Title:
Percent Composition of a Hydrated Crystal & the Empirical Formula of a Hydrate

Purposes:

1) To determine the percent water (by mass) in a hydrated crystalline ionic compound.

2) To determine the empirical formula of the hydrated ionic compound.

Background Information:
Some ionic compounds naturally absorb water from the air to form hydrates. Formulas for the hydrated crystals are written in the following manner: $MgSO_4 \bullet 7H_2O$. This means that for every one formula unit of $MgSO_4$ there are 7 water molecules incorporated into the crystalline structure. The water molecules are physically attached to the structure.

Today we will be working with $CuSO_4 \bullet XH_2O$ in order to experimentally determine:

1) the percentage of water by mass in this compound; and
2) the value of "X."

Materials:
balance, crucible and cover, ring stand, ring clamp, clay triangle, hydrated copper (II) sulfate, Bunsen burner.

Procedure:
Write a step by step procedure in which you underline each of the pieces of equipment and materials as you mention them. Hints: Use about 3-5 grams of solid. Don't forget to leave the lid "cracked" open to allow water vapor to escape. Heat for approximately 5 minutes. Find the mass of the crucible and lid only after they have cooled. Do not mass them while hot!!

Just for fun: after the lab, add drops of water one at a time to the dehydrated salt in order to re-hydrate it. Observe what happens. Dispose of the waste in the sink with lots of water.

Data:
What important pieces of data will you need? Don't forget anything:

Mass of crucible + lid	12.25 g
Mass of crucible + lid + hydrated salt before heating	16.42 g
Mass of crucible + lid + dehydrated (anhydrous) salt after heating	13.63 g

Calculations:

Show them clearly. Use appropriate units. Circle answers!

Purpose #1.

1. Calculate the mass of the original hydrated salt.

2. Calculate the mass of the water, which was driven off of the hydrated salt.

3. Calculate the % by mass of water in this hydrated salt.

Purpose #2

4. Calculate the mass of the dehydrated salt which remains after heating.

5. Calculate the number of moles of the dehydrated salt which remains after heating.

6. Calculate the number of moles of water which was driven off of the hydrated salt (for this calculation, begin with your answer from #2).

7. Calculate the value of "X" to two decimal places? In other words calculate the ratio of the moles of water to the moles of the dehydrated salt. This is the value of "X."

8. Write the formula of the hydrated salt.