JRG College of Pharmacy

JRG COLLEGE OF PHARMACY

UNIVERSITY SOLVED QUESTION

WITH ANSWER

Year : 2022-2023

Subject : Inorganic chemistry

Subject Code : BP-104T

Subject In-Charge : Kiranmayee Bhatra & Adyasha Senapati

Registration No : | | | | | | | | | | |

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Course: B.Pharm
Sub_Code: BP104T

1st Semester Regular/Back Examination: 2022-23
Pharmaceutical Inorganic Chemistry
BRANCH(S): B.Pharma
Time: 3 Hours
Max Marks: 75
Q.Code: L724

Answer Question No.1 (Part-1) which is compulsory, any seven from Part-II and any two from Part-III.

The figures in the right hand margin indicate marks.

Part-I

Q1 **Answer the following questions :** **(2 x 10)**

a) Mention the principle of limit test of heavy metals.
b) What is the molecular formula and uses of sodium bicarbonate?
c) Define the term astringent with examples.
d) What do you mean by buffer capacity?
e) What are the units used in radiopharmaceuticals?
f) Define limit test with its importance in pharmaceuticals.
g) What is anticaries agent, give two examples?
h) What is the role of citric acid in limit test of iron?
i) Why barium chloride solution is replaced with barium sulphate reagent in limit test of sulphte?
j) What is the use of chlorinated lime?

Part-II

Q2 **Focused-Short Answer Type Questions- (Answer Any Seven)** **(5 × 7)**

a) Discuss principle, chemical reaction and construction of limit test for Arsenic.
b) Discuss measurement of radio isotopes and half life period of radioactive elements.
c) What is isotonic solution and show out the tonicity with different concentrations of NaCl solutions?
d) Write down the chemical reaction and principle of limit test of chloride.
e) Discuss the term Haematinics and Emetics with examples.
f) Classify different types of Cathartics with examples.
g) What is the use Sodium thiosulphate in pharmaceuticals?
h) Briefly discuss different concepts of acids and bases with their limitation.
i) Write down the composition and uses of Oral Rehydration Salt (ORS).

Part-III

Long Answer Type Questions (Answer Any Two)

Q3 What do you mean by radiopharmaceuticals? Discuss briefly pharmaceutical application and storage conditions of radioactive substances. **(10)**

Q4 Discuss briefly classification and mechanism of antimicrobials agents with examples. **(10)**

Q5 What is buffer solution? Show out the mechanism of action of buffer solution with its PH expression relate to Henderson Hasselbalch equation. **(10)**

Q6 What is gastrointestinal agents and classify antacids? Enumerates preparation, properties and side effects of aluminum or magnesium containing antacid. **(10)**

Inorganic Chemistry

2 marks

1 a) Mention the principle of limit test of heavy metals.

Ans It is based upon the reaction between metallic impurities with Hydrogen sulphate in acidic medium to form brownish colour solution
→ metal that response to this reaction.

1) Lead
2) Mercury
3) Bismuth
4) Silver
5) Copper

$2Cu^{+} + H_2S \rightarrow Cu_2S + 2H^{+}$

$Cu^{2+} + H_2S \rightarrow CuS + 2H^{+}$

$2Bi^{+} + H_2S \rightarrow B_2S + 2H^{+}$

$2Ag^{+} + H_2S \rightarrow Ag_2S + 2H^{+}$

B) What is the molecular formula and uses of sodium bicarbonate?

Ans Molecular formula - $NaHCO_3$

uses of sodiumbicarbonate

→ sodium bicarbonate, ~~commonly~~ commonly known as baking soda.

1) **Cooking and Baking**
→ Mainly used for leavening agent.
→ used for tenderizer.

2) **Cleaning**
→ used for General cleaner.
→ used for Laundry.

3) Health and Medicine

Antacid

→ It neurauzes stomach acid, relieving heartburn and indigestion.

oral hygiene

→ used in tooth paste and mouthwash to clean teeth and freshen breath.

c) Define the term astrigent with example

Ans Astrigents are the drugs that helps to tightended to the skin.

→ These are those substances which are protein precipitation.

