Unit - III rd

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Gastrointistinal agents

→ The gastrointistinal tract startid from mouth and end to anus and it involvis various proass mainly digistion, absorption, elimination or secretion and rullasi of various enzyme and hormones.

→ It is mainly usi for digistion purposi and having the following important part that is mouth, osophagus, stomach, small and largi intistine rectum and anus in the digistivi tract or system.

- If acid secretion is less than digistivi process suffer and the condition is called achlorhydria.
- If acid is a exass quantity condition is called hyper acidity which leads to formation of ulcer.
- If piristaltic movimint (intistinal movement) is low than it leads to the condition of constipation and if the movimint is highir than it causis diarrhoia.

Acidifying agents / Acidifiers

→ Thisi are the inorganic chemical substancis that either produci or increasi acids.

→ Thisi chemicals increasi the livil of acid in the stomach whin ingistid, thirby decreasing the stomach pH.

① Gastric acidifiers :-

Thisi are the drugs which are usid to increasi acidity of the stomach in patints suffering from achlorhydria.

or hypochlorhydria.

② **Urinary acidifiers:-**

These are the drugs which are used to remove acidic urine from the body or to maintain the pH of urine.

③ **Systemic acidifiers:-**

These are the drugs which are able to neutralise alkaline body fluids, specially blood or to maintain the pH of all parts of body.

④ **Acid:-**

These are used as pharmaceutical aids in preparation of medicaments.

Amonium chloride

Molecular formula :- NH_4Cl
Molecular wight :- 53.49 g/mole
catigory :- Expectorant

→ It is having not less than 99.5 percent of ammonium chloride, calculated with refernce to substance dried over silica gel for four hour.

- **Preparation:-**

(i) It is commercially prepared by neutralizing ammonia with HCl. The solution is evaporated till crude crystalline mass of ammonium chloride is obtained.

$$NH_3 + HCl \longrightarrow NH_4Cl.$$

(ii) It can also be prepared by heating ammonium sulphate with sodium chloride.

$$2NaCl + (NH_4)_2SO_4 \longrightarrow 2NH_3 + 2HCl + Na_2SO_4$$

$$NH_3 + HCl \longrightarrow NH_4Cl.$$

• **Properties :-**

① It is white fine crystalline or coarse crystalline powder.
② It is odourless and having a cooling saline taste.
③ It is slightly hygroscopic in nature.
④ It is soluble in water and glycerol.
⑤ Freshly prepared aqueous solution is neutral to litmus but on standing it undergoes ~~hyg~~ hydrolysis become acidic.

• **Identification test :-**

It gives the reaction of ammonium and chlorides.

• **Uses :-**

① It is used as a mild expectorant.
② It maintains acid-base equilibrium of body fluid.

Dilute Hydrochloric acid

Molecular formula :- HCl
synonyms :- spirit of salt, Muriatic acid.

• **Preparation :-**

It can be prepared by the action conc. sulphuric acid on sodium chloride and passing the liberated hydrogen chloride through water.

$$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$$

• **Properties :-**

① It is nearly colourless clear and fuming liquid.
② It possesses pungent odour.
③ It is soluble with water and alcohol.

④ It is a strong acid and attacks mutals, foaming the hydrochlorides with the evolution of gas.

- **Chemical properties :-**

→ It is oxidised by strong oxidising agents liberating chlorin gas.

- **Storage :-**

It is stored in well closed container of glass or other inert material at a temperature not exceding 30°C.

- **Uses :-**

① It is used as a pharmaceutical aid or as an acidifying agents.

② Used as gastric acidifiers when levels of hydrochloric acid in gastric juice are low.

③ Externally used as a solvent, catalyst in pharmaceuticals and as acidifiers.

- **Dose :-** 0.6 - 8 ml.

Antacids

→ Antacids are the substances which reduce gastric acidity resulting in an increase in the pH of stomach and duodenum. Gastric acidity occurs due to excessive secretion of HCl in stomach due to various reasons.

→ The pH of the stomach is 1.5 - 2.5 when empty and raises to 5-6 when food is ingested. Low pH is due to the presence of endogenous HCl, which is always present under physiological conditions. when hyperacidity occurs the result can range forom.

① gastritis (a general inflammation of gastric mucosa).
② peptic ulcer or oesophagal ulcer (lower end of oesophagus).
③ gastric ulcer (stomach).
④ duodenum ulcers.

