

Classify each as a carbohydrate, protein or lipid.

_____ **starch**

_____ **long term energy storage**

_____ **contains C, H, N and O**

_____ **cellulose**

_____ **enzyme**

_____ **glycerol**

_____ **amino acid**

_____ **glucose**

_____ **unsaturated fatty acid**



Identifying Macromolecules in the Lab

Honors Biology

Tests for Biomolecules

- ▶ **Benedict's Solution** – color change indicator for simple sugars (uses heat)
- ▶ **Iodine Solution** – color change indicator for starch
- ▶ **“Paper Bag”** test for lipids
- ▶ **Sudan IV** test for lipids
- ▶ **Biuret's Solution** – color change indicator for protein

Test for Simple Sugars

Benedict's solution

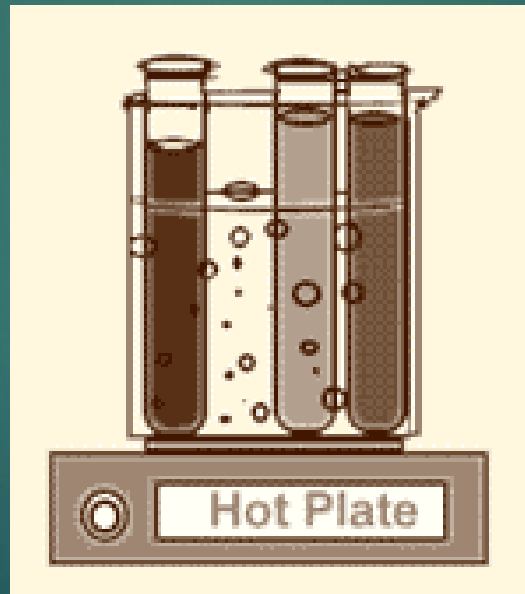
- ▶ Benedict's solution is a chemical indicator for simple sugars such as glucose: $C_6H_{12}O_6$.
- ▶ Aqua blue: negative test
- ▶ yellow/green/brick red : positive test



Test for Simple Carbohydrates

Benedict's solution

- ▶ Unlike some other indicators, Benedict's solution does not work at room temperature - **it must be heated first.**



Test for Complex Carbohydrates

Iodine solution

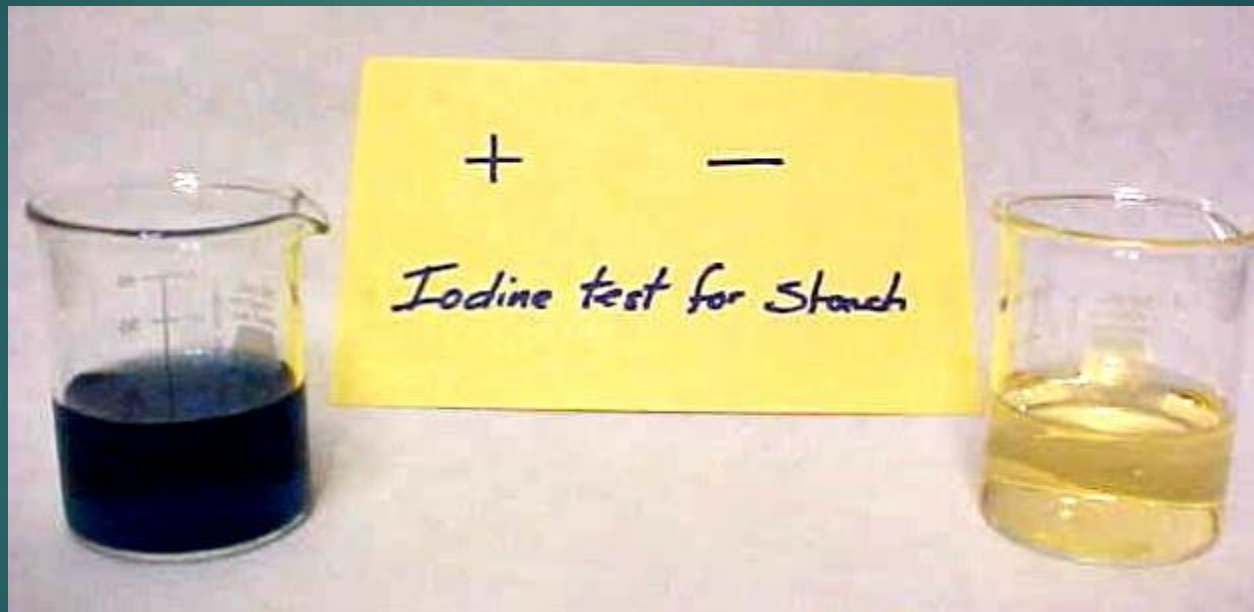
- ▶ Iodine solution is an indicator for a molecule called starch.
- ▶ Starch is a huge molecule made up of hundreds of simple sugar molecules (such as glucose) connected to each other.



