NAME _____ PREF ____ SECTION SC_____ DATE _____

EXPERIMENT 19: THE FORMULA FOR A HYDRATE

Equipment: triple beam balance, 6" test tube, 150mL beaker, clamp, ringstand, Bunsen burner, tongs, test tube rack
Materials: 10g blue Cu_2SO_4 crystals

Many salts exist in two or more forms with respect to water content. Ionic crystals containing covalently bonded water (called HYDRATES) may be converted, by heating, to the form lacking water molecules (ANHYDRATES). A DOT indicates the water is not directly part of the compound but is bonded to it.

For example: $CaBr_2 \bullet 3H_2O_{(s)} + HEAT = CaBr_{2(s)} + 3H_2O(g)$.

IN THIS EXPERIMENT YOU'LL DETERMINE THE VALUE OF *X* IN ONE OR BOTH OF THE FOLLOWING COMPOUNDS: $CuSO_4 \bullet XH_2O$ AND $BaCl_2 \bullet XH_2O$

SAFETY WARNING: **All chemicals used in this lab are toxic if eaten. Wash your hands before leaving. WEAR EYE PROTECTION AT ALL TIMES !**

PROCEDURE:

Note: All readings should be to 2 or 3 decimal places depending on your balance.

I Find the mass (weight) of a salt sample.

1) Zero your balance and weigh a 6" test tube in a 150 mL beaker (both must be dry). Record the weight in spaces (B) and (D) (lines 2 and 5).

2) Fill the test tube to a height of about 1.5" with the copper compound (less than 10g. of the blue crystals). Weigh the test tube again (in the beaker) and record the weight in space (A) (line 1).

3) Subtract the container mass (weight) from the total to get the sample mass. (A-B=E).

Data Table - Record all measurements here.

$CuSO_4 \bullet XH_2O$	NOTE: W= Weight of beaker + test tube	
1 (A)	W + $CuSO_4 \bullet XH_2O$	____g
2 (B)	- W	____g
3 (E)	$CuSO_4 \bullet XH_2O$	____g
4 (C)	W + $CuSO_4$	____g
5 (D)	- W	____g
6 (F)	$CuSO_4$	____g
7 (E)	$CuSO_4 \bullet XH_2O$	____g
8 (F)	- $CuSO_4$	____g
9 (G)	XH_2O	____g

II Dehydrating the salt.

4) Clamp the test tube horizontally on a ringstand in the hood. The clamp should be near the mouth of the tube and the mouth should point into the hood.

5) Using the hottest flame (see exp. 1 Part F), heat the compound vigorously for at least 10 minutes. Hold the burner by the base and keep the flame moving under the sample in the test tube to avoid "hot spots." Also heat the empty part of the tube to drive out any water that may have condensed there. **Caution**: Avoid heating the clamp.

6) Use the clamp to transfer the hot test tube to the 150 mL beaker. Determine the weight and enter in space (C) (line 4).

III Clean-up and Disposal

7) When the tube and sample have cooled, empty your anhydrate into the designated container on the teacher's desk. Wash and invert the test tube you used. Put your balance near the center of the table with a major rider off zero.

IV Calculating the hydrate formula

8) To complete the calculations use the readings from the data table in the calculation box.

9) What is the formula for this hydrated salt? _____

V (If time permits, repeat the procedure with the barium compound using approximately 20 grams of the hydrate.)

VI **SUMMARY QUESTIONS**

1. What are the main sources of error in this experiment? _____

_____

_____

_____

2. What evidence is there for a chemical change? _____

_____

_____

Calculations

$CuSO_4 \cdot XH_2O$		
(F)	$CuSO_4$	____g
	gfw $CuSO_4$ = 160g/mole	
$\frac{(F)}{160}$	= moles $CuSO_4$	____ mole
(G)	XH_2O	____g
	gfw H_2O = 18g/mol	
$\frac{(G)}{18}$	= moles H_2O	____ mole
X =	$\frac{\text{moles } H_2O}{\text{moles } CuSO_4}$ =	____ mole
Calculate % error:	$\frac{\text{(Observed value) - (Accepted value)}}{\text{(Accepted value)}} \times 100$ =	
	Observed value = X =	
	Accepted value =	