Biology

CARBOHYDRATES

Carbohydrates make up a large group of chemical compounds found in cells. Carbohydrates are an energy source or are used in making cell structures. In this "dry" lab, you will learn more about carbohydrates.

PART A WATER MODEL

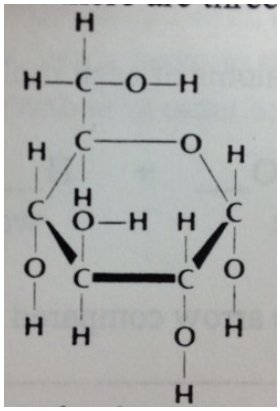
1. Examine the model of water, H_2O. What elements, make up water? _____

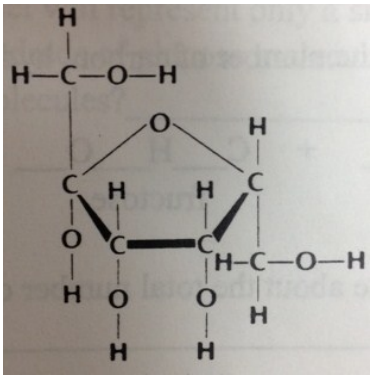
2. How many atoms of hydrogen are in water? _____ oxygen? _____

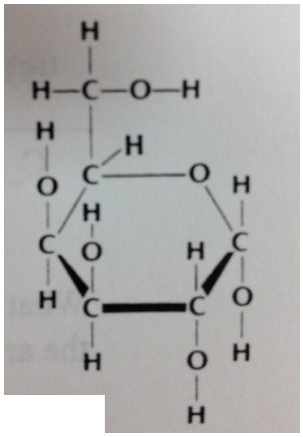
PART B MONOSACCHARIDES

A single molecule sugar is called a monosaccharide. The prefix "mono" means one. Notice that there are three different types of monosaccharides:

Glucose **Fructose** **Galactose**







1. Look at the three drawings above. What three chemical elements are present in these?

_____

2. How many atoms of carbon, hydrogen, and oxygen are in each of the three monosaccharides?
   glucose: C _____H_____O_____
   fructose: C_____H_____O_____
   galactose: C_____H_____O_____

3. So, if glucose, fructose, and galactose are all monosaccharides and they all have the same formulas, then what exactly makes one different from an other?

_____

Carbo's ... I like sweets, breads, and pastas .. I guess I like carbohydrates! Yeah!

Biology

PART C DISACCHARIDES

Two monosaccharide sugar molecules can join chemically to make a disaccharide. The prefix "di" means two. There are three of disaccharides - sucrose, maltose, lactose.

Cut out the paper models to use for the following questions.

1. (a) Try to join one molecule of glucose and one molecule of fructose like a puzzle. Do they fit together easily? _____ What would you need to do to make them fit more easily?_____

(b) When you put a glucose and a fructose together, you make a disaccharide called a SUCROSE. In the space below, draw the proper structures above the words

glucose + fructose ⟶ sucrose + water

(c) Now, write the number of carbon, hydrogen, and oxygen atoms of each molecule:

C___H___O___ + C___H___O___ ⟶ C___H___O___ + H___O___
glucose fructose sucrose water

What do you notice about the total number of C,H,O before the arrow compared to after the arrow? _____

2. (a) Try to join one molecule of glucose with another molecule of glucose like a puzzle.
Do they fit together easily? _____ What would you need to do to make them fit more easily? _____

(b) When you put a glucose and a glucose together, you make a disaccharide called a MALTOSE. In the space below, draw the proper structure above the words:

glucose + glucose ⟶ maltose + water

(c) Now, write the number of carbon, hydrogen, and oxygen atoms of each molecule:

C__H__O__ + C__H__O__ ⟶ C__H__O__ + H__O__
glucose glucose maltose water

What do you notice about the total number of C, H, O before the arrow compared to after the arrow? _____

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3. Summarize how a disaccharide is made. (The removal of water to make a disaccharide is called *dehydration synthesis*.)

_____

_____

PART D POLYSACCHARIDES

Polysaccharides are formed when many single sugars are joined together. The prefix "poly" means many. Starch, glycogen, and cellulose are the three most common polysaccharides in biology.

1. All polysaccharides are made by joining many molecules of glucose. In the space below, construct a starch molecule. This model will represent only a small part of a starch molecule because starch consists of hundreds of glucose molecules. What do you need to remove in order to join the glucose molecules? _____

glucose + glucose + glucose ⟶ starch + water

ANALYSIS

1. Name the three categories of carbohydrates studied in this investigation.
   _____
2. What three elements are present in all carbohydrates?_____
3. Give two examples of each sugar that are:
   (a) Monosaccharide _____
   (b) Disaccharide _____
   (c) Polysaccharide _____
4. How many times more hydrogen atoms than oxygen atoms in all carbohydrates?_____
5. Give an example of a food that is a:
   (a) Monosaccharide _____
   (b) Disaccharide _____
   (c) Polysaccharide _____