Empirical Formulas

One of the first things that we want to do when a new compound is created is to determine it's chemical composition. One way to do that is by determining the empirical formula of the compound.

The empirical formula is the lowest whole number ratio of the elements in the compound.
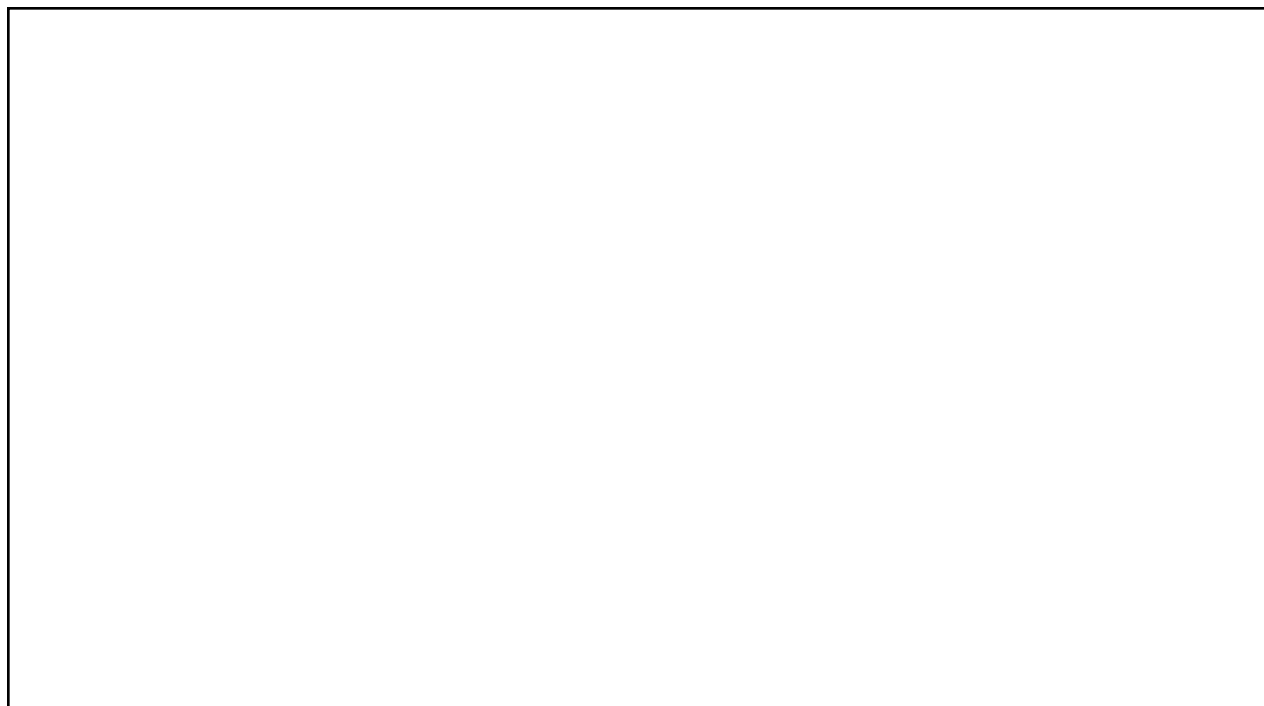
To find the empirical formula we need to determine the ratio of moles of all the elements in a compound.

Empirical Ex

$$52.2\% \text{ C} = 52.2g \text{ C} \cdot \frac{1mol \text{ C}}{12.01g \text{ C}} = 4.35mol \text{ C} \qquad \frac{4.35mol \text{ C}}{2.17mol} = 2.00 \text{ C}$$

$$13.1\% \text{ H} = 13.1g \text{ H} \cdot \frac{1mol \text{ H}}{1.008g \text{ H}} = 5.99mol \text{ H} \qquad \frac{13.0mol \text{ H}}{2.17mol} = 5.99 \text{ H}$$

$$34.7\% \text{ O} = 13.1g \text{ O} \cdot \frac{1mol \text{ O}}{16.00g \text{ O}} = 2.17mol \text{ O} \qquad \frac{2.17mol \text{ O}}{2.17mol} = 1.00 \text{ O}$$

$$C_2H_6O$$

In this case the ratios were all whole numbers, if not then they need to be multiplied by some number to get whole numbers.

Molecular Formulas

The empirical formula is the lowest whole number ration for a compound it is not the true molecular formula. To get the true formula we need some additional information.
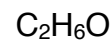
To find the true formula we need the true molar mass. By finding the ratio between the ratio between the true molar mass and the empirical formula's molar mass we can find the ratio between the empirical formula and the true formula.
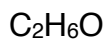
C_2H_6O True Molar Mass= 46.07 g/mol

        Empirical Molar Mass= 46.07 g/mol

$$\frac{46.07}{46.07} = 1$$

$$C_2H_6O$$

Future Thoughts-

    What happens when something burns? What is made when something burns?