Ex zinc sulphate & potash alum.

d) what do you mean by buffer capacity

Ans the amount of acid/base required to produce a unit change in PH of buffer soln is known as buffer capacity.

→ It is also known as
1) Buffer index
2) Buffer value
3) Buffer efficacy
4) Buffer co-efficient.

$$\beta = \frac{\Delta A \text{ or } \Delta B}{\Delta PH}$$

ΔA/ΔB = Amount of acid or base added
ΔPH — Change in PH

e) What are the units used in radiopharmaceuticals.

Any units of Radioactivity

→ It is the number of disintegration per second

1) Curie

1 curie = 3.7×10^{10} dps

2) Becquerel (BQ)

It is S.I unit.

1BQ = 2.703×10^{11} Ci

3) ROentgen (R)

→ International system of units.

1R = 2.58×10^{-4} CKg^{-1}

f) Define limit test with it's importance in pharmaceuticals.

Limit test is a process in which if in a formula any impurities is present i.e more or less than the prescribe limit.

Importance of limit test in pharmaceuticals

→ 1) Safety Assurance

→ Limit test help ensure that pharmaceutical product do not contain harmful levels of impurities or contaminants.

2) cost efficiency.

→ Early detection of impurities through limit tests can prevent costly recalls and legal issues.

g) what is anticaries agent. give two examples.

Ans Anticaries agents are the chemical compound used to prevent the dental caries by the action of micro organism.

Ex ① Fluoride, ② chlorhexidine

h) what is the role of citric acid in limit test of iron?

Ans complex formation

→ citric acid reacts with iron ions (Fe^{3+} or Fe^{2+}) to form a soluble complex. This complexation helps in preventing the precipitation of iron as hydroxides.

→ It is also helps in pH maintenance.

→ It is role in stabilization of Iron ions.

i) Why barium chloride solution is replaced with barium sulphate reagent in limit test of sulphate?

Ans purity and reactivity

→ Barium sulphate reagent is generally more pure and less reactive than barium chloride solution. This ensures that the results are more accurate and not influenced by potential impurities or side reaction.

→ Barium sulphate is less hazardous compared to barium chloride.

→ using barium sulphate reagent can improve the sensitivity of the test than barium chloride

→ Barium sulphate reagent doesnot introduce additional ions thus minimizing the risk of contamination.

1) What is the use of Chlorinated lime.

Ans Water Treatment

→ Chlorinated lime is widely used to disinfect drinking water and swimming pools.

→ It effectively kills bacteria, viruses and other pathogens, making water safe for consumption and reaction.

→ Chlorinated lime is used as a bleaching agent to whiten fabrics and paper products.

5 marks

2a) Discuss principle, chemical reaction and construction of limit test for Arsenic.

Ans Limit test of Arsenic

→ Limit test for Arsenic (As) is based on the fact that Arsenic is easily reduced into Arsine gas (AsH_3). which on mercuric chloride paper gives yellow stain.

→ Arsenic (As) may be present As^{3+} (Trivalent) or As^{5+} (Pentavalent)

→ As^{3+} (trivalent arsenic) $\xrightarrow{HCl}$ $As(OH)_3$ (H_3AsO_3) Arsenious acid

As^{5+} (pentavalent Arsenic) $\xrightarrow{HCl}$ $O=As(OH)_3$ (H_3AsO_4) Arsenic acid.

→ The solution is treated with a reducing agent (Stannous chloride) to convert the pentavalent arsenic acid into trivalent arsenious acid.

$$H_3AsO_4 \longrightarrow H_3AsO_3$$

$$O=As(-OH)(-OH)(-OH) \xrightarrow[\text{Reduction}]{SnCl_2} As(-OH)(-OH)(-OH)$$

Arsenious acid.

→ The Arsenious acid is then converted into ~~gas~~ arsine gas with the help of nascent hydrogen, which is produced by Zn+HCl.

$$H_3AsO_3 + 3H_2 \longrightarrow AsH_3 + 3H_2O.$$

Arsenious acid.

$$Zn + 2HCl \longrightarrow ZnCl_2 + H_2\uparrow.$$

→ Arsine gas is carried through the tube by the stream of hydrogen and out through the mercuric chloride paper.

