

DEPTH OF BIOLOGY

UNIT IV

08 Hours

- **Miscellaneous compounds**

Expectorants: Potassium iodide, Ammonium chloride*.

Emetics: Copper sulphate*, Sodium potassium tartarate

Haematinics: Ferrous sulphate*, Ferrous gluconate

Poison and Antidote: Sodium thiosulphate*, Activated charcoal, Sodium nitrite³³³

Astringents: Zinc Sulphate, Potash Alum

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Expectorants

- ❖ The cough is a protective physiological reflex (both, voluntary and involuntary) to clear the airway.
- ❖ Infections, chemical irritants, retained body secretions and the presence of foreign bodies that block one's airways and causes coughing by stimulating the nerve endings in the respiratory tract.
- ❖ Dry and Productive Cough: Irritative or unproductive cough is dry cough, which may be caused by colds or by inhalation of irritating dust and gases and produces no sputum or other discharge, whereas productive cough is sputum or exudate producing cough and is often associated with asthma and bronchitis

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Expectorants

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

Eg- ammonium chloride, potassium iodide, NaI

Classification

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graph TD; A[Classification] --> B[Sedative expectorants]; A --> C[Stimulant]
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**Sedative
expectorants**

Stimulant

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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.

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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, Arise

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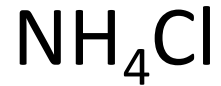
Cough

- Cough is a protective reflex helps to expel 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:-

Productive	Non-productive
A productive cough produce sputum	Non-productive cough also known as irritative cough.
	It does not produce sputum

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Ammonium Chloride



Ammonium chloride is prepared by neutralizing hydrochloric acid with ammonia.

❖ The resulting solution of ammonium chloride is evaporated to dryness.

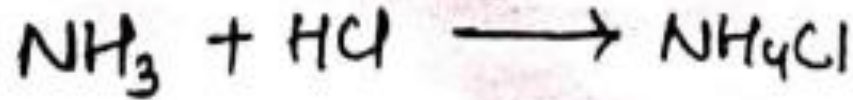
The crude product thus formed is purified either by recrystallization or by sublimation.

It also acts as expectorants as well as acidifier.

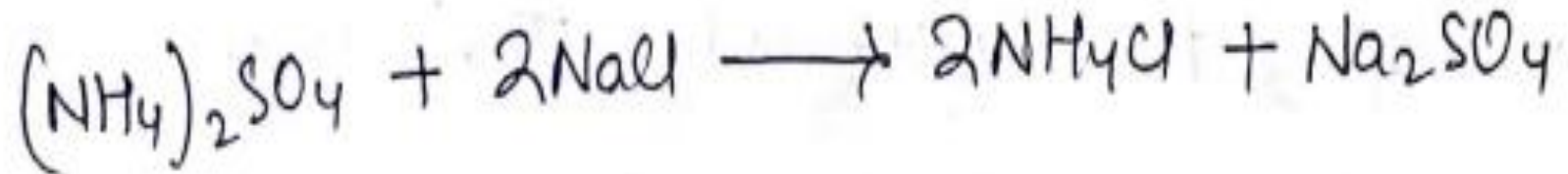
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Method of Ammonium Chloride

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



- It is also produce by heating ammonium sulphate and sodium chloride.



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❖ Properties:

- Ammonium chloride occurs as colorless crystals or as white crystalline powder.
- It is odorless and possesses cooling saline taste.
- It is freely soluble in water but sparingly; soluble in alcohol.
- Its 5% solution is acidic (pH 4.5 to pH 6.0). On heating it sublimes without melting.

Test for identity :

- It gives the reaction of ammonium salts and chlorides.

Test for impurity:

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

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Uses

(I) Expectorant: Ammonium Chloride in doses of 300 mg to 1 gm is used as an ingredient in expectorant cough mixtures.

