

Expectorants

Expectorants are the drugs that help in removing sputum from respiratory tract by increasing the volume of fluid that have to be expelled from respiratory tract by coughing.

eg- ammonium chloride, potassium iodide, NaCl.

Classification

① Sedative expectorants: These are stomach irritant expectorants which are able to produce their effect through stimulation of gastric reflexes.

eg- Ipecac, Senega, compounds such as antimony potassium tartarate, ammonium chloride, KI. etc.

② Stimulant: These are the expectorants which bring about a stimulation of the secretory cells of the respiratory tract directly or indirectly. Since these drugs stimulate secretion, more fluid in respiratory tract and sputum is diluted.

eg- Eucalyptus, Lemon, Anise.

Cough

Cough is a protective reflex helps to expell incident matter from respiratory track.

→ It is a vital part of defence mechanism. It can be caused by infection, chemical irritants, asthma, lung tumour.

Cough is of two types :-

(i) Productive (ii) Non-productive

→ A productive cough produce sputum.

→ Non-productive cough also known as irritative cough. It doesnot produce sputum.

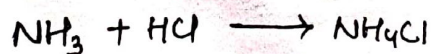
(A) Ammonium chloride (NH_4Cl) $M.W = 53.49$

→ It is having not less than 99.5% of ammonium chloride which is calculated with reference to substance dried over silica gel for 4 hours.

→ It also acts as expectorants as well as acidifier.

Method

Neutralization of hydrochloric acid with ammonia and evaporation of the solution to dryness yield ammonium chloride.



It is also produced by heating ammonium sulphate and sodium chloride.



Properties

- (i) It is white fine crystalline powder.
- (ii) Odourless, having a cooling saline taste.
- (iii) Soluble in water, alcohol.
- (iv) Freely soluble in glycerine.

Test for identity

It gives the reaction of ammonium salts and chlorides.

Test for purity

It is tested for arsenic, iron, heavy metals, loss on drying, sulphated ash.

Assay: It was previously assayed by precipitation titration by Volhard's method.

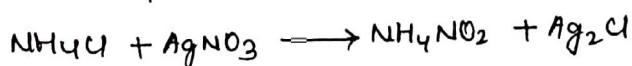
Weight accurately quantity (0.2g) of NH_4Cl

↓
Dissolved in 40ml H_2O

↓
Acidified with HNO_3 (3ml)

↓ Shake well

Add 50ml of N/10 ammonium thiocyanate using ferric sulphate as indicator.



→ Each ml of 0.1N $AgNO_3 = 0.005349$ gm of NH_4Cl .

Uses

- ① It is used for the treatment of severe metabolic alkalosis, to maintain the urine at an acid pH for the treatment of some urinary-tract disorders.
- ② Also used for cough preparation, diuretics.

Storage

Stored in highly closed containers.

⑬ Potassium Iodide (KI) M.W = 166

→ It is having not less than 99% of potassium iodide.

Preparation in Industry

It is prepared by treating iron filings with iodine under water to get iodide which is then reacted with potassium carbonate.



Treatment of hydroiodic acid with potassium bicarbonate also gives potassium iodide.



Properties

- (i) Colourless, odourless.
- (ii) Having a saline & bitter taste.
- (iii) Soluble in water, alcohol & glycerol.

Tests for identification

It gives the reactions of potassium and of iodides.

Test for purity

It is tested for arsenic, heavy metals, barium, sulphate and loss on drying.

Uses

→ Used as expectorant & for the treatment of thyroid.

→ In laboratory it is also used as reducing agent & used in preparing soln of iodine.

eg - complex iodide.

Storage

It should be stored in well closed container.

Emetics

Emetics are the agents which when administered orally or by injection induce vomiting.

Mechanism of action

- ① By stimulation of chemoreceptor trigger zone.
- ② By reflexly producing irritation on G.I. tract.