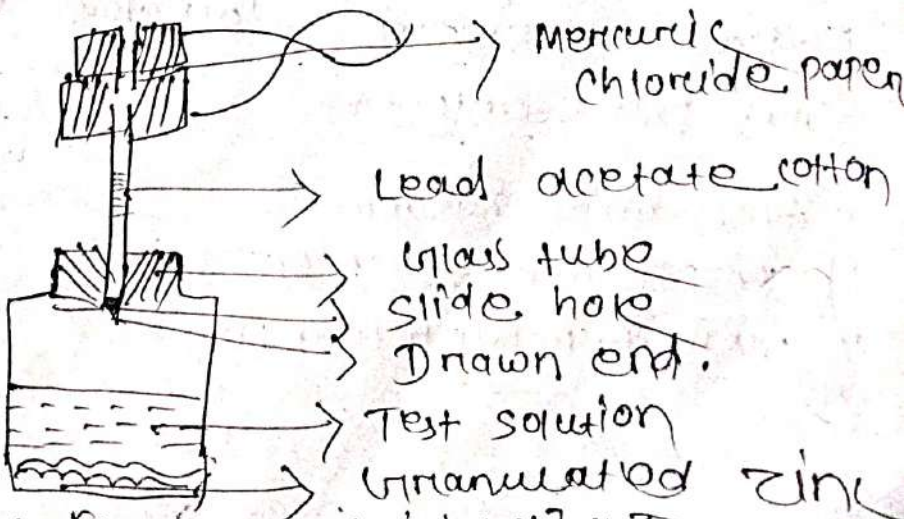
$$AsH_3 + 3HgCl_2 \longrightarrow Hg(-AsH_2)(-AsH_2) + 2HCl$$

Arsine gas — paper — (yellow in colour)

→ The results in the formation of yellow or brown stain on the mercuric chloride paper.

→ The intensity of the colour is proportional to the quantity of arsenic.

⊙ Apparatus



[Apparatus for arsenic limit test] IAST.

Procedure

→ The solution or Test (sample) is prepared in the acid and stannous chloride as specified in I.P and is placed in wide mouth bottle.

→ To this is added 1 gm of potassium iodide AST and 10 gm of Granulated zinc AST. The glass tube with its outer fitting is placed quickly: kept solution aside for 40 minutes

→ The yellow stain is produced on the mercuric paper if arsenic is present.

→ It is compared in day light with the Standard stain produced by doing the test separately in a similar manner with known quantity of dilute arsenic solution.

→ The solution contains 1.32 mg of arsenic trioxide in 100ml water.

b) Discuss measurement of radio isotopes and half life period of radioactive element.

Ans The measurement of nuclear radiation and detection is an important aspect in the identification of type of radiations (α, β, γ) and to assay the radionuclide emitting the radiation. Suitable detectors are required.

