

Name: _____

We have already seen that 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. Different hydrated ionic compounds will have different numbers of molecules of water that normally attach to it. Each of these hydrated compounds has a specific number of water molecules that do attach to it.

CuSO_4 holds 5 waters (pentahydrate).

This one holds onto 7 water molecules at a time.

You will be using magnesium sulfate heptahydrate.

When a hydrate is heated this water is released as steam.

The dehydrated ionic compound is now called an anhydrous salt. This hydrate is white in color, as is the anhydrous salt is white. When the water (hydrate part) escapes as steam, you're left with just magnesium sulfate anhydrous salt.

There is NO COLOR CHANGE in this lab.



Using the percent composition by mass formula, you can measure the water in this hydrate, then compare it to the actual value that you measure. This lab works well if you are careful.

PROCEDURE:

1. Get equipment set up as shown by teacher. Mass the evaporating dish empty and dry.
2. Measure out 3.00 grams of hydrate, start heating - not super hot, just evaporate the water away.
3. While heating for 14 minutes, calculate the molar mass of this compound on the next page. Then do the percent composition by mass for this compound as well.
4. Stop heating after 14 minutes. Cool your evaporating dish on the table for 4 minutes, record the mass the dish with the salt.
5. Re-heat for two minutes. Cool down for 4 minutes, and then re-mass. If the mass has remained within 0.01 gram you are done. If not, you must repeat this step.

Some people soak their feet in Epsom salts.

Some take it as a laxative.

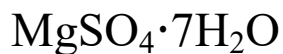
Keep it out of your mouths!

When done, wash the evaporating dish with soap and water.

Then wash your hands.

Calculate the molar mass of magnesium sulfate heptahydrate. Then do the percent composition by mass for all of the compound. Please TREAT THE WATER as a unit, List Mg, S, O, and H₂O. Do not break up the WATER!

Molar mass



% Comp by mass

Mg

Mg

S

S

O

O

H₂O

H₂O

	Data Table	Mass in grams		
A	Mass of evaporating dish empty			Scale mass
B	Mass of evaporating dish + hydrate			A + 3.00 g
C	Mass of evaporating dish + salt (final)	First heating	Second heating	Scale mass
D	Mass of anhydrous salt left over			Lowest C - A =
E	Mass of the missing water			3.00 g - D =

Lab Questions - do on loose leaf paper - SHOW WORK + Formulas

1. State the % comp by mass of water in $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (this is your actual value)
2. Calculate % comp by mass of water in your 3.00 grams of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ (this is your measured value)
3. Calculate your percent error (SF and sign required)
4. Fill in chart into your questions, fill in the blanks with units.

	Species	Molar mass (with unit)	Atomic mass (with unit)
A	One Mg		
B	One S		
C	Four O		
D	Seven H_2O		
E	One $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$		

5. What is the mass of 7 moles of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$?
6. What is the mass of 7 formula units of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$?
7. Calculate the percent composition by mass of bismuth in bismuth (III) oxalate.
8. Calculate the percent composition by mass of iron in iron (III) dichromate.
9. Calculate the percent composition by mass of oxygen in ammonium phosphate
10. Calculate the percent composition by mass of tungsten in tungsten phosphide.
11. Calculate the percent composition by mass of sulfur in Nickel (III) sulfate.
12. Calculate how many formula units are in 182.7 grams of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$
13. Skip this one
14. How many grams of magnesium are in 3.00 grams of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$?
15. One pound is 454 grams. How many grams of sulfur are in exactly 454 grams of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$?
16. How many grams of sulfur are in exactly 454 grams of $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$?

page	This lab requires	points
Cover	Title, short intro paragraph	1 + 1 = 2
2	The 15 questions above	15
Last	Write a short summary of what the point of the lab experiment was. State specifically: what did you measure, what did you calculate, what's your percent error, and why did you get it? What do you conclude about this concept of % composition by mass. Make sure you <u>use your data numbers</u> : do not hint at anything, say it clearly.	8 25 total points