

III Reactions of Monosaccharides.

physical ppts

- colorless, crystalline solids
- water soluble.

Eneidiol formation.

(UG)

Color of Benedict's reagent - Blue.

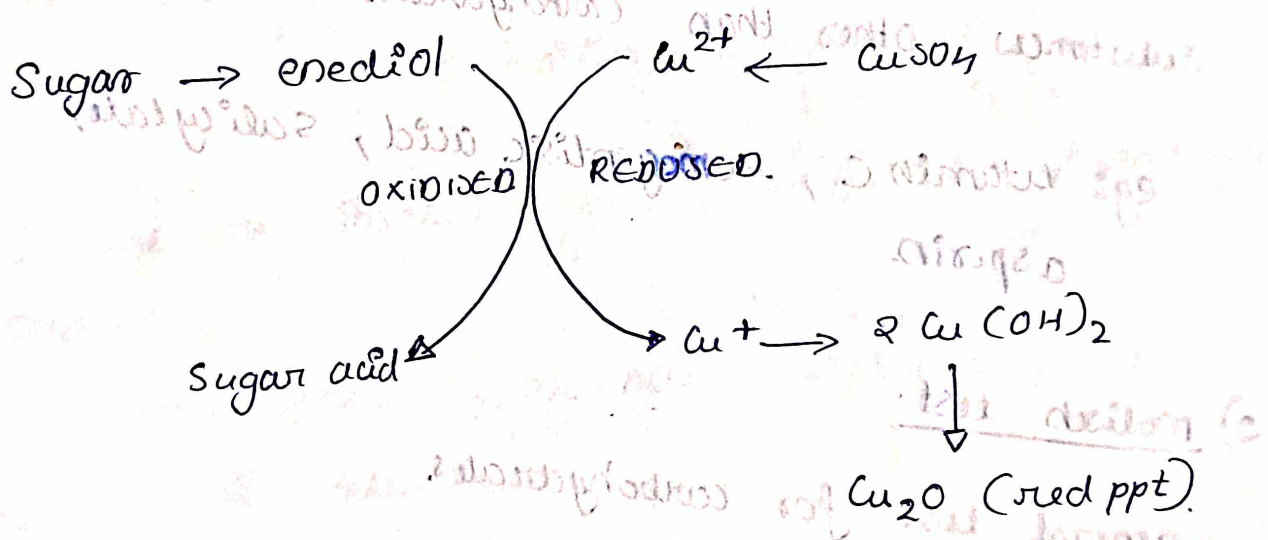
- In mild alkaline solutions, carbohydrates containing a free functional group will tautomerize to form eneidiols.
- Eneidiols are highly reactive; so sugars are powerful reducing agents in alkaline medium.

Benedict's test. (semiquantitative test.)

- standard laboratory test for follow-up of diabetes mellitus.
- any sugar with free functional group can reduce Benedict's reagent
- so, not specific for glucose.
- Benedict's reagent contains copper sulphate, sodium carbonate and sodium citrate.
- In the alkaline medium provided by sodium carbonate, sugars form enediols which are highly reactive, they can reduce cupric ions to produce coloured ppt.
- Sodium citrate act as a stabilizing agent.

✓ 1 mark
 non-carbon containing reducing substances that give positive test for Benedict's.

- Vitamin C
- aspirin
- Uronic acid.



Colour indicates % of reaction.

- # Blue - No reaction.
- Green. -
- Orange -
- Red -

Benedict's test is used to give the approximate quantity of sugar present in solution. can be determined by colour of solution.

✓ Important q's

- Benedict's test will be positive for reducing substances other than carbohydrates.

eg: Vitamin C, Homogentisic acid, salicylate, aspirin.

2) Molisch test:

- general test for carbohydrates.

- Monosacch treated with conc. H_2SO_4 , dehydration with removal of 3 molecules of water occurs.

- Hexoses give hydroxy methyl furfural and pentoses will give. furfural derivatives.

ii molisch reagent is alpha naphthol in alcohol.

- Furfural derivative then condenses with phenolic compounds to form coloured products.

Osazone formation.

- with excess of phenylhydrazine, reducing sugars form osazones at boiling temperature.
- Osazone are insoluble and they form characteristic crystals
- Glucose, fructose, mannose differ only in first 2 carbon atom.
- \therefore glucose, fructose, mannose give same {needle shaped crystals}
- as first 2 C reacts with phenylhydrazine

Reaction of monosaccharides

Formation of Glycosides (Acetals)

4 marks.

- when hemiacetal (hydroxy group of the anomeric carbon) is treated with one molecule of alcohol or phenol.

Glycoside

- Naturally occurring substances in which carbohydrate portion, consisting of one or more sugars or a uronic acid (a sugar acid) is combined with a hydroxy compound.

- The hydroxy comp, usually a non-sugar group (aglycone), such as a derivative of phenol or alcohol.

- Glycosides do not have reducing property as the sugar group is masked.

- Enzyme hydrolysis helps to distinguish between α & β glycosides.

Some glycosides of medical importance.

- digitonin - cardiac stimulant.
- phlorescin - produce renal ~~dam~~
- damage in experimental animals.

Prac 11.

Reduction to alcohols.

- When treated with reducing agents like sodium amalgam, hydrogen can reduce sugars.
- Aldose yields corresponding alcohol
- Ketoses form 2 alcohols.
- Glucose reduced to sorbitol [Sorbitol causes cataract in diabetic patients]
- monose \rightarrow mannitol.
- Galactose \rightarrow dulcitol.

Dulcitol. aldose \rightarrow aldehyde \rightarrow Carbohydrate

- Mannitol is used to reduce intracranial tension when glucose levels are high in blood stream, sorbitol can be produced by an enzyme called aldose reductase.

- High levels of sorbitol can contribute to cataracts, which is a clouding of lens in eye.
- Cataracts are commonly seen in diabetics.

2. Oxidation of to aldonic acids.

• aldehyde group of an aldose can be oxidised, under mild oxidation conditions, to a carboxyl group.

- glucose oxidise to gluconic acid.
- mannose to mannoic acid and galactose to galactonic acid.

3. Oxidation to Uronic acids.

- When aldehyde is protected & the molecule is oxidised, the last C becomes COOH group to produce Uronic acid.

4. Oxidation to dicarboxylic acids.

- Under strong oxidation (nitric acid + heat) first and last C get oxidised to form dicarboxylic acid, Saccharic acid.

- Galactose to mucic acid.

- Mucic acid test - is used for the identification of galactose.

5. Amino Sugars.

- Amino gp may be substituted for hydroxyl gp of sugars to give amino sugars.

- Amino gp is added generally to 2nd C of hexose.

- Amino sugars will not show reducing ppty.

Disaccharides.

Sucrose (table sugar) [Invert sugar].

- most abundant obtained principally from the juice of sugar cane and sugar beets.

- Non reducing sugar.

Invert sugar.

(4 mark)

(+66.5)

(+52.5)

(-92)

• Hydrolysis of sucrose (optical rotation, $+66.5^\circ$).

↓ Enzyme - sucrase / Invertase.

• one molecule of glucose ($+52.5^\circ$)
and.

• one molecule of fructose (-92°)

ie, dextro convert to laevo

that is called inversion of sugars.