❖ **Diuretic:** It is given for its diuretic action especially to help the excretion of over dosage of basic drugs such as amphetamine and in the treatment of lead poisoning, by increasing its excretion.

❖ **Systemic acidifier:** It is helpful in producing mild acidosis. For this purpose, it is given by mouth in a dose of 2 g. It is rapidly absorbed through

❖ G.I.T. and is converted into urea in the liver

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Potassium Iodide

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

Preparation

- It is prepared by treating slight excess of iodine with a hot aqueous solution of potassium hydroxide.
- The pale yellow solution is evaporated to dryness and residue is heated with charcoal to reduce the iodate.
- The product is extracted with water and filtered and the filtrate is evaporated to crystallization.

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Potassium Iodide

Properties

- Colorless, odorless
- Having a saline and bitter taste
- Soluble in water, alcohol and 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 less on drying.

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Potassium Iodide

Uses

1.Expectorant: It is used as an ingredient of expectorant mixture.

2.Source of iodine: It may be used for the prophylaxis and treatment of simple goitre

3.Antifungal: It is used as antifungal agent in veterinary practice.

4.Iodine solutions:- It is one of the most important ingredient of various official iodine solutions (Antimicrobials).

Storage

It should be stored in well closed container.

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Emetics

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

Mechanism of action

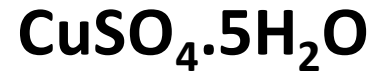
By stimulation of chemoreceptor trigger zone.

By reflexly producing irritation on G.I.T

❖ Emetics are contraindicated in debilitated patients and in poisoning caused by corrosive or petroleum products.

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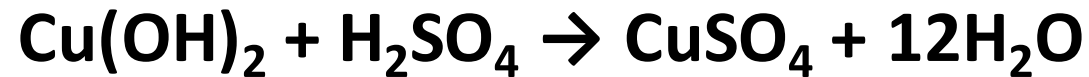
Copper Sulphate



249.7g

Synonym:- blue vitriol, cupric sulphate

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



Properties :-

- It is a greenish-grey powder (Anhydrous) and blue (pentahydrate) very hygroscopic
- It is blue crystalline granules or powder
- Freely soluble in water, slightly soluble in methanol, practically insoluble in alcohol.
- Acidic in nature

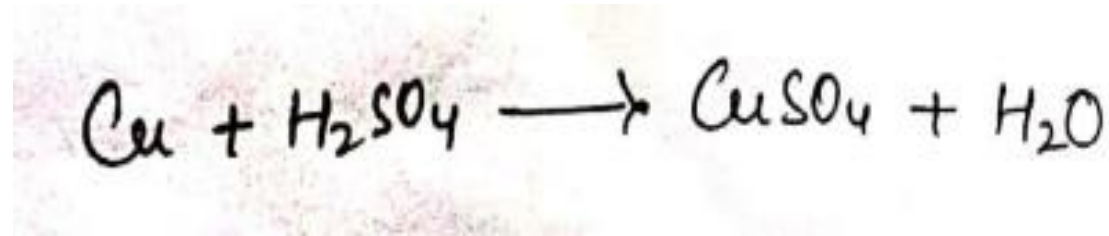
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Copper Sulphate

Preparation

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

The solution is filtered and evaporated collect the CuSO_4 precipitated.



Identification

It gives reaction which are characteristic of copper and sulphate.

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Copper Sulphate

Uses:-

- Used as an emetic
- Used as chemical antidote in phosphorous poisoning
- Externally used as astringents and fungicidal
- Use in preparation of absolute alcohol

