

Poison and Antidot

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⇒ A poison may be defined as any substance administered by mouth, injection, inhalation, skin causes illness, some disease or may be death.

⇒ Poisoning may be accidental / suicidal or criminal

⇒ Treatment of poison depends on identification of ingested poison substance, so we can choose specific antidot for this.

Types of poisoning

(A) Intentional Poisoning

a person taking or giving a substance with intention of causing harm to that person. e.g. Suicide / assault

(B) Unintentional Poisoning

of a person taking or giving a substance without knowing its toxic effect e.g. Accidentally.

(C) Undetermined

When there is no clarification b/w intentional and unintentional. e.g. poisoning due to insecticide or pesticide.

Other Causes of poisoning

heavy

- (1) Most common cause due to "Metallic poisoning"
→ heavy metal can cause contamination of food by leaching process.
- (2) Due to overdose of drug.
- (3) Self medication is also cause of poisoning.

Sign and Symptom of Poisoning

- 1) Nausea & Vomiting.
- 2) Partial consciousness
- 3) Reduced breath rate
- 4) Increase or decrease of heart rate.
- 5) Dilated or shrunken pupil
- 6) Muscle cramp.

COMMON EXAMPLES OF POISONING

① Gas Poisoning

- Common example is "Carbon monoxide"
- Major hazard for those who work in chemical industries.
- ⇒ Symptoms : It occurs immediately or after some time.

- Person looks like in cherry red color and having difficulty in breath.

TREATMENT

- Turn off supply of poisonous gas.
- Open window for proper ventilation.
- Place victim in fresh air.
- loose the cloth of victim and give mouth to mouth respiration.
- check pulse, & call to Doctor.

(2.) HEAVY METAL POISONING

- It happens b/c of intake of salt of Arsenic, lead, Hg and iron or cadmium.
- Toxic effect depends on content and type of heavy metal. most deadly form is arsine gas.
- Arsin interferes \approx cellular respiration by combining \approx -SH group of mitochondrial enzyme.
- within 30 minute, symptoms occurs like metallic taste \approx odour of garlic.
- Source of poison : Tobacco, Seagood, insecticide linseed oil (skin contact) & drinking H₂O.

Symptom

- Nausea / vomiting
- Abdominal pain
- Excessive salivation / Diarrhea
- Headache
- Muscle paralysis / Blindness
- Mental impairment
- Kidney failure.

Treatment

(1) Lab test :

- As arsenic deposit mainly in nails and hairs
- Blood analysis → to check serum arsenic level
- Urin spot test → use chelating agent

(2) Gastric lavage

washing out stomach content w tube.

(3) Transfusion to replace loss of blood and fluid, Vit C by I.V.

(4) Dimercaprol → used as chelating agent.

CYANIDE POISONING

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This poisoning may be due to following reason.

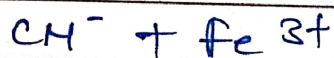
→ Inhalation of fumes of Hydrocyanic acid

→ Ingestion of inorganic salt of cyanide or cyanide releasing substance like cyanamide, cyanogen chloride, bitter almond etc.

* Consumption of 300 mg KCN may lead death.

Physiology of cyanide in Body

→ cyanide readily combines with Fe^{3+} of cytochrome oxidase, & prevent the electron transfer and stop cellular respiration or oxidation-reduction reaction.



↓ Electron transport



Stop cellular respiration



Stop cell function &



cell death.