Gas filled detectors

1) Ionization chamber
2) proportional counter
3) Geiger-muller counter

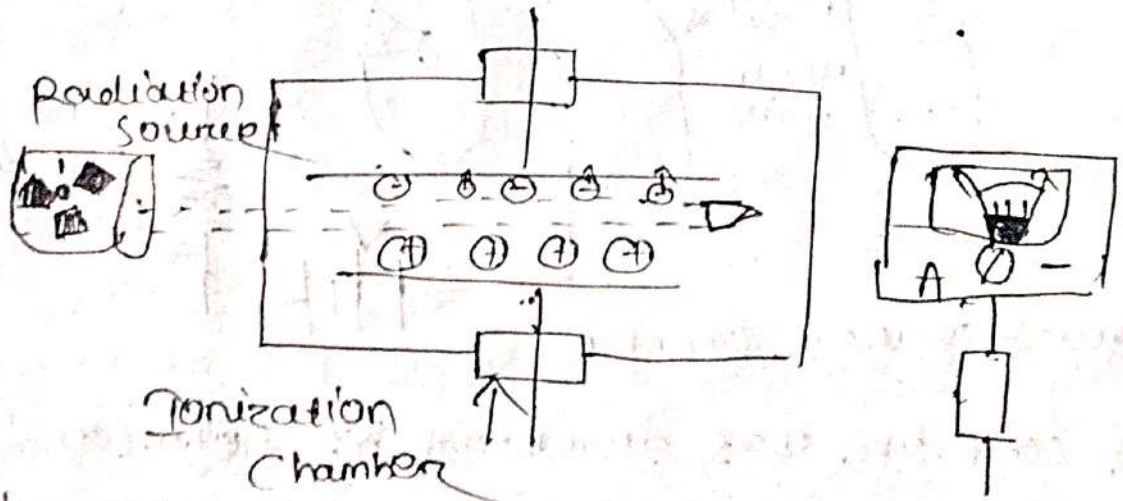
Ionization chamber

→ It is the simplest gas filled detector which is based on the collection of all the charges created by direct ionization of the gas molecules through the application of electric field.

→ It consists of chamber filled with gas like Argon, Heliumor Air etc.

→ Ionization chamber is fitted with two electrodes (kept at different electric potential (50-100V for each cm of distance between two electrodes) and a measuring device to indicate the flow of current.

→ Radiations bring about ionization of gas molecules or ions which cause emission of electrons which is turn reveals the changes in electric current.



Advantages

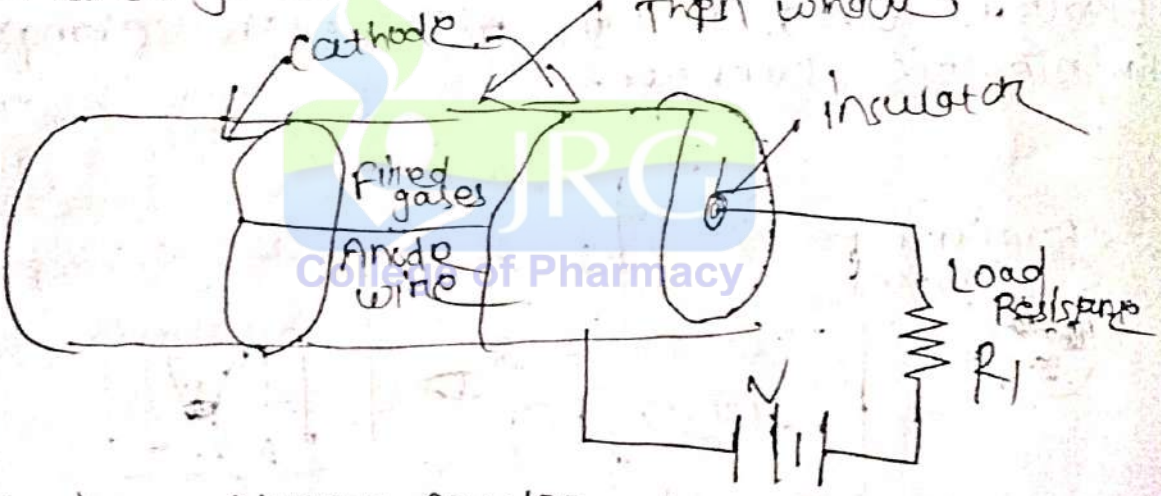
→ Good uniform response to a radiation over a wide range of energy.

Disadvantages

→ Relatively weak output pulse.

2) Proportional counter

→ It is the modified form of ionization chamber.
→ operate at high voltage (1000 - 2000 V).
→ It is device used to detect charged particle having low ionization power (i.e β / γ).
→ Filling gas 90% Ar and 10% methane
→ Principal
→ when voltage between cathode and anode is sufficiently increase primary ion will produce by interaction of gas particles.
→ They gain sufficient energy to further collide with gas molecule and produce secondary ions and give rise to detector pulse.



3) Geiger - Muller counter

→ GM counter was developed by Geiger and muller in Germany in the year 1928.
→ It is a device used to detect and measuring ionization radiation.
→ It is used to all type radiations α, β & γ easily.
→ It is the oldest radiation detector due to its low cost, simplicity and in case of operation, it is best detector among all.

