

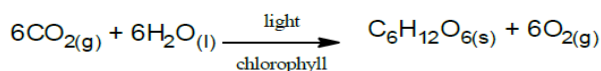
**WORKSHEET 21**School: **Ba Sangam College**Subject: **Chemistry**Year: **12**

Name: _____

Strand	4 Materials
Sub strand	5 Food Chemistry
Content Learning Outcome	CH 12 5.1.2 Investigate the types, properties and uses of carbohydrates

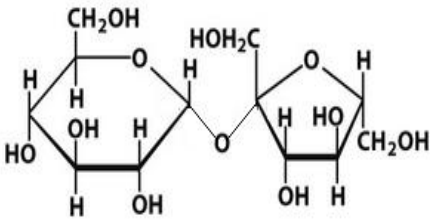
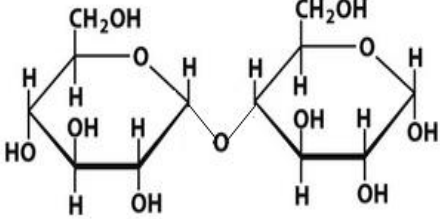
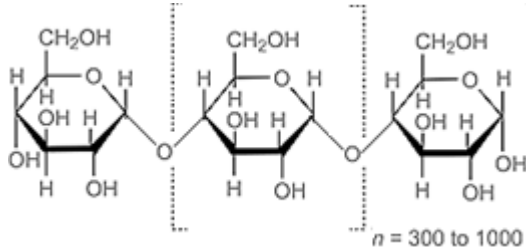
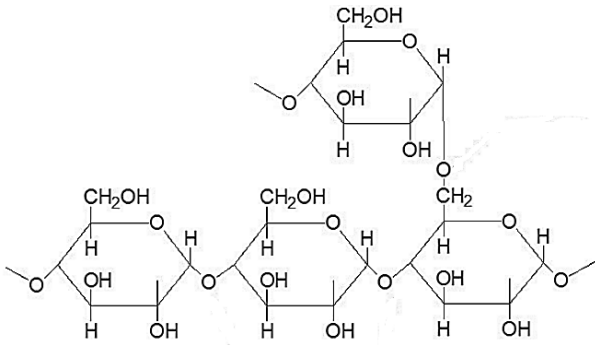
5.1.2 Carbohydrates

- Carbohydrates are one of the main types of nutrients. They are the most important source of energy for the body.
- The digestive system changes the carbohydrates into glucose (blood sugar) for energy for the cells, tissues and organs.
- Carbohydrates are produced by plants through the process of photosynthesis. The overall process can be represented as:



- Glucose and more simple carbohydrates are then converted to more complicated carbohydrates such as starch or cellulose.
- Carbohydrates can be categorised into three main groups as summarized in the table below.

Molecule	Description
1. Monosaccharides	- Monosaccharides are the simplest form of carbohydrate and all of them have the empirical formula CH_2O. - Examples are glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) and fructose ($\text{C}_6\text{H}_{12}\text{O}_6$). Glucose Fructose - These molecules have the same molecular weight but the arrangement of the atoms in each of these molecules is slightly different (see structures above). - Therefore, glucose and fructose are isomers of each other. - Glucose is a monosaccharide that occurs in significant quantities in nature and fructose is a sugar found naturally in many fruits and vegetables, and added to various beverages such as soda and fruit-flavored drinks. - The primary function of monosaccharide is as a source of energy. - In the presence of oxygen, the monosaccharides can be broken down to carbon dioxide and water with the release of energy. This energy is used by the cell to do work. - Monosaccharides serve as “building blocks” for the formation of disaccharides and polysaccharides.

2. Disaccharides	- Two joined monosaccharides is called a disaccharide. - These are the simplest polysaccharides. - Examples include sucrose and maltose.  Sucrose  Maltose - Sucrose is a disaccharide formed by linking glucose and fructose molecules - Maltose is a disaccharide formed by linking two glucose molecules. - The primary function of disaccharides is as a nutritional source of monosaccharides. Many of the sugars found in foodstuffs are disaccharides.
3. Polysaccharides	- Polysaccharides are long chains of monosaccharide units bound together by glycosidic linkages. - The two important polysaccharides are starch (made by plants) and glycogen (made by animals). - The function of starch and glycogen is as a major storage form of glucose. - Polysaccharides can also be used as structural components.  Starch  Glycogen

