

Name _____ Date _____ Period _____

Introduction

Carbohydrates are made up of single, double, or multiple parts of sugars collectively called saccharides. Single sugars are called monosaccharides, and they are easily broken down for quick, short-term energy. Double sugars are called disaccharides, which are a bit harder to break down, but still provide relatively short-term energy. Sugars that are made up of more than 2 combined components are called polysaccharides, which take some time to break down fully and serve as a more long-term energy source. Your task for this first set of experiments is to determine which types of foods provide which type of saccharide. For this, you will need to perform two different tests; a Benedict's test and an iodine test.

Saccharide testing, part 1 – Benedict's solution

Materials needed

- 6 test tubes
- test tube rack
- hotplate
- 250 mL beaker – half filled with water
- Benedict's solution

Procedure

1. Label 6 clean test tubes 1-6.
2. Start warming the 250 mL beaker that is half-filled with water on the hot plate.
3. Put 1 squirt/dropperful monosaccharide in test tube 1. Follow the same procedure for test tubes 2-6, filling them with their respective solutions.
4. Put 1 squirt/dropperful of Benedict's solution into each test tube. Note the beginning color of the test tubes (all start out blue before putting into water bath).
5. Gently heat all 6 test tubes in the hot water for about 1 minute.
6. Remove the test tubes and record any color changes.
7. Complete the data table below:

Tube #	Color before heating	Color after heating
1 Monosaccharide		
2 Disaccharide		
3 Polysaccharide		
4 Sugar		
5 Oats		
6 Apple		

Analysis

1. For what type of saccharide does Benedict's solution test?
2. Which type of food(s) contains a positive Benedict's test?

Saccharide testing, part 2 – iodine test (you will not be heating this solution!)

Materials needed

6 test tubes
test tube rack
iodine solution

Procedure

1. Label 6 clean test tubes 1-6.
2. Put 1 squirt/dropperful of monosaccharide in test tube 1. Follow the same procedure for test tubes 2-6, filling them with their respective solutions. Note the beginning color of the solutions in each test tube **before** adding the iodine.
3. Put 1 squirt of iodine solution into each test tube. Note the color of the test tubes.
4. Complete the data table below:

Tube #	Color before iodine	Color after iodine
1 Monosaccharide		
2 Disaccharide		
3 Polysaccharide		
4 Sugar		
5 Oats		
6 Apple		

Analysis

1. For what type of saccharide does iodine solution test?
2. Which type of food(s) contains a positive iodine test?
3. What kind of saccharide is found in apple juice?
4. What kind of saccharide is found in table sugar?
5. What kind of saccharide is found in oats?
6. If you were going to run a marathon and needed to eat something that would provide you with enough energy to complete the race, which type of food would you eat: apples, candy (which has table sugar in it), or oatmeal? Explain your answer.

Lab 2: Protein testing – xanthoproteic test

Introduction

We need protein in our diet for just about everything that our cells need to do. Proteins are made of individual units called amino acids, which get broken down in the liver and reassembled into proteins for building muscle, proteins for your body, or any number of other functions. The test for the presence of a protein is quite simple. It is called a xanthoproteic test, which consists of two words: Xantho – “yellow”, and Proteic – “protein”.

Materials

- 5 items to be tested for the presence of protein
- 5 test tubes
- 1 test tube rack
- nitric acid w/ dropper
- nail clipper (or scissors)

Procedure

1. Put a small amount of one white substance in each of the 5 test tubes.
2. Record the color of the substance (white) before your test.
3. Add about 5 drops of nitric acid to each of the test tubes. **CAUTION: THE ACID IS CONCENTRATED AND CAN CAUSE BURNS!**
4. Wait about 3 minutes and record the color of the substances.

Tube #	Color before acid	Color after acid
1 fingernail		
2 egg white		
3 hair		
4 cotton		
5 white paper		

Analysis

1. Which substances contained a protein?

2. What is the relationship between the presence of a protein and the type of material you tested? (Hint: look at the types of things that turned color versus the types of things that did not turn color.)

Lab 3: Lipid testing, part one – water versus ethyl alcohol

Introduction

Lipids are an essential part of our body. They help to insulate us, provide an energy source for us, and they ensure good nerve conduction. Without lipids, our bodies would suffer from many disorders, some severe enough to cause death. In this first lab, you will be determining the presence of a lipid based on the density of lipids. Since lipids are less dense and nonpolar (doesn't stick to water), they will rise to the top of water. However, since ethyl alcohol is also nonpolar, lipids will get broken up and evenly dispersed in the alcohol rather than rising to the top collectively.

Materials

- 5 food items
- 10 test tubes (2 for each food)
- 1 test tube rack
- water
- ethyl alcohol

Procedure

1. Crush and place the respective food item in 5 test tubes. Each test tube is to be filled halfway with water.
2. Repeat step 1 for test tubes 6 – 10. Fill each of these test tubes halfway with ethyl alcohol.
3. Take the two test tubes with the first food item and shake them vigorously for 30 seconds. Repeat for the remaining 4 food items.
4. Allow the test tubes to sit undisturbed for 1 minute.
5. Record your observations of what is seen at the top of the test tubes. You should be looking for a distinct layer of substance collecting above the water or ethyl alcohol.

Food	Tube # (with water)	Separation layer? (yes or no)	Tube # (with alcohol)	Separation layer? (yes or no)
Veg. oil	1		6	
Peanut	2		7	
Chips	3		8	
Apple	4		9	
Egg white	5		10	

Analysis

1. Which food(s) contained lipids? How did you know?
2. What is the relationship between the type of food and the presence of lipids?

Lab 4: Lipid testing, part two – lipid confirmation

Introduction

Everyone has seen an example of this lab at one point or another. Lipids will make brown paper towel permanently translucent when rubbed into it. In contrast, foods without lipids will make the paper temporarily translucent from their water content, but as the water dries, the towel returns to being opaque. This last experiment can also be called “The McDonald’s Test”.

Materials

- 5 food items
- 5 short lengths of brown paper towel

Procedure

1. One each length of paper towel, write down the name of the food item you will be testing.
2. Vigorously rub each food item into the respective paper towel until a wet spot is formed on the paper towel.
3. Wait about 5 minutes to see if the wet spot disappears or if the towel remains translucent.
4. Record your results in the table below.

Food	Translucent?	Lipid present?
1 Veg oil		
2 Peanut		
3 Chip		
4 Apple		
5 Egg white		

Analysis

1. How did your results compare to the water versus ethyl alcohol test?

2. Since both lipid tests are looking for the same thing, which test do you prefer to use? Explain your reasoning, considering: reliability of the test, ease of conducting the test, personal preference.