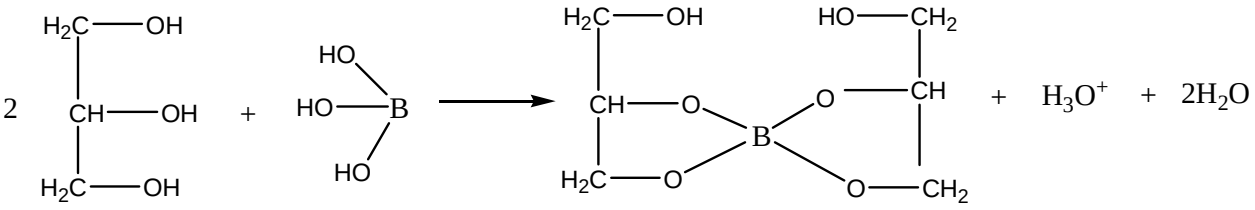
Q.1 Answer any FIVE: (Each question will carry Four Marks)

a) Explain why glycerin is used in the assay of Boric Acid. Give reactions involved.

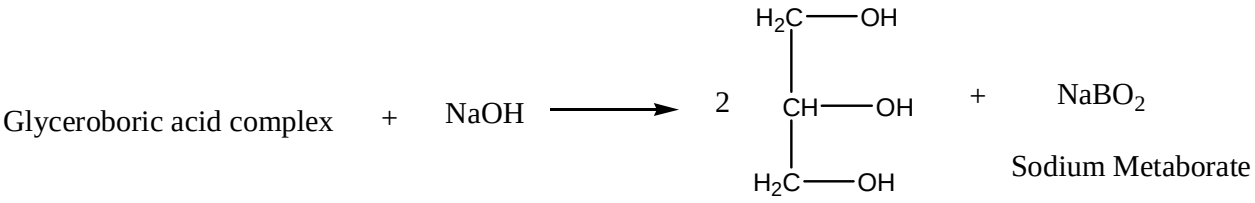
Ans. (Two marks for reason and two marks for reactions)

Glycerin is used in the assay of Boric Acid because; boric acid is a very weak acid which is to be titrated against strong alkali like sodium hydroxide, but it does not give sharp end point. So when glycerin is added it forms glyceroboric acid complex which acts as a strong monobasic acid and is strong enough to titrate against strong solution of sodium hydroxide.

Reactions involved in the assay of boric acid-



Glycerol Boric acid Glyceroboric acid complex



Sodium Metaborate

Glycerol

b) Discuss the various uses of radioisotopes in pharmacy

Ans. (One mark for first two points and half mark for remaining four points)

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

1. Diagnostic applications: By using radioisotopes, size & morphology of 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 to destroy diseased tissue without affecting on normal cells.

Gamma radiation has high penetrating power hence it destroy deep seated tumor.

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

^{131}I- Treatment of f 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 dressing, disposable syringes etc.

4. Research applications: In biochemical research radioisotopes are used in the determination of reaction mechanism. e.g. ^{13}C- used to lable 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 solution

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

c) Give uses and properties of Ferrous sulphate and Calcium carbonate

Ans.- (One mark each for uses and properties of Ferrous sulphate and Calcium carbonate)

Ferrous sulphate properties:

1. Odourless, bluish-green crystals
2. Astringent or metallic taste
3. Efflorescent in dry air
4. On exposure to air oxidized to brown color ferric sulphate
5. Soluble in water, insoluble in ethanol
6. It gives tests for Fe^{+2}, & $SO4^{-2}$

Ferrous sulphate uses:

1. Haematinic (Treatment of anemia caused by iron deficiency)
2. To dye fabrics & cloths
3. Manufacturing of ink
4. Used in photography
5. Disinfectant
6. Coloring agent in paint

Calcium carbonate properties:

1. White, odorless, tasteless, microcrystalline powder
2. Stable in air
3. Insoluble in water
4. It dissolve in dil. acids with effervescence
5. Induces constipation

Calcium Carbonate uses:

1. Antacid
2. Treatment gastric duodenal ulcer
3. Treatment of diarrhea
4. Polishing agent in tooth powder
5. Used in homeopathic medicine

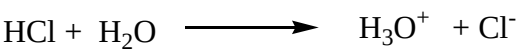
d) Define buffer. Expalin Mechanism of action of buffer.

Ans. (One mark for definition and Three marks for mechanism)

Definition: It composed of weak acid & its salts of strong base or weak base & its salts of strong acid, capable of resisting large change in pH.

