LAB: Determining the Percent Water In a Hydrate Salt

Name: ___________________________
Period:_____ Date: ______________

BACKGROUND:

Many salts that are crystallized from aqueous solutions appear to be perfectly dry, yet, when heated, they liberate large quantities of water. The crystals change form, even color, as the water is driven off. Such compounds are called ***HYDRATES***. The number of moles of water present per mole of *anhydrous salt* (the compound without the water) is usually a whole number. The water is bonded to the metal atom in the compound by a special type of bond - called a *coordinate covalent* bond or *dative* bond.

In this experiment you will be asked to determine the percentage of water in a hydrate. You will determine the mass of the hydrated salt sample, drive off the water by heating, and find the mass of the anhydrous salt. By calculating the moles of water driven off and the moles of the anhydrous salt remaining, you will be able to determine the empirical formula of the hydrate.

MATERIALS:

___________• **n** H_2O	hot plate	evaporating dish	cooling pad (or wire gauze)
scoopula	tongs	hot hands	stirring rod

PROCEDURES:

1) Weigh an evaporating dish and record mass in the data chart. **Use the SAME balance for all weighings.**
2) Measure out **5.00 grams** of the hydrate sample in the evaporating dish and record the exact mass of the evaporating dish and hydrate. Record the chemical formula of the unknown hydrate.
3) Place the evaporating dish containing the hydrate onto a hot plate set on medium-high heat. **Observe**.
4) Heat the sample *approximately* 5 minutes. **Make sure not to let any of the sample escape from the dish!**
5) Let the evaporating dish cool on the cooling pad for 3-5 minutes. When cool to the touch, weigh the mass of the dish and its contents.
6) The sample needs to be heated to a **constant mass** to ensure all of the water has been evaporated. To do this, re-heat the anhydrous salt for 5 minutes, cool it to room temperature, and re-weigh to ensure that all of the water has been evaporated away.
7) Repeat this heating and cooling process until the mass of the dish and contents is **constant**.

DATA: (2 pts)

Mass of **EMPTY** evaporating dish:		
Mass of evaporating dish **AND** hydrate:		
These should be within +/- 0.10g	Mass of evaporating dish **AND** anhydrous salt after 1st heating	
	Mass of evaporating dish **AND** anhydrous salt after 2nd heating	

Formula of anhydrous salt (1 pt) =

CALCULATIONS: Show calculations in space provided – even if calculation is as simple as subtraction! **(2 pts each)**

MASS of hydrate:

MASS of anhydrous salt:

MOLES of anhydrous salt:

MASS of water that evaporated:

MOLES of water that evaporated:

MOLE RATIO of ANHYDROUS SALT to WATER: ***(round to nearest whole #)***

FORMULA of the hydrate **(1 pt)**:
NAME of the hydrate **(1 pt)**:

PRACTICE PROBLEMS: Be sure to show ALL of your work to receive full credit! (3 pts each)

1) A sodium carbonate hydrate has a mass of 8.85 grams. After heating for several minutes, the compound came to a constant mass of 7.57 grams. Determine the **formula** and **name** of this hydrate.

2) Write the **formula** and **name** of a hydrate consisting of 60.0 % iron (III) chloride and 40.0 % water. (Assume there is 100g of total hydrate compound).