• Ideal properties of antacids :-

→ Primarily in pain relief.
→ Higher doses given continuously can promote ulcer healing.
→ superior to H_2 blockers in bleeding peptic ulcers.
→ It should not be absorbable or cause alkalosis in the body.
→ It should not liberate carbon di oxide (CO_2) and cause rebound hyperacidity.
→ It should not interfere with absorption of food.
→ It should not be a laxative or cause constipation.
→ It should be quick acting and its effect over long period of time.
→ It should buffer in the pH range 4-6.
→ It should probably inhibit pepsin.
→ It should be palatable and inexpensive.

• Combination of antacids :-

Mostly antacids are used in combination because the single component not suitable for full filling the requirement to be an ideal antacids.

(i) Magnesium and aluminium containing preparation e.g- magnesium hydroxide a fast acting antacid with aluminium hydroxide which is a slow acting antacid.

(iii) Magnesium and calcium containing preparation when one is laxative and the later one is constipative in nature.

Classification of antacids

① Systemic antacids :-

Systemic antacids are antacids, which get systemically absorbed e.g → sodium carbonate is water soluble and potent neutralizer, but it is not suitable for the treatment of peptic ulcer because of risk of ulcer perforation due to production of carbon dioxide in the stomach.

→ Systemic absorption leads to alkalosis, may worsen edema and congestive heart failure because of sodium ion load.

② Non systemic antacids :-

They are insoluble and poorly absorbed systemically. In magnesium salt, magnesium carbonate is most water soluble and reacts with HCl at a slow rate, while magnesium hydroxide has low solubility and protect the ulcer base.

→ Aluminium hydroxide is a weak and slow reacting antacid. The aluminium ions relax smooth muscles and cause constipation.

→ It also prevent phosphate absorption.

→ Calcium carbonate is a potent antacid with rapid acid neutralizing capacity, but on long term use, it can cause formation of calcium stone in kidney.

Sodium Bicarbonate

Molecular formula → $NaHCO_3$

Molecular wight → 84.01

Synonym → Baking soda.

→ It contains not less than 99% and not more than 101% of $NaHCO_3$.

• Properties :-

(1) white crystalline powder,
(2) odourless with saline and slight alkaline taste.
(3) stable in dry air.
(4) sparingly soluble in water, insoluble in alcohol.

• Preparation :-

(1) By Passing strong brine containing high concentration of ammonia through a carbonating tower where it is saturated with CO_2 under pressure. The ammonia and CO_2 reacts to form ammonia bicarbonate which is allowed to react with NaCl to precipitate $NaHCO_3$ which is separated by filtration.

$$NH_3 + H_2O + CO_2 \longrightarrow NH_4HCO_3$$

$$NH_4HCO_3 + NaCl \longrightarrow NaHCO_3$$

(2) It can also be prepared by covering sodium carbonate crystals with water and passing carbon dioxide to saturation.

$$Na_2CO_3 + H_2O + CO_2 \longrightarrow NaHCO_3$$

• Test for identification :-

To 5ml of 5% w/v soln in CO_2 free water add 0.1 ml phenolphthalein solution a pale pink color is obtained. on heating a gas is evolved and the solution turns red.

• For sodium :-

Acidified the sample solution with 1M acetic acid and add excess of magnesium uranyl acetate solution yellow crystalline precipitate is obtained.

• For bicarbonate :-

To sample add magnesium sulphate no precipitate is produced. On boiling a white coloured precipitate is formed.

• Assay :-

weigh accurately 1gm and dissolve in 20 ml of water, titrate the solution with 0.5N sulphuric acid using methyl orange as indicator. Each ml of 0.5N sulphuric acid = 0.0425 gm of $NaHCO_3$.

• Use :-

It is used as antacid, and in electrolyte replacement.

Aluminium hydroxide gel

Molecular formula → $Al(OH)_3$

Molecular weight → 78.0

→ Aluminium hydroxide gel is an aqueous suspension of hydrated aluminium oxide with different amounts of basic aluminium carbonate and bicarbonate.

I.P limit :-

It contains not less than 3.5% and not more than 4.4% of Al_2O_3.

• properties :-

① It is a white, light odorless, tasteless amorphous powder.

② It is soluble in dilute mineral acids and in solution of alkali hydroxides but practically insoluble in water.