Mechanism:

1. When small amount of acid is added to solution containing basic buffer system, acid will react with weak base or conjugated base from buffer system and converted in to weak acids.
2. If small amount of base is added to solution containing acidic buffer system, base will react with weak acid and converted in to weak base.
3. Thus each component of buffer system will react with either added acid or base and resist or prevent large change in pH.
4. E.g. Phosphate buffer system contain
   i) $H_2PO_4^-$ - act as a weak acid
   ii) HPO_4^{-2} - act as a weak base
5. In non buffered solution, if small amount of HCl is added, it will ionize to hydronium ion and chloride ($Cl^{-)}$ resulting in remarkable lowering of pH



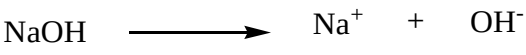
$$HCl + H_2O \longrightarrow H_3O^+ + Cl^-$$

6. If small amount of HCl is added to buffered solution H_3O^+ ion will react with weak base and converted in to weak acid.

$$H_3O^+ + HPO_4^{-2} \longrightarrow H_2PO_4^- + H_2O$$

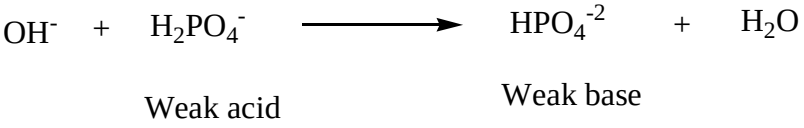
Weak base Weak acid

7. If small amount of NaOH is added to non buffered solution, it will ionized to hydroxide ion (OH^-) and Na^+, hence it will increase pH of preparation.



$$NaOH \longrightarrow Na^+ + OH^-$$

8. If small amount of NaOH is added to solution containing phosphate buffer, hydroxide ion will react with weak acid and converted in to weak base.



$$OH^- + H_2PO_4^- \longrightarrow HPO_4^{-2} + H_2O$$

Weak acid Weak base

e) Explain Lowery-Bronsted theory with examples.

Ans. (One mark each for definition and examples of acid and base)

As per Lowery-Bronsted theory

Acid- An acid is any substance capable of donating proton (H^+) in a chemical reaction; in short acid is a proton donor.

As per this theory Bronsted acid ionizes to produce a proton and the conjugated base of the acid which can be shown by following half reaction.

$HA \rightleftharpoons H^+ + A^-$

conjugated base

e.g.

$HCl \rightleftharpoons H^+ + Cl^-$

$H_2SO_4 \rightleftharpoons H^+ + HSO_4^-$

$H_3O^+ \rightleftharpoons H^+ + H_2O$

$NH_4^+ \rightleftharpoons H^+ + NH_3$

Base- Base is any substance capable of accepting a proton (H^+) in a chemical reaction; in short base is a proton acceptor.

Bronsted base accept a proton and forms conjugated acid.

e.g.

$OH^- + H^+ \rightleftharpoons H_2O$

$H_2O + H^+ \rightleftharpoons H_3O^+$

$HSO_4^- + H^+ \rightleftharpoons H_2SO_4$

$NH_3 + H^+ \rightleftharpoons NH_4^+$

f) Name four official antioxidants

Ans. (One antioxidant will carry one mark)

1. Hypophosphorous acid
2. Sulfur Dioxide
3. Sodium bisulphate
4. Sodium Metabisulphite
5. Sodium thiosulphate

6. Sodium nitrite

7. Nitrogen gas

g) Give synonym and molecular formula for:

(One mark each for synonym and molecular formula of Calcium hydroxide and Hydrochloric acid)

i) **Calcium hydroxide**

Synonym- Slaked lime

Molecular formula- $Ca(OH)_2$

ii) **Hydrochloric acid**

Synonym- Muriatic acid, Spirit of salt

Molecular formula- HCl

Q.2 Answer any THREE (Each question will carry FOUR marks)

a) Explain the physiological acid base balance in the body

Ans. The acid base balance in the body is well regulated by intricate mechanism.
Number of chemical reactions take place in the cell and the activity of 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 PH 7.38-7.42

Increase in acidity of body fluid & tissues means (PH < 7.38) is called as acidosis and
increase in alkali reserve in blood & body fluid (PH > 7.38) is called as alkalosis.

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

1. **Buffer mechanism**

Three major system of buffering system occurring in the body are

a) HCO_3^-/ H_2CO_3/ carbonic acid found in plasma & kidney
b) HPO_4^{-2}/ $H_2PO_4^-$ present in cells & kidney
c) Protein or buffer system

Proteins are composed of amino acids bound together by peptide linkage. However some amino acids like histidine have free acidic group which on dissociation from base and H+ which participate in buffering of the body fluid.

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 CO3 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 repiratory acidosis This can be overcome by renal mechanism by

i) Increase in acid excretion by Na^+-H^+ exchange
ii) Increase in ammonia (NH_3) formation
iii) Increase in reabsorption of HCO_3^- (bicarbonate)

In repiratory 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

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 control the acid-base balance of blood and thus of body fluids.

b)Define and classify antidotes with examples

Ans. (One mark for definition and three marks for classification)

Definition: Antidote is any Substance which counteracts the effect of poison.

