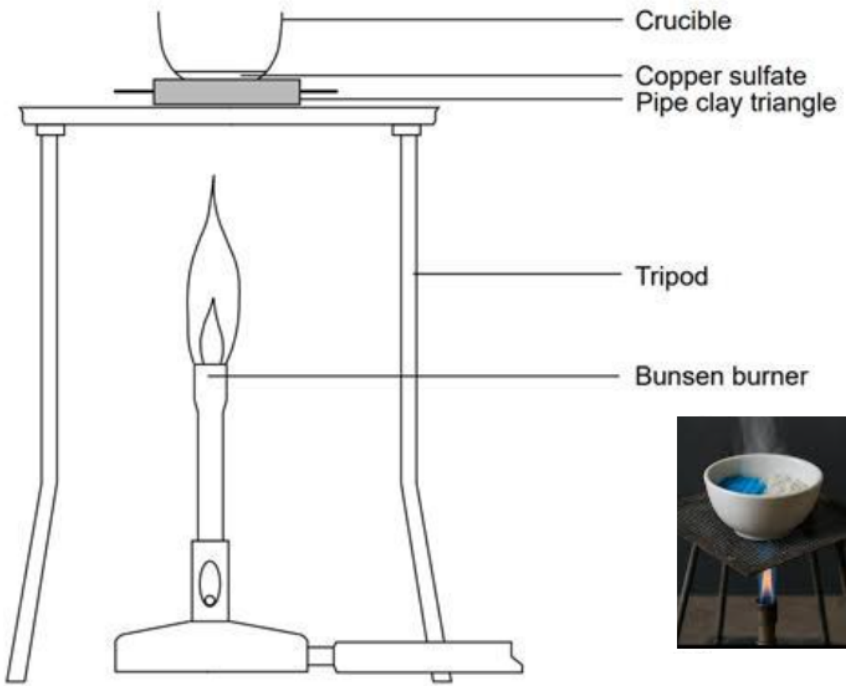
Determination of percent water of hydration and the Empirical Formula for the Hydrate of Copper (II) Sulfate: $Cu(SO_4)_{\cdot}$ X H_2O

Link to reference

*Name*_____



Materials: Copper sulfate hydrate, crucible, Bunsen burner, ring stand, wire gauze, electronic scale, tongs, instruction sheet.

Procedure

1. Prepare the set-up of the Bunsen burner, crucible and ring stand.
2. Heat the evaporating dish with the hottest part of the flame for three minutes to remove impurities.
3. Using crucible tongs, remove the crucible from the apparatus. Place it on an insulated pad and allow it to cool off for a few minutes.
4. Find the mass of the crucible to the nearest 0.01 gram. Record the mass.
5. Keeping the crucible on the balance, measure into it 2.00 grams of copper (II) sulfate hydrate. Record the exact mass of the crucible with the hydrate to the nearest 0.01 gram.
6. Record the appearance of the hydrate before it is heated.
7. Return the crucible with the hydrate to the wire gauze. Gently heat the hydrate by moving the burner back and forth around the dish. Try to avoid and popping or splattering.
8. Record observations of the hydrate during and after heating. If any of the solid appears to be turning brown, lower the heat.
9. Weigh the crucible with the hydrate. Record the mass.
10. Repeat steps 7-9 until constant mass is achieved (no further mass is lost).
11. Turn off the Bunsen burner after you think all of the water of hydration has been driven from the hydrate (heat to constant mass).The salt will become pale green color. Allow the evaporating dish to cool for about five minutes.
12. Measure and record the mass of the dish with the anhydrous salt.

Results and Calculations

- Observation chart: describe the physical appearance of the hydrate before, during, and after heating
- Data Table: include the following measurements (to the nearest 0.01 gram) *Reproduce the table if necessary.*

Item	**Mass-Trial 1**	**Mass- Trial 2**	**Average Mass**
Evaporating dish, X g			
Evaporating dish + Hydrate, Y g			
Evaporating dish + Anhydrous salt, Z g			
Hydrate (Y-X) g			
Anhydrous salt (Z-X) g			
Water lost from Hydrate, (Y-X)-(Z-X) g			

Show the following six calculations neatly in your lab report use the last two pages.

1. Calculate the percentage of water in your hydrate from Trial 1.

2. Calculate the percentage of water in your hydrate from Trial 2.

3. Using your average mass of water lost, convert grams of water to molesof water.

4. Using your average mass of anhydrous salt, convert grams of $CuSO_4$ to moles of $CuSO_4$.

5. Look at your answers to 3 and 4 above. Divide by the smaller of the two numbers to obtain the empirical formula for your hydrate. In other words, the ratio you obtain is the "x" in the formula $CuSO_4 \bullet x H_2O$.

Conclusion Questions

1. What is a hydrate?

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2. Why must you let the crucible cool slightly before measuring its mass?

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3. A student finished heating the hydrate, but wanted to leave for lunch. They asked the teacher if they could come in tomorrow to measure the mass of their anhydrous salt. What do you think the teacher's response was and justify your answer.

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Workspace