Test for Complex Carbohydrates

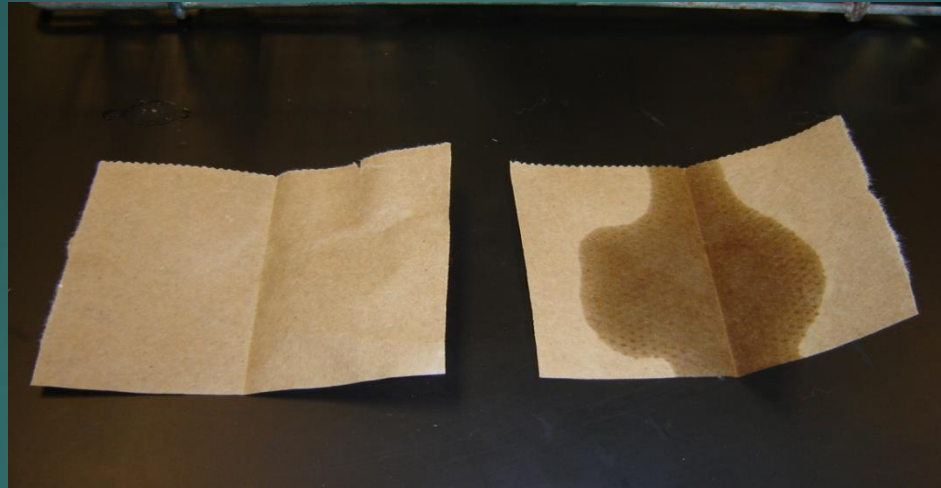
Iodine solution

- ▶ Iodine solution → color change = blue to black



Test for Lipids

("brown paper bag test" for the presence of lipids)



- ▶ The sample of on the left is the result of the lipid test on tap water (control)
- ▶ The sample on the right is a positive test for the presence of lipids tested on vegetable oil (note the translucent spot on the paper)

Test for Lipids

(Sudan IV for the presence of lipids)



- ▶ If lipids are present, the Sudan IV will stain them reddish-orange

Test for Protein (amino acids)

Biuret solution

- ▶ Biuret solution → dark violet blue to pinkish purple



Tests to Identify Carbohydrates, Lipids, and Proteins

SUBSTANCE	INDICATOR	START COLOR	POSITIVE TEST
Simple Sugars	Benedict's Solution	Blue	<i>ORANGE-RED or BRICK RED</i>
Starch	Lugol's Iodine Solution	Yellow-Orange	<i>DARK PURPLE or BLACK</i>
Proteins	Biuret's Solution	Blue	<i>VIOLET</i>
Lipids	Sheet of Paper	Opaque	<i>Translucent</i>
	Sudan IV	Dark red	<i>Reddish-orange</i>

A student tests an unknown colorless solution for the presence of sugars, starches, lipids, and proteins. The results are shown in the table below.

Unknown Solution Results	
Testing Indicator	Observation
Iodine	Unknown solution turned from colorless to brownish-orange
Benedict's Solution	Unknown solution turned from colorless to orange
Biuret Solution	Unknown solution turned from colorless to purple
Brown Paper Bag	No mark left; unknown solution dried completely

Based on the data collected, which molecules are present in the unknown solution?

- A. starches and lipids
- B. proteins and starches
- C. sugars and proteins
- D. lipids and proteins

Students conducted an investigation using Biuret reagent to determine the presence of proteins in different foods. The results are shown in the table below.

Substance	Color after adding Biuret reagent
Honey	Blue
Cottage Cheese	Purple/Lavender
Potato	Dark Blue
Water	Light Blue
Chicken Broth	Dark Purple
Yogurt	Light Purple

According to the data, which foods tested by the students contained proteins?

- A. Honey & Potato
- B. Potato & Chicken Broth
- C. Cottage Cheese & Water
- D. Cottage Cheese & Yogurt