

Check Homework - p. 477 #1-7

SATURATED = MAXIMUM

$$\frac{30g}{100mL}$$



Concentration of a Solution

concentration - a numerical ratio comparing the quantity of solute to the quantity of solution.

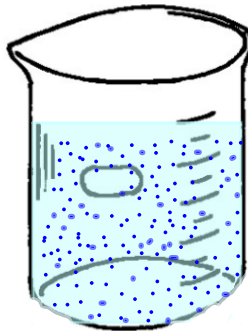
⇒ units: **g/L or g/mL** (solutes that are solids in pure form)

dilute - a solution that has a small amount of solute as compared to the amount of solvent



dilution - process of adding more solvent to cause a solution to become more dilute

concentrated - a solution that has a large amount of solute as compared to the amount of solvent



molar concentration (molarity) - the amount of moles of solute dissolved in one litre of solvent

⇒ units: mol/L

Ex. An intravenous solution contains 0.90 g NaCl in 100.mL of solution. What is the concentration of this solution?

$$m = 0.90\text{g}$$

NaCl

$$V = 100.\text{mL}$$

$$C = ?$$

$$0.90\text{g NaCl} \times \frac{1 \text{ mol NaCl}}{58.44\text{g NaCl}} = 0.0154 \text{ mol}$$

$$C = \frac{n}{V}$$

$$C = \frac{0.0154 \text{ mol}}{0.100 \text{ L}}$$

$$C = 0.154 \text{ mol/L}$$

$$C = \frac{n}{V}$$

Concentration (mol/L)

moles (mol)

volume (L)

Ex. What volume of solution is required to dissolve 1.75 mol to make a 0.95 mol/L solution of CaCO_3 ?

$$\begin{aligned}n &= 1.75 \text{ mol} \\ C &= 0.95 \text{ mol/L} \\ \text{CaCO}_3 \\ V &= ?\end{aligned}$$

$$\begin{aligned}C &= \frac{n}{V} \\ \frac{0.95 \text{ mol/L}}{1} &= \frac{1.75 \text{ mol}}{V} \\ (0.95 \text{ mol/L})V &= 1.75 \text{ mol} \\ V &= \frac{1.75 \text{ mol}}{0.95 \text{ mol/L}} \\ \boxed{V = 1.8 \text{ L}}\end{aligned}$$



Ex. A sample of laboratory ammonia solution has a concentration of 14.8 mol/L. What mass of ammonia is present in a 25.0 mL sample of this solution?



$$\begin{aligned}C &= 14.8 \text{ mol/L} \\ V &= 25.0 \text{ mL} \\ m &= ?\end{aligned}$$

$$\begin{aligned}C &= \frac{n}{V} \\ 14.8 \text{ mol/L} &= \frac{n}{0.0250 \text{ L}} \\ n &= (14.8 \text{ mol/L})(0.0250 \text{ L}) \\ n &= \underline{\underline{0.370 \text{ mol}}}\end{aligned}$$

$$0.370 \text{ mol NH}_3 \times \frac{17.04 \text{ g NH}_3}{1 \text{ mol NH}_3} = \boxed{6.30 \text{ g NH}_3}$$

Practice Problems

p. 481 #8,9

p. 483 #10,11

Concentration = Molarity

$$1 \frac{\text{mol}}{\text{L}} = 1 \text{ M}$$

Concentration Ratios

Percent by Volume

$$\%(v/v) = \frac{\text{volume of solute}}{\text{volume of solution}} \times 100\%$$

Ex. 5% acetic acid

$$\Rightarrow \frac{5 \text{ mL of acid}}{100 \text{ mL of solution}}$$

Mass - Mass Ratio (% (m/m))

$$\%(m/m) = \frac{\text{mass of solute}}{\text{mass of solution}} \times 100\%$$

Ex. 6% m/m of hydrogen peroxide

$$\Rightarrow \frac{6 \text{ g of H}_2\text{O}_2}{100 \text{ g of solution}}$$

Sample Problems

What is the percent by volume of ethanol in the final solution when 85mL of ethanol is diluted to a total volume of 250 mL with water?

What mass of KNO_3 would be needed to prepare 1250 mL of a 15.0% (m/m) KNO_3 solution?

Homework

p. 485 #14, 15

p. 486 #16-23