Classification: Depending on their mechanism of antidotal 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 methemoglobin in order to bind cyanide)

2. **Chemical antidote:** It changes chemical structure of poison.

   e.g. Sodium Thiosulphate (convert toxic cyanide (CN^-) in to non toxic 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

c)Write properties and uses of

Ans. (One mark each for properties and uses of Talc and Kaolin)

Properties of Talc:

1. Softest mineral,
2. Purified hydrated magnesium Silicate, may contain aluminium Silicate
3. Very fine, white or grayish white powder, tasteless, odorless, free from grittiness
4. Insoluble in water, dil. Acids, bases
5. Low adsorptive property

Uses of Talc:

1. Skin protecting dusting powder
2. Medicated dusting powder
3. Lubricating agent in Tablet Manufacturing
4. Filtering aid

Properties of Kaolin:

1. Hydrated Aluminium silicate
2. Finely divided, white, odorless, tasteless powder
3. Free from grittiness
4. Insoluble in water, mineral acid, alkali
5. Sterilized by heating at temperature not less than 160^0C

Uses of Kaolin:

1. Adsorbent in enteritis
2. Treatment of Colitis, dysentery
3. Treatment of Diarrhea
4. External dusting powder
5. Drying agent for moist sores & infective ulcers
6. Clarifying agent

d)Explain with reactions, principle involved in the assay of hydrogen peroxide solution.

Ans. (Two marks for reactions and two marks assay of Hydrogen Peroxide)

Principle:

This assay is based on Oxidation Reduction (Permanganate) type of titration in which solution of potassium permanganate is acts as an oxidizing agent and hydrogen peroxide also acts as an oxidizing agent but in presence of strong oxidizing agent like potassium permanganate hydrogen peroxide acts as reducing agent. The ability of potassium permanganate solution to oxidize is due to conversion of the MnO_4^- ion to Mn^{++} in acidic solution but MnO_4^- ion is reduced by reducing agent like hydrogen peroxide. Solution containing MnO_4^- ion are purple in color , solution of salt containing Mn^{++} ions are colorless, hence permanganate solution is decolorized by reducing agent as longer as MnO_4^- is present in the solution. The moment there is an excess addition of potassium permanganate solution becomes purple, thus potassium permanganate acts as a self indicator.

Reactions:

In this assay dilute sulfuric acid is used for conversion of MnO_4^- to Mn^{++}

$$MnO_4^- + 8H^+ + 5e \xrightarrow[\text{condition}]{\text{acidic}} Mn^{+2} + 4H_2O$$

Chemical reaction for assay:

$$2KMnO_4 + 3H_2SO_4 + 5H_2O_2 \longrightarrow 2MnSO_4 + K_2SO_4 + 8H_2O + 5O_2$$

e)Define the term with examples:

i) Lewis acid and Lewis base

ii) Antiseptic and Disinfectant

Ans. (Half mark for definition and half mark for examples of each term)

Lewis Acid: Acid is an any substance which can accept a pair of electrons in a reaction.

e.g H^+, Na^+, K^+, Al^{+3}, Mg^{+2} etc.

Lewis Base: Base is an any substance which can donate a pair of electrons in a reaction.

e.g. OH^-, F^-, CH_3COO^-, Cl^-, SO_4^{-2} etc.

Antiseptic: They are antimicrobial substances that are applied to living tissue/skin to reduce the possibility of infection, sepsis.

e.g. Hydrogen peroxide, potassium permanganate, Iodine, Povidone iodine etc.

Disinfectant:

Disinfectants are substances that are applied to non-living/inanimate objects to destroy microorganisms that are living on the objects.

E.g. Chlorinated lime, potassium permanganate, formaldehyde, phenol etc.

Q.3 Answer any THREE:(**Each question will carry Four Marks)**

a) Explain the importance of **"Combination Antacid Therapy**".(write 4 points for4 Marks)

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 balance the constipative effect of calcium & aluminium with the laxative effect of magnesium. Some of these products are also 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 antiflatulent action as they are antifoaming agents & causes dispersion of gases.

Some preparations are mixtures of two antacids are as follows:

1.**Aluminium hydroxide gel: Magnesium hydroxide combinations:**

The USP prescribes two dosage forms suspensions & tablets.

A)Suspensions:

-Alumina& magnesia oral suspension: It contains the 3.1to4% aluminium oxide as aluminium hydroxide & 1.4to 2.2%magnesium hydroxide.

-Magnesia & alumina oral suspension: It contain 2.9 to 4.2% magnesium hydroxide & the 2 to 2.4 % aluminium oxide as aluminium hydroxide.

B)Tablets:

-Alumina & magnesia tablets.

-Magnesia & alumina tablets.

2.Aluminium hydroxid gel: Magnesium trisilicate combinations:

Alumina Magnesium trisilicate oral suspension .potency is expressed in terms of aluminium oxide& magnesium oxide.

3.Calcium carbonate- containing antacid mixture:

Calcium carbonate with aluminium hydroxide gel gives a product which has rapid onset with the prolong actions.calcium carbonate can also be combine with magnesium containg antacid to balance constipating effect of calcium with the laxative effect of magnesium.

4.Algenic acid-Sodium bicarbonate combination:

It provides symptomatic relief of reflux esophagitis

5.Simethicone-containing antacid:

Simethicone is an activated dimethicone or activated polymethlysiloxane.Simethicone has an antifoaming activity so can be combined with some of the antacids.