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

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Sodium Potassium Tartrate



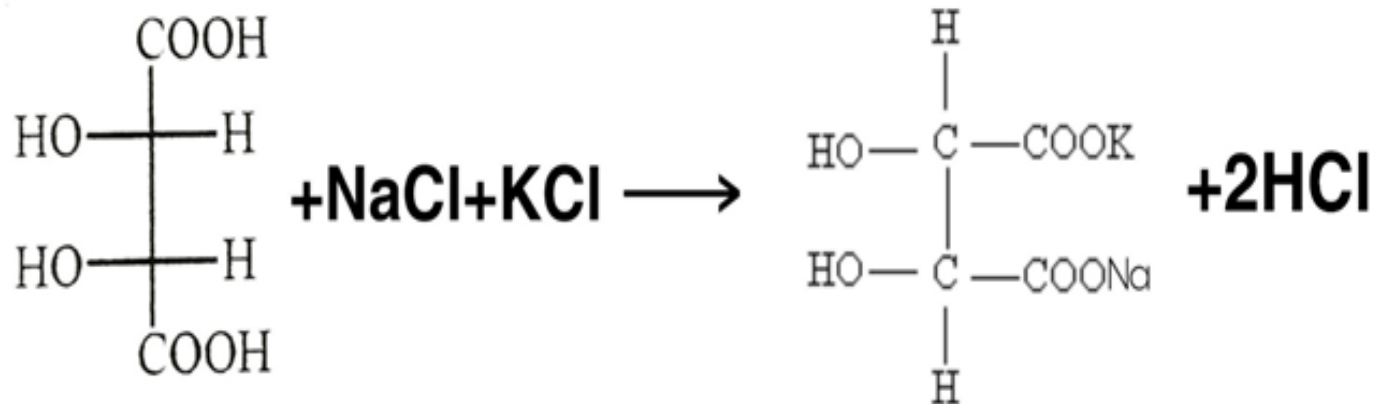
283.26

Synonyms:- Rochelle Salt, Seignette Salt

In 1672, Rochelle and Scignette discovered this compound.

Preparations

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



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Sodium Potassium Tartrate

Properties

- It is a white crystalline powder available in prismatic crystal form
- Odorless and have cooling saline taste
- It effervescence is dry air
- It is freely soluble in water and insoluble in alcohol

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Sodium Potassium Tartrate

Identification tests

When its salt is heated, it emits the odor of burning sugar and leaves a residue behind.

The residue produced is alkaline to litmus paper and give effervescence with mineral acids.

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Sodium Potassium Tartrate

Uses

Used as a saline cathartic

Depending upon dose, it is also used as mild laxative

It can also be used as diuretic and urinary alkalizer

It is used as food additive, as a stabilizer in meat and cheese products

Storage:- It must be stored in air light containers

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Hematinic

- ❖ The recommended dietary allowances per day are 10 mg in male and 18 mg in female.
- ❖ During growth, menstruation, pregnancy and pathological bleeding demand of iron increases considerably.
- ❖ It is absorbed according to the body requirements and the absorption increases in presence of HCl and ascorbic acid (vitamin C).
- ❖ Apart from hemoglobin, it is also associated with myoglobin, catalase, ferredoxin, cytochromes, electron transport and enzyme cofactor.
- ❖ The deficiency of iron in the body is clinically manifested by anaemia (hypochromic i.e. lack of hemoglobin in the blood) and the excess of iron results in haemochromatosis

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Hematinic

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

The main hematinic are iron, vitamin B12 and folate ions

These agents increase the number of erythrocytes or hemoglobin content in the blood

Eg- Ferrous sulphate, ferrous gluconate, ferrous fumarate

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Anaemia

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

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 and vitamin B12
3. Bone marrow depression
4. Increased destruction of RBC's

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Type of Anaemia

1. **Microlytic** :- The size of red blood cells is smaller than normal size.
2. **Macrolytic** :- The size of red blood cells is larger than the normal size.
3. **Aplastic** :- It is a condition in which there is inadequate red blood cells formation occurs. (as a result of bone marrow depression)
4. **Haemolytic** :- It is a condition in which there is increased destruction of red blood cells. The RBC present is of normal size and contain normal quantity of haemoglobin.
5. **Iron deficiency** :- It is due to the loss of iron
6. **Megaloblastic** :- In this condition, erythrocytes fail to mature because of deficiency of Vitamin B12

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Ferrous Sulphate

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 hydrogen gas is evolved. The liquid is then concentrated and cooled to get crystals.



