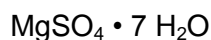


# DETERMINING THE EMPIRICAL FORMULA FOR A HYDRATED SALT

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Sometimes water is an integral part of an ionic crystal structure. The water in the crystal is given the term **water of hydration**. For instance, for every formula unit of magnesium sulfate (i.e. for every magnesium ion and sulfate ion) there are also seven water molecules. This is usually denoted as follows:



In this lab you will plan, design, and carry out an experiment to find out how many water molecules are attached to the hydrated salt copper (II) chloride.

## Background Information:

- Copper (II) chloride is a blue crystal in the hydrated form. In the dehydrated form (when the attached water molecules are no longer within the crystalline structure), it turns to a rusty brown powder. Gentle heating within a crucible usually is sufficient for dehydrating this material.
- As with all chemicals, take care to avoid direct contact with this chemical. Should you get some on your skin, wash it off with soap and water.
- Place your dehydrated chemical in the waste beakers provided in the lab.

## Part 1: Preliminary Questions:

1. What is the proper chemical formula for copper (II) chloride?
2. What is the molar mass of copper (II) chloride?
3. What is the molar mass of water ( $\text{H}_2\text{O}$ )?

## Part 2: Experimental Design

Provide a brief but complete outline of your experimental approach. Include the necessary information to address the items listed below, and have your teacher check and initial this procedure prior to actually starting the lab.

1. A detailed method describing your approach to the problem.
2. Equipment and materials to be used.
3. How long you intend to heat your crystals after they have changed color.
4. Means for recording and organizing observations/data.
5. Safety

## Part 3: Your Report

The report of your experiment should include the following;

1. A brief introduction to the problem.
2. Your experimental methods.
3. Results: (All data collected during your procedure as well as all calculations used to obtain your final answer.) Be sure to provide what you believe to be the correct chemical formula showing the proper number of  $\text{H}_2\text{O}$  molecules attached to each formula unit of your crystal (as shown for the magnesium compound above). Also in this section, abide by the rules of significant figures.
4. Error Analysis: Anytime lab work is done, there are inevitable errors that will arise. In this section, discuss the sources of the errors and the effects of those errors. You should work your errors through the calculations that you did to discuss how the error affected your results.