A) Copper Sulphate ($\text{CuSO}_4 \cdot \text{H}_2\text{O}$) n.w \rightarrow 249.7 g

Synonym \rightarrow Blue vitriol, cupric sulphate.

\rightarrow It contains not less than 98.5% and not more than 101% of copper sulphate.

Properties

\rightarrow It is blue crystalline granules or powder.

\rightarrow Soluble in water, insoluble in alcohol.

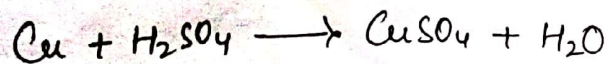
\rightarrow Acidic in nature.

Preparation

It is obtained by treating granulated copper in presence of air with sulphuric acid.

The solution is filtered & evaporated.

Collect the CuSO_4 precipitated.



Identification

It gives reaction which are characteristic of copper and sulphate.

Uses

- (i) Used as em. emetic
- (ii) Used as chemical antidote in phosphorous poisoning.
- (iii) Externally used as astringents & fungicidal
- (iv) Use in preparation of absolute alcohol.

Storage: It must be protected from air, heat & moisture.

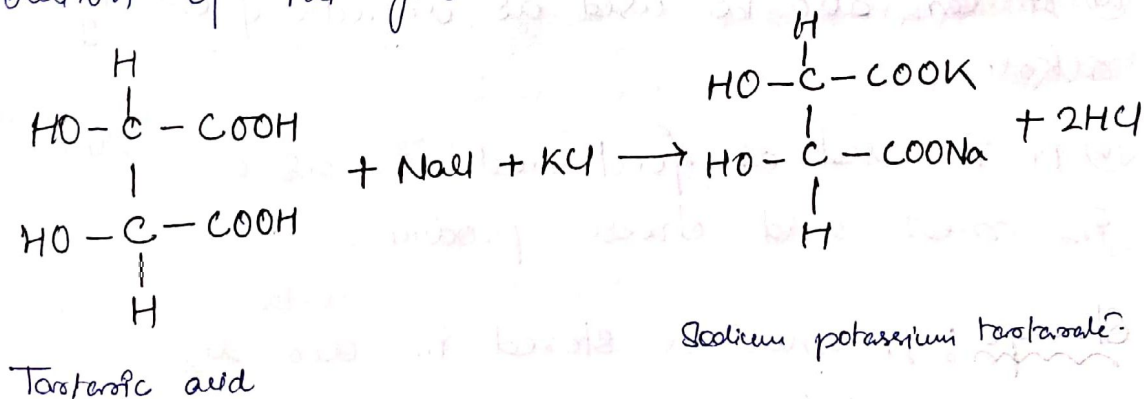
B) Sodium Potassium Tartrate ($C_4H_4KNaO_6 \cdot 4H_2O$) M.W. - 283.26

Synonyms - Rochelle salt, Seignelle salt.

In 1672, Rochelle and Seignelle discovered this compound.

Preparations

It is prepared by the reaction of tartaric acid with sodium and potassium chloride with the evolution of HCl gas.

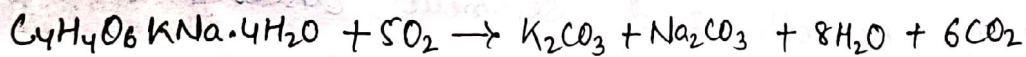


Properties

- (i) It is a white crystalline powder available in prismatic crystal form.
- (ii) Odourless and have cooling saline taste.
- (iii) It effervesces in dry air.
- (iv) It is freely soluble in water and insoluble in alcohol.

Identification Tests

When its salt is heated, it emits the odour of burning sugar and leaves a residue behind. The residue produced is alkaline to litmus paper and give effervescence with mineral acids.



Uses

- (i) Used as a saline cathartic.
- (ii) Depending upon dose, it is also used as mild laxative.
- (iii) It can also be used as diuretic & urinary alkalisers.
- (iv) It is used as food additive, as a stabilizer for meat and cheese products.

Storage: It must be stored in air light containers.

