



# FACULTY OF HUMANITIES & SCIENCES

<b>Title of practical</b>	<b>Testing for Carbohydrates</b>
<b>Module Name</b>	<b>Introduction to Biology</b>
<b>Module Number</b>	<b>SC1143</b>
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<b>Date of Practical</b>	<b>28.08.2021</b>
<b>Submission Date</b>	<b>03.09.2021</b>

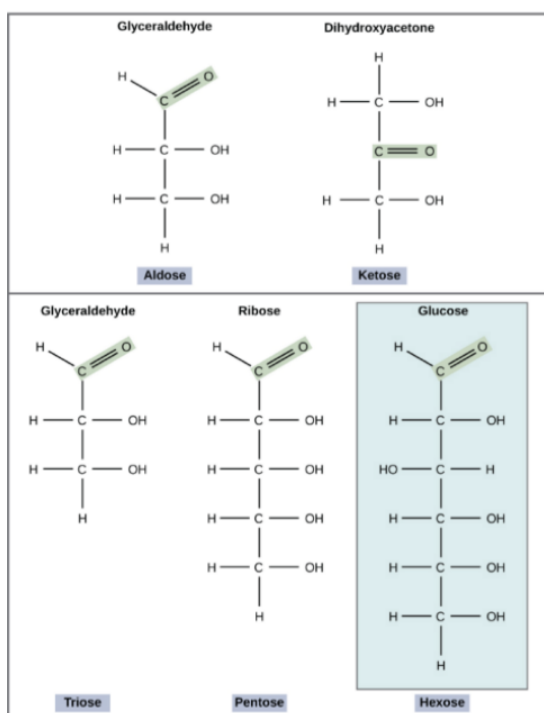
**BSc (Hons) Biotechnology**  
**Sri Lanka Institute of Information Technology**  
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**Practical Number: - 03****Practical Name: - Testing for Carbohydrates****Objectives: -**

- To identify the importance of a control in a biochemical test.
- To identify an unknown compound with biochemical test.

**Introduction:** - Living matter is classified into two categories based on carbon. Carbon containing compounds called as organic molecules and non-carbon compounds are called as inorganic molecules. Organic molecules besides on carbon and hydrogen and also contains such as oxygen, nitrogen, sulphur, phosphorus. Small organic molecules are joined together to form large molecules. Macromolecules is a very large molecules that composed of thousand of covalently connected atoms. All macromolecules classified into four major categories such as carbohydrates, proteins, lipids and nucleic acids. But lipids are non-polymeric molecules. Most macromolecules are polymers which are made from monomers.

Carbohydrates are the most common type of the organic molecules. And it includes polymers of sugars. Carbohydrates consist only carbon, hydrogen and oxygen in the ratio of 1:2:1. Carbohydrates are made of small, repeating units called as monosaccharides. Most carbohydrates characterized as monosaccharides, disaccharides and polysaccharides. monosaccharides are the monomers of all carbohydrates. It includes glucose, fructose and galactose. monosaccharides have a formula of  $(CH_2O)$ . they are basically containing from 3 to 7 carbon atom. If the sugar has aldehyde group, it is known as an aldose. The sugar which has ketone group, it called as ketose.

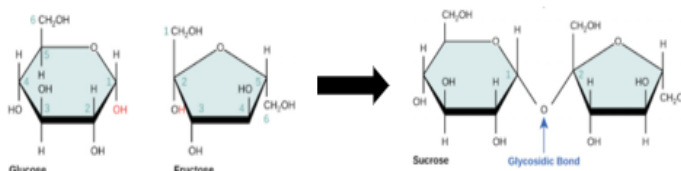


**FIGURE 1 – classification of monosaccharide.**

Disaccharides form when two monosaccharide join together via dehydration reaction. It includes maltose, sucrose, lactose.



These two sugar rings are connected by a glycosidic bond.



**FIGURE 2 – Formation of sucrose.**

A long chain of a monosaccharide is called as polysaccharide. Monosaccharides are bind together by glycosidic bond. It includes starch, glycogen and cellulose. Storage polysaccharide and structural polysaccharide are the two types of polysaccharides.