Half life

→ It is the time period in which a substance or radionuclei is reduced by 50 % or half of it's intial amount.

$$t_{1/2} = \frac{0.693}{\lambda}$$

c) What is isotonic solution and show out the tonicity with different concentration of Nacl solutions.

Ans Tonicity

The word, Tonicity is simply desined as concentration of a solution as compared to another solution.

Tonicity / concentration of blood = 0.9 % w/v of Nacl

Isotonic solution

→ A buffer solution whose concentration osmotic pressure is equal to the 0.9 % w/v of Nacl is known (Buffer isotonic solution).

Cell Shrinkage

→ if the concentration of solution is ~~greater~~ less than concentration of blood cell the solvent move from blood to solution and this cause cell shrinkage and the solution will be Hypertonic.

Condition - II (No change)

-> if the concentration of solution is equal to the concentration of blood cell then there will be no movement of solvent and due to this there will be no change in the size of blood cell. or it will remain constant and the solution will be Isotonic

Condition - III (Cell swelling)

-> if the concentration of solution is greater than the concentration of blood cell then solvent particles moves from solution to blood cell and this cause cell swelling and the solution will be Hypotonic.

d) write down the chemical reaction and principle of limit test of chloride.

Any principle

-> It is based upon the simple reaction between silver nitrate ($AgNO_3$) and Chloride(Cl^-) to obtain silverchloride ($AgCl$) in the presence of HNO_3.

Chemical reaction -

$$AgNO_3 + Cl^- \xrightarrow{HNO_3} AgCl\downarrow + NO_3^-$$

-> In this reaction only AgCl produce the turbidity and we compare the turbidity with a standard solution.

Reason for using of HNO_3

→ This is S.O the common ion effect that's why the dissociation of Ag increased

procedure

Test solution	Standard solution
→ Specified sample 1 gm	→ 1ml of 0.0584 5.0 % Sodium chloride
+	+
Add 10 ml water	Add 1.0 ml of HNO_3
+	+
Add 10 ml HNO_3	Volume make up to 50 ml of water
+	+
Volume make up to 50 ml of water	Add 1 ml of $AgNO_3$ soln.
+	
Add 1 ml of $AgNO_3$ soln	

Observation

→ ~~Limit~~ If the the turbidity of Test soln is lower as compared to the turbidity of standard soln then limit test is passed.

Q Discuss the term Haematinics and Emetics with examples.

Any Emetics word derived from Emesis (vomit)

→ Emetics are the agents which when administration orally or by injection to induce vomit.

→ Emesis is vomitting is characterised by forceful elemination of gastric content through the mouth.

→ Emetics are used as mechanical antidote which given before absorption of poison into intestine.

Mechanism

1) By stimulating of chemoreceptor trigger zone
2) By reflexly producing irritation on the GIT

Ex saline water
salt in high dose act as emetics
zinc sulphate.

Emetics drugs

Ex Apomorphine
Ipecacuanha.
Copper sulphate.

Haematinics

→ Haematinics is a substance that helps the formation of blood components such as Haemoglobin.

→ common Haematinics include, Iron, Vitamin B_{12} folic acid which are essential for healthy red blood cell production

→ Anaemia occurs when the balance between production & destruction of RBC is disturbed by blood loss.

Ex i) ferrous sulphate
ii) ferrous gluconate

f) Classify different types of cathartics with example.?

Ans Cathartics are mainly classified into 2 categories.
i) Laxative
2) purgative

Laxative

-> Laxative are mild acting cathartics.
-> They work by either
i) Increasing intestenal movement.
2) make stool softner.
-> prolong use of laxative may cause habit or dependency.

purgatives

-> They are strong cathartics.
-> They are given in very serious conditions.
-> They are generally given to completely remove solid materials from intestine before surgery.

Classification (on the basis of mechanisim)

1) Stimulant cathartics.
2) Lubricant
3) Bulk forming
4) Saline cathartics.

1/ Stimulant Cathartics

→ They act by producing local irritation on intestinal tract.

Ex castor oil, sodium picosulphate

2/ Lubricants

→ Provide Lubricant effect so that stool easily passes through rectum, also known as stool softner

Ex DOSS, Liquid paraffin..

