

## Honors Chemistry Lab #10- Hydrate Analysis

The polarity of the water molecule, which makes it a great solvent for ionic compounds, causes water molecules to cling to the structure of solid substances. When this occurs, the trapped water molecules are called water of hydration and they become an integral part of the crystal lattice structure. The crystal will be able to incorporate a definite number of moles of water per mole of the anhydrous ionic substance. This number is stated in the formula of the hydrate, as in the formulas  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$  and  $\text{CuSO}_4 \cdot n\text{H}_2\text{O}$ . There are many compounds that tend to absorb water vapor from the air. These compounds are said to be *hygroscopic*, and can be used as moisture-reducing agents. Other compounds absorb such large quantities of water vapor that they will dissolve in their own water of hydration, a property known as *deliquescence*. In this experiment, you will test a hygroscopic ionic compound to determine its water of hydration. Although the water molecules are securely attached to the ionic solid that you will test, they are susceptible to removal by heat.

**Ask a Question:** How can I design an experiment to determine the water of hydration for a compound?

**Possible Materials:** crucible with cover, crucible tongs, ring stand, ring, and clay triangle, Bunsen burner, magnesium sulfate,  $\text{MgSO}_4 \cdot n\text{H}_2\text{O}$ , copper(II) sulfate,  $\text{CuSO}_4 \cdot n\text{H}_2\text{O}$ , manganese(II) sulfate,  $\text{MnSO}_4 \cdot n\text{H}_2\text{O}$ , sodium carbonate,  $\text{Na}_2\text{CO}_3 \cdot n\text{H}_2\text{O}$ , balance

**Research:** Take some time to read back through the background information. Devise a detailed research plan to present to Mr. Pedersen. Make sure the entire procedure is recorded in your STEM journal before asking for permission to start your research and conduct your first trial. Once approved, you will need to make a data table for your evidence. I will provide you with the accepted (i.e., known) value for each sample you choose to explore.

**Make a Claim:** Make your claim based on the analysis of your data and evidence.

**Summarize:** Summarize your data, conclusions, and any modifications you would make to future investigations. Your conclusion should show how or why the data are relevant and support the claim. You should justify why the evidence is important to the claim. Your conclusion should always indicate the relationship to one or more scientific or math principles (i.e., Georgia Standards of Excellence and College Board Learning Objectives).

Please self-assess your lab report using the STEM Journal rubric/checklist.

A.R.M.S.