

Prelab Information

Purpose Explore the presence of nutrients in food using a laboratory experiment and deductive reasoning.

Time Approximately 45 minutes

Scenario Your biology teacher found an unknown food sample in the classroom, and there are four suspects: students who have different foods for lunch.

Student	Food	Macromolecule Present
Zack	Tofu	Protein
Nicole	Salad dressing	Lipid
Christian	Jelly sandwich	Monosaccharides
Abigail	Pasta	Polysaccharides

For various reasons, your teacher strongly suspects Zack of leaving the food sample. In this lab, you will figure out who was guilty by determining which macromolecules are present in the mystery food sample.

Question Which macromolecules are present in the mystery food sample?

Hypothesis If the mystery food is tofu, then it will react with the reagent that indicates the presence of a protein because tofu is primarily protein.

Variables *Independent variable:* presence of macromolecules, including monosaccharides, polysaccharides, proteins, and lipids
Dependent variable: color changes observed in tests

Safety

- Always wear safety goggles and a lab coat when performing an experiment.
- Keep behavior in the lab purposeful.
- Use caution when working with dyes. They may stain your clothes or body.
- Check glassware such as test tubes and beakers for cracks and chips prior to use.
- Use the right gear, such as insulated gloves and test tube tongs, when moving test tubes into and out of the boiling water bath. When handling test samples otherwise, use thinner protective gloves of latex or other suitable material.
- Report all accidents—no matter how big or small—to your teacher.
- Never eat food in a science laboratory. Contamination could cause illness.

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Lab Procedure

Step 1: Gather Materials

Mystery Food Sample

- 3 test tubes
- Hot pad
- Hot plate
- Graduated pipette
- 100 mL beaker
- Test tube tongs
- Insulated gloves
- Latex (or similar) gloves

Indicators

- Biuret reagent (a protein indicator)
- Sudan red (a lipid indicator)
- Lugol's solution (a polysaccharide indicator)
- Benedict's solution (a monosaccharide indicator)

Positive Control Treatments

- Liquid gelatin (a protein)
- Vegetable oil (a lipid)
- Polysaccharide mixture
- Monosaccharide solution

Negative Control Treatment

- Water

Step 2: Test for the Presence of Proteins

- a. Label three test tubes "G" for liquid gelatin, "H₂O" for water, and "???" for the mystery food sample. Use the graduated pipette to fill each test tube with approximately 5 mL of its respective solution, rinsing the pipette with tap water after each use.
- b. Biuret reagent indicates the presence of a protein by turning a solution pink/purple. Use the pipette to add 3 mL of the Biuret reagent to each of the three test tubes. Record the color of the solutions in your data table.
- c. Draw a conclusion about the mystery food sample, and record it in the data table.
- d. Dispose of the materials following your teacher's instructions. Rinse the test tubes with tap water, and dry them for storage. Put away all other materials.

Step 3: Test for the Presence of Lipids

- a. Label three test tubes "Oil" for vegetable oil, "H₂O" for water, and "???" for the mystery food sample. Use the graduated pipette to fill each test tube with 3 mL of its respective material, rinsing the pipette with tap water after each use.

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- b. Sudan red indicates the presence of a lipid by causing a floating layer of the mixture to turn red. Use the pipette to add four drops of Sudan red to each of the three test tubes. While wearing latex gloves, cap the end of each test tube with your thumb, and shake the mixture. Record the color of the solutions in your data table.
- c. Draw a conclusion about the mystery food sample and record it in the data table.
- d. Dispose of the materials following your teacher's instructions. Rinse the test tubes with tap water for later use.

Step 4: Test for the Presence of Polysaccharides

- a. Label three test tubes "PS" for polysaccharide, "H₂O" for water, and "???" for the mystery food sample. Use the graduated pipette to fill each test tube with 3 mL of its respective mixture, rinsing the pipette with tap water after each use.
- b. Lugol's solution indicates the presence of polysaccharides by turning a mixture blue/black. Use the pipette to add four to five drops of Lugol's solution to each of the three test tubes. Record the color of the solutions in your data table.
- c. Draw a conclusion about the mystery food sample, and record it in the data table.
- d. Dispose of the materials following your teacher's instructions. Rinse the test tubes with tap water for later use.

Step 5: Test for the Presence of Monosaccharides

- a. Label three test tubes "MS" for monosaccharide, "H₂O" for water, and "???" for the mystery food sample. Use the graduated pipette to fill each test tube with 3 mL of its respective solution, rinsing the pipette with tap water after each use.
- b. Benedict's solution indicates the presence of monosaccharides by turning a solution red. Use the pipette to add 1 mL of Benedict's solution to each of the three test tubes. Record the color of the solutions in your data table.
- c. Place the test tubes in a water bath, and place the water bath on a hot plate. Heat to a gentle boil. After boiling for three minutes, remove the water bath from the hot plate, and remove the test tubes from the water bath. Record the color of the solution in each test tube in your data table.
- d. Draw a conclusion about the mystery food sample and record it in the data table.
- e. Dispose of the materials following your teacher's instructions. Rinse the test tubes with tap water for later use.

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Data

Record data and conclusions about the mystery food sample either below or in a lab notebook.

Step 2: Protein Test (Biuret Solution)

	Gelatin (Positive Control)	Water (Negative Control)	Mystery Food Sample
Color			
Conclusion			

Step 3: Lipid Test (Sudan Red Solution)

	Vegetable Oil (Positive Control)	Water (Negative Control)	Mystery Food Sample
Color			
Conclusion			

Step 4: Polysaccharide Test (Lugol's Solution)

	Polysaccharide Mixture (Positive Control)	Water (Negative Control)	Mystery Food Sample
Color			
Conclusion			

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Step 5: Monosaccharide Test (Benedict's Solution)

	Monosaccharide Solution (Positive Control)	Water (Negative Control)	Mystery Food Sample
Color Before Heat			
Color After Heat			
Conclusion			