

a. The above reaction is used to chemically extract copper from copper (II) sulfate. 2.234 grams of CuSO_4 are dissolved into water. After the reaction with iron is complete, 0.872 grams of copper have formed. Determine the percent copper (by mass) in the copper (II) sulfate, according to this lab data.

$$\% \text{ Cu} = \frac{0.872 \text{ g}}{2.234 \text{ g}} \times 100 = 39.0331 \rightarrow \boxed{39.0 \% \text{ Cu}}$$

lab value

b. Determine the percent (by mass) of each element in CuSO_4 , according to the periodic table masses.

Total formula mass of CuSO_4 : $63.546 \text{ amu} + 32.064 \text{ amu} + 4(15.9994 \text{ amu}) = 159.6076 \text{ amu}$

$$\% \text{ Cu} = \frac{63.546}{159.6076} \times 100 = 39.81389 \rightarrow \boxed{39.814 \% \text{ Cu}}$$

"book" value

$$\% \text{ S} = \frac{32.064}{159.6076} \times 100 = \boxed{20.089 \% \text{ S}}$$

$$\% \text{ O} = \frac{4(15.9994)}{159.6076} \times 100 = \boxed{40.0968 \% \text{ O}}$$

c. Determine the percent error for the experiment in (a).

$$\% \text{ error} = \left| \frac{\text{book} - \text{lab}}{\text{book}} \right| \times 100 = \left| \frac{39.81389 - 39.0331}{39.81389} \right| \times 100 = 1.961 \approx \boxed{2 \%}$$

3. Sodium chlorate, NaClO_3 , is heated until it decomposes into NaCl and oxygen gas. When 8.45 grams of sodium chlorate are heated, the reaction produces 3.71 grams of oxygen gas. Determine the percent oxygen (by mass) in sodium chlorate, according to this data.

$$\% \text{ O} = \frac{3.71 \text{ g}}{8.45 \text{ g}} \times 100 = 43.9053 \% \rightarrow \boxed{43.9 \% \text{ oxygen}}$$

b. Use the periodic table to determine the percent oxygen in NaClO_3 , by mass.

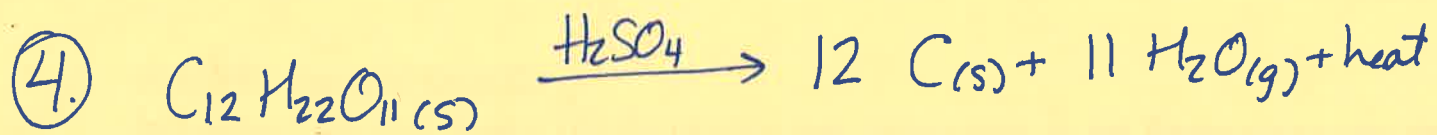
Total formula mass of $\text{NaClO}_3 = 22.9898 + 35.453 + 3(15.9994) = 106.441 \text{ amu}$

$$\% \text{ O} = \frac{3(15.9994)}{106.441} \times 100 = 45.093714 \rightarrow \boxed{45.0937 \% \text{ oxygen}}$$

c. Determine the percent error for the experiment in (a) 1.188

$$\left| \frac{\text{book} - \text{lab}}{\text{book}} \right| \times 100 = \left| \frac{45.093714 - 43.9053}{45.093714} \right| \times 100 = 2.635 \rightarrow \boxed{2.6 \%}$$

WS 7.0 key, cont'd



(a) % C in sucrose:

$$12(12.011) + 22(1.0079) + 11(15.9994) = 342.2992 \text{ amu}$$

total formula
mass.

$$\% \text{C} = \frac{12(12.011)}{342.2992} \times 100 = \boxed{42.107\% \text{C}}$$

(b) sucrose is a carbohydrate (all sugars are carbohydrates)
(carbohydrates have the formula $\text{C}_x(\text{H}_2\text{O})_y$)
in this case, $x = 12$, $y = 11$