



Digestive System

Name _____

Exploring Carbohydrates



Wear goggles at all times.
 Use care around the hot water bath.
 Lugol's Solution will cause a permanent
 stain.
 Chemicals are irritating to eyes and skin.

Background Information: An average American adult eats about half a pound of **carbohydrates** each day. Some of the most common foods contain mostly carbohydrates. Examples are bread, potatoes, pastries, candy, rice, spaghetti, fruits, and vegetables.

Many of these foods contain both **starch**, which can be digested, and fiber, which the body cannot digest.

Fiber is another carbohydrate. It is made of carbon, hydrogen, and oxygen, just like sugar, but the body cannot digest fiber. Fiber provides bulk that helps move food through the intestines.

Sugar and **starch** are carbohydrates. Each molecule of a carbohydrate is made of **hydrogen**, **carbon**, and **oxygen atoms**. **Energy** holds the atoms together. When carbohydrates are broken down in the presence of oxygen, this energy is released for use by the body. This is called **cellular respiration**.

The simplest carbohydrate is a sugar called **glucose**. Glucose is the body's first choice for fuel. All muscle contractions need fuel. For muscles to be able to move bones (or anything else), the energy from the breakdown of glucose is needed.

The body turns extra glucose into a substance called **glycogen**. It is stored in the muscles and liver. Glucose in the blood is used for energy during athletic events. As the glucose is used up, glycogen in the muscles is broken down into glucose for energy. As glucose, then glycogen, gets used up, the muscles become fatigued. Muscle glycogen is used up faster in some muscles than others.

Carbohydrates that can be digested are broken into simpler molecules by enzymes in the saliva, in juice produced by the pancreas, and in the lining of the small intestine.

If you eat more food than you need at the moment, some of the starch gets turned into fat.

Materials:

Benedict's Solution	2 test tube clamps	Food Samples: Marshmallow Sugar solution Potato buds Liquid egg white Starch
Lugol's Solution	2 eye droppers	
Distilled water	6 Small cups	
Spoons	2 test tubes	
Toothpicks	Goggles	
Water bath	Aprons	

Procedure Part 1 – testing for sugar:

- Put on your goggles and apron.
- Put 30 drops of sugar solution in a test tube.
- Add 10 drops of Benedict's Solution to the test tube.
- Use the test tube clamp to place the test tube in the hot water bath for 1 minute.
- Let the test tube cool.
- Observe the color of the solution and record.
- Rinse the test tube & eyedropper.
- Put 1 marshmallow and 40 drops of distilled water in a cup.
- Stir with a toothpick to dissolve *part* of the marshmallow. Don't try to dissolve the entire marshmallow – it will take too long.
- Pour the water / marshmallow solution into a test tube.
- Add 10 drops of Benedict's Solution to the test tube.
- Use the test tube clamp to place the test tube in the hot water bath for 1 minute.
- Let the test tube cool.
- Observe the color of the solution and record.
- Rinse the test tube & eyedropper.
- Repeat the procedure using
 - ½ spoon of potato buds & distilled water
 - 10 drops of liquid egg white and distilled water
 - ½ spoon of corn starch and distilled water
- Put 10 drops of distilled water in a test tube.
- Add 10 drops of Benedict's solution to the test tube.
- Use the test tube clamp to place the test tube in the hot water bath for 1 minute.
- Let the test tube cool.
- Observe the color of the solution and record.
- Rinse the test tube & eyedropper.

Determine the amount of sugar in each food by comparing the color of the food to this chart					
Amount of sugar in food	0 None	+	++ Little Sugar	+++ Some Sugar	++++ Much Sugar
Color	Blue	Blue / green	Green	Yellow	Orange / red

Procedure Part 2 – Testing for starch:

1. Using the same foods you used in part 1, put a small amount in a separate cup, mix with 40 drops of distilled water.
2. Put 3 drops of Lugol’s Solution in each cup. Observe. Look for a color *change in the food*, not the distilled water.
3. Record your observations.

