

LAB: Macromolecule Virtual Lab

H O N O R S B I O L O G Y : U N I T 1

Go to the website: <http://faculty.kirkwood.edu/apeterk/learningobjects/biologylabs.htm>

Background: The most common organic compounds found in living organisms are lipids, carbohydrates, proteins, and nucleic acids. Common foods, which often consist of plant materials or substances derived from animals, are also combinations of these organic compounds. Substances called **indicators** can be used to test for the presence of organic compounds. An indicator is a substance that changes color in the presence of a particular compound. In this investigation, you will use several indicators to test for the presence of lipids, carbohydrates, and proteins in various foods.

CARBOHYDRATES

Scroll down to the bottom and click on **Carbohydrate**

1. What are some examples of carbohydrates?
2. How do you test for sugars?
3. Draw the lab set up and label the different test tubes.

Add 10 drops of **Benedict's solution** to each test tube. When heated, Benedict's solution will change color from blue to green, yellow, orange, or red in the presence of a simple sugar, or monosaccharide. The more sugar present, the more orange/red the solution should be.

► Click on **Add Benedict's Reagent**

1. What was the color of each test tube (tt)?

tt1

tt2

tt3

tt4

tt5

► Click on **Hot Water Bath**

In your diagram above, shade in the test tubes that showed a positive test for sugar.

2. Which solutions changed colors after heating in hot water bath?
3. Which test tube had the greatest amount of sugar in it? How did you know?

Add 5 drops of iodine solution to **iodine** each test tube. Iodine will change color from yellow-brown to blue-black in the presence of starch.

► Click on the scroll down bar on the right hand side and go to **starches**

1. What chemical is being added to the test tubes?

2. What should happen if starch is present

► Click on **Add Iodine**

1. Which solutions changed colors?

PROTEINS

Add 5 drops of **biuret reagent** to each test tube. Biuret reagent changes color from yellow to blue-violet in the presence of protein.

► Click on the tab marked **protein**

1. What are the building blocks that make up proteins?

2. What test do we use to test for proteins?

3. Draw and label the test tubes for the demonstration

► Click on **Add Biuret Reagent**

In your diagram above, shade in the test tubes that showed a positive test for protein.

1. What solutions changed color?

2. What does it mean?

LIPIDS

► Click on tab marked **Lipids**

Sudan III stain will dissolve in lipids and stain them red or orange.

1. What test is used for lipids?

2. How does it work?

3. What color do the solutions change if lipids are present?

► Click on add **Sudan III**

1. What solutions changed colors?

2. What does this mean?

EVERYDAY FOODS

► Click on the tab marked **Everyday Foods**

Run the tests on each of the everyday foods. In the data table below. Record the color of the test tube AFTER the test was run, and place a check mark in the boxes that showed a positive test.

For the other foods in the data table, predict which tests would you expect the food to test positive for and what color results you would get.

Data Table								
Substance	Lipid Test		Carbohydrate Test				Protein Test	
	Sudan color	Lipids present (Yes or No)	Iodine color	Starches present (Yes or No)	Benedict's color	Sugars present (Yes or No)	Biuret color	Proteins present (Yes or No)
Gelatin								
Apple juice								
Ritz cracker								
Skim milk								
For the foods below, PREDICT which macromolecules they would test positive for.								
Bacon								
Candy								
Corn oil								
Bread								
Honey								
water								
Chicken								
Pasta								

Analysis Questions:

1. Match the molecule to the chemical used to test for it to the color that the chemical would change for a positive test. (*draw lines to connect*)

<u>Macromolecule</u>	<u>Reagent</u>	<u>Color Change</u>
Sugar	Biuret Reagent	Green, Orange, or Red color
Protein	Sudan III	Blue-black color
Lipid	Iodine	Red or Orange color
Starch	Benedict's Solution	Blue-Violet color

2. Which substances contained a **protein**?

3. Which substances contained **lipids**?

4. Which substance contained **sugars**?

5. Which substances contained complex (large) **carbohydrates**?

6. How are the **reagents** useful in determining which macromolecules are present?

7. A very thin slice is removed from a peanut and treated with Sudan III stain. Then a drop of Biuret reagent is added to the peanut slice. When you examine the peanut slice under a microscope, patches of red and blue-violet are visible. What conclusions can you draw from your examination?

8. A cracker crushed in water will test positive with iodine but negative with benedict's solution. A cracker crushed in water has another chemical called amylase added to it. After a few minutes, this cracker tests negative with iodine and positive with benedict's solution. Explain what happened.

9. Whole milk does not have any of the fat removed from it that skim milk does. What changes would you expect in tests run on whole milk compared to the results received from skim milk?