citrate	-----	-	2.9 gm
Potassium Chloride	1.5 gm	1.5 gm	1.5 gm
Anhydrous Glucose	36.4 gm	20 gm	20 gm
Or glucose	40.0gm	22.0gm	—

Formula II and III are recommended by WHO and UNICEF for control in diarrhoeal diseases.

b) **Give the storage and labeling of:**

Ans. **i) Oxygen ii) Carbon dioxide**

i) Oxygen: Storage and labeling: Store under compression in metal cylinder. Valve should not be lubricated with oil or grease. Cylinder should be stored in a special room which should be cool and free from inflammable materials. The metal cylinder is painted BLACK and the shoulder is painted WHITE. The name of the gas or symbol "O₂" is stenciled in paint on the shoulder of the cylinder. It is clearly and indelibly stamped on the cylinder valve also.

ii) Carbon dioxide: 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 stenciled in paint on the shoulder of the cylinder and clearly and indelibly stamped on the cylinder valve.

c) **Explain the following terms with examples:**

Ans. **i) Anticaries agent ii) Desensitizing agents**

i) Anticaries agent:

2 marks each

2 marks each



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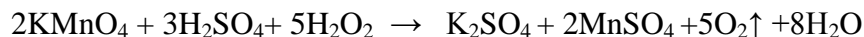
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indicator.

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 decolourised 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:



6. **Answer any THREE of the following:**

a) **Explain physiological acid base balance.**

Ans.

The acid base balance in the body is well regulated by intricate mechanism. A number of chemical reactions takes place in the cell and the reactions occurring inside is greatly influenced by pH or hydrogen ion concentration.

Acids are being constantly produced in process of metabolism. E.g. carbonic acid, lactic acid.

Acids or alkalis produced in the body may cause change in pH. Most of metabolic reactions occur between body pH 7.38-7.42.

Required pH (7.38-7.42) of plasma is maintained by:

1) Buffering system: Three major systems of buffering system occurring in the body are:

a) $\text{HCO}_3^- / \text{H}_2\text{CO}_3$ found in plasma & kidneys

b) $\text{HPO}_4^{--} / \text{H}_2\text{PO}_4^-$ present in cells & kidneys

c) Protein or Hb buffer system

2) Respiratory mechanism

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 fluid leads to the changes in pH of blood. Retention of CO_2 in the body due to decrease in ventilation as a result of mechanical/muscular impairment, lung disease, pneumonia, CNS depression due to narcotic drugs, CHF etc. induces respiratory acidosis This can be overcome by renal

3x4=12

4 marks



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mechanism by :

i) Increase in acid excretion by $\text{Na}^+ - \text{H}^+$ exchange

ii) Increase in ammonia (NH_3) formation

iii) 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 factors, fever, hypoxia, loss of appetite, salicylate poisoning etc. This can be overcome by renal mechanism by :

i) Increase in bicarbonate (HCO_3^-) excretion

ii) Decrease in ammonia (NH_3) formation

iii) Decrease in reabsorption of HCO_3^- (bicarbonate)

3) Renal mechanism

The third mechanism is via elimination of some ions through urine by kidney.

Absorption of certain ions and elimination of other ions control the acid-base balance of blood and thus of body fluids.

b) **Define expectorant. Give properties and uses of ammonium chloride.**

Ans.

Definition: The drugs or compounds that remove sputum from the respiratory tract are known as Expectorants. These drugs either increase the fluidity of sputum or increase the volume of fluids that have to be expelled from respiratory tract. Expectorants are used in the treatment of cough.

Properties of Ammonium chloride:

- It occurs as white crystals, odorless, cooling or saline taste
- Slightly hygroscopic, soluble in water, sparingly soluble in alcohol but freely soluble in glycerine.
- It sublimes on heating.
- Its aqueous solution is acidic to litmus.
- It shows reactions of ammonium and chloride radicals.

Uses of Ammonium chloride:

- Expectorant

1 mark
Define

1.5
marks
prop.

1.5
marks
uses



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c)
Ans.

- Diuretic
 - Replaces chloride lost during vomiting
 - Systemic acidifier (treatment of metabolic alkalosis)
 - It is also used in the treatment of urinary tract infections.
- Give properties and uses of calcium hydroxide and ferrous sulphate.**
- i) Calcium hydroxide:**
- Properties:**
- It is white powder.
 - It has alkaline and slightly bitter taste.
 - It is slightly soluble in water, very slightly soluble in boiling water. but soluble in glycerin and solution of sugar and insoluble in alcohol.
- Uses:**
- It is used in the form of calcium hydroxide solution in some skin lotions and oily preparations to form calcium soaps of fatty acids in various oils e.g. oleic acid which acts as emulsifying agents.
 - It is also antacid and astringent action.
 - It is used to absorb exhaled carbon dioxide in metabolic tests, anaesthesia and oxygen therapy.
 - Calcium hydroxide solution is used as an antidote.
- ii) Ferrous sulphate:**
- Properties:**
- It is odorless, bluish-green crystalline powder
 - It has astringent or metallic taste
 - It shows efflorescence in dry air
 - On exposure to air, ferrous sulphate is oxidized to brown color ferric sulphate
 - It is soluble in water and insoluble in ethanol
 - It gives identification tests for Ferrous & sulphate ions

2 marks
each



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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 convert ferric form of impurity into ferrous form and then forms 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.

e) **Give two identification tests for (ANY TWO):**

Ans.

i) Chloride ion

ii) Calcium ion

iii) Sodium ion

iv) Acetate ion

i) Chloride ion:

a) 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 re-precipitated by addition of dil. nitric acid.

b) 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.

ii) Calcium ion:

a) Calcium salt dissolved in HCl neutralized with NaOH & treated with carbonate solution to give white ppt of Calcium carbonate.

b) Concentrated solution of calcium salt treated with chromate gives yellow ppt of calcium chromate.

c) Calcium salt dissolved in acetic acid or glacial acetic acid, on adding 0.5ml of potassium ferrocyanide solution, the solution remains clear. After addition of 50mg ammonium chloride it gives white crystalline ppt.

2 marks
each



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d) In aq. solution of calcium salt add a few drops of ammonium oxalate solution, a white ppt is formed.

iii) Sodium ion:

a) Sodium compounds moistened with hydrochloric acid, take on a platinum wire and ignite in the flame of a Bunsen burner, it gives a yellow colour to the flame.

b) Solution of sodium salts with a solution of uranyl zinc acetate yields a yellow crystalline precipitate.

iv) Acetate ion:

a) Heat the substance with oxalic acid. It gives the acid vapours with the characteristic odour of acetic acid.

b) Warm 1gm of substance with 1ml of sulphuric acid & 3ml of alcohol, ethyl acetate, recognizable by its odour, is evolved.

c) Dissolve about 30mg of the substance being examined in 3ml of water; add 0.25ml of lanthanum nitrate solution, 0.1ml of 0.1N iodine & 0.05ml of dilute ammonia solution. Heat carefully to boiling, within a few minutes a blue ppt is formed or dark blue colour produced.