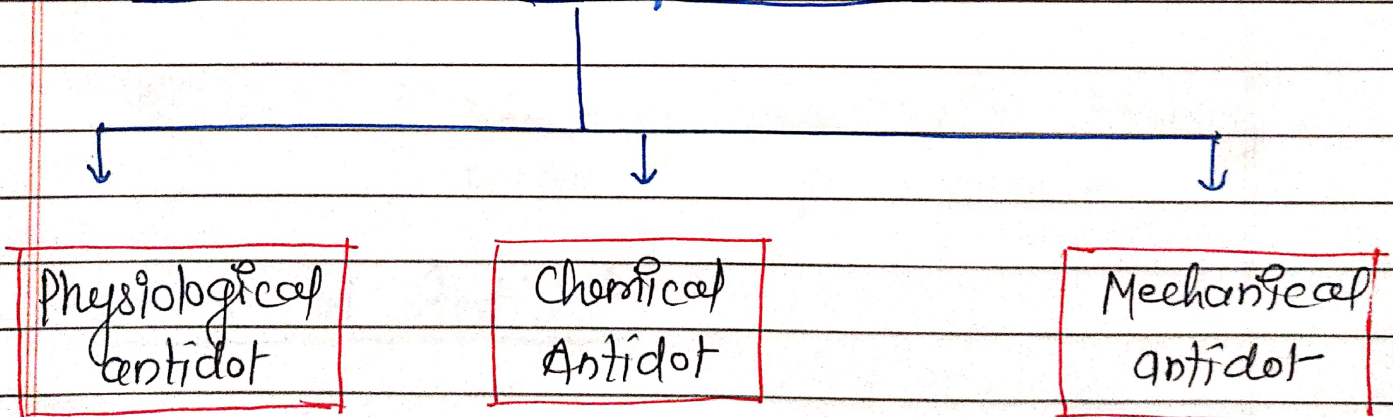
Treatment

Sodium nitrite and sod. thiosulphate inj. both antidot one by one are administered for treatment of poisoning (cyanide)

Antidotes

Antidotes are the substance that counteract the effect of poison or neutralize the effect of poison.

Classification of Antidot



① Physiological

- It is also called antagonist.
- It produce the effect opposite to that of poison.

→ They are used after some of the poison is absorbed in the circulation.

e.g. Sodium nitrite → Used in cyanide poisoning.
 Atropine \rightleftharpoons physostigmine (both are antidotes of each other)

Chemical Antidote

→ They react by combining with the poison and change its chemical nature by converting the poison into inactive or harmless compound.

e.g. Sodium thiosulphate

1) \Rightarrow It converts the systemic toxic cyanide into non-toxic thiocyanate,

2) EDTA = chelating agent for heavy metal poisoning.

Mechanical Antidote

→ They act by preventing the absorption of poison into the body, or expel out the poison prior to absorption into intestinal wall.

→ ex. Activated charcoal adsorbs the poison prior to absorption into intestinal wall.

→ CuSO_4

→ Sodium monohydrogen phosphate (Na_2HPO_4)

SODIUM NITRITE INJECTION

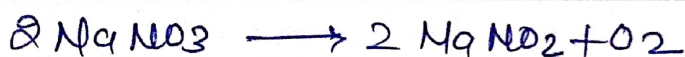
→ Molecular formula = NaNO_2

→ m. wt. = 69 gm.

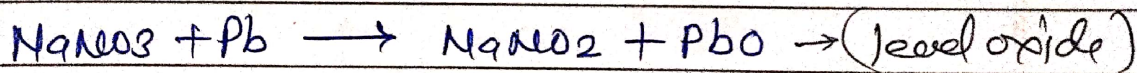
→ Synonym = Nitrous acid sodium salt,
Etnitrit

