

Exploring Biomolecules: Looking at Carbohydrates

PROBLEM/PURPOSE:

The purpose of this lab was to learn about the three types of carbohydrates (monosaccharide, disaccharides, and polysaccharides) through the use of chemical indicator tests.

HYPOTHESIS:

If we add honey in a test tube with Benedict's solution then it will be a monosaccharide (it will turn orange) because honey is thick and sweet, so it must have a lot of sugar (glucose) in it and glucose is a type of monosaccharide.

EXPERIMENTAL PLANNING:

The independent variables are the type of solution that we put into the test tubes for example: polysaccharide, monosaccharide, and disaccharide solutions, also honey, liquid oats, table sugar, apple juice, and powdered sugar. The dependent variable was the color the solution changes when we added iodine solution or Benedict's solution and heated. The variables that needed to be held constant are the heat of the water when we heated up the solutions with Benedict's, also the amount of drops of Benedict's or iodine and the number of drops of unknown carbohydrates. There we two trials for each of the unknown carbohydrates, one with Benedict's and one with iodine.

Materials:

- Test tubes
- Test tube racks
- Polysaccharide solution
- Disaccharide solution
- Monosaccharide solution
- Droppers
- Hot plate
- Apple Juice
- Water
- Beakers
- Benedict's solution
- Iodine
- Powdered Sugar
- Table Sugar
- Oats
- Honey

PROCEDURE :

1. First we completed the pre-lab by answering the questions and reading through the lab.
2. The next day, we started by labeling three test tubes 1, 2, and 3.
3. In the test tubes we added 30 drops of monosaccharide (test tube 1), disaccharide (2), and polysaccharide (3) solution.
4. Then in each of those test tubes we added 15 drops of Benedict's to each one.
5. Next we took the three test tubes and put them in a hot water bath for five minutes.
6. When the test tubes were done we observed them and recorded any change of color.
7. Next we repeated step number three with three new test tubes: In the test tubes we added 30 drops of monosaccharide (test tube 1), disaccharide (2), and polysaccharide (3) solution.
8. Then to each of those test tubes we added 4 drops of iodine solution to each.
9. We observed and recorded the change of color.
10. Next we moved on to testing the unknown carbohydrates.
11. We got 5 clean test tubes and labeled them 1-5. We added 20 drops of honey, liquid oats, table sugar solution, apple juice, and powdered sugar solution to one of each of the five test tubes.
12. Then we added 30 drops of Benedict's solution to each of the test tubes.
13. We placed the test tubes in the hot water bath for five minutes.
14. When we took the test tubes out, we observed them and then recorded the color change.
15. Next we got 5 clean test tubes and added the same substances that we just used (oats, honey, etc.)
16. Instead of adding Benedict's, we added four drops of iodine.
17. Then we observed the color and recorded it.

Results:

Results of Tests with Known Carbohydrates:

Tube #	Carbohydrate Type	Benedict's color After Heating	Iodine Color
1	monosaccharide	orange	brown
2	disaccharide	blue	amber
3	polysaccharide	turquoise	dark purple

Results of Tests with Unknown Carbohydrate:

Carbohydrate	Benedict's Color	Iodine color	Type of Carbohydrate
Honey	orange	brown/red	monosaccharide
Oats	orange	dark purple	monosaccharide/ polysaccharide
Table Sugar	turquoise	orange	disaccharide
Apple	orange	red	monosaccharide
Powdered Sugar	blue	dark green	polysaccharide

CONCLUSIONS:

The purpose of this lab was to learn about the three types of carbohydrates (monosaccharide, disaccharides, and polysaccharides) through the use of chemical indicator tests. We found the type of carbohydrate of the five unknown carbohydrates. My hypothesis was: If we add honey in a test tube with Benedict's solution then it will be a monosaccharide (it will turn orange) because honey is thick and sweet, so it must have a lot of sugar (glucose) in it and glucose is a type of monosaccharide. I accept this hypothesis. When we tested the honey it was a monosaccharide. The three categories of carbohydrates we tested in this lab were monosaccharide, disaccharide, and polysaccharide. Carbon, hydrogen, and oxygen were present in all three types of these carbohydrates. The prefixes mono- di- and poly- were used to describe the three types of carbohydrates because they mean one, two, and more than two which describe the number of molecules of sugar. By using Benedict's and iodine solutions you can tell which carbohydrates are present because before we tested the unknown carbohydrates we tested the color it changed when it was mixed with the known carbohydrate. So when we tested the unknown we matched the color of the known and the unknown to find out which type it was. If another sugar turned orange when mixed with Benedict's it is a monosaccharide. After doing this lab I have learned about three types of carbohydrates, and also I have learned the type of carbohydrate of some sugars such as honey, and oats. A related question that I am left with is: What substance is in Benedict's solution that applying heat changes the color of the solution?