

## Hydrate Lab #2 - Magnesium sulfate heptahydrate

Name: \_\_\_\_\_

40/1200

A hydrate is an ionic compound that has a specific amount of water as part of its structure. The water is loosely bonded to the compound and is in a definite ratio. Various hydrates have different ratios but the ratio is specific for a given hydrate. In this lab you will be using magnesium sulfate heptahydrate, also known as Epsom Salts.

When a hydrate is heated the water is released as steam. The remaining ionic compound is now known as an anhydrous salt. You will be heating up magnesium sulfate heptahydrate in this lab. The hydrate is white in color and the anhydrous salt is white as well. When the water (the hydrate part) escapes as steam, you are left with just magnesium sulfate.

Using the concept of % composition by mass, you can determine exactly what the percentage of water is in this large compound. You can then measure out some of this HYDRATE, heat it up and get the new mass of the ANHYDROUS SALT. The mass difference should match up with your calculations. Then you can do your percent error comparing your measured value with the ACTUAL or calculated value. This lab works pretty well if you are careful. When heating the HYDRATE, keep the lid on the crucible so none "pops" out when the water boils away.

WRITE THE FORMULA FOR THIS COMPOUND: \_\_\_\_\_

### PROCEDURE:

1. Get equipment set up as shown by teacher. Measure out 3.00 grams. Start heating.
2. Determine the molar mass of this compound. Determine the % composition by mass of the water in this compound - (This will be Lab Question #1)
3. Warm the compound until it turns white (about 8 minutes). Cool your crucible, then re-mass the crucible with the salt. Record your data. Over heating will cause a chemical reaction – not just water evaporation, which will give you problems.
4. Re-heat for one minute. Cool and re-mass. If the mass has remained constant (within 0.01 grams) you are done. If not, you must re-heat again and re-mass again.
5. This compound starts white in color and stays white as the anhydrous salt. There is no need to "re-hydrate" it, you couldn't tell from a color change. Put salt in trash can.

Two very important safety items: Hot crucibles do not look hot but they can be skin burning hot! Hot crucibles can melt scale pans too. They cost eleven dollars each. Please say out loud to your lab partner: "I promise to cool my crucible before massing on the scales, AND, before adding water in step 8". Sit crucibles at least 2 minutes on the black tables before placing on scales. Promise!

While your hydrate is heating up, determine the molar mass of the Magnesium sulfate heptahydrate. Then determine the actual percent composition by mass of water in this hydrated ionic compound.

Molar mass

\_\_\_\_\_

% Comp by mass

<b>Data Table</b>	
Mass of crucible empty	
Mass of crucible and hydrate	
Mass of crucible and salt (end)	
Mass of missing water	
Mass of anhydrous salt left over	

Lab Questions - do these on one sheet of loose leaf paper

1. State the molar mass of magnesium sulfate heptahydrate, then the percent by mass of water in magnesium sulfate heptahydrate.
2. Determine the measured percent composition by mass of water in magnesium sulfate heptahydrate. Then compare your measured value with the actual value from question 1 using %error.
3. What is the mass in grams of 6.00 moles of magnesium sulfate heptahydrate?
4. What is the mass in amu of 6.00 formula units of magnesium sulfate heptahydrate?

page	This lab requires	points
Cover	Title, short intro paragraph	1 + 2 = 3
2	data table on the second page of this lab report	3
3	4 questions above	10
Last	Conclusion - every lab report should have these 4 parts: What did you measure, what did you calculate, what is your % error, and what can you conclude or decide from this lab work? Use lots of numbers, use details and not story. Work hard on this part.	9  25 total points