

**Identifying Macromolecules Lab**

**Background:** The most common elements in organisms (living things) are carbon, hydrogen, nitrogen, and oxygen. These four elements constitute about 95% of the human body. Organisms need large organic (naturally) molecules called macromolecules for proper functioning and survival. Macromolecules are classified into 4 general categories: carbohydrate (sugars), protein, lipid (fats and oils), and nucleic acid (DNA and RNA). For functioning and survival, all organisms (living things) need to obtain fuel from something. Whether it is from yourself through the process of photosynthesis or by ingesting something and breaking it into smaller components. Common foods, which often consist of plant material or substances derived from animals, are usually combinations of the four macromolecules. Therefore, scientists use certain tests to identify the presence of those macromolecules.

**Purpose:** To test for the presence of macromolecules in various food.

**Hypothesis:** Predict whether each substance you will be testing is a macromolecule and if so, what type.

Substance	Do you think this substance is a carbohydrate (sugar), lipid (fats and oils), protein, or none of these?
Vegetable Oil	
Egg Whites	
Potato Solution	
Yogurt	
Powdered Milk	

**Materials (per group):** Brown paper bag, Biuret reagent, Iodine, 2 spot plates, Small Beakers with the following substances: vegetable oil, egg whites, potato solution, yogurt, and powdered milk.

**Lab Safety:** Do not smell or taste any lab material. Do not put the Iodine or a test tube containing Iodine into the hot bath. Iodine stains, please be careful! Test tubes are fragile and can break easily.

**Procedure:****1. Lipid (Fats and Oils) Test**

1. If a food that contains lipids is put on brown paper, it will leave a spot that lets light through. To test for lipids, divide a piece of a brown paper bag into 5 sections. Label the sections for each food substance to be tested: vegetable oil, egg whites, etc.
2. In each section, rub a small amount of the substance onto the brown paper. With a paper towel, rub off any excess that may stick to the paper.
3. Set the paper aside until the spots appear dry- about 10 to 15 minutes.
4. Observe the results on the brown paper. Hold the paper up to the ceiling lights to see if there are any see-through sections.
5. In data table 1, record a "+" for samples that recorded positive for lipids and a "-" for samples that did not.

## 2. Protein Test

1. Add a small amount of each substance into each well of a spot plate.
2. To test for protein you will use Biuret reagent as an indicator. Biuret reagent turns from blue to purple in the presence of protein. The solution will remain blue if no protein is present. Add 2 drops of biuret reagent to each spot plate well.

**CAUTION: Biuret reagent contains sodium hydroxide, a strong base. Be very careful not to splash or spill any. If you splash any reagent on yourself, wash it off immediately with water. Call your teacher for assistance.**

3. Record the color change of each Biuret solution in Data Table 1. Put a “+” next to the samples that tested positive for protein and a “-” for those testing negative for protein.
4. Rinse and clean the spot plate thoroughly.

## 3. Carbohydrate Test

1. Put a small amount of each test substance into a well on a spot plate.
2. Add 2 drops of Iodine to each well in the spot plate.
3. Iodine causes complex carbohydrates (starch) to turn dark blue or black. Substances without starch are colored brown by iodine, but do not react with it. In Data Table 1, write a “+” if complex carbohydrates are present or a “-” if complex carbohydrates are not present in each sample.
5. Rinse and clean the spot plate thoroughly.

## Data/Results

Data Table 1

	<b>Lipid Test</b>	<b>Protein Test</b>		<b>Carbohydrate Test</b>	
Solution	Lipid Present	Biuret Test Color	Protein Present	Iodine Test Color	Carbohydrate Present
Vegetable Oil					
Egg Whites					
Potato Solution					
Yogurt					
Powdered Milk					

## Identifying Macromolecules Lab Analysis Questions

1. What are the four types of macromolecules? \_\_\_\_\_

Which macromolecule was not tested for in this lab? \_\_\_\_\_

2. Using Biuret reagent, what indicates the presence of protein? \_\_\_\_\_

3. What indicates the presence of lipids? \_\_\_\_\_

4. Using Iodine, what indicates the presence of complex carbohydrates, called starch? \_\_\_\_\_

5. You are a scientist for the Food and Drug Administration (FDA). Recently, there has been fear of an attack by a new species of undead (like zombies). Scientists believe that the only way to combat this attack is by feeding them a substance with high levels of carbohydrates and protein, since these macromolecules appear to kill the new species' cells. Scientists have also found that the undead seem to thrive and grow rapidly when fed lipids. Complete the data table below.

	Lipid Test	Protein Test		Carbohydrate Test	
Solution	Lipid Present	Biuret Test Color	Protein Present	Iodine Test Color	Carbohydrate Present
Sample A	+	Purple		Brown	
Sample B	–	Purple		Dark blue/Black	
Sample C	–	Blue		Dark blue/Black	
Sample D	+	Blue		Brown	

Analyze the food samples below and determine which substance is best and worst to feed to new species to eradicate (get rid) them. **Explain your reasoning.**