

Identifying Food Nutrients

The food you eat contains nutrients important to your body. Sugars, starches, proteins, and lipids are examples of nutrients that are organic compounds.

You can perform *qualitative tests* to detect the presence of organic compounds in food, using *indicators*, chemical substances that react in a certain way when a particular substance is present. *Benedict's solution* is used to detect the presence of reducing sugars, such as glucose. *Lugol's iodine solution* is used to detect the presence of starch. *Biuret solution* is used to identify the presence of protein. *Sudan III* is used to detect the presence of lipids. A *standard* is a positive test for a known substance. Unknown substances can be tested and compared with the standard for positive identification of the substance.

In this lab, you will use standards to analyze an unknown food for the presence of different organic compounds.

OBJECTIVES

Test samples for the presence of organic compounds.

Relate indicator reactions to the presence of organic nutrients.

Recognize a standard.

MATERIALS

- albumin (protein) solution
- Benedict's solution
- biuret solution
- dropping pipets (5)
- glucose solution
- hot water bath
- lab apron
- Lugol's iodine solution
- plastic stirring rod
- safety goggles
- spatula
- starch solution
- Sudan III
- test tubes (10)
- test-tube holder
- test-tube rack
- unknown
- vegetable oil
- water
- wax pencil



Procedure

1. Fill in the first two rows of **Table 1**, using information from the introduction above and from your textbook. You will fill in the third row (Positive result) as you test for each nutrient.

Identifying Food Nutrients *continued***TABLE 1 STANDARDS DATA**

Substance	Glucose	Starch	Protein	Lipid
Nutritional role				
Indicator				
Positive result				

- Put on safety goggles and a lab apron.
- Use a spatula to place a small amount of the unknown in a test tube labeled “unknown.” Add 20 mL of water, and stir with a sterile plastic stirring rod to dilute the unknown.

TESTING FOR GLUCOSE

- Select three clean test tubes to perform the Benedict’s test. With a wax pencil, label the tops of the test tubes “1,” “2,” and “3.” To test tube 1, add 40 drops of glucose. To test tube 2, add 40 drops of the unknown. To test tube 3, add 40 drops of water.
- Add 10 drops of Benedict’s solution to each test tube. **CAUTION: If you get Benedict’s solution on your skin or clothing or in your eyes, rinse it immediately, and alert your teacher.** Heat the test tubes in a hot water bath with a temperature range of 40–50°C for 5 minutes.
 - In which test tubes do you see a reaction?

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- What color change occurs when Benedict’s solution is heated in the presence of this substance?
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In **Table 1**, record the color change that occurred, which indicates a positive result. Record the information about test tube 2 in **Table 2**. Indicate whether glucose is present (+) or not (–) and any color change that you observed.

Identifying Food Nutrients *continued***TABLE 2 UNKNOWN DATA**

Nutrient	Presence (+/-)	Observation
Lipid		
Starch		
Glucose		
Protein		

TESTING FOR STARCH

6. Select three clean test tubes to perform the Lugol's iodine test. With a wax pencil, label the tops of the test tubes "1," "2," and "3." To test tube 1, add 40 drops of starch. To test tube 2, add 40 drops of the unknown. To test tube 3, add 40 drops of water.
7. Add 2 drops of Lugol's iodine solution to each test tube. **CAUTION: Lugol's solution will stain your skin and clothing. Promptly wash off spills to minimize staining.**
- What color change occurs when Lugol's iodine solution is in the presence of starch?

Record the color change in **Table 1**. Record the information about test tube 2 in **Table 2**.

TESTING FOR PROTEIN

8. Select three clean test tubes to perform the biuret test. With a wax pencil, label the tops of the test tubes "1," "2," and "3." To test tube 1, add 40 drops of albumin solution (a protein). To test tube 2, add 40 drops of the unknown. To test tube 3, add 40 drops of water.
9. Add 3 drops of biuret solution to each test tube. **CAUTION: If you get biuret solution on your skin or clothing or in your eyes, rinse it immediately, and alert your teacher.**
- What color change occurs when biuret solution is in the presence of protein?

Record the color in **Table 1**. Record the information about test tube 2 in **Table 2**.

TESTING FOR LIPID

10. Select three clean test tubes to perform the Sudan III test. With a wax pencil, label the tops of the test tubes "1," "2," and "3." To test tube 1, add 5 drops of vegetable oil. To test tube 2, add 40 drops of the unknown. To test tube 3, add 5 drops of water.

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11. Add 3 drops of Sudan III to each test tube. **CAUTION: Sudan III will stain your skin and clothing. Promptly wash off spills to minimize staining. Do not use Sudan III when there are flames in the room.**

- What color change occurs when Sudan III shows a positive reaction?

Record the color change in **Table 1**. Record the information about test tube 2 in **Table 2**.

12. Dispose of your materials according to your teacher's instructions.
13. Clean up your work area, and wash your hands before leaving the lab.

Analysis

1. **Examining Data** What are the controls in this lab?

2. **Organizing Data** Which indicator detects the presence of glucose? starch? protein? lipid?

Conclusions

1. **Drawing Conclusions** What can you conclude about the unknown food, based on your data?

2. **Drawing Conclusions** You are asked to analyze and compare a food substance with standards for organic compounds. You observe a positive response with Lugol's iodine solution and biuret solution. What can you conclude about this food?

Extensions

1. **Research and Communications** Dietetic technicians assist therapeutic dietitians in planning the diets of hospital patients and overseeing food-tray preparation. Find out about the skills and training required to become a dietetic technician. Investigate job opportunities and the types of businesses that employ dietetic technicians.
2. **Designing Experiments** Design an experiment using standards to test for organic compounds in a variety of food, such as honey, pasta, oats, and butter. Have your teacher approve your procedures before you carry out the experiment.