• Preparation :-

It is prepared by dissolving sodium carbonate in hot water and the solution is filtered. To the filtrate add clear solution of alum (aluminium salt, chloride or sulphate) in water with constant stirring. Add more of water and remove all gas. The aluminium hydroxide precipitate out, collect the precipitate, wash and suspend in sufficient Purified water flavoured with 0.01% peppermint oil and Preserved with 0.1% sodium benzoate.

$$Al_2(SO_4)_3 + 3Na_2CO_3 + 3H_2O \longrightarrow 2Na_2SO_4 + Al(OH)_3 + 3CO_2$$

• Test for identification :-

A solution in 2N HCl gives the characteristic reaction of aluminium salts. To sample add 5 drops of freshly prepared 0.05% w/v solution of NaOH heated to boiling, cool, acidify with excess of acetic acid a reddish violet color is produced.

• Assay :-

Accurately weigh 5 gm and dissolve in 3 ml HCl by warming on water bath, cool to below 20°C and dilute to 100 ml with water. To 20 ml of this solution add 40 ml of 0.05M disodium EDTA, 80 ml water, 0.15 ml methyl orange/red and neutralize by the dropwise addition of 1M sodium hydroxide. Again warm on water bath for 30 minute, add 3 gm hexamine and titrate with 0.05M lead nitrate using 0.5 ml xylenol orange as indicator.

Each ml of 0.05M disodium EDTA = 0.002549 gm of Al_2O_3

• Uses :-

(1) It is used as antacid in the management of peptic ulcer, gastritis, gastric hyperacidity.

(2) It is also used as skin protectant and mild astringent.

Magnesium hydroxide mixture

Molecular formula → $Mg(OH)_2$
Molecular weight → 58.32 g/mol
Category → Antacid, laxative.
Synonyms → Milk of magnesia, magnesium hydroxide oral suspension.

I.P limit :- It contains not less than 40% and not more than 45% of magnesium oxide.

- **Properties :-**

① It is white fine amorphous powder.
② It is almost insoluble in water and it yields a solution which is slightly alkalin.
③ It dissolves in dilute mineral acids.

- **Preparation :-**

It is prepared by mixing hot solution of magnesium sulphate and sodium carbonate. The mixture is evaporated to dryness and the residue consisting of magnesium carbonate and sodium sulphate is digested for half an hour with boiling water. The precipitate of magnesium carbonate is collected on filter paper, washed with water until free from sulphate and then dry.

$$5MgSO_4 + H_2O + 5Na_2CO_3 \cdot 10H_2O \longrightarrow (MgCO_3)_4 Mg(OH)_2 \cdot 5H_2O + 5Na_2SO_4 + 5O_2 + 79H_2O$$

- **Test for identification :-**

A solution of 1 ml in 2 ml dilute hydrochloric acid gives the reaction of magnesium.

• **Assay :-**

Accurately weigh 1.5g of magnesium carbonate and dissolve in a mixture of 20ml of water and 2ml 2M HCl. To this solution add 50 ml of water and 10 ml strong ammonia chloride solution titrate this with 0.05M disodium EDTA using mordant black II mixture as indicator until blue color is obtained. Each ml of 0.05M disodium.
EDTA = 0.002015g MgO.

• **USES :-**

(1) It is used as antacid and mild laxative.
(2) It is used as pharmaceutical aid (dispensing volatile oil for use in inhalants).

• **Dose :-**

5 to 10 ml as an antacid.
15 to 30 ml as an laxative.

• **Labelling :-**

The label on the container states that "shake well before use."

Cathartics

Cathartics are drugs used to relive constipation or bring out defecation. The term laxative is used for mild cathartic whereas purgatives is used for strong cathartics.

→ Constipation can also be caused by many factors like weakness of intestine, intestinal injury and use of certain drugs and diet etc, in constipation. faecal matter becomes dry and hard.

→ Use of laxative or purgative (lubricants) gives relief in constipation by elimination of bowel contents.

• Cathartics mainly work by four different methods:-
(1) Lubricant
(2) Bulk formation
(3) stimulant.
(4) Increasing osmotic load in intestine.
(5) saline cathartics (osmotic laxative).

⇒ Lubricant:-

In case of constipation the intestine become hard so difficulty in empty the bowl.
The lubricants causes smooth clearance of the fecal material e.g- Glycerin, mineral oil, liquid Paraffin.

⇒ Bulk formation:-

The material made up of cellulose or non-digestive material which soil and contract with water and increases the bulk of intestinal contact due to increased bulk Purgation movement increases which cause defecation.
e.g→ methyl cellulose, sodium carboxide.