Method of Preparation

① By heating sodium nitrate



② By heating sodium nitrate & Pb



Physical Property

→ colour = white crystalline powder

→ Taste = saline taste

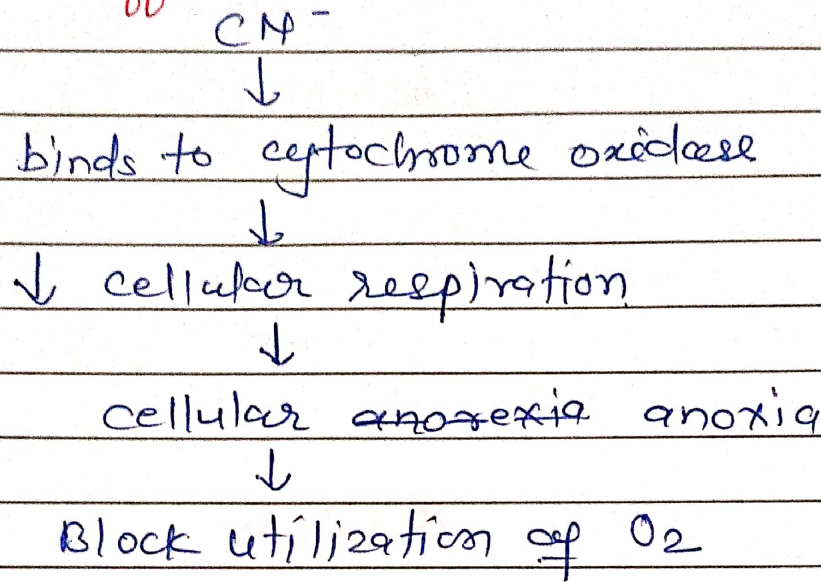
→ Odour = Odourless

→ Solubility = Soluble in H_2O

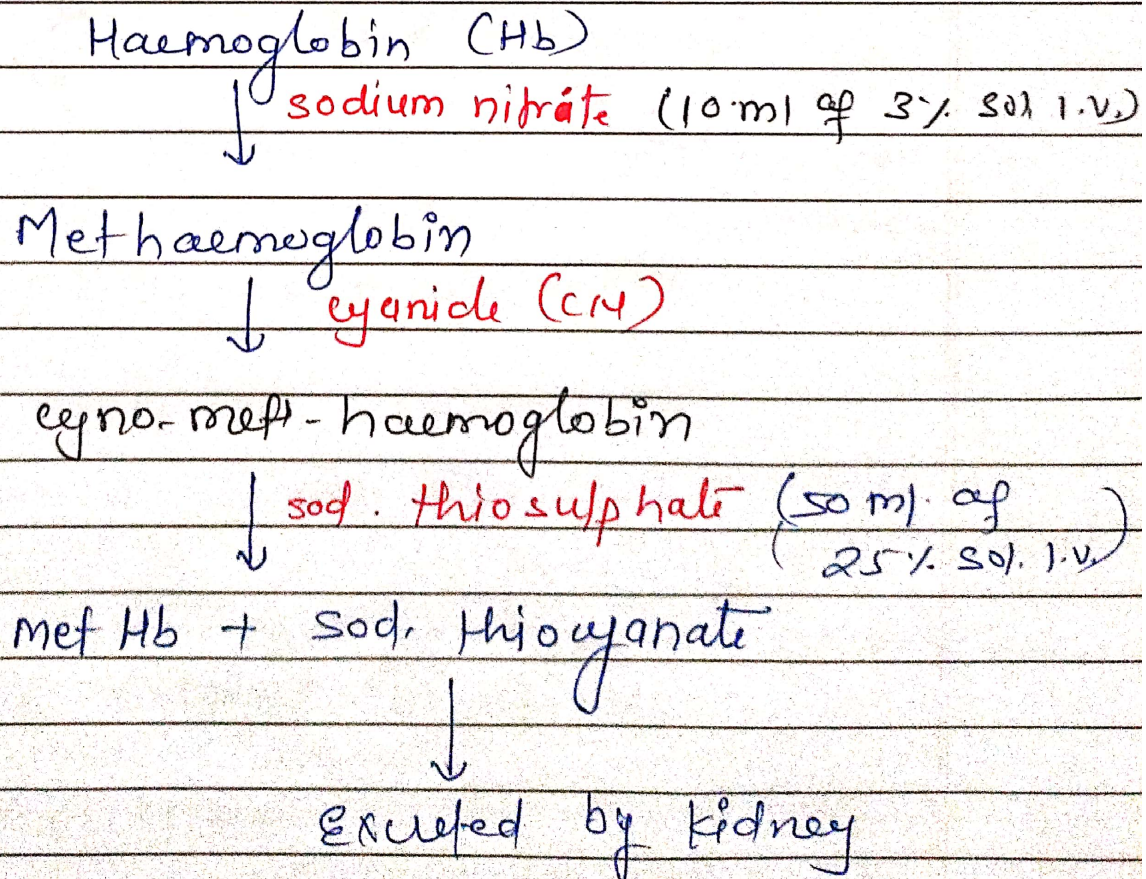
less soluble in $2\text{H}_5\text{OH}$

Mechanism of Antidote Action

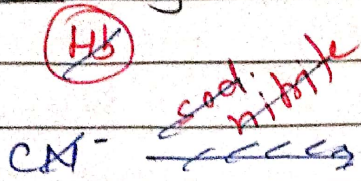
⇒ How CN^- affect cellular Respiration



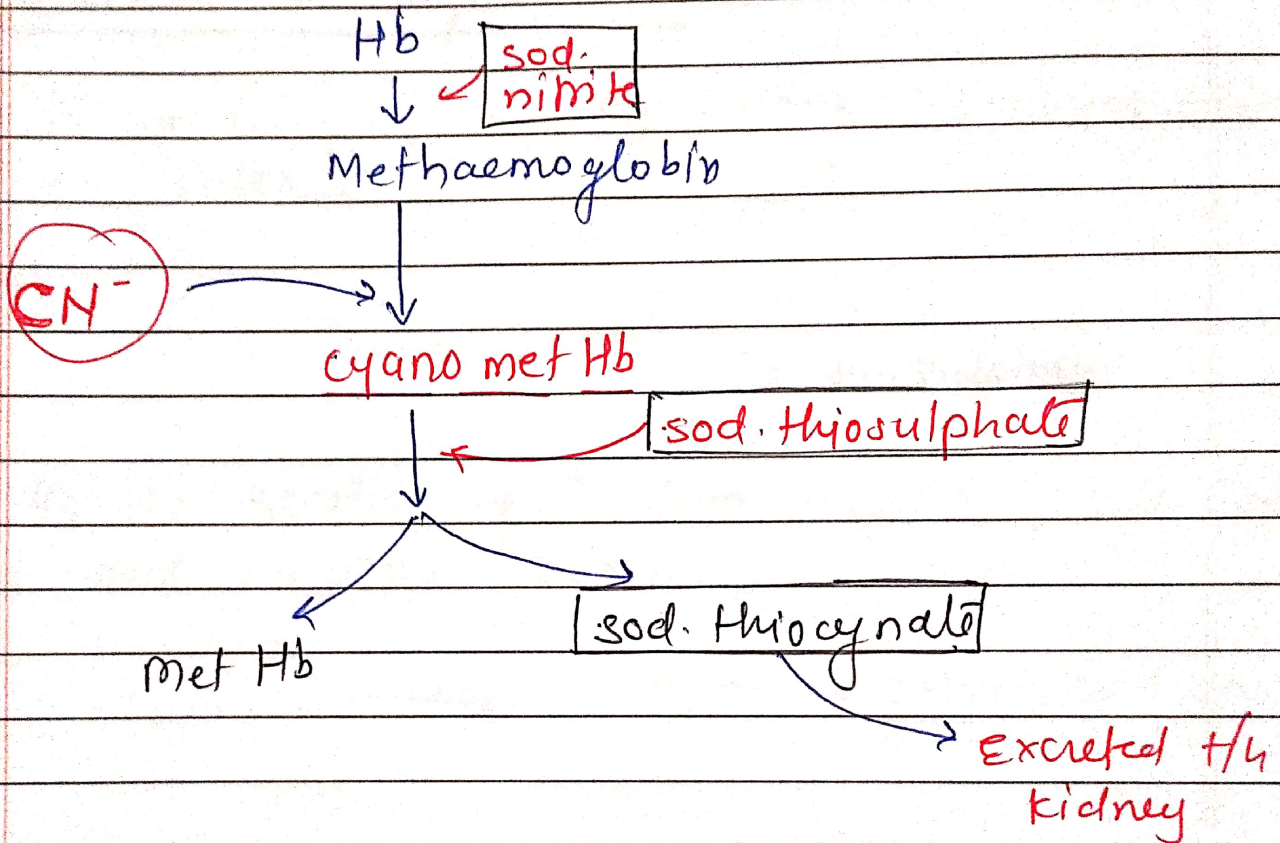
⇒ Role of Nitrate



Summary



Summary



⇒ USES

- 1) It act as a vasodilator.
- 2) Mainly used in cyanide poisoning.