Haematinics

→ These are the agents which are required for the formation of blood cells and also used in the treatment of anaemia.

→ The main haematinics are iron, vitamin B₁₂ and folic acids.

→ These agents increase the number of erythrocytes or haemoglobin content in the blood.

eg - Ferrous sulphate, ferrous gluconate, ferrous fumarate.

Anaemia

It is a disorder occurs in human body characteristic by decrease haemoglobin in blood to level below the normal range.

This disorder or condition may occur due to decrease in RBC production or increase.

- ① Anaemia occurs when the balance between production and reduction of RBC is disturbed may be due to blood loss.
- ② Unpaired RBC are due to deficiency of essential factors like iron, folic acid & vitamin B₁₂.
- ③ Bone marrow depression.
- ④ Increased destruction of RBC's.

Types of anaemia

- (i) Microlytic : The size of red blood cells is smaller than normal size.
- (ii) Macrolytic : The size of red blood cells is larger than the normal size.
- (iii) Aplastic : It is a condition in which there is inadequate red blood cells formation occurs. (as a result of bone marrow depression).
- (iv) Haemolytic : It is a condition in which there is increase destruction of red blood cells. The RBC present is of normal size and contain normal quantity of hemoglobin.
- (v) Iron deficiency : It is due to the loss of iron.
- (vi) Sickle cell :
- (vii) Megaloblastic : In this condition, erythrocytes fail to mature because of deficiency of vitamin B₁₂

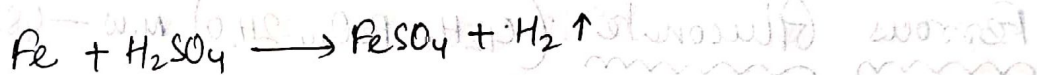
Ferrous Sulphate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) M.W = 278g.

Synonyms = Green vitriol, Iron vitriol.

It contains not less than 98% and not more than 103% of ferrous sulphate.

Preparations

It is obtained by adding slight excess of iron to dilute sulphuric acid, iron gets dissolved to form ferrous sulphate and hydrogen gas is evolved. The liquid is then concentrated and cooled to get crystals.



Properties

- (i) It occurs as odourless bluish-green crystals or powder.
- (ii) Its taste is metallic and astringent.
- (iii) It effloresces in dry air.
- (iv) On exposure to moisture, it gets oxidised and becomes brown in colour.
- (v) It is completely soluble in water & insoluble in alcohol.

Identification Test

Aqueous solution of ferrous sulphate gives all the colour reactions of ferrous ion and sulphate ion.

Uses

- (i) It is used as haematinic i.e. promote the formation of haemoglobin.
- (ii) Used in the treatment of anaemia caused by iron deficiency.
- (iii) Used in the manufacturing of ink and in photography.
- (iv) It also possess disinfectant property.

Storage: Must be stored in air tight containers.

Ferrous Gluconate ($C_{12}H_{22}FeO_{14} \cdot 2H_2O$) M.W - 482.18

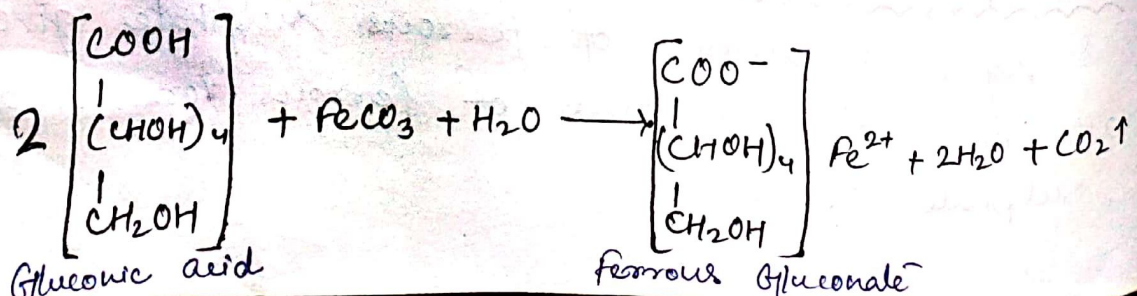
Synonyms : Iron gluconate, Glucoferon.

