EXPERIMENT # 07

14.Dec.2020

Title :-

Fehling's Test (For reducing sugars)

Fehling's solution (deep blue colored) is used to determine the presence of reducing sugars and aldehydes.

Principle :-

Reducing carbohydrate can be detected by several tests based on their oxidation by certain metal ions e.g copper, bismuth, silver, mercury. In Fehling's test the reducing sugar can reduce cuprous ions to cupric ions. Copper sulphate is present in Fehling's reagent hydrolyzes to give cuprous hydroxide:

$$CuSO_4 \longrightarrow Cu^{++} + SO_4^{-2}$$

$$Cu^{++} + 2OH^{-2} \longrightarrow Cu(OH)_2$$

$$Cu(OH)_2 + \text{Na-k tartrate} \longrightarrow Cu(OH)_2\text{-Nak tartrate Complex}$$

$$Cu(OH)_2\text{-Nak tartrate complex} \longrightarrow 2OH^- + Cu^+ + \text{Sodium citrate} + \text{oxidized sugar}$$

$$Cu^+ + OH^- \longrightarrow CuOH \longrightarrow Cu_2O \text{ (Red ppt)}$$

This complex dissociates to provide cupric ions for oxidation. The reduction occur best in alkaline medium which is provided by potassium.

Summary of the Reaction :-

Sugar + alkali $\longrightarrow$ Enediol

Enediol + Cu^{++} $\longrightarrow$ Cu^{+}

$Cu^{+} + OH^{-} \longrightarrow CuOH \longrightarrow Cu_2O\downarrow$ (Red ppt)

Reagents :-

Fehling's Solution A :-

It contains 7 % copper sulphate soln which is prepared by dissolving 34.65 g of $CuSO_4.5H_2O$ in 500 ml of distilled water.

Fehling's Solution B :-

It contains potassium hydroxide and sodium potassium tartrate (Rochelle salt). It is prepared by dissolving 125 g of KOH and 173 g of sodium potassium tartrate in 500 ml of distilled water

Working Solution :-

Fehling solution A and B are mixed in equal volumes. This is freshly prepared and it has a deep blue color.

Procedure :-

Take 2ml of working solution in a test tube. Heat it till boiling. Add 1 ml of original sample solution boil for 2 minutes. Appearance of yellow or brick red precipitates. indicates the presence of reducing carbohydrate

Disadvantages and Advantages of Fehling's reagent :-

1_ The reagent is unstable usually the storage time

Observations and Results :-

S.NO	Reducing Sugar	PPT	Results
1.	Presence of reducing sugars	Reddish brown PPt	Positive Test
2.	Absence of reducing sugar	Deep blue PPt.	Negative Test

is 2 months.

2. It has to be prepared in two parts and stored separately.
3. The strong alkali present in reagent can destroy the carbohydrate.
4. Auto-reduction of cupric hydroxide may occur resulting in False positive test.
5. Because of these drawbacks Fehling is being replaced by another test as Benedict's test. It is however sensitive test. By this test even minor quantities of reducing sugars can be detected.