

Biochemists have developed standard tests to determine the presence of the most abundant macromolecules made by cells. In this investigation, your group will conduct one or more of the standard tests to identify the presence of sugars, starch, lipid, and protein in known samples. Some of these tests involve the use of an indicator—a chemical that changes colour when it reacts with a specific substance.

Safety Precautions

Do not taste any substances in the laboratory. Be careful when handling iodine, Benedict’s solution, and Biuret reagent as they are toxic and can stain skin and surfaces. Take care when working with heat sources and to prevent test tubes from breaking, do not allow the hot-water bath to boil vigorously. Keep electrical equipment, such as the hotplate, away from water sources. If there is a spill, immediately clean it with plenty of water and inform your teacher.

Materials

- Benedict’s solution
- iodine solution in dropper bottle
- Biuret reagent
- hot plate
- potato juice
- Egg white solution
- Apple juice
- Crackers Solution
- Milk
- 5 test tubes
- tongs
- 500 mL beaker
- Test tube rack
- 10% NaOH solution
- Tape
- pencil or pen
- 4 medicine droppers
- paper
- Q-tips
- Margarine
- Canola Oil

Procedure

Part 1: Test for Proteins

Biuret reagent has a blue colour that changes to violet in the presence of proteins or to pink in the presence of peptides.

- 1.) Label each test tube appropriately and add 3ml of each solution to each test tube.
- 2.) Now add 3ml of 10% NaOH solution to each test tube.
- 3.) Add three drops of Biuret reagent to each test tube and record the results below.

Biuret Test for Protein			
Test Tube Contents	Colour Before	Colour After	Contains Protein
Potato Juice			
Egg White Solution			
Apple Juice			
Cracker Solution			
Milk			

Part 2: Test for Starch

Iodine solution turns from a brownish colour to blue-black in the presence of starch.

- 1.) Add 3ml of each solution to each test tube.
- 2.) Now add 3 drops of iodine solution to each test tube. Record the results in the table below.

Iodine Test for Starch			
Test Tube Contents	Colour Before	Colour After	Contains Starch
Potato Juice			
Egg White Solution			
Apple Juice			
Cracker Solution			
Milk			

Part 3: Test for Sugars:

Sugars react with Benedict’s solution after being heated in a boiling-water bath. Increasing concentrations of sugar give a continuum of colours, as shown in the table below.

Typical Reaction for Benedicts Solution		
Chemical	Chemical Category	Benedicts Solution Colour After Heating
Distilled water	Inorganic	Blue, no change
Glucose	Monosaccharide (carbohydrate)	varies with concentration: • very low: green • low: yellow • moderate: yellow-orange • high: orange • very high: orange-red
Maltose	Disaccharide (carbohydrate)	varies with concentration (See results for glucose.)
Starch	Polysaccharide (carbohydrate)	Blue, no change.

- 1.) Add 3ml of each solution to each test tube.
- 2.) Now add 3 drops of benedicts solution to each test tube
- 3.) Place each solution in the hot water bath for 5-10 minutes. Record your results in a table below.

Benedicts Test for Sugars			
Test Tube Contents	Colour Before	Colour After	Contains Sugar
Potato Juice			
Egg White Solution			
Apple Juice			
Cracker Solution			
Milk			

Part 4: Test for Fats

Fats leave a translucent, oily spot on paper. Liquid fats penetrate paper, while solid fats rest predominantly on top.

1. Use a Q-tip to rub some of each material on a small piece of paper and record the immediate effect in the table.
2. Wait 5 minutes and then record if the solution penetrated the paper or not. To do this examine each piece of paper to determine which test material penetrates the paper and which completely dried.
3. Record your results in a table below.

Test for Fats		
Material	Immediate Effect	After 5 minutes
Canola oil		
Margarine		
Potato Juice		
Egg White Solution		
Apple Juice		
Cracker Solution		
Milk		

Analysis

1.) Which foods that you tested contained protein? How do you know?

2.) Which foods that you tested contained starch? How do you know?

3.) Which foods that you tested contained sugar? How do you know?

4.) Which foods that you tested contained fats? How do you know?