⇒ Stimulant:-

These agents directly act on intestine and stimulate peristaltic movement.
e.g→ castor oil, senna, Podophyllon.

⇒ Increase osmotic load in intestine:-

These are mainly salt or poorly soluble in anions and cations they increase the fluid content of intestine by absorbing large quantity of water.
e.g→ Magnesium sulphate, Na sulphate, sodium orthophosphate.

Magnesium sulphate

Molecular formula :- $MgSO_4 . 7H_2O$

Molecular weight :- 246.7 gm / mole.

Category → osmotic laxative.

→ It is having not less than 99% and not more than 100% of $MgSO_4$, calculated reference to ignited substance.

• Preparation :-

Magnesium sulphate is prepared by the action of dilute sulphuric acid on magnesium carbonate or magnesium oxide. The solution is filtered and the filtrate is evaporated to crystallisation.

$$MgCO_3 + H_2SO_4 \longrightarrow MgSO_4 + H_2O + CO_2$$

• Properties :-

(1) It occurs as odourless crystals having a cool, saline bitter taste.

(2) It is insoluble in water and sparingly soluble in alcohol.

• Identification :-

It gives the reaction of magnesium and sulphate.

• Assay :-

The assay of magnesium sulphate is based upon complexometric titration.

Magnesium sulphate is dissolved in water and ~~magnesium~~ titrated with 0.05M disodium EDTA solution.

During this titration EDTA - magnesium complex is formed. Strong ammonia - ammonium chloride solution is used as the buffer so that the pH may be raised to more than 10 and maintained at that level.

This is because complexation of magnesium by EDTA takes place only at this pH. Mordant black II is used as an indicator. At the end point deep blue colour appears.

- **Uses:-**

① It is used as a saline purgative.
② It is used in the form of enema.
③ It is helpful to promote evacuation of gall bladder content in the treatment of cholecystitis.

- **Dose** → 10-15g

- **Storage:-** Kept in tightly closed container.

Sodium orthophosphate

Molecular formula:- Na_3PO_4
Molecular weight:- 358.14 gm/mol.
Category → osmotic laxative.

→ It is dodecahydrate of disodium hydrogen orthophosphate. It contains not less than 98.5% and not more than 101% of Na_2HPO_4.

- **Preparation:-**

sodium orthophosphate is prepared by treating sodium carbonate with phosphoric acid disodium phosphate is obtained. Disodium phosphate is further neutralised with sodium hydroxide to form sodium orthophosphate.

$$Na_2CO_3 + H_3PO_4 \longrightarrow Na_2HPO_4 + CO_2 + H_2O$$

$$Na_2HPO_4 + NaOH \longrightarrow Na_3PO_4 + H_2O$$

- **Properties:-**

(1) It occurs in the form of colourless transparent crystals, having a saline taste.

(2) It is odourless and efflorescas in air. It is soluble in water but insoluble in alcohal.

- **Identification:-**

It gives the reaction of sodium phosphat and orthophosphati.

- **Uses:-**

It is used as a salin laxative.
It is a cathartic and buffering agent.

- **Storage:-**

It is stored in tightly closed containers.

- **Dose:-** 2-16gm

Kaolin ($Al_2O_3 . 2SiO_2 . 2H_2O$)

It is a negativ hydratid aluminium silicat which is free from most of its impurities by dried.

- **Preparation:-**

It is prepared from natural clay by powdering and separating particles by electrical sidimentation.
It must be purified from gritty particles and other impurities.

- **Properties:-**

→ It is light, white powder free from gritty particles.
→ It is odourless, tasteless and having greasy or soapy to the touch.

- **Uses:-**

(1) It finds use in mixtures which are intended for dysentry, diarrhoea and for symptomatic treatment of cholitis, cholra etc.

(2) It is used in the treatment of food and alkaloid poisoning, as it adsorbs toxins.

(3) It finds use in dusting powder, cosmetic preparation.

- **Storage :-**

It is stored in well-closed containers.

- **Dose :-** 15-75g.

Bentonite ($Al_2O_3 . 4SiO_2 . H_2O$).

→ It is a colloidal hydrated aluminium silicate which occurs naturally. It is obtained from the naturally occuring sources. Bentonite is having SiO_2, Al_2O_3, Fe_2O_3, CaO, MgO and some sodium and potassium.