3/ Bulk forming

→ These agents increase the amount of stool production.

Ex methyl cellulose.

4/ Saline Cathartic's

→ They increases the osmotic load of GIT.

Ex $MgSO_4$, $Mg(OH)_2$,

Q/ what is the use sodium thiosulphate in pharmaceuticals?

Ans we find various uses of sodium thiosulphate in different fields such as medicine, photography, gold extraction and many other areas.

+) Sodium thiosulphate is used in the manufacture of paints.

→ In Industries, the chemical is used for the dechlorination of small water bodies like ponds, aquarium etc.

→ In photography, the chemical used as a fixing agent to dissolve ~~in a vast quantity of warm wat~~ the silver salts from the negatives.

→ The chemical can be used as a cleansing agent when dissolved in a vast quantity of warm water.

→ It is well used as an antidote agent concerning cyanide poisoning.

→ In the medical field, it is employed in pharamaceutical preparation. such as anionic surfactant aiding in dispersion

H) Briefly discuss different concepts of acids and bases with their limitations.

Ans There are 3 theories explain the concept of acid & base.

1) Arrchenius theory
2) Bronsted-lowery theory
3) Lewis theory

1) Arrchenious theory

→ An acid is a substance that, when added into water. It increses the concn. of Hydrogen ion.

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

→ A base is a substance when added into water it increses the concn of Hydroxide ion

Limitation of Arrchenious theory

→ Arrchenius theory required the solution.
→ It only applied to substance that produce H^+ or OH^- ion.
→ He didn't explain in his theory the behaviour of acid or base in non aqueous solution.

Ex NH_4NO_3 doesn't give H^+ ion but act as an acid in liquid NH_3

2) J.M Bronsted - Lowery theory

→ Bronsted - lowry theory also caused as proton theory of acid & base.
→ They both step that any substance which transfer a proton to any other compound is caused an acid.
→ That any compound which accpect the proton is caused base.

Limitation

→ This Theory is based upon the transfer of proton but some acid are not protonic.

Ex Boric acid.

→ They are many acid & base reaction in which proton transfer don't occur.

Lewis theory

→ A/C to lewis theory the species donate a pair of electron caused base or lewis base

→ The species which accept the pair of electron is called lewis acid.

Ex. $BaCl_2$, $AlCl_3$.

Limitation

→ Lewis acid & base cannot be arranged in their order of strength, as their strength depends on the reaction type.

→ Lewis acid and base reaction are expected to be very fast due to the movement of electron but some of the reactions are slow.

1) write down the composition and use of oral rehydration sal (ORS)

Ans The composition of the new, ~~added~~ reduced osmolarity ORS, as recommended by WHO is as follow.

Sodium chloride (NaCl) - 2.6g.

potassium chloride (KCL) - 1.5g.

Trisodium citrate dehydrate - 2.9g.

Glucose (anhydrous/dextrose) - 13.5g

How is the ORS reconstituted

→ The contents of the packet are dissolved in 1L of drinking water.

What is the role of each of the constituents

→ Glucose facilitates absorption of sodium.

→ Sodium & potassium replace the loss of the essential element in diarrhoea & vomiting.

→ Citrate corrects the acidosis that occurs due to diarrhoea & dehydration.

Uses of ORS

→ ORS is primarily used to treat dehydration caused by diarrhea, especially in children.

→ It helps replenish lost fluids and electrolyte

→ ORS can be used in situations where there is a high risk of dehydration, such as during intense physical activity, high temp.

Part-III

3) What do you mean by radiopharmaceuticals. Discuss briefly pharmaceutical application and storage condition of radioactive substance

Ans Radiopharmaceuticals

→ These are radioactive substances which are used therapeutically for treatment.

→ These substances get distributed in the body emit radiation, which used to detect injury, abnormal cell growth.

E.g X-ray.

Application of Radioactive substance

1) Diagnostic application

→ The radioisotopes are used for diagnosis of various organs.

Eg Heart - Thallium Tl^{-201} Chloride injection is used for myocardial image

Thyroid

→ Iodine ^{131}I [sodium iodide] used for thyroid scanning.

