

ORGANIC CHEMISTRY

Score Advance : Guided Revision Plan - Question Bank- (01)

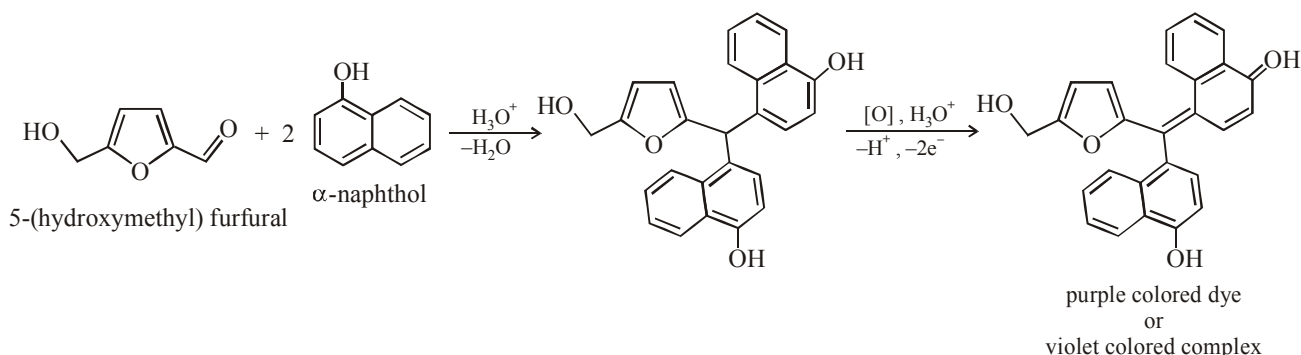
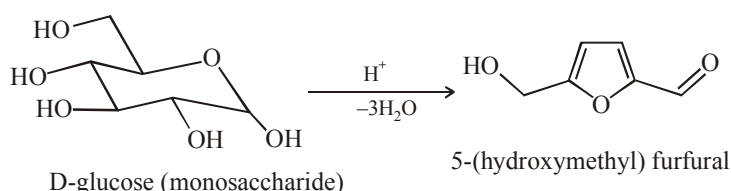
Topic : CARBOHYDRATES

TEST OF CARBOHYDRATES

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|-----------------|------------------|-----------------------|------------------|
| 1. Molish Test | 2. Barfoed Test | 3. Salivanoff's Test. | 4. Bial's Test |
| 5. Osazone Test | 6. Benedict Test | 7. Fehling Test | 8. Tollen's Test |
| 9. Iodine Test | | | |

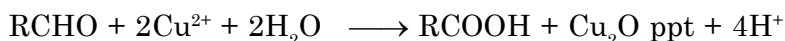
1. Molish Test

Molish test is the general test for the identification of all carbohydrates (Monosachharides, Disachharides and Poly sachharides) and Glycoprotein, Sulphuric acid is added to hydrolyzes the all glycosidic linkage to yield monosachharides, which on dehydration form furfural or its derivative in presence of acid. which condensed with alpha naphthol to give a violet colored complex.



2. Barfoed Test

This test is used to differentiate reducing monosaccharide from a disaccharide sugar. It is done in mild acidic medium.



It is based on the reduction of copper(II) acetate to copper(I) oxide (Cu_2O), which forms a brick-red precipitate.

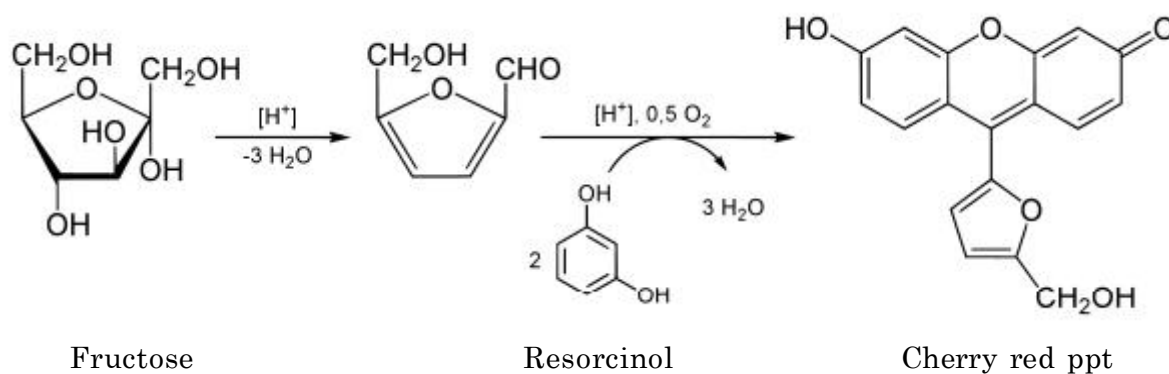
Reducing monosaccharides react with Barfoed's reagent much faster than disaccharides and produce red precipitate of copper (I) oxide within three minutes.

