

Name _____ Date _____ Period _____

Chem 07-32 Wkst D Hydrates

A 10.0 g sample of hydrated copper(II) sulfate is heated to drive off the water. The dry sample has a mass of 6.4 g. What is the mass of the water driven off? What is the formula of the hydrated crystal?

Solving Process:

What mass of water was driven off?

$$\begin{array}{r} 10.0 \text{ g CuSO}_4 \cdot x \text{ H}_2\text{O} \\ - 6.4 \text{ g CuSO}_4 \\ \hline 3.6 \text{ g H}_2\text{O} \end{array}$$

Convert the masses of water and anhydrous copper (II) sulfate to moles.

Molar mass of CuSO₄

$$\begin{array}{r|l} 1 \text{ mole Cu} & 63.55 \text{ g Cu} \\ \hline & 1 \text{ mole Cu} \end{array} = 63.55 \text{ g Cu}$$

$$\begin{array}{r|l} 1 \text{ mole S} & 32.06 \text{ g S} \\ \hline & 1 \text{ mole S} \end{array} = 32.06 \text{ g S}$$

$$\begin{array}{r|l} 4 \text{ mole O} & 16.00 \text{ g O} \\ \hline & 1 \text{ mole O} \end{array} + \underline{\hspace{2cm}} = 159.61 \text{ g/mole CuSO}_4$$

$$\begin{array}{r|l} 6.4 \text{ g CuSO}_4 & 1 \text{ mole CuSO}_4 \\ \hline & 159.6 \text{ g CuSO}_4 \end{array} = \begin{array}{l} \text{Divide by the smallest} \quad \text{Mole Ratio} \\ \underline{0.040} \text{ moles CuSO}_4 = 1 \text{ mole CuSO}_4 \\ 0.040 \end{array}$$

Molar Mass of Water

$$\begin{array}{r|l} 2 \text{ mole H} & 1.01 \text{ g H} \\ \hline & 1 \text{ mole H} \end{array} = 2.02 \text{ g H}$$

$$\begin{array}{r|l} 1 \text{ mole O} & 16.00 \text{ g O} \\ \hline & 1 \text{ mole O} \end{array} + \underline{\hspace{2cm}} = 18.02 \text{ g/mole H}_2\text{O}$$

$$\begin{array}{r|l} 3.6 \text{ g H}_2\text{O} & 1 \text{ mole H}_2\text{O} \\ \hline & 18.02 \text{ g H}_2\text{O} \end{array} = \begin{array}{l} \underline{0.200} \text{ mole H}_2\text{O} = 5 \text{ moles H}_2\text{O} \\ 0.040 \end{array}$$

The ratio between CuSO₄ and H₂O is 1 mole CuSO₄ to 5 moles H₂O.

The formula is written as CuSO₄ · 5 H₂O Copper (II) Sulfate Pentahydrate

Find the formulas for the following hydrates.

1. 3.71 g Na₂CO₃ and 6.29 g H₂O
2. 0.546 g CoCl₂ and 0.454 g H₂O
3. 75.5 g CaCl₂ and 24.5 g H₂O