6.Magaldrate:

It is a hydrated magnesium aluminate .It is a chemical combination of magnesium hydroxide & aluminium hydroxide.It contain 28to39% magnesium oxide & 17 to 25% of aluminium oxide.

7**.Aluminium hydroxide gel-Kaolin combinations**

Kaolin as absorbant property so can be combined with aluminium hydroxide gel.

b.Discuss the effect of impurities present in pharmaceuticals.(write minimum8 points for 4 marks)

It can be seen that almost pure substances are difficult to get & some amount of impurity is always present in the material**. The impurities present in the substances may have the following effects**:

-Impurities which have a toxic effects, can be injurious when present above certain limit.

-impurities , even when present in traces, may show a cumulative toxic effect after a certain period.

-Impurities are sometimes harmless, but are present in such a large proportion that the active strength of the substance is lowered.

-Impurities may bring about a change in the physical & chemical properties of the substance, thus making it medically useless.

-Impurities may cause technical difficulties in the formulations & use of the substances.

Impurities may bring about an incompatibility, with other substances.

-Impurities may lower the shelf life of the substances.

-Impurities though harmless in nature, may bring about changes in odour, colour, taste etc. thus making the use of the substance unethical, as well as unhygenic.

C)Discuss the biological effects of radiations on human body.(write minimum 8 points for 4 marks)

Ans.**The effect of radiation upon biological tissue depends upon a number of factors such as**:

1.Ability of the radiation to penetrate tissue.

2.The energy of radiation.

3.The kind of tissue.

4.Surface area of the tissue exposed.

5.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 undersirable 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.

$\times H_2O \rightarrow \times H + \times HO$

$\downarrow \quad \downarrow$

$yH_2 \quad yH_2O_2$

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 these type of radiation are high enough to produce significant damage in the particular tissue at distances of several metres from the source.

D)Name four official Calcium compounds(2 marks)along with their molecular formula(2Marks).

1.Calcium carbonate I.P.-$CaCO_3$

2.Calcium Hydroxide B.P.-$Ca(OH)_2$

3.Calcium gluconate -$C_{12}H_{22}O_{14}Ca.H_2O$

4.Calcium chloride -$CaCl_2.2H_2O$

5.Calcium AcetateB.P. -$C_4H_6CaO_4$

6.Calcium lactateI.P. -$C_6H_{10}CaO_6.H_2O$

7.Calcium Levulinate I.P.-$(CH_3COCH_2CH_2COO)_2Ca.2H_2O$

8.Calcium Dibasic PhosphateI.P-$CaHPO_4$

-$CaHPO_4.2H_2O$

9.Calcium phosphate Tribasic-$Ca_3(PO_4)_2$

10.Calcium suphate Dried B.p.-$CaSO_4.1/2H_2O$

11.Sodium calcium Edetate B.P.$C_{10}\ H_{12}\ CaN_2Na_2O_8$

12.Calcium Amino Salicylate I.P.-$C_{14}H_{12}CaN_2O_6.3H_2O$

e) **Mention uses of:**

1.Chlorinated lime(2marks)

-It is used as disinfectant & bleaching agent.

-It shows bactericidal action. It is used to disinfect faeces, urine , sputum& other organic material.

-It is employed for disinfecting drainages.

-It is a powerful bleaching agent .Its powerful bleaching action must be considered while disinfecting coloured materials.

-it is used as one to two grams per litre for sterilization of water. The treated water should be exposed to air & allowed to settle before use.

-Chlorinated lime is used in the preparation of surgical chlorinated soda solution, employed as a wound disinfectant.

2.Selenium sulphide.(2marks)

-It is used as an antiseborrheic agent & also used in non- inflammatory non exudetive seborrhea of the scalp & external glabrous skin.

-It is used in form of shampoos in the treatment of dandruff &seborrhoeic dermatitis of the scalp,

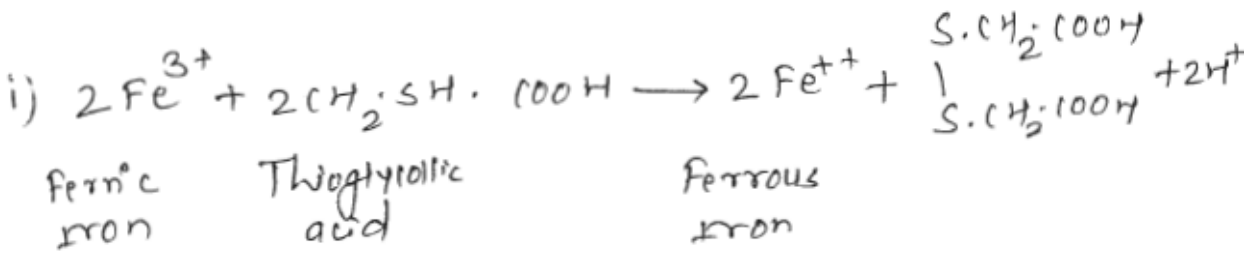
dermatitis & allergic dermatosis with seborrhea.