Test for glucose with Fehling's or Benedict's solution

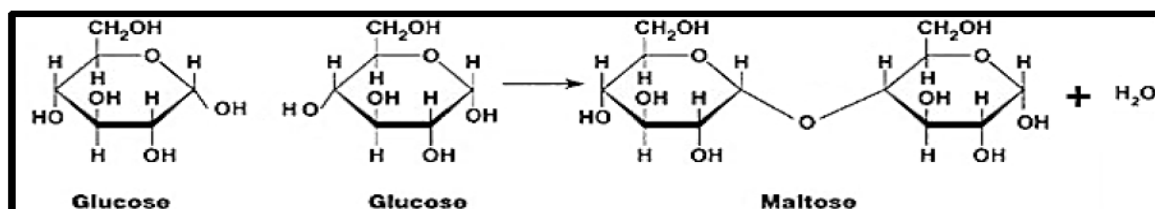
- ✚ Glucose reduces the blue copper sulphate solution in the Fehling's or Benedict's solution (containing Cu^{2+} ions) to insoluble reddish-brown copper(I) oxide, which is seen as a precipitate.
- ✚ Positive test is indicated by a green suspension and a red precipitate.

Condensation and Hydrolysis Reactions

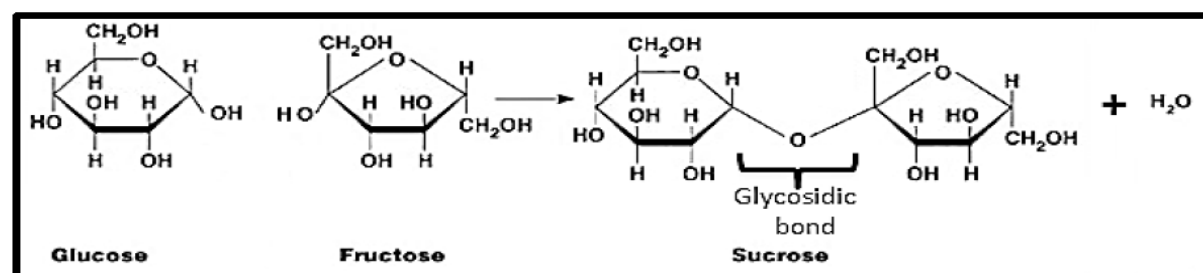
1. Condensation

- ✚ A chemical process by which two or more molecules are **joined** together to make a larger, more complex molecule with the **loss of a water molecule**.
- ✚ Examples include formation of maltose and sucrose.
- ✚ A **glycosidic bond** is a type of chemical linkage between the monosaccharide units of disaccharides and polysaccharides which is formed by the removal of a molecule of water.

Example 1: Formation of maltose



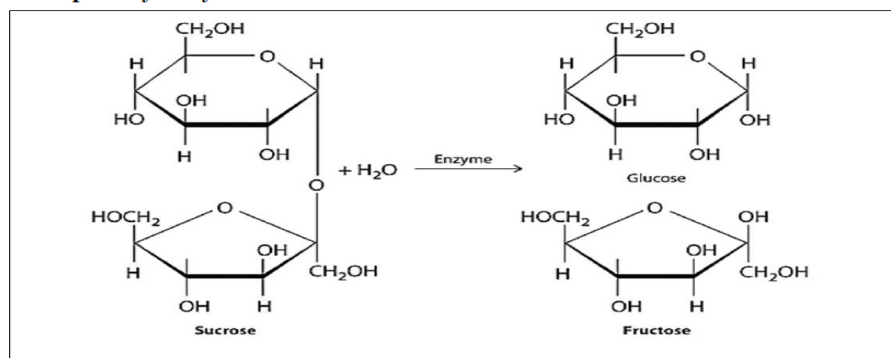
Example 2: Formation of sucrose



Hydrolysis

- A hydrolysis reaction uses enzymes or acids to separate a compound into its sub-units through the addition of a water molecule. For instance, disaccharides are hydrolyzed into two monosaccharides.

Example: Hydrolysis of sucrose



Activity

1. Explain the difference between condensation and hydrolysis reaction.
_____(1m)
2. What is a glycosidic bond?

(1m)
3. Polysaccharide and disaccharides are two forms of carbohydrates.
- i. Give an example of a polysaccharide.
_____(1m)
- ii. Name the polysaccharide that is used as a food reserve in plants.
_____(1m)
- iii. Name the two reagents that initiate hydrolysis in polysaccharides and disaccharides.

_____(1m)
4. In the school laboratory, a student found two amber bottles, without labels. Upon discussion with some teachers, the student found out that one of the bottles definitely contained glucose solution. Briefly describe how you would carry out a test to determine which of the two bottles contained glucose solution.
_____(2m)
5. Starch can be converted to glucose by reacting it with water in the presence of dilute hydrochloric acid.
- i. What is the name of the type of chemical reaction involved?
_____(1m)
- ii. What is the function of the hydrochloric acid?
_____(1m)
- iii. How could you show that the final reaction mixture contains glucose?

_____(1m)