2) Therapeutic Applications

→ These radiations have destructive features so the radiations destroy abnormally multiplied cells and further formation of new cells.

→ It is used in the treatment of cancer which involves abnormal cellular multiplication

3) Sterilization

→ Radiation are used to sterilise the pharmaceuticals and surgical instrument in hospital.

→ Cerium-137 be used for sterilising surgical instrument.

4) Research

→ Excellent biological and medicinal studies have been carried out with radio isotopes as tracers.

Storage of radioactive substances

→ Radio pharmaceuticals should be kept in well-closed containers and stored in a area assigned for the purpose.

→ The storage conditions should be such that the maximum radiation dose rate to which person may be exposed is reduced to an acceptable level.

→ Can should be taken to comply with national regulation for protection against ionizing radiation.

→ Radiopharmaceutical preparation that are intended for parenteral use should be kept in glass vial, ampoule or syringe that is sufficiently transparent to permit the visual inspection of the contents; glass container may absorb under

4) Discuss briefly classification and mechanism of antimicrobials agents with examples

Any Antimicrobials

→ Antimicrobials agents are those chemical compound or drug that inhibit or destroy the growth of microorganisms.

Classification

1) Antiseptic
2) Disinfectant
3) Germicides
4) Bacteriostatic
5) ~~steri~~ sanitizer
6) Sterilization

1) Antiseptic

→ Antiseptic are those an antimicrobial agents that are mainly used in living cells
→ They either kills or inhibit the growth of bacteria.
→ An ideal Antiseptic agent, should destroy bacteria, virus etc. & should not cause any harm.

2) Disinfectant

→ Antimicrobial agents that are mainly used on non living cell.
→ kill or destroy the bacteria.
→ It used in home & hospital cleaning.

EX sulphur dioxide.

3) Germicides

→ Agents, used to kill micro organisms.
→ It can be used either use on living or non living surfaces.

1) Bactericides — TO kill bacteria
2) virucides. — " " viruses
3) fungicides — " " fungi

4) Bacteriostatic

→ Agents used to prevent the growth of bacteria.

→ they don't kill bacteria.

→ can be used on living or nonliving surface.

5) Sanitizer

→ used in cleaning & washing.

→ Generally used to maintain General public health / standard.

Ex. soap, alcohol

6) sterilization

→ It is a process, by which all the microorganisms are either killed or removed.

→ In this process, the products / surface or area will be free from all type of microorganism.

Mechanism of action of antimicrobial

→ Microorganism mainly contains proteins to survive.

→ Antimicrobials act by changing their protein structure which results in death of microorganism.

→ mainly act by 3 mechanism.

1) Oxidation
2) Halogenation
3) precipitation

Oxidation

→ The MOA shows by oxygen releasing compound
→ They cause oxidation of active functional group present in protein & inactive them.

Halogenation

→ The MOA shows by Halogen releasing compound.
→ The agents add halide atom to N' present at peptide linkage of protein & inactive them

Precipitation

→ The MOA shows by metal containing compound.
→ Metal binds with important group in protein. change their structure & inactive them,

Ex 1) potassium permanganent
2) Hydrogen peroxide
3) Boric acid
4) Chlorinated lime
5) Iodine

5) what is buffer solution? show the mechanism of action of buffer solution with it's pH expression related to Henderson Hasselbalch equation?

H

Buffer solution

Ans Buffer soln are those which resist change in their pH when a small amount of acid or base added in it.

Mechanism of Buffer action

→ It is basically describes the mechanism of action of buffer means how buffers actually works to resist change in their pH if we add small amount of acid or base

Mechanism of acidic buffer

→ Lets consider a buffer system of CH_3COOH & CH_3COONa. Now these CH_3COOH & CH_3COONa will dissociates like this.

$$CH_3COONa \rightleftharpoons CH_3COO^- + Na^+$$
$$CH_3COOH \rightleftharpoons CH_3COO^- + H^+$$

if we add an Acid (HCl)