### Method and Materials: -

#### 1. Practical – Benedict's test for reducing sugar.

Materials – Five test tubes, Distilled water, Onion solution, Potato solution, Sucrose solution, Glucose solution, Benedict's solution and Boiling water bath.

Method –

Five test tubes were obtained and numbered them as from 1 to 5. The materials to be tested were added into each test tubes. Benedict's solution (2ml) was added into each test tube by using droppers. and mixed it well. All the test tube were placed in a boiling water bath for three minutes. The colour changes were observed during this time. After three minutes test tubes were taken from the boiling water bath and were let them cool to room temperature.

#### 2. Practical – The Iodine test for starch

Materials – Five test tubes, Distilled water, Onion solution, Potato solution, Sucrose solution, Glucose solution and Iodine solution.

Method –

Five test tubes were obtained and numbered them as from 1 to 5. The materials to be tested were added into each test tubes and three to five drops of Iodine solution was added into each test tubes and were mixed well.

### Results: -

Practical 1 –

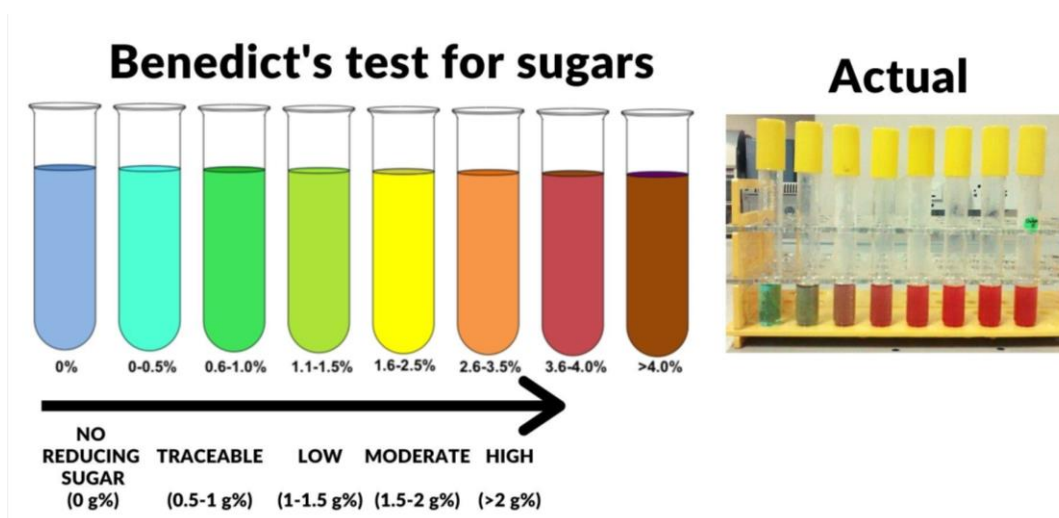
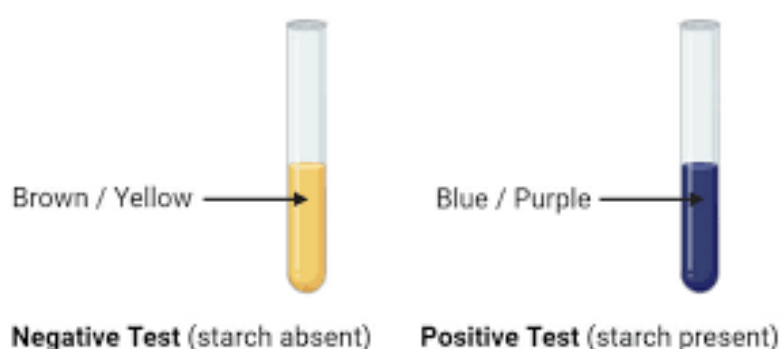


FIGURE 3 – Results of Benedict's test for sugar reducing.

