

Composition of a Hydrate Lab - Copper (II) Sulfate Pentahydrate

Name: _____ 80/1200 due: _____

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 amounts of water that normally attach, but the number of water molecules is specific for each given hydrate. You will be using copper (II) sulfate pentahydrate.

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 the copper (II) sulfate pentahydrate in this lab. The hydrate is blue in color and the anhydrous salt is white. When the water (the hydrate part) escapes as steam, you are left with just copper (II) 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 well if you are careful.

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. Allow crucible to cool for at least five minutes. Then, using an eyedropper, add three drops of water to the crucible. Watch what happens. (Q#5 in lab questions)

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 \$18 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 copper (II) sulfate pentahydrate. Then determine the actual percent composition by mass of water in this hydrated compound.

Molar mass

% Comp by mass

Data Table	
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 copper (II) sulfate pentahydrate, then the percent by mass of water in copper (II) sulfate pentahydrate
2. Determine the measured percent composition by mass of water in copper (II) sulfate pentahydrate. Then compare your measured value with the actual value from question 1 using % error.
3. What's the mass in grams of 6.00 moles of copper (II) sulfate pentahydrate?
4. What's the mass in amu of 6.00 formula units of copper (II) sulfate pentahydrate? THINK!
5. Why did the copper (II) sulfate anhydrous salt, which is white, turn blue again when you dripped some water into it at the end of this lab experiment?

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	Five 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