Partial work Nº2 : Reducing power of carbohydrates

(Reduction of Fehling liquor)

1. Principle

Fehling's solution can be used to distinguish aldehyde vs ketone functional groups. The compound to be tested is added to the Fehling's solution and the mixture is heated. Aldehydes are oxidized, giving a positive result, but ketones do not react. The bistartratocuprate(II) complex oxidizes the aldehyde to a carboxylate anion, and in the process the copper(II) ions of the complex are reduced to copper(I) ions. Red copper(I) oxide then precipitates out of the reaction mixture, which indicates a positive.

The net reaction between an aldehyde and the copper(II) ions in Fehling's solution may be written as:

$$\mathrm{RCHO + 2\,Cu^{2+} + 5\,OH^- \longrightarrow RCOO^- + Cu_2O + 3\,H_2O}$$

2. Material

- Test tubes
- Boiling water bath
- Balance
- Pipettes, propipettes

3. Reagents

- Glucose, fructose, sucrose and solutions at 1% in distilled water.
- Fehling's A solution
- Fehling's B solution
- Concentrated H_2SO_4
- NaOH at 10%

4. Operating mode

- Prepare 4 test tubes : Put in each tube 1ml of Fehling's A solution then 1ml of Fehling's B solution.
- Put in the first tube 2ml of glucose solution, in the second 2ml of fructose solution, in the third 2ml of sucrose solution and in the fourth one 2ml of distilled water.
- Shake the tubes to mix the contents.
- Heat the tubes for 3 minutes in a boiling water.
- Observe and note the coloring obtained.

5. Reducing power of the chemical hydrolysis product of sucrose

- Put 5ml of sucrose in a test tube.
- Add 3 drops of concentrated H_2SO_4
- Shake the tube and heat it for 3 minutes in a boiling water. Sucrose is thus hydrolysed.
- Add 5 drops of NaOH solution (10%).

- Prepare 2 test tubes: put in the first tube 2ml of hydrolyzed sucrose solution and in the second 2ml of non hydrolyzed sucrose solution.
- Add to each tubes 1ml of Fehling's A solution then 1ml of Fehling's B solution.
- Shake the tubes and heat them for 3 minutes in a boiling water.
- Observe and note the coloring obtained.

6. Questions

Compare and justify the difference in the results obtained in the tubes in the first and second test.