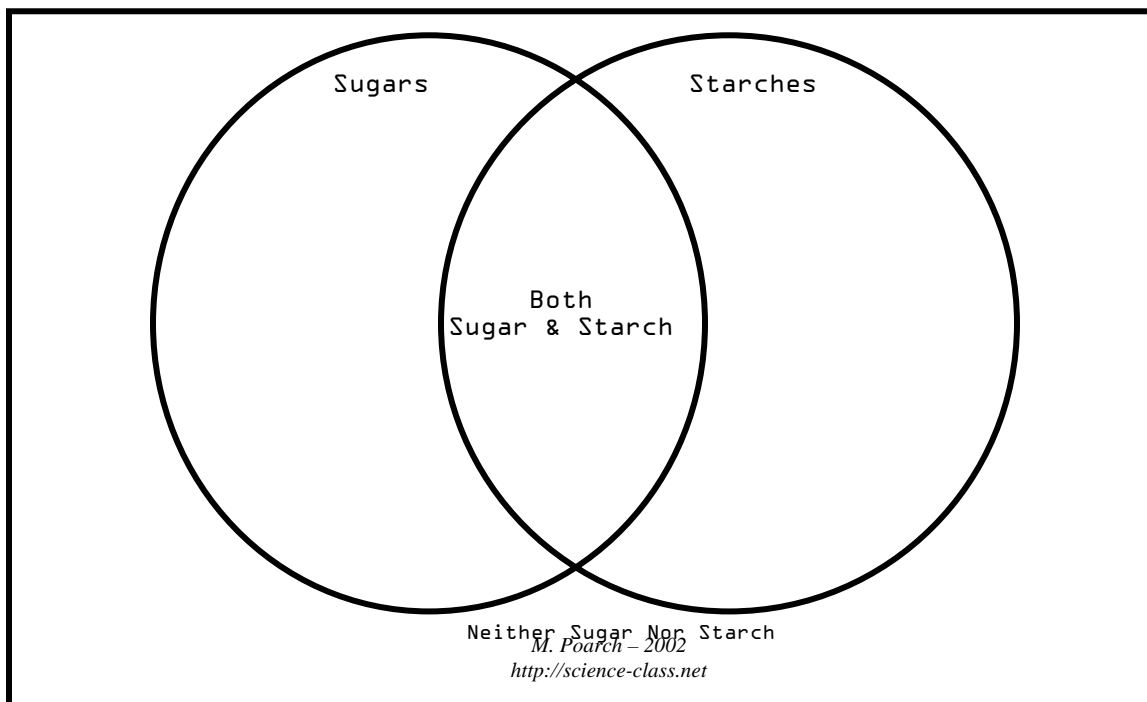
Determine the amount of starch in each food by comparing the color of the food to this chart					
Amount of starch in food	0 None	+	++ Little Starch	+++ Some Starch	++++ Much Starch
Color	Reddish – brown	Dark Reddish – brown	Light Blue / black	Blue / black	Dark Blue / black

Data:

Carbohydrate Tests				
Food Sample	Sugar Test		Starch Test	
	Color Blue - Red	+ 0 - +++++	Color Red - Black	+ 0 - +++++
Cup 1 – Sugar solution				
Cup 2 – Marshmallow				
Cup 3 – Potatoes				
Cup 4 – Powdered egg white				
Cup 5 – Starch				
Cup 6 – Distilled water				

Data Analysis:

Create a Venn Diagram to show your results:



Conclusions:

1. Using the data you have collected and the background information, which solutions contain sugar?

2. In the space below, explain the reason for your answer.

3. Using the data you have collected and the background information, which solutions contain starch?

4. In the space below, explain the reason for your answer.

5. Which foods tested would your body use for a quick burst of energy? Explain your answer. _____

6. Which foods tested would be best for an athlete competing in an endurance sport? Explain your answer.

7. Was the investigation descriptive or experimental? Explain your answer.