- 3) used as anti-rust solution to prevent rusting of surgical instruments.

⇒ InCOMPATIBILITIES

It is incompatible with Acetanilide, antipyrine, caffeine tribate, chlorate.

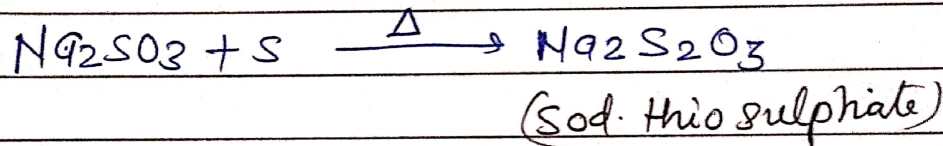
Sod. Thiosulphate Injection

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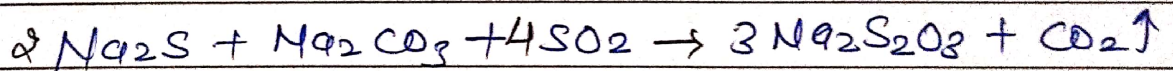
- M. formula → $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$
- m. wt. → 248.18 gm
- Synonyms → sodium hyposulphite, anti-chlor.

Method of Preparation

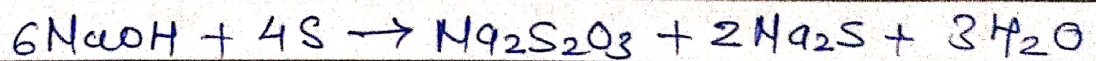
- ① It can be prepared by boiling "sodium sulphite & sulphur"



