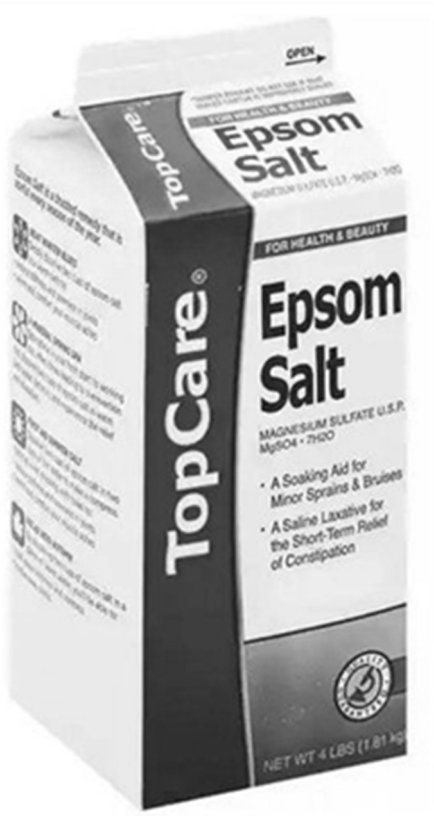
Magnesium Sulfate Heptahydrate Lab

Percent Comp by Mass 40/1200 minutes 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.



We saw $CuSO_4 \cdot 5H_2O_{(S)}$ which is a pentahydrate. This lab uses the compound $MgSO_4 \cdot 7H_2O_{(S)}$ which holds 7 water molecules per formula unit.

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, and so is the anhydrous salt. When the water (hydrate part) escapes as steam, you're left with just magnesium sulfate—the anhydrous salt.
There is NO COLOR CHANGE in this lab.

$$MgSO_4 \cdot 7H_2O_{(S)} \xrightarrow{\text{heat}} MgSO_{4(S)} + 7H_2O_{(G)}$$

Using the percent composition by mass formula, you can measure the water in this hydrate, then compare it to the actual value that you calculate. 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. Data on page 2.

2. Put 3.15 grams of $MgSO_4 \cdot 7H_2O$ into the evaporating dish, heat the evaporating dish for 24 minutes.

3. While heating, calculate the molar mass and the percent composition by mass for this compound too.

4. Cool your evaporating dish on the table for 4 minutes. Record the mass of the dish with the salt.

Safety

Hot evaporating dishes do not look hot but they can be skin burning hot!
Hot dishes can melt the top of the scales. The tops to the scales cost $25.

	Data Table	Mass in grams	This is…
A	Mass of evaporating dish empty	grams	Mass of empty dish
B	Mass of evaporating dish + white hydrate	grams	Dish + 3.00 g hydrate
C	After heating Mass of evaporating dish + the white salt	grams	Dish + anhydrous salt
D	Mass of just the anhydrous salt	grams	"C" minus "A"
E	Mass of the evaporated water	grams	3.00 g minus "D"

Calculate the molar mass of copper (II) sulfate pentahydrate. Then do the percent comp. by mass for the whole compound. TREAT THE WATER as a unit: Calculate for: Cu, S, O, and H_2O. Molar mass has UNITS.

Molar mass

$\underline{MgSO_4 \cdot 7H_2O}$

Mg

S

O

H_2O

% Comp by mass

Mg

S

O

H_2O

Lab Questions - do <u>on loose leaf paper</u> - SHOW ALL WORK + Formulas

1. State the % comp by mass of water in $MgSO_4 \cdot 7H_2O$ (you already did this on page 2)

2. Calculate % comp by mass of water in your 3.15 grams of the $MgSO_4 \cdot 7H_2O$
   **** You MUST write the % comp formula from the reference table first

3. Calculate your percent error between your measured percent comp water and the actual percent comp by mass of water in the compound. (SF and sign required)

4. Calculate the % comp by mass of anhydrous salt left over in your evaporating dish from the original 3.00 grams of compound that you started with.
   **** You MUST write the % comp formula from the reference table first

5. Calculate the percent composition by mass of bismuth in bismuth (III) oxalate.
   (round to whole number)

6. Calculate the percent composition by mass of iron in iron (III) dichromate.
   (round to whole number)

7. How many formula units are in 3.15 grams of $MgSO_4 \cdot 7H_2O$?

8. Calculate how many formula units are in 182.7 grams of $MgSO_4 \cdot 7H_2O$.

9. How many grams of magnesium are in 3.15 grams of $MgSO_4 \cdot 7H_2O$?

10. What is the mass of 7.00 moles of $MgSO_4 \cdot 7H_2O$?

11. What is the mass of 7 formula units of $MgSO_4 \cdot 7H_2O$?

12. One pound = 454 grams. How many grams of sulfur are in 454 grams of $MgSO_4 \cdot 7H_2O$?

13. skip

there are a few more questions on the next page, but you're getting close to the end!

14. How many grams of water are in 454 grams of $MgSO_4 \cdot 5H_2O$?

15. In 125 grams of bismuth (III) oxalate, how many grams are just bismuth?

16. In 333 grams of iron (III) dichromate, how many grams are just chromium?

17. Calculate the % Comp by mass of H_2O in vanadium (V) bromide dihydrate.

18. Of 189 grams of vanadium (V) bromide dihydrate, how many grams are bromine?

19. One mouthful of water is approximately 45.0 milliliters. How many molecules of water will fit inside of your mouth at once?

page	This lab requires	points
Cover	Title, short intro paragraph	1 + 2 = 3
2	The 18 lab questions	18
Last	Conclusion What did you measure? What did you calculate? What was your percent error and why did you get that? What can you conclude about this lab experiment?	4
	This lab is due on	25