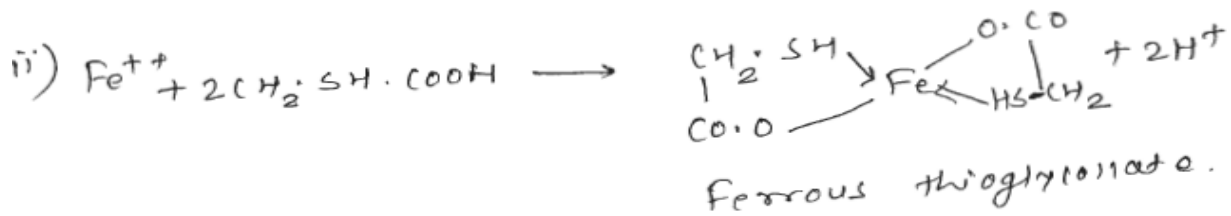
Q.4 Answer any THREE(each answer carries 04 marks)

a) Explain **the principle**(2marks) along with **reactions(**2Marks) involved in iron Limit Test IP.

Ans. Principle-It depends on the reaction of iron in an ammoniacal solution, in presence of citric acid with thioglycollic acid when a pale pink to deep reddish purple colour is produced. Citric acid forms a complex with iron & prevent its precipitation by ammonia.The colour is due to the formation of ferrous compound, ferrous thioglycolate which is stable in absence of air but fades in air due to oxidation.

The original state of oxidation of iron is immaterial, as thioglycollic acid is a reducing agent & reduces ferric iron to ferrous.Ferrous thiglycollate is colourless in acid or neutral solutions. The colour develops only in the presence of alkali.The reactions are given below.





b) Define Cathartics.(1Marks) Classify with examples.(3Marks)

Ans.**Cathartics** are the agents that quicken & increase evacuation from bowels & also drugs used to relieve constipation.

Classification:

The cathartics can be considered under the following class,

1.**Mild purgatives or laxatives** : It helps to promote defaecation causing minimum adverse effects. Drugs included in this group are:

a)Bulk –producing drugs: Which promote evacuation by increasing the stools bulk-volume & water contents e.g. Isapgol, agar-agar, methycellulose, bran, psyllum seed, sodium carboxymethylcellulose & karaya gum.

b) Stool softners (Emollient): Which penetrate ,lubricate & soften the stool e.g. D-octyl sodium sulphosuccinate, liquid paraffin.

2.Strong Purgatives: It cause complete evacuation of the bowel & the bowel become inactive ,constipation usually follows for which a milder purgative is again needed.

There are two kinds of strong purgatives:

a) Irritant or stimulant purgatives e.g. Phenolphthalein, senna glycosides ,aloe, cascara sagrada, rhubarb extract, podophylin, castor oil, bisacodyl & calomel.

b) Saline cathartics/Purgatives (osmatic laxatives) these are further sub classified as under:

i) Sodium-containing products e.g. Sodium biphosphate, sodium phosphate, potassium sodium tartrate

ii) Magnesium-containing product e.g. magnesium hydroxide, magnesium citrate, Magnesium sulphate

iii) Sulphur as cathartic

iv) Non official cathartics e.g. sodium sulphate , potassium phosphate, potassium bitartrate,calomel.

C) Explain **role of Sodium ion** as major extra cellular electrolyte.(write minimum 8 points for 4 marks)

Ans. **Sodium ion** – It is the principal cation in the extra cellular fluid compartments. It is the predominant cation of all extra cellular fluids, supplying more than 90% of the cations present, on an equivalent basis.

Normally about 142mEq/l sodium ions are present in extra cellular fluid.only 35mEq/l are found in the intra cellulaer fliud. Sodium maintains normal hydration & osmotic pressure.

Generally our daily diet contains more than sufficient amount of sodium which is mostly absorbed from the intestinal tract. Excess of sodium is eliminated through the kidneys by glomerular secretion. Acting through its osmotic effects in the extra cellular fluids , sodium ion regulates fluid distribution throughout the boby. There is a correlation between sodium content of the tissues & hypertension.

Condition under which there is low serum sodium level can be summarized as fllows: -loss due to excessive urination as in case of biabetes inspidus.

-excessive sodium excreation in metabolic acidosis

-diarrhoea & vomiting

-in Addison's disease in which there is a decreased excreation of hormone aldosterone which is antidiuretic in nature.

Condition under which there is a high serum sodium levels are as follows:

-severe dehydration

-hyper adrenalism

-certain types of brain damage

-excessive treatment with sodium salts

D)Define radio-opaque contrast media.(1Marks) Explain properties(1& ½ Marks) & uses(1&1/2 Marks) of barium sulphate.

Ans.**Radio-opaque contrast media** is the X-ray 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.

