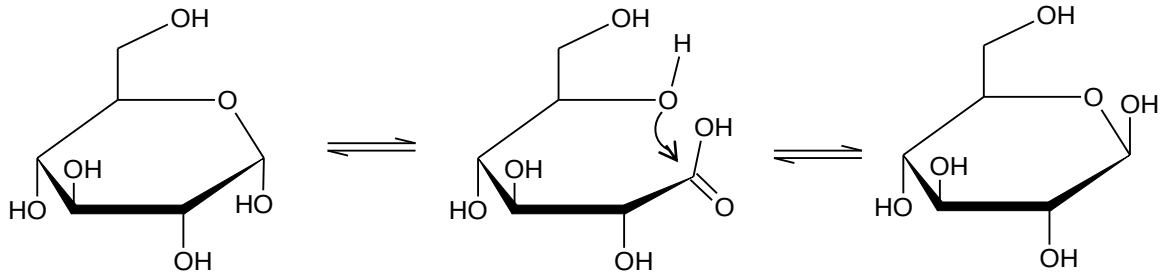
Detecting the reduction properties:

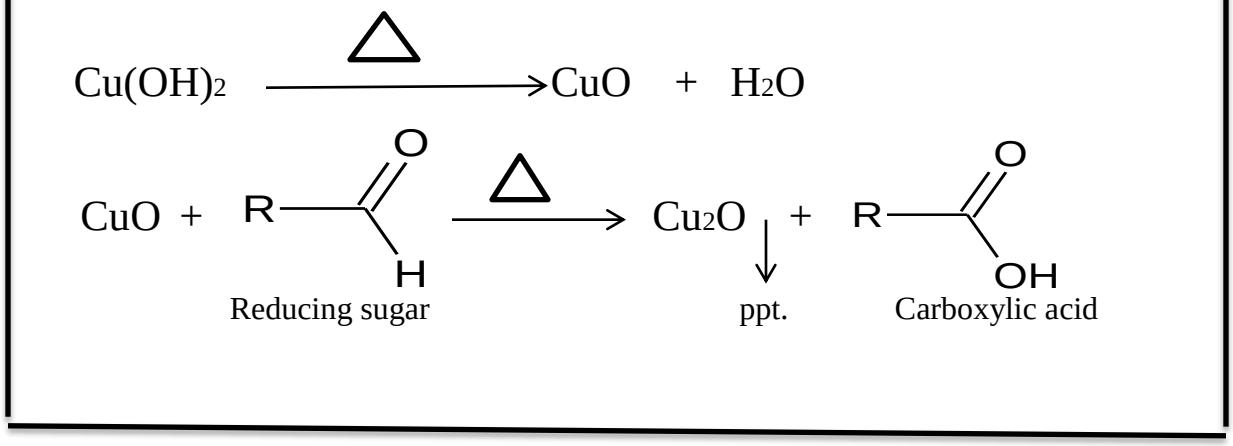
Sugars generally have reduction properties such as aldehydes and ketones, which contain free carbonyl group. The reduction properties depend on the number of monosaccharaide units, for example disaccharides have less reduction than monosaccharide, and so for polysaccharides (is not considered to be a reduction in the laboratory) although they contains free carbonyl group because they have large size of the molecule. The open aldehyde or ketone form in the sugar solution (where the oxidation process is performed) is 1% only and the rest 99% will be cycle.



α – D –Glucose β – D –Glucose

2-Bnedict`s test :

It is a general test of all reducing sugars (this include monosaccharaides and disaccharides). The cupric ions (Cu^{+2}) are reduced in a weak alkali medium to the cuprous ions (Cu^{+}) which get precipitated as insoluble red copper (I) oxide. Benedict`s reagent can be used to test for the presence of glucose in urine (glucosuria) and can be indicative of diabetes mellitus.

