Organic Food Lab =)

Problem: What test 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 test 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 ---> Benedicts 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 Benedicts 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: fill one test tube with 2 ml of glucose and fill one test tube with 2 ml of corn syrup and fill one test tube with 2 ml of water.
2. Add 2 ml 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 2 test tubes: fill one with 2 ml of starch and fill one test tube with 2 ml of water.
2. Place 5 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: fill one test tube with 2 ml of egg white and fill one test tube with 2 ml of water.
2. Fill both the tubes with about 1 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 five (5) drops of 1% $CuSO_4$ (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 two circles on the brown paper. Place 1 drop of water in one and 1 drop of oil in the other circle.
2. Raise the paper up to the light.
3. Observe and describe the transparency of 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

	TUBE 1	**TUBE 2**	**TUBE 3**
Food type	Tap water	Corn syrup solution	Glucose solution
Initial color			
Final color			

Observations:

II. Starch Test ----> Iodine Test

Food type	Tap Water	Starch Solution
Initial color before Iodine		
Final color after Iodine		

Observations:

III. Protein Test ---> Protein Test

Tube #	**TUBE 1**	**TUBE 2**
Food type	Tap water	Egg white solution
Initial color		
Final color		

Observations:

IV. Fat Test ---> Brown Paper Test

Food type	Tap water	Oil
Initial color		
Final color		

Observations:

V. Unknown Testing!!!

Unknown #	*Test Type*	Sugar Test	Starch Test	Protein Test	Fat Test
	Positive Result/Color				
	Unknown Result				

Unknown #	*Test Type*	Sugar Test	Starch Test	Protein Test	Fat Test
	Positive Result/Color				
	Unknown Result				

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?**