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Ferrous Sulphate

Properties

- It occurs as odorless blush-green crystals or powder
- Its taste is metallic and astringent
- It effloresces in dry air
- On exposure to moisture, it gets oxidized and becomes brown in colour
- It is completely soluble in water and insoluble in alcohol

Identification Test

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

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Ferrous Sulphate

Uses

1. It is used as hematinic i.e. promote the formation of hemoglobin
2. Used in the treatment of anaemia caused by iron deficiency
3. Used in the manufacturing of ink and in photography
4. It also possess disinfectant property
5. Storage:- Must be stored in air light containers

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Ferrous Gluconate

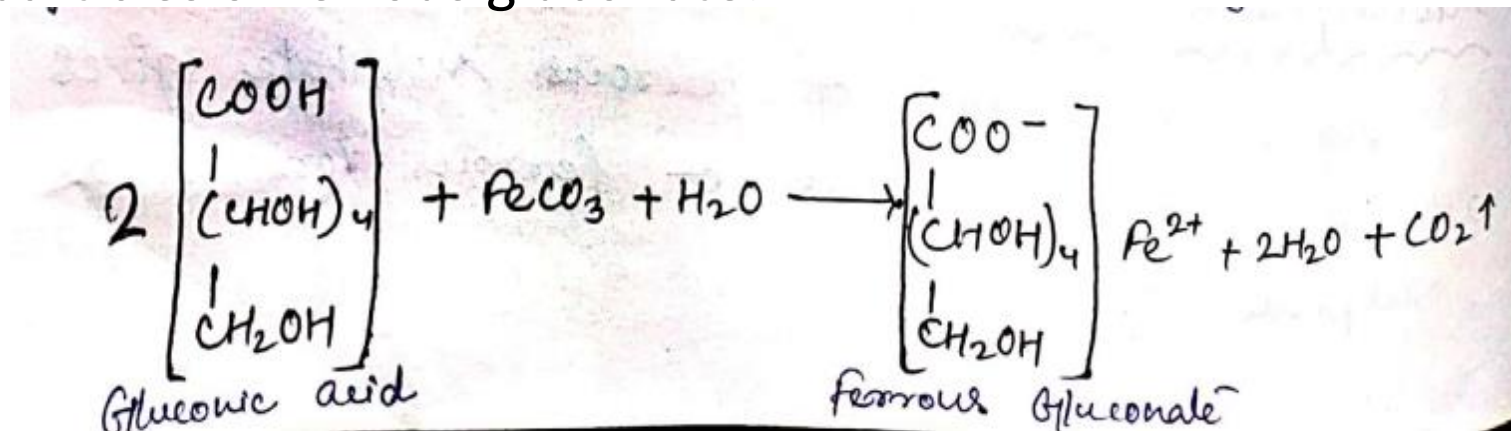
Synonyms :- Iron gluconate, Glucoferron

It contains not less than 95% of pure ferrous gluconate

Preparation

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

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



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Ferrous Gluconate

Properties

1. It is a fine yellowish grey or pale greenish yellow powder
2. It has an odor like burnt sugar
3. It is slowly soluble in water, rapidly soluble in warm water and insoluble in alcohol
4. Its aqueous solution is acidic in nature

Identification Tests :- It gives reactions which are characteristics of ferrous salts.

