

Carbohydrates

With this lab exercise, you will be expected to build molecular models of carbohydrates using items from around your house or purchased from the grocery store. Answer related questions in complete sentences. Take pictures of your models and attach them to your assignment.

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| Item used: |
| Carbon atoms (black) = |
| Oxygen atoms (red) = |
| Nitrogen atoms (blue) = |
| Hydrogen atoms (white) = |
| Covalent bonds = |

Part One: Water

1. Create water. Then, draw and label the structure of water as shown in your model.
2. What do the lines between O and H represent?

Part Two: Monosaccharides

3. Build a glucose and a ribose. Then, draw and label the structures of ribose and glucose as shown in your model.
4. Write the molecular formulas for glucose and a ribose.
5. Compare the number of hydrogen atoms to the number of oxygen atoms in each sugar. What is the ratio of carbon to hydrogen to oxygen?

Part Three: Disaccharides

Two monosaccharide molecules can chemically join together to form a larger carbohydrate molecule called a disaccharide. When a glucose molecule chemically joins with another glucose molecule, a double sugar known as maltose is formed.

6. Build another glucose molecule. Then, join your two glucoses together to build a maltose molecule. It will be necessary to remove an –OH end from one molecule and an –H end from another in order to join the molecules. Draw and label the structure of maltose as shown in your model.
7. Write the molecular formula for maltose.
8. The –OH and –H ends removed from the glucoses can now be joined to form what familiar compound?
9. What is the ratio of hydrogen atoms to oxygen atoms for the molecule?
10. How many monosaccharide molecules are needed to form a disaccharide molecule?

Part Four: Polysaccharides

Just as disaccharides were formed from two monosaccharide molecules, complex sugars are formed when many single sugars are joined together chemically. The exact number of glucose molecules attached to form these polysaccharides varies, but it can be in the thousands. The three most common polysaccharides in biology are starch, cellulose and glycogen. They consist of long chains of glucose molecules joined together.

11. Construct a starch molecule by joining 3-6 glucose molecules. This represents only a small part of a starch molecule because starch consists of hundreds of glucose molecules. Draw and label the structures of starch as shown in your model.
12. Write the molecular formula for your small starch molecule.
13. What is the ratio of hydrogen atoms to oxygen atoms for the molecule?

Part Five: Interpretations

14. Synthesis means the “process by which simple compounds are united to form more complex materials.” Dehydration means “loss of water.” Explain why chemists refer to the joining of monosaccharide molecules to form disaccharides as a dehydration synthesis reaction.
15. The word carbohydrate is derived from carbon and water (hydrate). Explain why this combination correctly describes this chemical group.