***Qualitative Analysis of Chemical Bonds***

Test the four known chemicals to identify physical and chemical properties that can be used to *qualitatively analyze* the type of bonding present in the unknown samples. The known chemicals and types of chemical bond present in each sample are:

Copper(II) sulfate—ionic bonding

Paraffin wax—nonpolar covalent bonding

Dextrose—polar covalent bonding

Zinc—metallic bonding

Observe the color and appearance of each solid and perform the following qualitative tests:

(a) observe the color and appearance of each sample

(b) observe the relative (high or low) melting point

(c) observe the conductivity of each solid sample

(d) observe the conductivity of aqueous solution

(e) observe the solubility

To test the relative melting point:

aluminum foil

iron ring

ring stand

**Figure 1**.

1. To test the melting point of a substance, first place a small amount of each solid in separate locations on a piece of aluminum foil. The size of the aluminum foil should be about 5” by 5”, but does not need to be perfect. You will need multiple pieces of aluminum foil to test all of the chemicals.
2. Hold the dish with tongs above a boiling water bath on a hotplate and observe if the solids melt.
3. If the chemical sample does NOT melt, set up a ring stand with an iron ring attached. Place the aluminum square on the iron ring, as shown at right in Figure 1. Place a small pea-sized sample of the chemicals to be tested on the aluminum foil sheets.

salt

sugar

**Figure 2**.

1. Light the Bunsen burner and adjust the flame height so that the tip of the flame is just an inch or so below the height of the aluminum foil. Raise or lower the iron ring if you need to (before you put the burner under it, of course). Move the Bunsen burner so that the flame is directly below the center of the aluminum square. Heat for 1–2 minutes and record observations.
2. Repeat steps 1-4 until all of the known and unknown samples have been tested.

To test the conductivity:

1. Observe the conductivity of each solid sample (for the known and unknown chemicals) using the conductivity testing apparatus.
2. Dissolve a small amount of each sample in water. Observe the conductivity of the aqueous solution and record your observations.

To observe the solubility:

1. Dissolve a small amount (pea-size) of each sample in 2 mL of water in a test tube. Record if the sample dissolves or not.
2. Dissolve a small amount (pea-size) of each sample in 2 mL of hexane in a test tube. Record if the sample dissolves or not.
3. Dissolve a small amount (pea-size) of each sample in 2 mL of alcohol in a test tube. Record if the sample dissolves or not.

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**Conclusion**: Classify each unknown as having ionic, polar covalent, nonpolar covalent, or ionic bonds.