Properties:

It is a fine ,white,odourless,tasteless & bulky powder that is free from grittiness. The salt is insoluble in water ,organic solvents & dilute acid & alkalies. It is soluble in concentrated H2SO4

$BaSO_4 + H_2SO_4 \rightarrow Ba(HSO_4)_2$

It can be solubilised with sulphuric acid or by fusing it with alkali carbonates. Once it is converted to carbonates, it reacts with acids easily.

Uses:

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 by enema for examination of the colon.

Barium sulphate is ingested for use in GIT, in the form of a suspension usually with flavouring & suspending agents(200-300g orally) .

e) Discuss dehydration products of Boric Acid with reactions.(each points gives 1 mark)

On heating to certain temperatures boric acid gives various dehydration products.

EFFECT OF HEAT ON BORIC ACID:-

- **When heated above 100°C, it dehydrates, forming *metaboric acid* (HBO_2):**
- **$H_3BO_3 \rightarrow HBO_2 + H_2O$**
- **Boric acid melts at about 160°C, forming *tetraboric acid* or *pyroboric acid* ($H_2B_4O_7$):**
- **$4\,HBO_2 \rightarrow H_2B_4O7 + H_2O$**
- **and when heated above 160°C further dehydrates, forming boron trioxide.**
- **$H_2B_4O_7 \rightarrow 2\,B_2O_3 + H_2O$**
- **Borontrioxide dissolves in water to form orthoboric acid.**
- **$3H_2O + B_2O_3 \rightarrow 2H_3BO_3$**

Q5.Each answer carries 04 marks

A] .(01 mark for definition & 03 marks for classification)

Topical agents:- 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. They mainly act by mechanical or physical mechanism.
Classification of topical agents:-
1]Protectives and adsorbents. e.g. **Silicone Polymers, talc, Titanium Dioxide, Calamine, Zinc Oxide, Zinc Stearate,**
2]Antimicrobial agents.
-Acting by oxidation. E.g. **Hydrogen Peroxide, Sodium Perborate, Potassium Permanganate,**
-Acting by halogenation. E.g. **Chlorinated Lime, Sodium Hypochlorite Solution, Iodine and Iodine Preparations.**

- Acting by protein precipitation. E.g. **Boric Acid, Borax, Silver Compounds and Preparations , Mercury Compounds.**

3]Astringents. E.g. **Alum, Aluminium Chloride, Aluminium Sulphate, Aluminium Subacetate Solution, Zinc Chloride, Zinc Sulphate.**

4]Miscellaneous compounds. E.g. **Sulphur and Sulphur Compounds.**

B] 02 marks for each.

i. Oxygen:- Oxygen is stored and supplied in metal cylinders under pressure.
The shoulder of the cylinder is painted white (as an international colour code) and the remainder part of cylinder is painted black.
The name and symbol of oxygen (0_2) is stencilled on the shoulder of the cylinder.
ii. **Carbondioxide:-** Carbondioxide is stored & supplied in metal cylinders.
The shoulder of cylinder is painted grey and has the name and symbol of CO_2 stencilled on it.