→ It contains not less than 95% of pure ferrous gluconate.

Preparation

It can be prepared by double decomposition reaction between calcium gluconate & ferrous sulphate.

Calcium sulphate is insoluble and filtered off. The filtrate is concentrated to get grey colour particles of ferrous gluconate.



Properties

- It is a fine yellowish grey or pale greenish yellow powder.
- It has an odour like burnt sugar.
- It is slowly soluble in water, rapidly soluble in warm water & insoluble in alcohol.
- Its aqueous solution is acidic in nature.

Identification Tests

It gives reaction which are characteristics of ferrous salts.

Uses

- Used as haematincs.
- It is much safer than ferrous sulphate and can be used in anaemia with lesser side effects.
- Ferrous gluconate is used in the form of tablets or elixirs.

Storage: It should be stored in air tight containers protected from light.

Poison

- It may be defined as any substance that leads to unwanted effects on human body.
- The most common poisoning occurs because of heavy metal as the environment is getting richer in heavy metals. or metallic contamination of food & water.
- The poisoning can also occurs because of insecticides or pesticides.
- The poisoning can also occurs because of excessive use of drugs (drug overdose).

Antidote

Antidotes are the substances which react specifically with the injected poison or toxic substance or with potent drugs in case of overdose.

They are used to neutralize the effect of poison in the body.

Physiological : They act by producing the effect opposite to that of poison or counteract the effect of poison.

Chemical antidote : They react by combining with the poison and change its chemical nature by converting the poison into inactive or harmless compounds.

Mechanical : They act by preventing the absorption of poison into the body or expel out the poison by emesis or eliminate through urine.

A) Sodium Nitrite Injection (NaNO_2) M.W - 69g

Synonyms - Nitrous acid sodium salt.

It contains not less than 97% and not more than 101% of sodium nitrite.

Preparation

It is prepared by reaction between nitrogen oxide gas and oxygen in sodium carbonate solution.

The solution is concentrated and the crystalline product is collected.

Properties

→ Yellow or white crystalline powder.

→ Have saline taste, freely soluble in water but less soluble in alcohol.

→ Odourless in nature.

Uses

→ Mainly used in cyanide poisoning.

→ Prevents rusting of surgical instruments.

→ Also used as preservative.

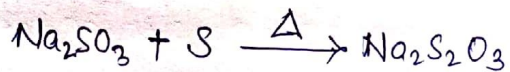
B) Sodium Thiosulfate ($\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$) M.W - 248.18 g.

Synonyms = Sodium hyposulfite

It contains not less than 99% and not more than 101% of $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$.

Preparation

(i) It can be prepared by boiling sodium sulphite with sulphur.



(ii) It can also be prepared by passing sulphur dioxide into sodium sulphide solution.



Properties

(i) It occurs as large, transparent prismatic crystalline powder.

(ii) It effervesces in dry air.

(iii) It is practically soluble in water & insoluble in alcohol.

Identification Test

Add few drops of iodine solution to 10% w/v solution of sodium thiosulphate. The solution will appear colourless.

Uses

→ Mainly used as antidote in cyanide poisoning.

→ Topically, it is used as an anti-fungal agent.

→ Used as a standard titrant in iodimetric analysis.

Heavy Metals & Their Antagonist ^{- poisoning}

→ Heavy metal poisoning occurs due to intake of salts of arsenic, lead, mercury, iron and cadmium.

→ Depending upon the content and type of heavy metal, toxic effect can be seen in the future.

Treatment

→ The initial treatment for heavy metal poisoning is to administered activated charcoal for absorbing heavy metal poisoning.

→ It is followed by administering compound which are able to produce emesis, this eliminate any poison left in stomach being absorbed in blood circulation.

