

## Identifying Nutrients Lab

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**Macromolecules** are large molecules with complex structures. There are four categories of macromolecules in our food: carbohydrates, lipids, proteins, and nucleic acids. It is important to be able to identify what foods contain these macromolecules.

Biochemists have developed standard tests to test for the presence of these macromolecules. Some of these tests involve the use of an **indicator**, a chemical that changes colour when it reacts with a specific substance.

A few tips when using an indicator:

- Add the indicator by holding the dropper bottle directly above the test tube and allowing the drops to “free-fall” into the solution. Do not touch the walls of the test tube with the dropper bottle.
- Give each test tube a gentle shake after adding the indicator to ensure solution is properly mixed.

Indicators used:

- **Biuret reagent:** Blue in colour and turns pink to violet in the presence of protein.
- **Iodine solution:** Turns from brown to blue-black in the presence of starch.
- **Brown paper bag:** Turns translucent when fat is left on it.
- **Benedict’s solution:** React with sugars after being heated in a hot water bath. Increasing concentrations give a continuum of colours as indicated below.

Chemical	Chemical Category	Benedict’s Solution (after heating)
Distilled Water	Inorganic	Blue
Glucose	Monosaccharide	Very low concentration: Green Low Concentration: Yellow
Maltose	Disaccharide	Moderate Concentration: Yellow - Orange High Concentration: Orange Very High Concentrations: Orange - Red
Starch	Polysaccharide	Blue

**Purpose:** Use laboratory tests to identify single sugars, starches, proteins, and lipids.

### Materials

Distilled Water	Iodine Solution	Brown Paper	5 test tubes
Biuret Reagent	Benedict’s Solution	Vegetable Oil	Test Tube Rack
Albumin Solution	Glucose Solution	Butter	Dropper
Pepsin Solution	Onion Juice	Thread	Hot Plate
Starch Suspension	Potato Juice	Ruler	Scoopula
4 food samples	Skim Milk	Whipping Cream	

## Procedure

### A: Proteins

- 1) Use a ruler to mark the 1cm and 2cm mark on a piece of string. The string will act as a guide when filling test tubes.
- 2) Fill each test tube as follows.
  - Test Tube 1: Fill to the 1 cm mark with distilled water and add Biuret reagent to the 2cm mark.
  - Test Tube 2: Fill to the 1 cm mark with albumin solution and add Biuret reagent to the 2 cm mark.
  - Test Tube 3: Fill to the 1cm mark with skim milk and add Biuret reagent to the 2 cm mark.
  - Test Tube 4: Fill to the 1 cm mark with unknown suspension and add Biuret reagent to the 2 cm mark.
- 3) Record the results and conclusions in the table below. (4 marks)

Test Tube	Contents	Colour Change	Conclusions
1	Distilled Water		
2	Albumin		
3	Skim Milk		
4	Unknown		

- 4) Dispose of the contents of the test tube in the waste container. Clean and dry all test tubes.

### B: Starch

- 1) Use a ruler to mark the 1cm and 2cm mark on a piece of string. The string will act as a guide when filling test tubes.
- 2) Fill each test tube as follows.
  - Test Tube 1: Fill to the 1 cm mark with starch suspension and add five drops of iodine solution.
  - Test Tube 2: Fill to the 1 cm mark with distilled water and add five drops of iodine solution.
  - Test Tube 3: Fill to the 1 cm mark with unknown solution and add five drops of iodine solution.
- 3) Record the results and conclusions in the table below. (3 marks)

Test Tube	Contents	Colour Change	Conclusions
1	Starch suspension		
2	Distilled Water		
3	Unknown Solution		

- 4) Dispose of the contents of the test tube in the waste container. Clean and dry all test tubes.

### C: Sugar

- 1) Use a ruler to mark the 1cm and 2cm mark on a piece of string. The string will act as a guide when filling test tubes.
- 2) Fill each test tube as follows.
  - Test Tube 1: Fill to the 1 cm mark with distilled water and the add Benedict's solution to the 2 cm mark. Heat in a hot water bath for 5 minutes.
  - Test Tube 2: Fill to the 1 cm mark with glucose solution and add Benedict's solution to the 2 cm mark. Heat in a hot water bath for 5 minutes.
  - Test Tube 3: Fill to the 1 cm mark with sucrose solution and add Benedict's solution to the 2 cm mark. Heat in a hot water bath for 5 minutes.
  - Test Tube 4: Fill to the 1 cm mark with unknown solution and add Benedict's solution to the 2 cm mark. Heat in a hot water bath for 5 minutes.

- Test Tube 5: Fill to the 1 cm mark with starch solution and add Benedict's solution to the 2 cm mark. Heat in a hot water bath for 5 minutes.

3) Record the results and conclusions in the table below. (5 marks)

Test Tube	Contents	Colour Change	Conclusions
1	Distilled Water		
2	Glucose Solution		
3	Sucrose Solution		
4	Unknown Solution		
5	Starch Solution		

4) Dispose of the contents of the test tube in the waste container. Clean and dry all test tubes.

#### D: Fats

- 1) Place a small drop of distilled water on brown paper. Describe the immediate effect.
- 2) Place a small drop of vegetable oil on a square of brown paper. Describe the immediate effect.
- 3) Use a scoopula to place a small quantity of butter on a square of brown paper. Describe the immediate effect.
- 4) Use a dropper to place a few drops of skim milk on a square of brown paper. Describe the immediate effect.
- 5) Use a dropper to place a few drops of whipping cream on a square of brown paper. Describe the immediate effect.
- 6) Wait five minutes and examine the area where the test material was placed. Record your observations and conclusions in the following table. (5 marks)

Sample	Test Results	Conclusions
Distilled Water		
Oil		
Butter or Margarine		
Skim Milk		
Whipping Cream		

#### Clean-up (5 marks)

#### Analysis

Which test tube served as a control in each test? Why is a control necessary? (2 mark)

A drop of iodine accidentally falls on a piece of paper. Predict the colour change, if any, and provide an explanation for your prediction. (2 marks)

Use the textbook to define the following terms: (4 marks)

Carbohydrate

Monosaccharide

Lipid

Protein

What is the main difference between a monosaccharide and a disaccharide? Provide one example of each. (2 marks)

Why is it not a good idea to consume a diet rich in saturated fats and cholesterol? Explain. (3 marks)

List 3 possible sources of error in this lab and indicate how you could improve the procedures. (5 mark)

In the protein section, you should have seen a variety of colours produced from each sample ranging from pink to violet. Why do you think a variety of colour were indicated? What do you think each colour represents (\*Hint, look at your results from your sugar test). (2 marks)