Chemistry 11: Percent Composition

1. A sample of alcohol contains 24.02 g of carbon, 6.048 g of hydrogen, and 16.00 g of oxygen. What is its percentage of each element by weight?

\[
\text{Total mass} = 24.02 \text{ g} + 6.048 \text{ g} + 16.00 \text{ g} = 46.068 \text{ g}
\]

\[
\% \text{ C} = \frac{24.02 \text{ g}}{46.068 \text{ g}} \times 100 = 52.14\%
\]

\[
\% \text{ H} = \frac{6.048 \text{ g}}{46.068 \text{ g}} \times 100 = 13.13\%
\]

\[
\% \text{ O} = \frac{16.00 \text{ g}}{46.068 \text{ g}} \times 100 = 34.73\%
\]

2. Find the percentage of oxygen in a nickel oxide if 0.2636 g of nickel reacts with oxygen in the air to form 0.3354 g of the nickel oxide.

\[
\text{mass of oxygen} = 0.3354 \text{ g} - 0.2636 \text{ g} = 0.0718 \text{ g}
\]

\[
\% \text{ oxygen} = \frac{0.0718 \text{ g}}{0.3354 \text{ g}} \times 100 = 21.4\%
\]

3. What is the percentage by mass of vanadium in a vanadium oxide if 0.3546 g of vanadium combines with 0.2784 g of oxygen to form the compound?

\[
\text{mass of compound} = 0.3546 \text{ g} + 0.2784 \text{ g} = 0.6330 \text{ g}
\]

\[
\% \text{ vanadium} = \frac{0.3546 \text{ g}}{0.6330 \text{ g}} \times 100 = 56.02\%
\]

4. Find the percentage of iodine in a metal iodide when 0.530 g of the metal reacts with excess iodine to form 2.796 g of the iodide.

\[
\text{mass of iodine} = 2.796 \text{ g} - 0.530 \text{ g} = 2.266 \text{ g}
\]

\[
\% \text{ iodine} = \frac{2.266 \text{ g}}{2.796 \text{ g}} \times 100 = 81.04\%
\]

5. What is the percentage of uranium in uranium hexafluoride, UF₆?

\[
\text{FW \ UF₆} = 238.0 \text{ u} + 6 \times 19.0 \text{ u} = 352.0 \text{ g/mol}
\]

\[
\% \text{ uranium} = \frac{238.0 \text{ g/mol}}{352.0 \text{ g/mol}} \times 100 = 67.61\%
\]

6. What is the percentage of water in iron (III) nitrate hexahydrate, Fe(NO₃)₃•6H₂O?

\[
\text{FW \ Fe(NO₃)₃} \cdot 6 \text{H₂O} = 55.8 \text{ u} + 3 \times (16.0 \text{ u}) + 9 \times (14.0 \text{ u}) + 12 \times (1.0 \text{ u}) + 6 \times (18.0 \text{ u}) = 349.8 \text{ u}
\]

\[
\text{FW 6H₂O} = 6 \times (18.0 \text{ u}) + 12 \times (1.0 \text{ u}) = 108.0 \text{ u}
\]

\[
\% \text{ H₂O} = \frac{108.0 \text{ u}}{349.8 \text{ u}} \times 100 = 30.87\%
\]