Solution	Benedict's colour reaction	Remarks
Distilled water	No colour change	No reducing sugar is present
Onion	Blue → Orange	A moderate amount of reducing sugar is present
Potato	Blue → Dark Greenish colour	Traceable amount of reducing sugar is present
Sucrose	No colour change	No reducing sugar is present
Glucose	Blue → Dark Reddish	A large amount of reducing sugar is present
Rice	Blue → Light Purple (bottom)	A small amount of reducing sugar is present
Starch	Blue → Orange (base)	A small amount of reducing sugar is present

## Practical 2 -



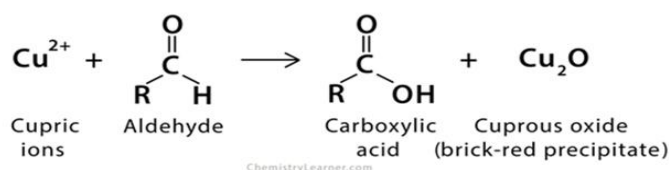
**FIGURE 4 – The Iodine test for starch**

Solution	Iodin colour reaction	Remarks
Distilled water	No colour change	No starch is present
Onion	No colour change	No starch is present
Potato	Purple	Starch is present
Sucrose	No colour change	No starch is present
Glucose	No colour change	No starch is present
Starch	Dark Purple	Starch is present
Rice	Dark Purple	Starch is present

## Discussion: -

benedict's solution is a deep blue alkaline chemical solution.  $\text{Cu}^{2+}$  in the alkaline solution and reducing sugar go under go reactions and gave the colour formation. Benedict's test identified, reducing sugars based on their ability to reduce the  $\text{Cu}^{2+}$  to  $\text{Cu}_2\text{O}$  at basic PH.  $\text{Cu}^{2+}$  coming from the benedict's region and aldehyde is a reducing sugar. When the test tubes were kept in a boiling water bath for a few minutes, able to see the colour development in the testing.  $\text{Cu}^{2+}$  become  $\text{Cu}^+$  and aldehyde, it is been oxides into carboxylic acid ( $\text{Cu}_2\text{O}$ ), which is insoluble in water. Aldehyde or ketone groups in the material that were tested has ability to go reduce  $\text{Cu}^{2+}$  ions. Finally, the solution was changed colour to brick-red precipitate.

## Benedict's test reaction



In this Benedict's test, Cuprous Oxides will get a colour range from Greenish to Reddish Orange. Distilled water and starch were got no colour change, because distilled water and starch do not have any reducing sugar present in it. Onion solution was showed orange colour. because it has moderate amount of reducing sugar. Potato solution was showed dark greenish colour, because it has traceable amount of reducing sugar. Furthermore, Glucose solution was showed dark reddish colour, because it has a large amount of reducing sugar. Rice solution were showed light purple at bottom and starch solution was showed orange colour at the base. both of these solutions have a small amount of reducing sugar.

To get the colour reactions, the test tubes were needed to be heated. Boiling water bath used to allow a chemical reaction to occur at an elevated temperature. it is used for temperatures up to 100°C.

Sucrose was given a negative reaction with Benedict's region. There are two types of sugar namely reducing and non-reducing sugars. Disaccharides like sucrose are non-reducing sugars and they do not react with either Benedict's region or Iodine region. When the non-reducing sugars were decomposed into their components Glucose and Fructose, the Benedict's test were given positive reaction.

Starch is a Polysaccharide. Structural features of the starch are causes to change the colour in the Iodine. Starch is made out of amylose and amylopectin. Both amylose and amylopectin are made out of glucose monomer. Amylose has a 1,4 glycosidic bond and has a linear structure. Amylopectin has 1,6 and 1,4 glycosidic bonds. Ultimately you get a coiled structure of a starch. Iodine is an insoluble region. The positive test for starch shows a bluish-black colour and the negative test for starch shows a yellowish-brown colour. In Iodine test, distilled water, onion, sucrose and glucose solutions were got no colour change because all of them do not have starch present in them.

## References: -

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