EXPERIMENT: CHEMICAL DETECTIVE
You have now learned a great deal about chemicals and how they behave. To use this knowledge we would like you to take on the role of a chemical detective. This is very similar to what happens in crime labs around the world. You will have several tests that you can perform to determine what chemicals are present in your sample. You will have a chance to test all the possible suspect chemicals, then you will decide what procedure is best to determine the identity of the compounds in your unknown sample vial.

Here is a list of the "suspect" chemicals:
Table salt (sodium chloride)  Citric acid (C₆H₈O₇)
Fructose (C₆H₁₂O₆)  Cornstarch (polymer of glucose)
Baking soda (sodium bicarbonate)

The testing materials you will have to work with are:
A conductivity meter  Litmus paper (both blue and red)
Vinegar  Iodine solution
Benedict’s Reagent
Each test will give a definite response to each of the suspect chemicals. You will need to make good observations to know what to look for in each test.

General Procedures: *These tests can be done in any order.*

**Hazards**
This experiment involves many reagents. Wear goggles until all chemicals are put away. Iodine and Benedict’s reagent are corrosive – avoid skin contact and ingestion. When heating test tubes of solutions, beware for superheating – if it bubbles over it can cause burns.

**Procedure**
You will need to test the reactions of each known suspect chemical with the testing materials. You can simultaneously analyze **two** unknown vials. **There are two suspect chemicals in each unknown vial.** The following are general notes on how each process is performed. You will probably want to do the same test to all five known chemicals at one time to see how they are different.

A. **Conductivity Meter Test:** Take a small amount of your sample, about the size of a match head, and place it in a 50 mL beaker. Add about 30 mL of distilled water and stir until it is dissolved. Place both electrodes into the beaker until they are covered with the liquid by about a centimeter. Push and hold the small button on the meter to turn it on. Test first on low and if you get a reading of 10, then test on high. Think of low as a scale from 1-10 and high as a scale from 11-20.

B. **Litmus paper test:** Litmus paper comes in two colors, red and blue. It is used for detecting acids and bases. (Hint to remember colors: Bases Become Blue). If the red paper turns blue, the solution is basic. If the blue paper turns red, the solution is acid. If neither paper changes color, the solution is neutral. To test this, dissolve a small amount of your sample in water, or use your sample from the conductivity test, and dip the litmus paper into the solution. The change should be obvious. Be sure to recap the container the paper is stored in to prevent reaction with the air.

C. **Vinegar test:** Take a small amount of your sample, about the size of a match head, and place it on a spot plate. Add a few drops of vinegar to it from the dropper bottle. Observe any reaction.

D. **Iodine Solution test:** The Iodine solution tests for large carbohydrates. Take a small amount of your sample, about the size of a match head, and place it on a spot
plate. Add a few drops of iodine solution to it from the dropper bottle. Observe any reaction.

E. **Benedict's Reagent**: Benedict's Reagent is used to identify small carbohydrates. Set up a hot water bath with a hot plate and beaker filled with water. Take a small amount of your sample, about the size of a match head, and place it in a test tube. Add 1 mL (one full dropper) of Benedict's Reagent to the test tube. Heat the mixture for 2-3 minutes. Observe any color changes. You may want to heat all of the samples at the same time. Be sure each test tube is labeled. *(Note: All samples with Benedict's solution MUST be placed in a waste jar.)*

F. Obtain two unknown vials and analyze them using the tests described above. EACH VIAL CONTAINS TWO SUSPECT CHEMICALS.
Prepare a data chart for your experiment.

Conclusions:

Vial # _______________ contains _______________ and _______________.

Vial # _______________ contains _______________ and _______________.