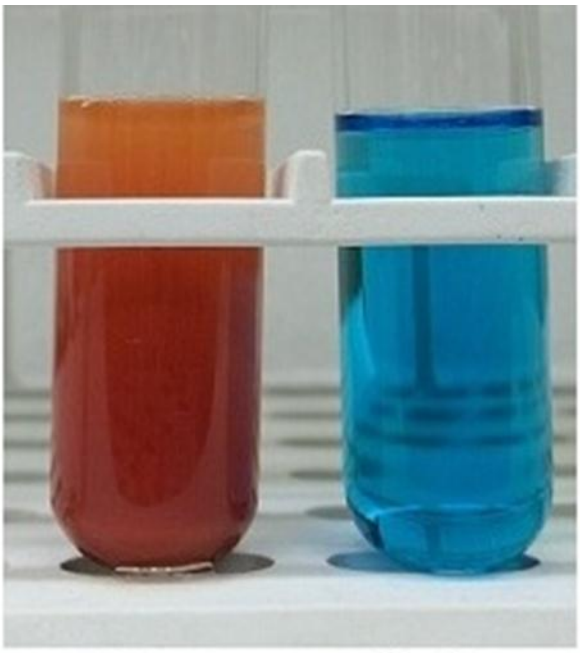


Method :

1- Benedict`s reagent is prepared by adding 173 gm of sodium citrate and 100 gm of sodium carbonate anhydrous to 800 ml of distilled water, the solution is filtered, then 17.3 gm of copper (II) sulfate pentahydrate is added and the volume of the solution is completed to the 1000 ml by using distilled water.
2- In a clean and dry test tube, 1 ml of Benedict`s reagent is added to 1ml of sugar solution and mixed well.
3- The solution is heated in a boiling water bath for 3-5 min.
4- The change in the color of the solution is noticed (red precipitate is present).

Caution:

All sugars give a positive reaction only sucrose, because it has not the free reduction group.

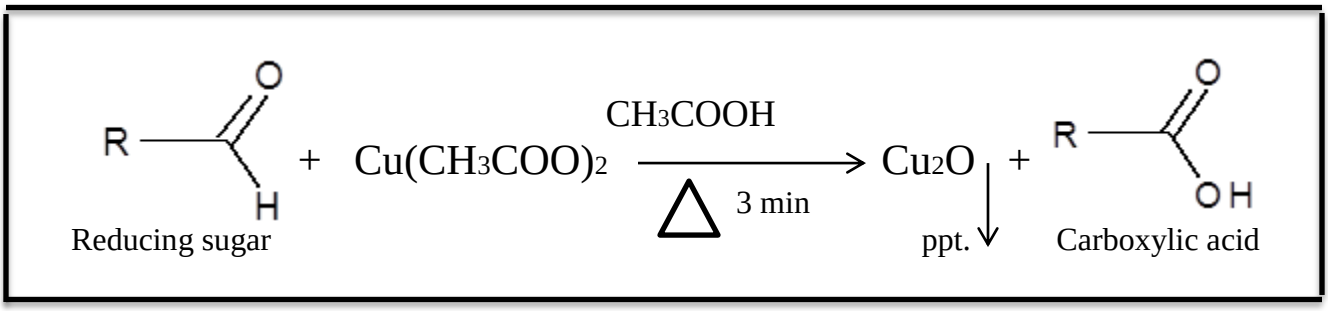


Positive Benedict's Test

Negative Benedict's Test

3-Barfoed`s test :

It is a chemical test used to detect the presence of monosaccharides. In this test, the cupric ions (Cu^{+2}) are reduced in a weak acidic medium to the cuprous ions (Cu^{+}) which get precipitated as insoluble red copper (I) oxide after cooling. Only monosaccharide can reduce the cupric ions in the weak acidic medium (hardly), so we can distinguish between monosaccharides and disaccharides. The heating time has an important role in determining the positive detection (increasing in time, disaccharide will be able to gives a positive result because disaccharide will be hydrolyzed in weak acidic medium to a smaller units (monosaccharide).



Method :

1- Barfoed`s reagent is prepared by adding 13.3 gm of copper acetate in 200 ml distilled water, the solution is filtered, then 1.8 ml of glacial acetic acid are added to the solution.
2- In a clean and dry test tube, 1 ml of Barfoed`s reagent is added to 1ml of sugar solution.
3- The solution is heated in a boiling water bath for 3 min.
4- The change in the color of the solution is noticed (red precipitate is present