Carbohydrates Activity

Procedure:

Monosaccharides (single molecule sugars)

A single molecule sugar is called a monosaccharide. The prefix "mono" means one. However, one molecule can have different molecular structures due to a different arrangement of atoms. Three common monosaccharides are glucose, fructose, and galactose.

Examine the structural formulas of these three sugars and answer the following questions:

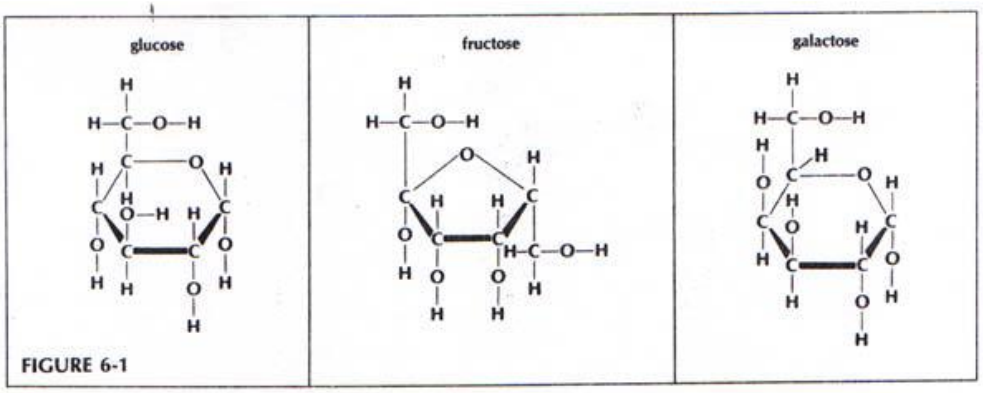

FIGURE 6-1

Monosaccharides:

1.What three elements are present in the three monosaccharides? _____

2. Add subscripts to the following to indicate the proper molecular formula

glucose: C___ H____ O____ fructose: C__ H__ O__ galactose: C__ H__ O_

3. How many times as many hydrogen atoms as oxygen atoms in a molecule of:

glucose: _____ fructose: _____ galactose: _____

4. Are there two times as many hydrogen atoms as oxygen atoms in a molecule of water?
_____

5. Compare the structural formula of glucose to fructose…

a. Are they exactly the same shape? _____

b. Are they both monosaccharides? _____

Disaccharides (double molecule sugars)

Two monosaccharides sugar molecules can join chemically to form a larger carbohydrate molecule called a double sugar, or disaccharide. The prefix "di" means two. By chemically joining a glucose molecule with a fructose molecule, a double sugar called sucrose is produced. This type of bond between monosaccharide units is called a *glycosidic linkage.*

Use the paper models supplied in this lab to complete the following questions on the answer sheet as you complete your models – paste the <u>picture</u> of the models in the space provided on the answer sheet:

1.Cut out models of one glucose and one fructose molecule. **Cut along solid lines only**.

2. Do the glucose and fructose models fit together easily to form a sucrose molecule?

3. In order to join the molecules, remove an –OH end from one molecule and an –H end from another. **Cut along the dotted lines**.

4. Does removing the –H and –OH ends now allow the molecules to fit easily together?

5. The –H and –OH ends that we removed can also fit together with each other to form a molecule. This new molecule has what molecular formula? and is called?

6. Write the molecular formula for sucrose by adding together the molecular formulas for glucose and fructose **and** then subtracting the formula for water, H_2O. (Use molecular formulas for finding this).

Different disaccharide molecules can be made by joining other monosaccharides in different combinations. By chemically joining a glucose molecule with another glucose molecule, a double sugar called maltose is formed.

7. Cut out an attempt to join the two new glucose model molecules like puzzle pieces.

8. What must be removed from the glucose molecules so that they easily fit together?

9. Write the molecular formula for maltose? (Use molecular formulas for finding this)'

10. How does the molecular formula for sucrose compare to maltose?

Polysaccharides

Just as double sugars were formed from two single sugar molecules, polysaccharides are formed when many single sugars are joined chemically. The prefix "poly-" means many. Starch, glycogen, and cellulose are the three most common polysaccharides in biology. They consist of long chains of glucose molecules joined.

1. In order to bond a monosaccharide to an existing chain, what molecule must be removed?

2. If a chain of 5 monosaccharides are to be linked together, how many water molecules must be removed?

3. How does the number of glycosidic linkages compare to the number of water molecules produced?

1. Write the appropriate molecular formula for each of the blanks provided
2. Make sure to include a picture of the constructed molecule for each of the blanks provided

Glucose + Fructose → Sucrose + Water

Glucose + Glucose → Maltose + Water

Glucose + Glucose + Glucose → Starch + Water