

# 3. Hydrated Compounds

- [Page 8](#)
- [Page 9](#)
- [Page 10](#)

## Lab 3. Hydrated Compounds

### Purpose:

To use hydrated compounds to practice calculating how much water molecules are attached to other molecules and compounds.

### Procedure:

1. Clean the crucible with water, dry it with a paper towel, and heat it for 2-3 minutes using the Bunsen burner.
2. Let the crucible cool for 3-5 minutes. Use the crucible tongs to carry the crucible to a balance and mass the empty crucible.
3. Mass out 3g of the assigned hydrated compound into the crucible.
4. Heat the crucible and its contents for about 10 minutes.
5. Let the crucible cool and re-mass it.
6. Heat the crucible and its contents for 2 more minutes.
7. Let the crucible cool and re-mass it.
8. If the last mass does not agree within 0.02g with the last mass reading, reheat the crucible and re-mass it until the last two measurements are within 0.02g of each other.
9. After final massing, place the crystals in the waste container provided. Clean the crucible, and clean the lab area.
10. Determine the percentage of the water in the assigned hydrated compound.

### Data:

Mass of crucible: 13.08g

Mass of hydrated compound: 3g  $\text{MgSO}_4 \cdot \text{H}_2\text{O}$

# Page 9

Mass of crucible and hydrated compound: 16.08g

Mass of crucible and anhydrous compound(first heating): 14.55g

Mass of crucible and anhydrous compound(second heating): 14.55g

## Observations:

The  $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$  turned a more white color and seemed to melt into a single mass. It started off as clear granules(like table salt), and ended up as a single white mass. Mass went down after heating.

## Analysis:

Mass of anhydrous compound:  $14.55\text{g} - 13.08\text{g} = \underline{1.47\text{g MgSO}_4}$

Mass of water in hydrated compound:  $3\text{g} - 1.47\text{g} = \underline{1.53\text{g H}_2\text{O}}$

Moles of anhydrous compound:  $1.47\text{g} / (24.30 + 32.06 + 4 \cdot 16.00) = \underline{12.2 \cdot 10^{-3} \text{ mol MgSO}_4}$

Moles of water in hydrated compound:  $1.53\text{g} / (2 \cdot 1.008 + 16.00) = \underline{84.9 \cdot 10^{-3} \text{ mol H}_2\text{O}}$

Ratio of moles of anhydrous compound to moles of water:  $12.2 \cdot 10^{-3} / 84.9 \cdot 10^{-3} \text{ mol MgSO}_4 : 84.9 \cdot 10^{-3} / 12.2 \cdot 10^{-3} \text{ mol H}_2\text{O} = 1:6.959 \sim \underline{1:7 \text{ mol. MgSO}_4 \cdot 7\text{H}_2\text{O}}$

## Conclusion:

The purpose of this lab was to use hydrated compounds to practice calculating how many water molecules are attached to hydrated compounds. We achieved this purpose by heating and weighing hydrated compounds until there was no water left and calculating the difference between the hydrated compound and anhydrous compound to find how much water was in the hydrated compound. Potential sources of error may be inaccuracies in weighing, contamination, or water that didn't get evaporated. Potential improvements may include a moisture-free environment, and a better controlled heating solution and weighing system. From the analysis, there was about 1.53g of water in the 3g of  $\text{MgSO}_4 \cdot x\text{H}_2\text{O}$ , leaving about 1.47g of  $\text{MgSO}_4$ ,  $\sim 51\% \text{ H}_2\text{O}$ .

# Page 10

10/14/24

I get a ratio of 1:9.6 mol  $\text{MgSO}_4$ : $\text{H}_2\text{O}$ , the correct ratio is 1:7. My results are pretty accurate. The water must have been pretty close to completely evaporated, assuming the scale was 100% accurate. The error most likely comes from an inaccurate scale, given how close the answer is to the actual value.