Disaccharide sugars as they are weaker reducing agents, react at a slower rate, so they do not form red precipitate even for ten minutes.

3. Selivanoff's Test

Test of Ketose sugar (eg Fructose), it is used to differentiate Ketose sugar from aldose sugar.

This test relies on the principle that keto hexose are more rapidly dehydrated than aldoses to form 5-Hydroxy methyl furfural when heated in acidic medium, which on condensation with resorcinol, a cherry red (or Brown red) colored complex is formed rapidly indicating a positive test.



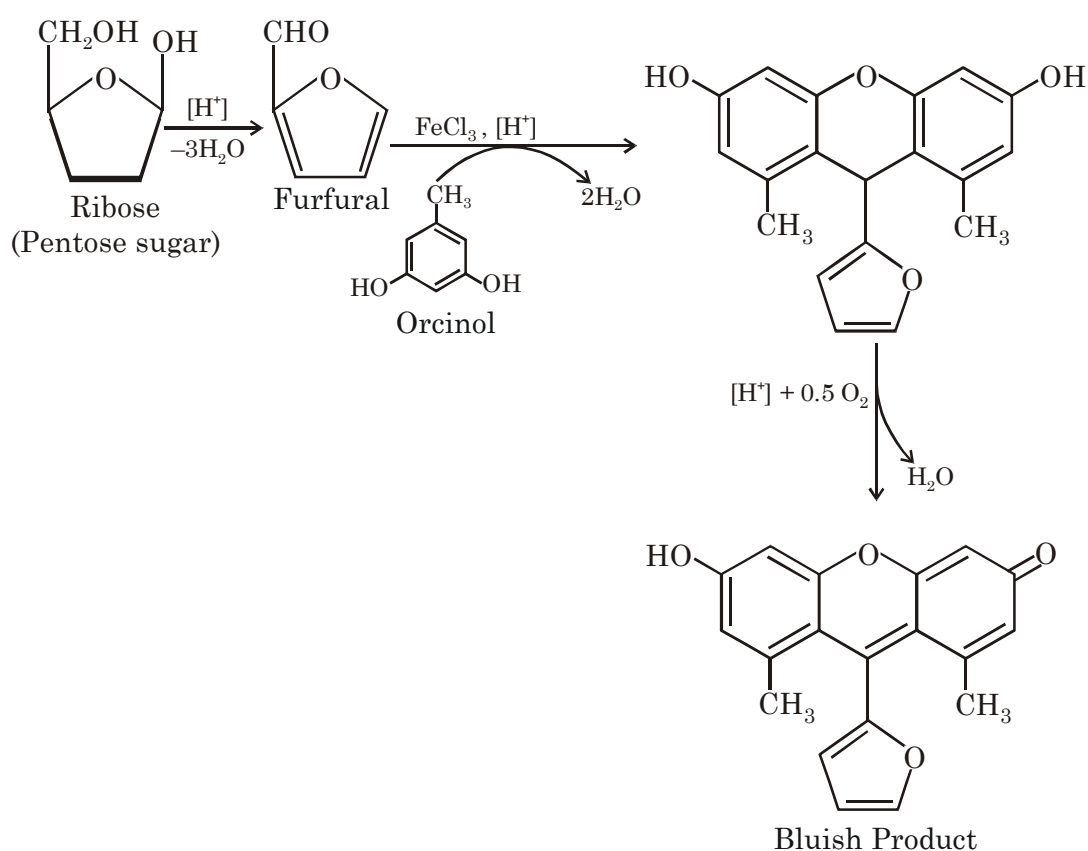
4. Bial's Test

Bial's test is positive for Pentoses

This test is used to differentiate Pentose and Hexose sugar

The test reagent dehydrates pentoses to form furfural. Furfural further reacts with Bial's reagent (a solution of orcinol, HCl and ferric chloride). orcinol and the iron ion present in the test reagent to produce a bluish product .

Figure insert



Specifically Pentose sugar gives bluish colored complex.

All other colors indicate a negative result for pentoses.

Note: hexoses generally react to form green, red, or brown products.

5. Osazone Test

Reducing Sugars when heated with Phenyl Hydrazine, Characteristic yellow crystals of Osazone are formed with specific shape.

Glucose, Maltose & Fructose gives same Osazone crystals, like NEEDLE SHAPED.

Maltose gives Maltosazone crystals, like SUNFLOWER SHAPED.

