**Percent Composition of Hydrates Lab**

**Introduction**:

Certain ionic compounds that form crystal structures can have water weakly bonded to it. These compounds are known as “hydrates.” The formula for a hydrate ends with a “• X H2O,” with X being any whole number. Naming hydrates involves using the prefixes used in covalent bonds. For example:

MnSO4 • H2O = Manganese Sulfate Hydrate

CuSO4 • 5 H2O = Copper (II) Sulfate Pentahydrate

Ionic crystallized structures will often have very high melting points. For example, Calcium Sulfate has a boiling point of approximately 1460oC! In comparison to water, which has as boiling point of 100oC, Calcium Sulfate is very difficult to melt. This fact will come in very useful in the lab we are conducting today.

**Purpose**:

Use heat, and water’s relatively low boiling point to assess what your unknown samples are. You will be using percent composition in order to obtain your correct answers.

**Materials**:

Crucible Hot Plate Samples Tongs

**Procedure**:

1. Plug in hot plate and turn to the highest possible heat setting (“10”). Once the hot plate is on, DO NOT TOUCH THE PLATE WITH YOUR BARE HANDS.
2. While the hot plate is heating up, find the mass of your crucible without any materials inside. Record the information onto your data table.
3. Obtain your first material from the teacher’s lab desk. You will want to get a relatively small amount, approximately 1 gram. Place this amount inside your crucible and once again find the mass. Record the information onto your data table.
4. Once the mass has been recorded, place the crucible onto the hot plate (bare hands is okay) and leave to heat up for 5 minutes. One member of your group is responsible for keeping the time.
5. Once 5 minutes have passed, USE THE TONGS to remove the crucible from the hot plate. Place the crucible onto the scale and record its (potentially) new mass onto your data table.
6. Using the tongs, carry the crucible over to the sink and carefully rinse out the material inside with running water.
7. Repeat Steps 2-6 for the remaining samples left to test. You will be doing 4 samples total.

**Hypothesis**:

When you are heating up the various unknown substances, do you think the mass of the hydrates will change over time? Why or why not?

**Pre-Laboratory** **Questions**:

1. Which of the materials listed as your possible choices will serve as your control during this experiment? How do you know (hint: look at the chemical formulas)?
2. Which of the samples do you think will have the biggest change of mass after heating? Why do you think so?
3. What is the name of MgCl2 •6H2O. What is its mass?
4. Of the mass you calculated in problem #3, find the Percent Composition for water (H2O).

**Data** **and** **Observations**:

Mass of Crucible: \_\_\_\_\_\_\_\_\_\_\_g

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Sample** | Total Mass – Mass of Crucible **BEFORE** | Total Mass – Mass of Crucible **AFTER** | **H2O mass**  *(Before – After)* | **H2O % Comp.**  *(H2O/BEFORE)* | **Sample Formula** | **Sample Name** |
|  |  |  |  |  |  |  |
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|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

In the space below, list the hydrates provided in the beginning of class. Calculate the Percent Composition of **water** (***H2O***) for all of the hydrates. This will help you figure out which substance your unknown samples are.

**1 mol H2O = \_\_\_\_\_\_\_\_\_\_ g**

Unknown # \_\_\_ Unknown # \_\_\_

Unknown # \_\_\_ Unknown # \_\_\_

**Post-Laboratory** **Questions**:

1. Briefly describe the method used to identify each substance? How were you able to tell which substance was which?
2. After doing this experiment, most of the samples experienced a change of mass. Why did this occur?
3. Did the percentages match up perfectly in your experiment? If not, why do you think this occurred?
4. Find the percent error for each of your four samples tested. Remember, the formula is:

|(Theoretical % – Actual %)

x 100

Actual %