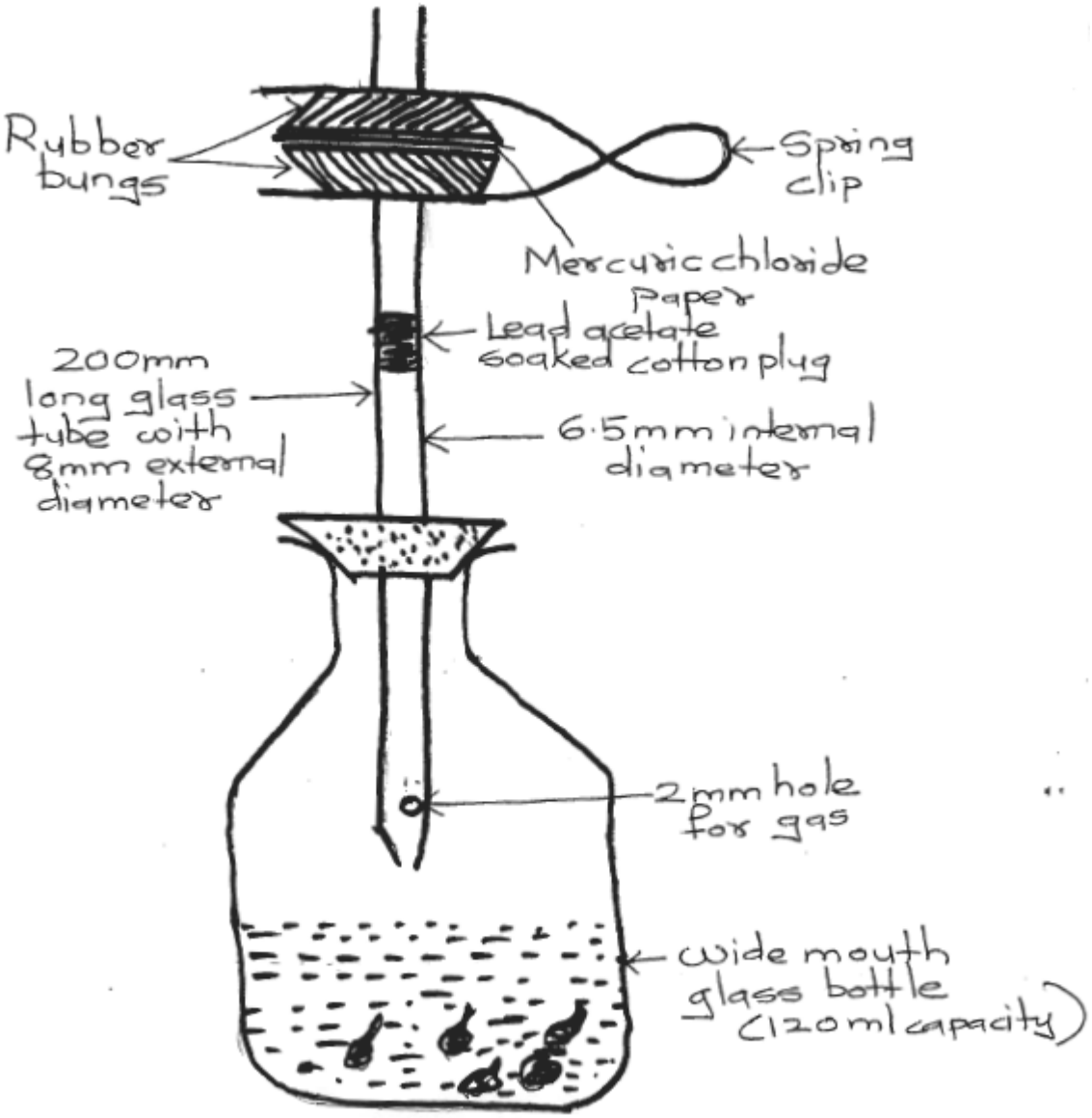
C] **02 marks for each.**

i. **Chloride ion**.:-1)chlorides when heated with manganese dioxide & sulphuric acid, gives chlorine gas which can be recognized by its odour or by its action on starch-potassium iodide paper which turns blue. Chlorine liberates iodine from KI, which turns starch blue.
2) Aqueous solutions of chloride when acidified with HNO3 & treated with silver nitrate solution, gives a curdy- white ppt. of silver chloride, which is insoluble in dilute nitric acid but dissolves in ammonia solution. On addition of nitric acid the ppt. appears.
3) When sample containing chloride ion is treated with potassium dichromate solution & sulphuric acid & a paper moistened with diphenylcarbazide solution is placed over opening of the test tube, the paper turns violet.

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.

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

D] GUTZEIT APPARATUS



LIMIT TEST FOR ARSENIC

E] Importance of quality control in pharmacy.

- The term 'Quality Control' has assumed lots of importance in pharmaceutical field.
- The basis of maintaining the quality of a product could be seen through, the following Good Manufacturing Practices.
- Since, it is necessary that a good quality product should be available to the doctors to treat patients or for the users; the responsibility of pharmacist and those of pharmaceutical industry has increased considerably.
- 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.
- In order to have the above referred properties in a drug, it is necessary to have a quality control.
- To achieve 'Quality Control' a concept of Total Quality Control' is to be followed.
- Total quality control will include all those aspects starting with the procurement of raw material to the finished product available at the drug store and till it is consumed by the customer.
- Thus, it will include not only the parameters of GMP but also the storage-handling and preserving the sample till ultimate use.
- The quality set for a drug is after consideration of recommendations of various expert bodies and these standards are published in the form books (compendiums) like pharmacopoeias, pharmacopoeial codex, etc.
- One of the important areas of quality control is to analyse a drug for quality and quantity.
- Various tests and procedures for analysis, including finding and determining impurities are laid down in the official books.
- This applies both to the drug as raw material as well in the form of finished product.
- The pharmacopoeial monograph gives details about this.
- The basis of all the studies and tests of quality control is to ensure that quality drug is available to the consumer and patient.

Q6.] Each anwer carries 04 marks.

A] Role of fluoride in preventing dental caries(01 mark)

- Administration of traces of fluoride containing salts or their use in topical use to the teeth have 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.

- 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 fluorosjs.**

Properties & storage of sodium fluoride(1&1/2 mark)

Properties :-

- It occurs as colourless, odourless crystals or as white powder.
- It is soluble in water but is insoluble in alcohol.
- Aqueous solutions of the salt corrode ordinary glass bottles and hence the solution should be made in distilled water and stored in dark, pyrex bottles.
- On acidification of salt solution, hydrofluoric acid is produced.
- This is weak acid and is poisonous.
- Aqueous solution of salt gives alkaline reaction.

Storage:- It should be kept in well-closed containers.

Properties & storage of stannous fluoride(1&1/2 mark)

Properties :

- It is a white crystalline powder with unpleasant astringent-salty taste.
- It is soluble in water but insoluble in alcohol and organic solvents.
- Aqueous solution of stannous fluoride deteriorates rapidly on standing due to oxidation of stannous cation to stannic form resulting in turbidity.

Storage:- It should be kept in well-closed containers.

