Lab – Analysis of A Hydrate

***Safety Hazards and Reminders:***

***1. Crucible and lid will be heated to high temperature- Handle with tongs.***

***2. All chemicals are mildly irritating to skin. Avoid contact.***

***3. Use caution around Bunsen burner. Turn off burner when not in use.***

***4. Follow safety guidelines.***

PROBLEM: A. To determine the formula and name of an unknown hydrate

1. To determine the percent of water in the hydrate
2. To become more familiar with the properties of hydrates versus anhydrous solids

BACKGROUND:

When an ionic solid is crystallized from a water solution, the crystal which forms often contains chemically-bound water molecules. The number of moles of water per mole of ionic substance is usually an integer – CuSO4:5H2O is known as copper (II) sulfate pentahydrate. Compounds of this sort are called **hydrates**. The water in a hydrate is bound loosely and so is relatively easy to remove by heating. Most hydrates lose their water of hydration at temperatures slightly above 100 C. Sometimes the water is liberated in stages, with one or more lower hydrates being observed during the heating process. Thus, CuSO4 may also be prepared with 3 moles of water or 1 mole of water per mole of ionic solid. If all the hydrated water is removed, as it will be if the solid is heated sufficiently, the ionic solid is said to be **anhydrous**.

You and your table will be given an unknown hydrate. You will know the formula of the anhydrous solid but you will need to find the number of moles of water per mole of anhydrous solid so you can determine the formula and name of the hydrate.

Video Prelab: For a typical lab set up and procedure of this lab view: http://www.youtube.com/watch?v=XOxoMYPWBC4&feature=results\_video&playnext=1&list=PLDC5A2CD193BC660C

PROCEDURE:

1. Find the mass of the crucible on an electronic balance and record.
2. Put about 3 grams of the hydrate sample in the crucible. Observe the appearance of the solid and record. Replace the cover and determine the mass and record.
3. Place the crucible on the clay triangle on a ring stand. With the cover on the crucible slightly ajar, heat the crucible and its contents for approximately until the water is driven off. Listen for the hissing sound indicating the water is evaporating. DO NOT STICK YOUR HEAD NEAR CRUCIBLE OR FLAME.
4. Place the crucible and cover on wire gauze to cool. Make sure the cover is ajar on the crucible. Let crucible cool to approximately room temperature. Waft hand near crucible to determine heat content. DO NOT TOUCH CRUCIBLE WHEN IT IS BURNING LAVA HOT. After it has cooled, find and record the mass of the crucible, cover and contents. Reheat for 2 minutes, cool as before, find and record the mass.
5. Observe the nature of the contents and compare to the observations you made when placing the solid into the crucible. Which one is more powdery? Which is more crystalline and shiny? How does adding water molecules to a solid change its appearance as the hydrate is formed? Record these observations.
6. Carry out your calculations and list results in the data/results chart. Show ALL set-ups for calculations.