

# Organic Food Lab =)

**Problem:** What tests are used to discover if certain organic molecules are present in food? Could these tests be used to identify an unknown food?

## Background:

We will be studying various systems in the body that use the basic units in food. To determine which molecules are present in food, scientists have devised various tests to detect whether there is *sugar, starch, protein, or fat*. These tests rely on the specific chemical properties of the compound being tested. An example is the test for fats. The test employs a fat soluble dye. If there is no fat, there is no color when you add the dye. Another test for fats would be by just using a brown paper bag. If the food creates an oil spot then there is fat, if there is no spot, there is no fat.

In your lab today, you will be testing various known compounds, using the 4 different tests described in the procedures. Then you will receive an unknown solution and a list of possible substances it could be. Your mission, if you choose (and yes you do choose) to accept it, will be to identify your unknown and report the results of the known substances for each test.

## I. Sugar Test ---> Benedict's Test

Benedict's reagent test for the presence of a certain chemical group found in simple sugars (glucose, fructose, etc.) and some more complex double sugars (maltose, lactose, found in milk). These sugars will give a positive test with the Benedict's reagent. These reactions will undergo a color change when there is sugar present. These color changing reactions are called **COLORIMETRIC ASSAYS**.

Color of solution with food/benedicts	Meaning of Color
BLUE	No sugar content
GREEN/YELLOW GREEN	Small amount sugar present
ORANGE/BRICK RED	Large amount of sugar present

## II. Starch Test ----> Iodine Test

Starch is a polysaccharide composed of hundreds of glucose subunits joined in long chains. Iodine is a yellow-brown solution, but will turn dark blue or black in the presence of starch.

## III. Protein Test ---> Protein Test

Proteins are made up of small subunits called amino acids. These amino acids link together by making special covalent bonds called peptide bonds. These peptide bonds react very nicely with copper ions under the right conditions to make a very pretty and attractive purple color. This part of the experiment is hazardous....so for this test:

**WEAR GOGGLES, GLOVES AND A LAB APRON!!!!**

## IV. Fat Test ---> Brown Paper Test

Water is a **polar** molecule and paper/wood is a **non-polar**. These don't mix. So a drop of water will not be readily absorbed by paper. On the other hand, a fat molecule is made up of three long fatty acid chains joined to a glycerol molecule. It is a **non-polar** molecule like the paper. **Non-polar** likes **non-polar** and a drop of oil/fat will get absorbed by the paper easily.

**\*Non-polar attracts non-polar\***

**\*Polar attracts polar\***

**Hypothesis:** N/A

**Procedures:**

**I. Sugar Test ---> Benedicts Test**

1. Take 3 test tubes and fill each of the tubes with 3 ml of each of the items indicated in the data chart.
2. Add the Benedict's Solution to each of the test tubes (2 ml).
3. Carefully place in the boiling hot water bath...They are HOT!!!
4. Wait for 3 minutes....then remove from the water bath with test tube clamps and place in your test tube rack.
5. Record your results in the data table.
6. Clean your test tubes with the test tube brushes.

**II. Starch Test ----> Iodine Test**

1. Take 1 test tube and fill with 3 ml of a starch solution indicated in the data chart.
2. Place 3 drops of Iodine solution in each and record your observations in the chart.
3. Clean your test tubes.

**III. Protein Test ---> Protein Test**

Retrieve 2 test tubes and make sure they have been thoroughly washed and rinsed

1. Fill each test tube to 1 ml full with each of the substances listed in the chart:
2. Fill both the tubes with about 3 ml worth of 10% NaOH. **BE VERY CAREFUL WITH THIS STEP...NaOH IS A VERY STRONG BASE!!!**
3. Mix each tube by tapping the bottom of the tube slightly with the side of your finger.
4. Add ten (10) drops of 1% CuSO<sub>4</sub> (copper sulfate) solution
5. Mix again and record the color change in the table.
6. Circle the substance that should have the positive result for protein.
7. Clean your test tubes carefully.

**IV. Fat Test ---> Brown Paper Test**

1. Draw a circle around each drop and label each one on the brown paper to help you locate them
2. Raise the paper up to the light.
3. Observe and describe the spots you made
4. Clean up and throw away your brown paper.

**V. Unknown Testing!!!**

1. Each group will get an unknown
2. Perform each of the 4 organic tests on the unknown sample
3. Use physical observations (color, odor, texture) to help figure out the unknown.

**DATA:**

**I. Sugar Test ---> Benedicts Test**

	<b>TUBE 1</b>	<b>TUBE 2</b>	<b>TUBE 3</b>
<i>Food type</i>	Tap water	Corn syrup solution	Glucose solution
<i>Initial color</i>			
<i>Final color</i>			

**Observations:**

**II. Starch Test ----> Iodine Test**

<i>Food type</i>	Tap Water	Starch Solution
<i>Initial color before Iodine</i>		
<i>Final color after Iodine</i>		

**Observations:**

**III. Protein Test ---> Protein Test**

<i>Tube #</i>	<b>TUBE 1</b>	<b>TUBE 2</b>
<i>Food type</i>	Tap water	Egg white solution
<i>Initial color</i>		
<i>Final color</i>		

**Observations:**

**IV. Fat Test ---> Brown Paper Test**

<i>Food type</i>	Tap water	Oil
<i>Initial color</i>		
<i>Final color</i>		

**Observations:**

## **V. Unknown Testing!!!**

<b><i>Unknown #</i></b>	<b><i>Test Type</i></b>	<b><i>Sugar Test</i></b>	<b><i>Starch Test</i></b>	<b><i>Protein Test</i></b>	<b><i>Fat Test</i></b>
	<b><i>Positive Result/Color</i></b>				
	<b><i>Unknown Result</i></b>				

<b><i>Unknown #</i></b>	<b><i>Test Type</i></b>	<b><i>Sugar Test</i></b>	<b><i>Starch Test</i></b>	<b><i>Protein Test</i></b>	<b><i>Fat Test</i></b>
	<b><i>Positive Result/Color</i></b>				
	<b><i>Unknown Result</i></b>				

### Conclusion Questions

- 1. What organic compound that we have studied was not tested for in this lab? Why wasn't it tested?**
  
- 2. Why was water tested in each of the different organic food tests? What did it act as?**
  
- 3. What number unknown did you have? What do you think it is and why?**