- ② By the reaction of "sodium sulphide", sod. carbonate and sulphur dioxide"



- ③ By reaction of NaOH & sulphure.



- ④ Reaction of Na_2S & SO_2

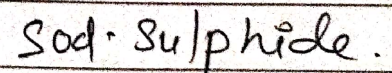
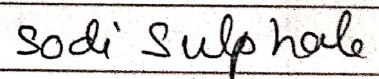
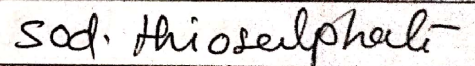
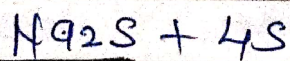
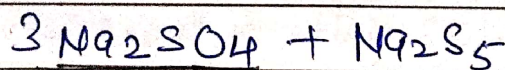
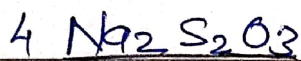


Physical Property

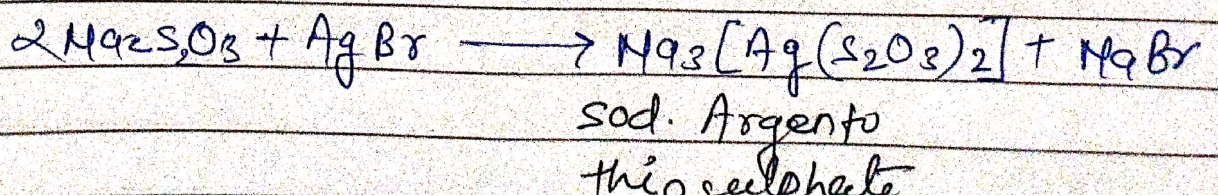
- 1) It occurs as large, transparent, prismatic crystalline powder
- 2) Effervescent in dry air
- 3) solubility → in H₂O / insoluble in alcohol.
- 4) It starts melting at 50°C and at 100°C it loses H₂O

