Pre-lab:

1. Epsom salt is a hydrate with the formula $MgSO_4 \cdot \textcircled{7}H_2O$. Calculate the percentage of water in Epsom salt.

$$\text{Hydrate} = \text{Ionic cmpd} + H_2O$$

$$\% \text{ composition} = \frac{\text{part}}{\text{whole}} \times 100$$

$$\% H_2O = \frac{\text{mass } H_2O}{\text{mass Hydrate}} \times 100 = \frac{(7)(18.02)}{246.51} \times 100$$

$$= \boxed{51.17 \%}$$

2. Washing soda is a hydrated compound whose formula can be written $Na_2CO_3 \cdot xH_2O$, where x is the number of moles of H_2O per mole of Na_2CO_3. When a 2.123 g sample of washing soda was heated at 130°C, all of the water of hydration was lost, leaving 0.787 g of anhydrous sodium carbonate. Calculate the value of x.
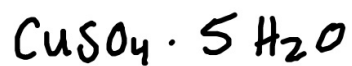
$$\text{Hydrate} = \text{Ionic cmpd (anhydrous)} + H_2O$$

$$2.123 \, g = 0.787 \, g + H_2O$$

$$\text{mass } H_2O = 1.336 \, g \, H_2O$$

$\boxed{x = 10}$

Empirical Formula:
$Na_2CO_3 \cdot 10 \, H_2O$

$$\frac{0.787 g \, Na_2CO_3}{} \Bigg| \frac{1 \, mol \, Na_2CO_3}{105.99 \, g \, Na_2CO_3} = .007425 \Bigg/ \frac{= 1 mol}{.007425} \, Na_2CO_3$$

$$\frac{1.336 g \, H_2O}{} \Bigg| \frac{1 \, mol \, H_2O}{18.02 \, g \, H_2O} = .0741398 \Bigg/ \frac{}{.007425} = 10 \, mol \, H_2O$$

$CuSO_4 \cdot 5 H_2O$

④ $\% H_2O = \dfrac{(5)(18.02)}{249.71} = $ ⬜

⑤ $\% H_2O = \dfrac{\text{mass } H_2O \text{ evolved}}{\text{mass hydrate}} = $ ⬜ $\%$