- **Properties :-**

→ It occurs as a very fine, pale or cream coloured powder. It is odourless, free from grit and has slightly earthy taste.

→ It is almost insoluble in water but swells to about 12 times its volume after neutralisation.

- **Uses :-**

(1) It is a good pharmaceutical aid and is used as a protective colloid to stabilise emulsions. Mainly it is used to suspend other insoluble powders.

(2) It finds use as an emulsifier for oil in water emulsions.

(3) It is also used as a base for many pharmaceutical preparation including plasters and ointments.

(4) It is an ingredient of calamine lotion which is used as a protective.

- **Swelling factor :-**

It is measured by dropping from the top. Add 2g of bentonite in 10 portions at intervals of 2 minutes to 100ml of water in a 100ml graduated cylinder about 3cm in diameter.

Allow each portions to settle before adding the next and let it stand for 1 day. Bentonite swells up at the bottom and it should occupy an apparent volume of not less than 24 ml.

Antimicrobial agents

The compound which kill the micro-organism or inhibit the growth of micro-organism are called antimicrobial compounds.

• Classification of anti-microbial :-

(1) Antiseptic :-

substance that kill or privent the growth of micro-organism, specific for preparation intended to be used for living tissues.

(2) Disinfectant :-

Prevent infection by the destruction of pathogenic micro-organism used to maintain objects.

(3) Germicide :-

An agent which kills micro organisms. More specific terminologies like 'bactericid' (against bactria), denote exact action.

(4) Bacteriostatics :-

An agent which function by inhibiting the growth of bactria - do not kill but stop the growth of bactria.

(5) Sterilization :-

Process of complete destruction of all living micro-organisms, including spores by physical and chemical methods.

(6) Sanitizer :- disinfectant used to maintain public health standard, mainly concerned with wash out microbes.

• Mechanism of action :-

Inorganic compounds generally exhibit antimicrobial action by three different mechanism. They are -

(1) oxidation mechanism.
(2) Halogenation mechanism
(3) Protein precipitation.

• oxidative mechanism :-

This belongs to class of peroxides, Peroxy acids, oxygen liberating like permanganate. They act on proteins containing sulph hydryl group and oxidises free sulphydryl to disulphide bridge and inactivate its function.

• Halogenation mechanism :-

Compounds which liberates chlorine or hypochloride or iodine act by this mechanism. They act on peptide linkages and alter it's property. The destruction of specific function of protein results in death of micro-organism.

• Protein precipitation :-

Many cations exhibit protein binding or protein precipitation. The interaction with protein occurs through polar group of protein which acts as ligands and metal cation as lewis acid. The complex formed may be strong chelate leading to inactivation of proteins.

Potassium permanganate

Molecular formula → $KMnO_4$
Molecular weight → 158 gm
Category → Anti-infective, antiseptic

• preparation :-

manganese dioxide → fused with solid potassium hydroxide + potassium chlorate → green mass potassium

manganat is obtained → cooled & extracted with water and filtered.

$$3MnO_2 + 6KOH + KClO_3 \longrightarrow 3K_2MnO_4 + KCl + 3H_2O$$

- **Properties:-**

(1) It occurs in the form of dark purple coloured monoclinic prism.
(2) It is odourless and sweet and astringent in taste.
(3) It is soluble in 15 parts of water and 3.5 parts of boiling water.
(4) It decomposes at high temperature.

- **Identification test:-**

solution in water → acidified with sulphuric acid and heated at 70°C → decolourised by the solution of hydrogen peroxide.

- **Test for purity:-**

chloride, sulphate, water insoluble matter, colour of solution.

- **Assay:-**

oxidation-reduction titration

- **storage:-**

It should be stored well closed container.

- **Uses:-**

(1) Used as an antiseptic and topical anti-infective.
(2) It is used in mouth wash and gargle.
(3) Used as disinfectant agents.
(4) Action occurs due to liberation of oxygen which oxidises protein of bacteria and kills them.
(5) It is also used as stomach wash in the treatment of narcotic drug poisoning.

Boric Acid

Molecular formula → H_3BO_3
Molecular wight → 62 gm
Catigory → Anti-infectiv and germicid.