Chemical Property

- ① It's aqueous solution decomposes slowly as



- ② It dissolves silver halide, hence used in photography and called "Hypo"



Incompatibility

When it mixed π solution containing other metal cation

↓

it shows incompatibility due to precipitation of (metal thiosulphate)

USES

- As Antioxidants
- Used as standard titrant in iodometric titration
- As Antidote in CN poisoning i.v. after sod. nitrite inj.
- Topically used as Anti-fungal agent.
- Also antidote in Pb, Bi, Hg & iodine poisoning
- Also used in photographic work.
- In textile industry → as Antichlor in bleaching process.

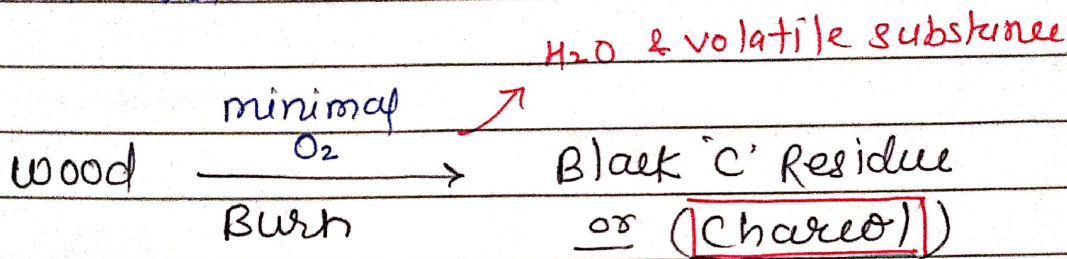
Storage

- Well closed container.

Activated Charcoal

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Charcoal is a light weight black carbon residue produced by strongly heating wood (or other plant/animal material) in minimal oxygen to remove all water and volatile constituent.



→ formula = 'C'

→ Category = Adsorbent, antidote

Method of Preparation and Properties (Properties)

- It is fine, black, odourless and tasteless powder.
- It is free from gritty matter
- It is insoluble in water and other organic solvent.

"Preparations"

It is prepared by 'C' which is produced from nut shells, woods, coal, coconut husk and petroleum pitch.

All these product/material passed the following steps.

(a) Carbonization

Materials are pyrolysed at temperatures b/w 600°C to 900°C in absence of O_2

(b) Activation

Carbonized material is exposed to oxidizing agents or atmosphere (CO_2 , O_2 , steam, ZnCl_2 , H_3PO_4) at temp b/w 600°C - 1200°C , then breaking down to granules.

⇒ Due to activation its adsorptive property ↑
porosity ↑

Summary

Wood / coconut shell

↓ Δ , $600-900^{\circ}\text{C}$
absence of O_2

carbonated material (Raw Charcoal)

↓ Δ
 $600^{\circ}\text{C} - 1200^{\circ}\text{C}$
Exposed to CO_2 , O_2 , H_2SO_4 , H_3PO_4
steam, ZnCl_2

Activated Charcoal

USES

- 1) Used as an emergency antidote in many form of poisoning.
- 2) Used as protective and adsorbent.
- 3) Used as burning fuel.
- 4) It has high surface area so used in filter aids.
- 5) It is used in cyanide & Pb poisoning as mechanical antidote.
- 6) Tablet and capsule of activated charcoal is used to treat diarrhoea and dysentery.
- 7) It is also a constituent of Gum powder.
- 8) It is used in toxic gastric disorder, ulcer as protective.