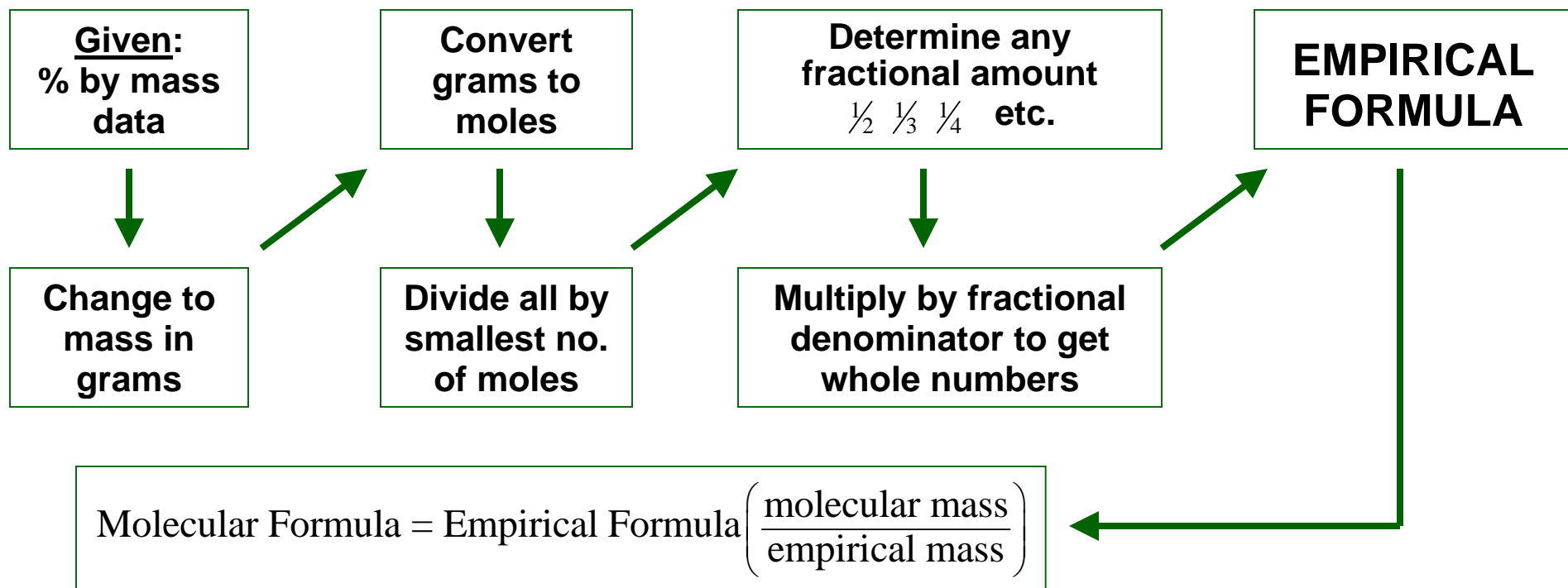


# DETERMINING EMPIRICAL & MOLECULAR FORMULAS

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**GIVEN INFORMATION: 40.7% carbon, 5.1% hydrogen, 54.2% oxygen, and a molecular mass of 177 g/mol.**

$$\left. \begin{array}{l}
 40.7\% \text{ C} \rightarrow 40.7 \text{ g C} \left| \frac{1 \text{ mol C}}{12.011 \text{ g C}} \right| = 3.3886 \text{ mol} \div 3.3876 \text{ mol} = 1.0 \times 2 = 2 \\
 5.1\% \text{ H} \rightarrow 40.7 \text{ g C} \left| \frac{1 \text{ mol H}}{1.00794 \text{ g H}} \right| = 5.0598 \text{ mol} \div 3.3876 \text{ mol} = 1.5 \times 2 = 3 \\
 54.2\% \text{ O} \rightarrow 40.7 \text{ g C} \left| \frac{1 \text{ mol O}}{15.9994 \text{ g O}} \right| = 3.3876 \text{ mol} \div 3.3876 \text{ mol} = 1.0 \times 2 = 2
 \end{array} \right\} \text{C}_2\text{H}_3\text{O}_2 \text{ Empirical Formula}$$

*1.5 is the same as 1 1/2*

*Smallest*

$$\text{Molecular Formula} = \text{Empirical Formula} \left( \frac{\text{molecular mass}}{\text{empirical mass}} \right) = \text{C}_2\text{H}_3\text{O}_2 \left( \frac{177 \text{ g/mol}}{59.0 \text{ g/mol}} \right) = \text{C}_2\text{H}_3\text{O}_2 (3) = \text{C}_6\text{H}_9\text{O}_6 \text{ Molecular Formula}$$