Cyanide Poisoning

(i) Cyanide poisoning may occur by inhalation of fumes of hydrocyanic acid (HCN), ingestion of inorganic cyanide salt or cyanide releasing substances like cyanamide, cyanogen chloride.

(ii) Consumption of 300 mg of potassium cyanide may cause death.

Physiology of Cyanide in body

Cyanide readily combines with ferric ion of cytochrome oxidase, which prevents the electron transfer and stops the cellular respiration or oxidation-reduction reaction.

Treatment

Sodium nitrite and sodium thiosulphate injections both the antidotes one by one are administered. ~~for~~

Activated Charcoal

Charcoal is a dark grey residue consisting of carbon and any remaining ash obtained by removing water and other volatile constituent from animal and vegetable substances.

Preparation

It is prepared by burning wood in absence of air. The residue obtained consists of nearly pure carbon.

Properties

- It is fine black, odourless & tasteless powder.
- It is free from gummy matter.
- It is insoluble in water & other organic solvents.

Uses

- (i) Used as an emergency antidote in many forms of poisoning.
- (ii) Used as protective & adsorbent.
- (iii) Used as disinfectant in wounds.

ASTRINGENTS

→ These are the compounds which bring about protein precipitation and form a protective layer on the surface and hence stop bleeding by constricting the blood vessels.

→ It has local styptic and antiseptic action.

→ Astringents applied over the wound in small quantity to stimulate the growth of new tissues but in higher concentration it produces irritation.

Mechanism

- The protein precipitation brought about by astringents is due to presence of metallic ions having large charge or form electrostatic field.
- The metal would form complex with various polar groups present on the protein or an enzyme.
- This complexation of important functional groups at the action site of protein causes a drastic change in the properties of proteins.

Astringents have other uses too:

- (i) They are used to treat diarrhoea.
- (ii) They also possess deodorant properties.
- (iii) They decrease sweating and make the skin tougher.
- (iv) They promote healing process.

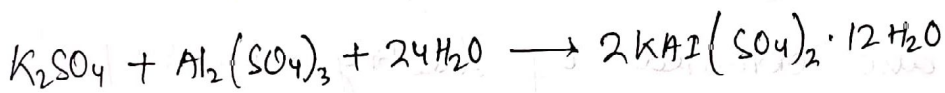
Potash Alum $[KAl(SO_4)_2 \cdot 12H_2O]$ M.w = 474.33g

Synonyms - Aluminium Potassium Sulphate

It is a double salt, having an amount of aluminium equivalent to not less than 99.5% of Alum.

Preparation

It is prepared by adding a concentrated solution of potassium sulphate to a hot solution of equimolar properties of aluminium sulphate.



Properties

- (i) It occurs as large, colourless crystals.
- (ii) It is odourless and sweet astringent in taste.
- (iii) It is soluble in water but insoluble in alcohol.

Identification Tests

Its aqueous solution gives the reaction of typical of sulphate and aluminium.

Uses

- Used as an astringent, antiseptic.
- It is having protein precipitation properties.
- It is also used as a pharmaceutical acid.

Storage: It should be stored in airtight containers.

Zinc Sulphate ($ZnSO_4 \cdot 7H_2O$) M.W = 287.54g

Synonyms — white vitriol.

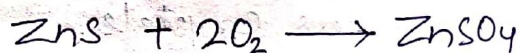
→ It is having not less than 55.6% and not more than 61% of zinc sulphate.

Preparation

(i) It is prepared by the action of dilute sulphuric acid on zinc oxide.



(ii) It is also obtained by heating zinc sulphide in the presence of air.



Properties

(i) Colourless, odourless and metallic taste.

(ii) It effloresces in dry air.

(iii) It is soluble in water and glycerine but insoluble in alcohol.

Storage: Stored in well closed container in a cool place.

Uses: → Mainly used as astringents.

→ when use internally, it acts as emetic agent.

→ It also have protein precipitation activity.