

PHARMACEUTICAL INORGANIC CHEMISTRY

UNIT 4 NOTES

- **MISCELLANEOUS COMPOUNDS**

EXPECTORANTS

- Expectorants are the drugs that are used to help in removal of sputum from respiratory tract or we can simply say they are used in the treatment of cough.
- The cough is a protective physiological reflex that helps to clear the respiratory tract.
- Cough can be further divided into two parts :
 - ① Dry Cough (No sputum discharge)
 - ② Productive Cough (Sputum discharge)

Classification of Expectorants

- Expectorants acts by two mechanism :
- Either by increasing fluidity (or reducing viscosity) OR by increasing volume of sputum.
- Now on the basis of these mechanism, expectorants can be classified into two categories :
 - ① Sedative Expectorants
 - ② Stimulant Expectorants

Sedative Expectorants

- These are stomach irritant expectorants.
- They produce their effect by increasing gastric reflexes.
- They cause sedation (sleep) in the patients.
- Hence, we can simply say they act by increasing volume of sputum.

Stimulant Expectorant

- They act by stimulating the secretory cells of the respiratory tract directly or indirectly.
- Since, these drugs stimulate secretion, more fluid gets produced in respiratory tract and sputum gets diluted and easily discharged from body through cough.
- Hence, we can simply say these drugs act by increasing fluidity of sputum (or reducing the viscosity).

POTASSIUM IODIDE

Molecular Formula : KI

Molecular Weight : 166 g/mol

Synonyms : kalii Iodidum

Method of Preparation

When Hydrogen Iodide treated with potassium bicarbonate it results in the formation of potassium Iodide.



Properties

- It occurs as colourless or transparent crystals or white granular powder.
- It is odourless.
- It is bitter in taste.
- It is hygroscopic in nature.
- It is soluble in both water and alcohol.

Uses

- It is used as expectorants.
- It is used as antifungal agent.
- It is used as Iodine supplement.
- It is also used as saline diuretics.

AMMONIUM CHLORIDE

- Ammonium chloride properties, ~~assay~~ uses and method of preparation is already covered in Acidifiers (Gastrointestinal Agents). **UNIT-III**
- Here is the Assay method of ammonium chloride.

Assay of Ammonium Chloride

Ammonium chloride assayed by precipitation titration using Volhard's Method. (Previously)

Procedure

- An accurately weighed 0.2 gm of ammonium chloride is dissolved in 40 ml of water
- Now solution is acidified with 3 ml of nitric acid.
- The solution is shaken vigorously after adding 50 ml of 0.1 N silver nitrate and 5 ml nitrobenzene.
- The excess of silver nitrate is titrated with 0.1 N ammonium thiocyanate using 2 ml ferric ammonium sulphate as indicator.



- Each ml of 0.1 N AgNO_3 = 0.005349 gm of NH_4Cl

Note : Above Assay Method was previously used, Now a days Ammonium chloride is assayed using Acid-Base Titration.

EMETICS

- Emetics are the drugs that cause vomiting (Emesis)
 - Vomiting is a forceful explosion of the content of stomach via mouth or sometime through nose.
 - Emetics takes a valuable part in treatment of poisoning.
 - Along with poisoning they are also used in the treatment of overdose or adverse effect of drugs.
 - Emetics sometimes also added to cough preparation in low doses to stimulate flow of respiratory tract secretions.
- Vomiting is an involuntary process

Mechanism of Action of Emetics

Emetics are generally act by two mechanism.

- Emetics act either directly by stimulating Chemoreceptor Triggered Zone located in the area of medulla oblongata in the brain.
- Or they can act by causing irritation in gastrointestinal tract.

COPPER SULPHATE

Molecular Formula : $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

Molecular Weight : 159.6 g/mol

Synonyms : Blue Vitriol

Method of Preparation

It is prepared by dissolving cupric carbonate in dilute H_2SO_4



Properties

- It occurs as blue crystalline granules or in powder form.
- It is odourless in nature.
- It is soluble in water.
- It is insoluble in alcohol.

Assay

- Assay of Copper sulphate is performed by Redox Titration.:
- An accurately weighed quantity of CuSO_4 is dissolved in water
- To this excess of potassium iodide is added followed by acetic acid.
- Now liberated iodine is titrated with standard sodium thiosulphate solution using starch solution as indicator.
- Titration continues until blue colour of solution disappears.

Uses

- It is used in emetics preparation.
- It is also used as germicides and insecticides.

SODIUM POTASSIUM TARTARATE

Molecular Formula : $C_4H_4NaKO_6$

Molecular Weight : 210.158

Synonyms : Rochelle Salt

Preparation

- First sodium carbonate is added to suspension of potassium tartarate.
- The mixture is then heated by boiling then allowed to cool.
- Crystal of sodium potassium tartarate forms.

