Formula of a Hydrate Lab Name: _____

The formula of a hydrate can be determined by careful experimentation.

Materials

1. Safety Glasses
2. Evaporating dish
3. ring stand w/ ring
4. wire mesh w/ ceramic center
5. Bunsen burner
6. striker
7. tongs
8. Magnesium Sulfate sample

Part A. Set up your experimental apparatus

1. Observe the example setup done by Ms. Neiman.
2. Create your own setup in a similar fashion and have it approved by Ms. Neiman

3. Arrange the beaker and ring stand as shown in **Figure 1**.

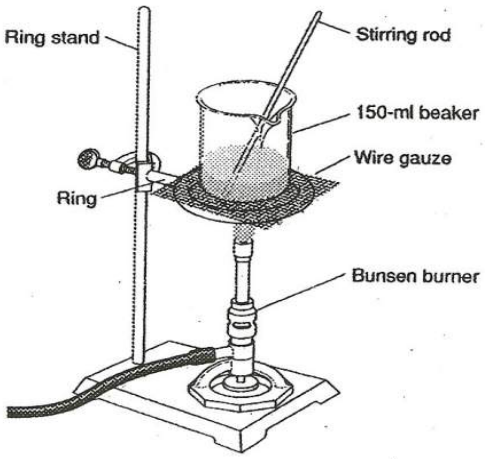

Figure 1
Apparatus to heat a solution

***** Note: You are using an evaporating dish, not a beaker! Same setup applies.**

Part B. Prepare your sample

1. Weigh evaporating dish on the scale and record this data.
2. Weigh out 5.0 grams of Magnesium Sulfate; record the exact weight of your sample.
3. Add the sample to the evaporating dish and record the weight of the sample plus the evaporating dish.

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Part C. Bye, Bye Water

1. Light your Bunsen burner and carefully lower the ring stand apparatus so that the mesh is just above the flame.
2. Place your evaporating dish on the mesh so that you are gently heating the evaporating dish for approximately 10 minutes.
3. Remove the evaporating dish from the heat using the tongs after 10 minutes.
4. Place the hot evaporating dish on your metal ring stand base. Allow to cool for at least 3 minutes.
5. Weigh the evaporating dish and sample on the scale.
6. Place the evaporating dish back on the heating apparatus for an additional 5 minutes.
7. Remove the evaporating dish form the heat using the tongs after 5 minutes
8. Place the hot evaporating dish on your metal ring stand base. Allow to cool for at least 3 minutes.
9. Weigh the evaporating dish and sample on the scale.
10. Compare this weight to the weight after 10 minutes. If the mass is within +/- 0.05 grams, you are finished. If not, continue to heat at 5 minute intervals until you reach a constant weight.

Part D. Questions Involving Formulas of Hydrates.

You must show all work… neatly hand written is ok.

1. Determine the mass of water driven off from the hydrate during heating.
2. Determine the mass of anhydrous salt remaining after the heating process.
3. Determine the percentage of water in the hydrate.
4. Determine the moles of anhydrous salt.
5. Determine the formula for the hydrate salt that you began with.
6. Explain in your own words: what is a hydrate?

Use the sample data to help you through the calculations and to help you set up your data tables for the experiment. Be sure to use your experimental data, not the numbers I have below… I used a different substance, but the way the calculations are done remains the same.

Sample Data/Calculations- Use this to help you with questions 1-5, but use your numbers, not mine!!!

1. Hydrate used: $(CuSO_4)_x(H_2O)_y$
2. mass of empty evaporating dish: 18.546 G
3. mass of evaporating dish plus hydrate: 20.832 G
4. mass of evaporating dish + contents (after 1st. heating): 20.597 G
5. mass of evaporating dish + contents (after 2nd. heating): 20.596 G
6. mass of hydrate used (#3 - #2): 20.832 - 18.546 = 2.286 G
7. mass of water driven off (# 3 - #5): 20.832 - 20.596 = 0.236 G
8. mass of anhydrous salt left behind (# 5 - #2): 20.596 - 18.546 = 2.050 G
9. percentage of water in hydrate (#7/#6): 0.236 / 2.286 = 10.3 % (3 sig. digits)
10. percentage of anhydrous salt left behind (#8/#6): 2.050 / 2.286 = 89.68 % (4 sig. dig.)
11. mols of anydrous salt present in hydrate (#8/molar mass of anhydrous salt)= 2.050 / 311.392 = 0.006583
12. mols of water present in hydrate (#7/molar mass of water)= 0.236 / 18.01 = 0.01310
13. mol ratio of water to salt (# 12/ # 11) : 0.0131/0.00658 = 1.99 (2 to 1)
14. Plug ratio into above formula water value in for y
15. Formula $CuSO_4(H_2O)_2$