

Stoichiometry - Calculations Involving Molar Concentration

Handout - Notes - [Stoichiometry - Molar Concentrations](#)

- In chemistry we want to be able to talk about how concentrated a liquid is. In chemistry we use units called Molarity (M). Molarity is a measure of how concentrated (strong) a liquid is in units of how many moles there is per litre $\frac{\text{mol}}{\text{L}}$. This ratio is a factor that can be used in the factor label method to go from moles to litres and litres to moles. Ex. - $0.5 \text{ M} = \frac{0.5 \text{ mol}}{1 \text{ L}}$ or $\frac{1 \text{ L}}{0.5 \text{ mol}}$

Demo - pHet - [Concentration](#)

Demo - pHet - [Molarity](#)

Ex. 1 - Tums™ is mostly CaCO_3 and in your stomach is HCl acid. When you eat Tums™ the following reaction occurs in your stomach

$$\text{CaCO}_3 (\text{s}) + 2 \text{HCl} (\text{aq}) \rightarrow \text{CaCl}_2 (\text{aq}) + \text{CO}_2 (\text{g}) + \text{H}_2\text{O} (\text{l})$$

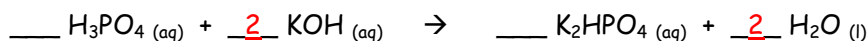
A tablet of Tums™ is 0.750 grams CaCO_3 . What volume of stomach acid, $[\text{HCl}] = 0.00100 \text{ M}$, is neutralized by the Tums™?

Answer - $0.750 \text{ g CaCO}_3 \times \frac{1 \text{ mol CaCO}_3}{100.09 \text{ g CaCO}_3} \times \frac{2 \text{ mol HCl}}{1 \text{ mol CaCO}_3} \times \frac{1 \text{ L HCl}}{0.00100 \text{ mol HCl}} = 15.0 \text{ L HCl}$

Ex. 2 - What volume of $\text{CO}_2 (\text{g})$ at STP is produced if 1.25 L of 0.0055 M HCl reacts with an excess of CaCO_3 ? *****Remember only use $\frac{22.4 \text{ L}}{1 \text{ mol}}$ when STP is stated!!!!*****

Answer - $1.25 \text{ L HCl} \times \frac{0.0055 \text{ mol HCl}}{1 \text{ L HCl}} \times \frac{1 \text{ mol CO}_2}{2 \text{ mol HCl}} \times \frac{22.4 \text{ L CO}_2}{1 \text{ mol CO}_2} = 0.077 \text{ L CO}_2$

Ex. 3 - 19.8 mL of H_3PO_4 with an unknown molarity reacts with 25.0 mL of 0.500 M KOH according to the following reaction below. What is the molarity of the H_3PO_4 ?



Answer - Is reaction balanced? $0.025 \text{ L KOH} \times \frac{0.500 \text{ mol KOH}}{1 \text{ L KOH}} \times \frac{1 \text{ mol H}_3\text{PO}_4}{2 \text{ mol KOH}} \times \frac{1}{0.0198 \text{ L H}_3\text{PO}_4} = 0.316 \text{ M H}_3\text{PO}_4$

Ex. 4 - What volume of 0.200 M KOH is required to react with 125 mL of 0.250 M H_3PO_4 in order to produce a solution of K_2HPO_4 ?

Answer - $0.125 \text{ L H}_3\text{PO}_4 \times \frac{0.250 \text{ mol H}_3\text{PO}_4}{1 \text{ L H}_3\text{PO}_4} \times \frac{2 \text{ mol KOH}}{1 \text{ mol H}_3\text{PO}_4} \times \frac{1 \text{ L KOH}}{0.200 \text{ mol KOH}} = 0.313 \text{ L KOH}$

Practice - [Worksheet](#) - [Stoichiometry - Molar Concentrations](#)

[Stoichiometry & Molar Concentrations - Answers](#)

Practice - Lab - [Double Replacement of Lead and Potassium](#)

[Double Replacement of Lead and Potassium - KEY](#)

Practice - Quiz - [Stoichiometry - Mass, Volume and Concentration](#)

[Stoichiometry - Mass, Volume and Concentration - KEY](#)