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

$V = ?$

$n = 1.75\ mol$

$C = 0.95\ mol/L$

$CaCO_3$

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

$$0.95\ mol/L = \frac{1.75\ mol}{V}$$

$$(0.95\ mol/L)V = 1.75\ mol$$

$$V = \frac{1.75\ mol}{0.95\ mol/L}$$

$$V = 1.8\ L$$

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?

NH_3

$C = 14.8\ mol/L$

$m = ?$

$V = 25.0\ mL$

$= 0.0250\ L$

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

$$14.8\ mol/L = \frac{n}{0.0250\ L}$$

$$n = (14.8\ mol/L)(0.0250\ L)$$

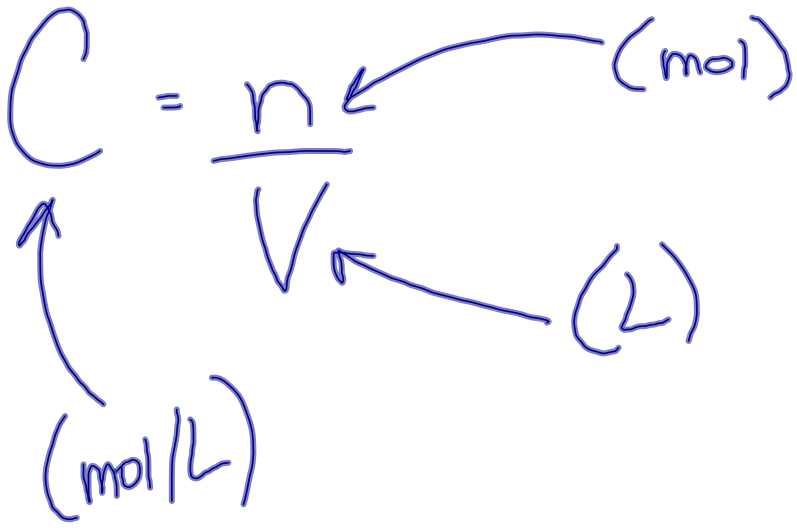
$$n = 0.370\ mol$$

$$0.370\ mol\ NH_3 \times \frac{17.04\ g\ NH_3}{1\ mol\ NH_3} = 6.30\ g\ NH_3$$

$$\frac{9}{1} = \frac{18}{x}$$

$$9x = 18(1)$$

$$x = \frac{18}{9} = 2$$


C = n / V
(mol)
(L)
(mol/L)

$CaCl_2$

$n = ?$

$V = 250.\,mL$

$C = 2.0\,M\ (2.0\,mol/L)$

$m = ?$

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

$n = (2.0\,mol/L)(0.250\,L)$

$n = 0.500\,mol$

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

$$\Rightarrow \frac{6 \text{ g of } H_2O_2}{100 \text{ g of solution}}$$

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?

$\%(v/v) = ?$

$\%(v/v) = \frac{V_{solute}}{V_{soln}} \times 100\%$

$V_{solute} = 85mL$

$V_{soln} = 250mL$

$\%(v/v) = \frac{85mL}{250mL} \times 100\%$

$\%(v/v) = 34\%$

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

$\%(m/m) = 15.0\%$

$m_{solute} = ?$

$m_{soln} = 1250g$

$\%(m/m) = \frac{m_{solute}}{m_{soln}} \times 100\%$

$15.0\% = \frac{m_{solute}}{1250g} \times 100\%$

$0.15 = \frac{m_{solute}}{1250g}$

$m_{solute} = (0.15)(1250g)$

$m_{solute} = 188g$

Practice Problems

p. 481 #8,9
p. 483 #10,11
p. 485 #14,15
p. 486 #22,23