- **Preparation :-**

Borax or sodium tetra borate may also decomposed with mineral acid (HCl or H_2SO_4).

$$Na_2B_4O_7 + H_2SO_4 + 5H_2O = Na_2SO_4 + 4H_3BO_3$$

→ Boric acid occurs in volcanic jets of steam → condensed and cooled.
→ crude boric acid → crystallizes out.
→ purified by recrystallization.
→ Allow to crystallize after filtration.
→ collected by filtration, washed free from soluble sulphate.
→ Get a dried residue.

- **Physical properties :-**

→ odourless, slight bitter taste.
→ white crystals or powder.

- **Identification test :-**

Dissolve sample in a mixture of methanol + conc. H_2SO_4 → ignite the solution flame burns with a green border due to the formation of methyl borate.

- **Assay :-**

Iodimetric titration by titrimetric analysis.

- **Storage :-**

It is stored in well-closed container.

• Uses :-

(1) Used as an Pharmaceutical aid and local anti-infective.
(2) Is a weak germicide.
(3) Used in solution, ointments, dusting Powders as an antiseptic.
(4) It is a weak bacteriostatic agent.
(5) Also used in ophthalmic preparation as buffers and in saturated (≈ 4.5%) solution as bacteriostatic eye wash.

Hydrogen Peroxide

Molecular formula → H_2O_2
Molecular wight → 34 gm
Catigory → Antimicrobial agent.

• Preparation :-

→ It is prepared by adding a paste of barium peroxide in ice cold water to a calculated quantity of ice cold dilute sulphuric acid. The insoluble barium sulphate is filtered off.

$$BaO_2 + H_2SO_4 \longrightarrow BaSO_4 + H_2O_2$$

• Properties :-

(1) Colorless liquid with slightly acidic taste.
(2) Is decomposed in contact with oxidisable matter, reducing agent, when made alkaline or even on standing.

$$2H_2O_2 \longrightarrow 2H_2O + O_2\uparrow$$

• Identification test :-

small quantity decolourises acidified $KMnO_4$ with evolution of gas.

• Assay :-

oxidation → reduction titration.

• **Storage :-**

It should be stored in light resistant container in a cool place.

• **Uses :-**

(1) Used as an antiseptic and topical anti-infective.
(2) It arrest the bleeding of wounds.
(3) It is used to clear the wounds and ears, when pus is present also can be treated.

Chlorinated lime

Molecular formula → $Ca(OCl)Cl$
Molecular wight → 143 gm
Catigory → Disinfectant.

• **Preparation :-**

It is prepared by treating $Ca(OH)_2$ (lime) with chlorine gas.

$$Ca(OH)_2 + Cl_2 \longrightarrow Ca(OCl)Cl + H_2O$$

• **Physical properties :-**

→ Dull white colour powder.
→ Strong odour of chlorine.
→ Partly soluble in water and alcohol.

• **Identification test :-**

When sample is treated with HCl, chlorine gas is evolved. The resulting reaction of calcium and chloride.

• **Assay :-**

Iodimetric titration.

• **Storage :-**

It is stored only in tightly stoppered containers. When exposed to air - gets slowly decomposed.

- **Uses:-**

(1) Used as an disinfectant.
(2) Acts as an bleaching powder.
(3) Has a rapid bactericidal action.
(4) As a cleaning agent.

Iodine

Molecular formula → I_2
Molecular wight → 127 gm
Category → Anti-infective and local germicide.

- **Preparation:-**

Alternatively, the solution having freely soluble iodides as above is treated with required proportion of chlorine and the precipitated iodine is collected and purified by sublimation.

$$NaI + H_2SO_4 + MnO_2 \longrightarrow MnSO_4 + 2NaHSO_4 + I_2 + 2H_2O$$

- **Properties:-**

(1) It melts at higher temperature.
(2) It is insoluble in water but soluble in alcohol.
(3) It is freely soluble in chloroform and ether.
(4) It occurs as heavy, bluish-black rhombic plates with metallic luster.

- **Identification test:-**

when a clear solution of iodine in KI is treated with starch, produces blue colour in the cold conditions. On heating blue colour disappears and reappears on cooling.

- **Storage:-**

It is volatile at room temperature and reacts with rubber and corks.

→ so it should be stored in amber colour bottles with tight glass stopper and kept in a cool place.

- **Assay :-**

Iodometric titration

- **USES :-**

(1) Externally used as antiseptics or internally as a source of iodine for the thyroid gland.

(2) As an effective disinfectant → act by oxidizing the protoplasm of organisms→ in presence of organic matter its action is very much reduced.

(3) It is also used as local germicide.

THANK YOU