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Ferrous Gluconate

Uses

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

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

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Poison

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

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Antidote

- Antidotes are the substance which react specifically with the ingested 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 counter act 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

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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

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Sodium Nitrite Injection

Properties

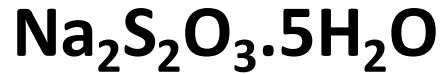
- Yellow or white crystalline powder
- Have saline taste, freely soluble in water but less soluble in alcohol
- Odorless in nature

Uses

- Mainly used in cyanide poisoning
- Prevents rusting of surgical instruments
- Also used as preservative

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Sodium Thiosulfate

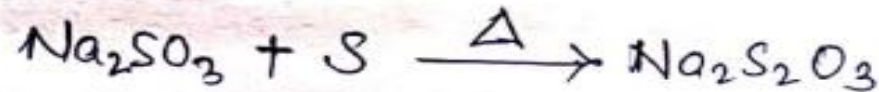


M.W – 248.18 g

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:- It can be prepared by boiling sodium sulphite with sulphur



It can also be prepared by passing Sulphur dioxide into sodium sulphide solution



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Sodium Thiosulfate

Identification Test

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

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

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Heavy Metals And their Antagonist

- 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

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Heavy Metals And their Antagonist

Treatment

- A. The initial treatment in heavy metal poisoning is to administered activated charcoal for absorbing heavy metal poisoning
- B. It is followed by administering compound which are able to produce emesis, this eliminate any poison left in stomach being absorbed in blood circulation

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Cyanide Poisoning

- 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
- Consumption of 300mg of potassium cyanide may cause death

❖ *Physiology of Cyanide in body*

- Cyanide readily combines with ferrous 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

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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

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Activated Charcoal

Properties

1. It is fine black, odorless and tasteless powder
2. It is free from grilly matter
3. It is insoluble in water and other organic solvents

Uses

1. Used as an emergency antidote in many forms of poisoning
2. Used as protective and adsorbent
3. Used as disinfectants in wounds

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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

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Astringents

❖ *Mechanism*

- The protein precipitation brought about by astringents is due to presence of metallic ion 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

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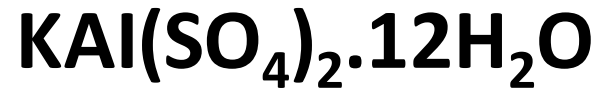
Astringents

Astringents have other uses too:-

1. They are used to treat diarrhea
2. They also possess deodorant properties
3. They decrease sweating and make the skin tougher
4. They promote healing process

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Potash Alum



M.W – 474.33g

Synonyms- Aluminium Potassium Sulphate

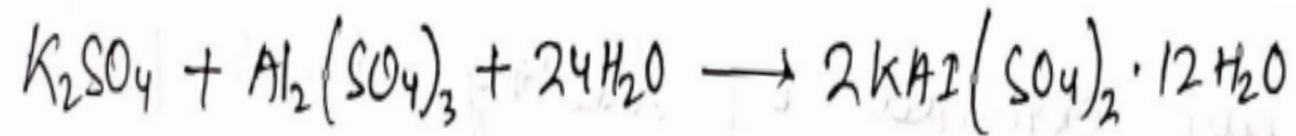
It is a double salt, having an amount of aluminium equivalent to not less than 99.5% of Alum

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Potash Alum

Preparation

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



Properties

1. It occurs as large, colourless crystals
2. It is odourless and sweet astringent in taste
3. It is soluble in water but insoluble in alcohol

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Potash Alum

■ *Identification Test*

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

■ *Uses*

1. Used as an astringents, antiseptic
2. It is having protein precipitation properties
3. It is also used as a pharmaceutical aid

■ *Storage*

It should be stored in air tight containers

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Zinc Sulphate

Synonyms – White vitriol

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

Preparation

1. It is prepared by the action of dilute sulphuric acid on zinc oxide



2. It is also obtained by heating zinc sulphide in the presence of air



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Zinc Sulphate

Properties

1. Colorless, odorless and metallic taste
2. It effloresces in dry air
3. It is soluble in water and glycerine but insoluble in alcohol

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

Uses :-

1. Mainly used as astringents
2. When use internally, it acts as emetic agent
3. It also have protein precipitation activity