Properties

- It occurs as white or colourless crystalline powder.
- It is odourless.
- It having saline taste
- It is soluble in water.
- It is insoluble in alcohol.

Uses

- It is used as emetics.
- It is also used as laxative.
- It is used in effervescent powder.

HAEMATINICS

- Haematinics are the substances that are required in the formation of blood and mainly used in the treatment of anaemias.
- These drugs increase the number of red blood cells and amount of haemoglobin when they are below normal level.
- Anaemia occurs when the balance between production and destruction of red blood cells get disturbed.

Anaemia

- Anaemia is a state of body in which concentration of haemoglobin gets reduced in the blood.
- Anaemia can be occur due to
 - ① Excessive blood loss
 - ② Unhealthy RBCs formation
 - ③ Increased destruction of RBCs

Types of Anaemia

- Iron Deficiency Anaemia
- Aplastic Anaemia
- Haemolytic Anaemia
- Sickle Cell Anaemia
- Pernicious Anaemia

FERROUS SULPHATE

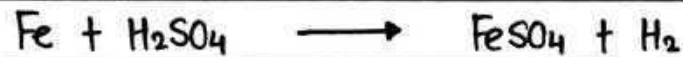
Molecular Formula $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$

Molecular Weight 278 g/mol

Synonyms Green Vitriol

Method of Preparation

When iron is treated with dilute H_2SO_4 , iron dissolves and form ferrous sulphate and hydrogen gas gets liberated.



Properties

- It occurs as transparent green crystals or pale bluish green crystalline powder.
- It is odourless
- It having metallic taste.
- It is soluble in water
- It is insoluble in alcohol

Assay

- Assay of ferrous sulphate is performed using Redox Titration.
- Add about 0.76 g of FeSO_4 in 100 ml water
- Add 0.1 ml of 3 drop H_2SO_4 as indicator.
- Titrate with 0.1 N KMnO_4 standard solution until purple colour disappears.

Uses

- It is used as haematinics.
- It can also be used as disinfectants.

POISON & ANTIDOTE

POISON

- Poison is defined as any substance administered in whatever way (by mouth or by injection) produce illness or even cause death.
- The diagnosis of poisoning is often difficult

Classification of Poisoning

- ① **Intentional Poisoning** : A person taking or giving a substance with intention of causing harm to that person
e.g. : Suicide , Assault
- ② **Unintentional Poisoning** : A person taking or giving a substance without knowing its toxic effect (Accidentally)
- ③ **Undetermined** : When the reason behind poisoning is not determined.

Other Causes

- Food Poisoning
- Overdose of Drug
- Cyanide Poisoning

Symptoms of Poisoning

- Reduced breathing rate
- Vomiting
- Diarrhoea
- Dilated Pupils
- Decreased Heart Rate

Cyanide Poisoning

Cyanide poisoning occurs by either :

- ① Cyanide poison taken accidentally.
 - ② Cyanide poison taken intentionally to commit suicide.
- Cytochrome Oxidase is an enzyme that is responsible for electron transfer reactions, necessary for cellular respirations.
 - In case of cyanide poisoning, cyanide binds with ferric ion of cytochrome oxidase.
 - Now this leads to stoppage of electron transfer reactions which ultimately inhibits cellular respiration.
 - If cyanide poisoning is not treated immediately, it could be very harmful and even lead to person's death.

Treatment

Sodium nitrite and sodium thiosulphate injections both the antidotes given one by one for the treatment of cyanide poisoning.

ANTIDOTES

- Antidotes are the substances which react specifically with the ingested poison and overcome its effect.
- They are used to neutralize the effect of poison in the body.

Classification

On the basis of their mechanism, Antidotes can be classified into following three categories :

- ① Physiological Antidotes
- ② Chemical Antidotes
- ③ Mechanical Antidotes

Physiological Antidotes

- They are also called Antagonists.
- They produce effect just opposite to that of poison.
- e.g. sodium nitrite.

Chemical Antidotes

- They act by combining with poison and changing its chemical structure or converting them into inactive or harmless compound.
- e.g. sodium thiosulphate.

Mechanical Antidotes

- They act by preventing the absorption of poison into the body.
- e.g. activated charcoal.

SODIUM THIOSULPHATE

Molecular Formula : $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$

Molecular Weight : 248.2 g/mol

Synonym : Sodium Hyposulphate

Preparation

It can be prepared by boiling sodium sulphite with sulphur



Properties

- It occurs as large colourless crystals
- It is odourless and having alkaline taste.
- It is soluble in water.
- It is insoluble in alcohol.

Assay

- Assay of $\text{Na}_2\text{S}_2\text{O}_3$ is based upon redox titration :
- Take about 0.5 gm of sample & dissolve in 20 ml water.
- Now it is titrated against 0.05 M iodine using starch as indicator.
- Titration continues until blue colour of solution disappears.

Uses

- It is used in the treatment of cyanide poisoning.
- It is also used to treat skin diseases.