B] Classification of G.I.T Agents(02 marks)

1)Products for altering gastric pH

a]products used for achlorhydria(hypochlorhydria)ie. Acidifying agents. E.g. HCl

b]products used for hyperchlorhydria i.e. Antacids. E.g. Aluminium containing antacids, Magnesium containing antacids, Calcium containing antacids.

2)Protectives for intestinal inflammation. E.g. Bismuth Compounds(Bismuth Subgallate, Bismuth Subnitrate, Bismuth Subcarbonate), Kaolin.

3)Adsorbents for intestinal toxins. E.g. Same as above.

4)Cathartics or laxatives for constipation.

-Stimulant. E.g. senna, rhubarb, cascara, podophyllum, castor oil, aloe, bisacodyl etc. belong to this class.

- Bulk purgatives. E.g. Methylcellulose, sodium CMC, gum, isapagol etc. are bulk purgatives.
- Lubricants. E.g. Substances like liquid paraffin, glycerine, mineral oils etc. act as lubricants.
- Saline cathartics. E.g. Poorly absorbable cations like calcium, magnesium and anions like phosphate, sulphate, tartarate contribute to this effect.

Uses of Aluminium hydroxide gel(01 mark)

Aluminium hydroxide gel preparations are used in the treatment of peptic ulcers and hyperchlorhydria.

Uses of Magnesium trisilicate (01 mark)

Magnesium trisilicate being insoluble in water has advantage over other carbonate and hydroxide type antacids of alkaline earth metals. It neutralises the excess acidity of stomach, without causing the alkalinization of the system. When magnesium trisilicate is ingested, the silicon dioxide

associated gets into colloidal form and acts as a protective on to the ulcers and thus prevents further attack of acid on peptic ulcers.

C] 01 mark for each synonym.

i.Potassium Aluminium Sulphate: Alum.
ii.Barium Sulphate Suspension: Barium meal.
iii.Potassium Hydroxide: Caustic potash.
iv.Antimony potassium tartarate:Tartar emetic, tartarated antimony.

D] Applications of astringents(01 mark for each use)

- In general term, astringents are the compounds that brings protein precipitation.
- This action may be on mucosal membrane when taken internally or on skin for topical use.
- Astringents when applied topically cause precipitation of protein of surface cell by coagulation.
- The action depends upon the extent of penetration of agent and the type of chemical action resulting with protein.

In general, astringents compounds do show the following uses:-

i) **styptic action** i.e. stopping of bleeding by coagulation of blood and constriction of small capillaries,

ii) **anti-inflammatory** by decreasing supply of blood to the tissues,

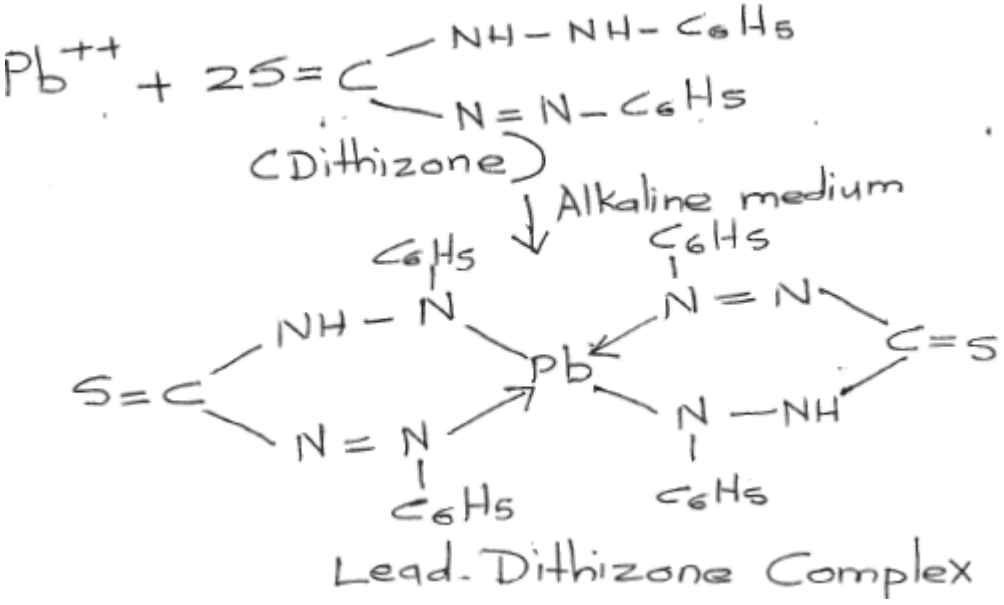
(iii) **antiperspirant** by decreasing secretion of persipration by reducing pore size of skin and

(iv) **antimicrobial** by protein precipitation mechanism.

E] Principle involved in the limit test for lead IP(02 marks)/Reactions involved (02 marks)

- 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 compels (red in colour).
- The original dithizone has a green colour in chloroform,thus the lead-dithizone shows a violet 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 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.

- REACTIONS:



Lead-Dithizone Complex