Lab: Empirical Formula of a Hydrate

Purpose: The purpose of this lab is to determine the empirical formula of a hydrate salt.

Theory: The empirical formula is the lowest whole-number ratio of elements for a compound. A hydrate is an ionic salt which has water as part of its crystalline structure. For example: $ZnCl_2 \bullet 2H_2O$. This is the empirical formula for Zinc chloride dihydrate. It is already in the lowest ratio. How would you calculate the Molar Mass from the Periodic Table?

Materials: crucible with lid, crucible tongs, ring stand, ring clamp, clay triangle, Bunsen burner, electronic balance, a hydrate salt

Safety: Use proper safety precautions when using a bunsen burner. Assume that the hydrate chemical is dangerous and should be treated with care. Avoid handling with bare skin.

Procedures:

1. Set up your Bunsen burner, ring stand, clamp, and triangle
2. Clean a crucible and its lid with water. Dry them by heating them with the burner for 5 minutes. Allow to cool (5-10 min). Weigh the crucible and lid. (Alternatively, an evaporating dish and watch glass can be used).
3. Add enough of the hydrate into the crucible so that it is at least 1/3 full. Weigh the crucible, lid, and hydrate (or evaporating dish, watch glass and hydrate).
4. Heat over the flame for 5 minutes. If using a crucible, make sure the lid is askew to allow steam to leave the crucible.
5. Allow to cool for 10 minutes. Weigh again.
6. Repeat Step 4 & 5 again. (In other words, you are going to heat it twice).
7. Dispose of the chemical into the trash can and rinse your equipment.

Honors Chemistry **Name(s):**_____

Bonita Vista High School _____

Topic: Stoichiometry _____

Observations and Data Collection

What does your hydrate look like before heating?	
Weight of the heating dish/lid	
Weight of the heating dish/lid/hydrate	
Weight after first heating	
Weight after second heating	
What does your hydrate look like after heating? (Note: this is now anhydrous)	

Analysis-SHOW ALL CALCULATIONS. INCLUDE UNITS.

1. Determine the mass of the hydrate used.

2. Determine the mass of the water that is lost during the heating.

3. Determine the moles of water driven off.

4. The instructor will give you the molecular formula of the **anhydrous salt.** Determine its molar mass.

5. Determine the mass of the anhydrous salt remaining.

6. Determine the moles of the anhydrous salt remaining.

7. Calculate the ratio between the moles of water and moles of anhydrous salt and express in the simplest whole number formed.

8. Based on your experimental data, write the empirical formula for your hydrate.

9. The empirical formula and the molecular formula turn out to be the same for your hydrate. Therefore empirical mass is equal to the molar mass. Determine the molar mass of your compound.

10. Your instructor will give you the true molar mass of your hydrate. Calculate the percent error in your molar mass.