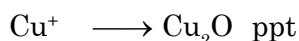
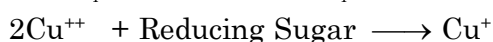
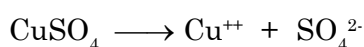
Lactose gives lactosazone crystals,

like TIGHT BALL or POWDER PUFF SHAPED..

6. Benedict test

Carbohydrates which has Aldehyde functional group (Not Aromatic Aldehyde) or Having alpha hydroxy ketone gives positive Benedict Test

It is in mild Basic Medium.



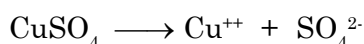
Glucose (Blue Red Solution), Galactose (Orange Red Solution)

Maltose (Dark Brown with Brick Red Solution), Fructose (Dark Brown with Brick Red Solution)

Xylose (Brick Red solution)

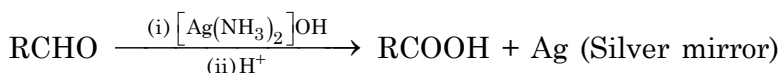
7. Fehling's test

All reducing Carbohydrates give Positive Fehling's test with Fehling solution. Carbohydrates which has Aldehyde functional group (Not Aromatic Aldehyde) and alpha hydroxy carbonyl also gives positive Fehling's test (e.g. fuctose). While Ketones give negative fehling test. During this reaction the aldehyde group is oxidised to acid while the copper ions are reduced to red/brown precipitate of Cu_2O . This is a common test used to detect glucose in urine as positive indication of diabetes.



8. Tollen's test

This test is also given by reducing sugars. Carbohydrates reacts with Tollens reagent forms a silver mirror on the inner walls of the test tube. This confirms the presence of reducing sugars. Silver ions are reduced to metallic silver.



Note : Sucrose, polysaccharides also others non reducing sugar do not give Benedict test, Fehling test and Tollen's Test.

9. Iodine Test

The iodine test is used to test for the presence of starch. Starch turns into an intense 'Deep blue' colour upon addition of aqueous solutions of the triiodide anion.

Additional Questions

1. Match the following

List-i

Pair of carbohydrates

- (i) D-glucose and D-fructose
- (ii) D-glucose and Lactose
- (iii) D-glucose and D-ribose
- (iv) D-glucose and Amylose

The correct options is

- (A) i \rightarrow S; ii \rightarrow Q; iii \rightarrow R; iv \rightarrow P
- (C) i \rightarrow S; ii \rightarrow P; iii \rightarrow Q; iv \rightarrow R

List-ii

Distinguished by

- (P) Barfoed's Test
- (Q) Bial's test
- (R) Benedict test
- (S) Secivanoff's test

- (B) i \rightarrow R; ii \rightarrow P; iii \rightarrow Q; iv \rightarrow S
- (D) i \rightarrow R; ii \rightarrow Q; iii \rightarrow S; iv \rightarrow P

2. Which of the following carbohydrate do not give, needle shaped crystals of osazone (i.e. same osazone) with phenyl hydrazine

- (A) D-glucose (B) L-glucose (C) D-fructose (D) D-mannose

3. Which of the following disachharide do not give Fehling or Benedict test

- (A) Lactose (B) Maltose (C) Sucrose (D) Mannose

4. In which of the following test of carbohydrate, furfural or derivative of furfural is not formed as intermediate?

- (A) Molish test (B) Barfoed's test (C) Selivanoff's test (D) Bial's test

5. Which of the following test of carbohydrate is done in acidic medium?

- (A) Fehling's test (B) Benedict test (C) Tollen's test (D) Molish test

6. Which of the following carbohydrate contains β -D-glucose as monomer

- (A) Starch (B) Glycogen (C) Sucrose (D) Cellulose

7. Which of the following epimer of D-glucose gives same osazone crystal with Phenyl hydrazine?

- (A) C-2 epimer (B) C-3 epimer (C) C-4 epimer (D) C-5 epimer

8. I_2 (Iodine) gives blue colour with starch, the other test which is positive for starch is?

- (A) Benedict test (B) Test with Fehling solution
- (C) Tollen's test (D) Molish test

9. Incorrect statement related to diabetes and carbohydrate is?

- (A) In diabetes patient blood sugar level increases
- (B) The insulin hormone facilitate the entry of sugar from blood into cells.
- (C) Insulin hormone is not carbohydrate, it is polypeptide chain of amino acids.
- (D) Diabetes patient is advised to excess of carbohydrates.

10. Fructose is ketose sugar, then also it gives positive Fehling test. Find out the incorrect statement?

- (A) Fructose is reducing sugar
- (B) Fructose is α -hydroxy ketone, so it give positive Fehling test
- (C) Fructose also show mutarotation
- (D) Fructose is present in DNA on the other hand Ribose sugar is present in RNA