

Percent Water in a Hydrate

Data Table

“Unknown” hydrate label code (Step 1)	
Color and appearance of unknown hydrate (Step 1)	
Mass of test tube (Step 4)	
Mass of test tube and hydrate (Step 5)	
Mass of test tube and anhydrous residue (Step 13)	
Mass of test tube and anhydrous residue after second heating (Step 14)	
Color and appearance of anhydrous residue (Step 15)	

Post-Lab Questions *(Show all work in the space provided.)*

- Calculate (a) the original mass of the hydrate, (b) the mass of water lost upon heating, and (c) the percent water in the hydrate.
- The unknown hydrate is one of the following substances. Complete the table to calculate the theoretical percent water for each hydrate (see Question #3 in the *Pre-Lab Questions*).

	$\text{AlK}(\text{SO}_4)_2 \cdot 12\text{H}_2\text{O}$	$\text{MnCl}_2 \cdot 4\text{H}_2\text{O}$	$\text{ZnSO}_4 \cdot 7\text{H}_2\text{O}$
Sum of atomic masses (anhydrous salt)	258.15	125.83	
Sum of atomic masses ($n\text{H}_2\text{O}$)	216.24		
Sum of atomic masses (hydrate)			
Percent water in hydrate (theoretical)			

- What is the probable identity of the unknown crystalline hydrate? Explain your reasoning.

4. Assume you have correctly identified the unknown. Calculate the percent error in the percent water analysis.

$$\text{Percent error} = \frac{|\text{Experimental value} - \text{Literature value}|}{\text{Literature value}} \times 100\%$$

5. Compare your results for the percent water in the hydrate with other groups that analyzed the same unknown. How precise are the results?

6. Describe any changes in the color and appearance of the solid before and after heating.

7. Is the unknown hydrate a mixture or a pure substance? Explain your reasoning.

8. What is the difference between a physical change and a chemical change? Is the conversion of the hydrate to its anhydrous salt an example of a physical change or a chemical change? Explain.

9. Consider the following potential sources of error in this experiment. Predict whether the experimental percent water in the hydrate will be high (H), low (L) or unchanged (NC) as a result of each error.

Source of Experimental Error

Result

Water was observed around the mouth of the test tube after heating.

The anhydrous residue decomposed upon heating, liberating a gas.

The hydrate spattered during heating and some of the sample was lost.