→ if we add HCl into the above buffer soln then first HCl will dissociates into H^+ & Cl^- and these H^+ ion will react with CH_3COO^- ion and form CH_3COOH which is already present in soln. i.e no any other extra compound form and that's how the pH of buffer soln remain unchanged.

$$HCl \longrightarrow H^+ + Cl^-$$
$$H^+ + CH_3COO^- \rightleftharpoons CH_3COOH$$

If we add a base (NaOH)

Now again if we add a base NaOH in the above acidic buffer soln then NaOH breaking into Na^+ & OH^- & these OH^- reacts with H^+ ion & form water which doesn't affect the pH of water soln

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

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

Mechanism of basic buffer

→ Let's consider a buffer system of NH_4OH & NH_4Cl

Now $NH_4OH \rightleftharpoons NH_4^+ + OH^-$

$NH_4Cl \rightarrow NH_4^+ + Cl^-$

If we add an acid (HCl)

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

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

If we add HCl into the above buffer soln then first HCl will dissociates into H^+ & Cl^- and these H^+ ion will reacts with OH^- ion and form water which doesn't affect the pH of water soln.

If we add a base

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

$$OH^- + NH_4^+ \rightleftharpoons NH_4OH$$

→ Now again if we add a base NaOH in the above ~~acidic~~ basic buffer soln then NaOH break down into Na^+ & OH^- & these OH^- reacts with NH_4 then form NH_4OH. which is already present in soln. i.e no any other extra compound form and that's how the pH of buffer soln remain unchanged

Buffer equation / Henderson-Hasselbalch equn

→ Buffer equn also known as Henderson-Hasselbalch equn used to calculate the pH of buffer soln

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

Applying laws of mass action.

$$Ka = \frac{[H^+][A^-]}{[HA]}$$

$$\frac{Ka[HA]}{[A^-]} = [H^+]$$

or we can write

$$[H^+] = Ka\frac{[HA]}{[A^-]}$$

Now we already see HA → acid
A^- → salt.

we can write above equation like

$$[H^+] = Ka\frac{[acid]}{[salt]}$$

taking −log on both sides

$$-\log[H^+] = -\log\left(Ka\frac{[Acid]}{[salt]}\right)$$

$$\Rightarrow -\log[H^+] = -\log Ka - \log\frac{[Acid]}{[salt]}$$

Now $-\log[H^+] = pH$ and similarly we can write

$-\log Ka = pKa$

$pH = pKa - \log\frac{[Acid]}{[salt]}$

we can write

$$pH = pKa + \log\frac{[salt]}{[Acid]}$$

6) What is Gastrointestinal agents and classify antacids? Enumerates preparation properties and side effects of aluminium or magnesium containing antacid.

Ans The Gastrointestinal tract is the pathway of digest system which helps in the digestion of food and it's excretion.

→ It starts from mouth and ends to anus.
→ The main portion of GIT includes the stomach, small intestine, large intestine, rectum and anus.

Classification of antacid

→ They are mainly divided into 2 parts.

1) systemic Antacid

→ These are those antacids which absorbs in the blood circulation. these are soluble or absorbable and can cause metabolic alkalosis.

Eg Sodium bicarbonate.

2) Non systemic Antacid

→ These are those antacids which does not absorb in blood circulation instead they give local action in stomach to decrease acidity.

Eg Aluminium magnesium hydroxide

Aluminium-containing antacids

1) Constipation

Aluminium can cause constipation.

2) Hypophosphatemia

→ prolong use can lead to low phosphate level in the blood, as aluminium binds to phosphate and reduces its absorption.

3) Osteomalacia

→ Chronic use may lead to bone softening due to phosphate depletion.

4) Neurotoxicity

→ In people with kidney disease, aluminium can ~~cause~~ accumulate in the body and lead to toxicity, affecting the Nervous system.

Magnesium-containing antacids

1) Diarrhea

→ magnesium has a laxative effect, which can cause diarrhea.

2) Hypermagnesemia

→ Excessive use, especially in individuals with kidney disease, can lead to elevated magnesium levels, causing muscle weakness low blood pressure and cardiac issue.

3) Electrolyte imbalance

→ prolonged use can disrupt the balance of electrolytes in the body.