Solutions & Concentration 3

(1) What is the concentration of a solution prepared by dissolving 455 mg of $FeCl_2$ in enough water to make 25.0 mL of solution?

$$\frac{455\ \text{mg} \mid 1\ \text{g} \mid 1\ \text{mol}\ FeCl_2}{1000\ \text{mg} \mid 126.75\ \text{g}} = 0.003590\ \text{mol}$$

$$[FeCl_2] = \frac{0.003590\ \text{mol}}{0.0250\ \text{L}} = 0.144\ \underline{M}$$

(2) What are the concentrations of Na^+ and S^{2-} ions in a solution that is 1.2 *M* Na_2S?

$$Na_2S_{(s)} \xrightarrow{H_2O} 2\,Na^+_{(aq)} + S^{2-}_{(aq)}$$

~~1.2 M~~ 2.4 M 1.2 M

$[Na^+] = 2.4\ \underline{M}$

$[S^{2-}] = 1.2\ \underline{M}$

3 What mass of solid nickel (III) chloride is required to prepare 250.0 mL of a 0.750 *M* solution of $NiCl_3$? Describe the preparation of this solution using the appropriate glassware and lab equipment.

$$\frac{250.0\,mL}{1000\,mL}\left|\frac{1\,L}{1\,L}\right|\frac{0.750\,mol}{1\,L}\left|\frac{165.05\,g}{1\,mol}\right. = 30.9\,g$$

Mass out 30.9 g of $NiCl_3$ & transfer it to a 250-mL volumetric flask. Add water to fill half-way. Shake to mix. Add water to the line. Mix again.

4 You wish to prepare 25.0 mL of a 0.112 *M* solution of Na_2SO_4. You have one liter of a 0.520 *M* stock solution of sodium sulfate. What volume of the stock solution is required to make the dilution? Describe its preparation.

$M_1 = 0.520\,M$ $M_2 = 0.112\,M$

$V_1 = ?$ $V_2 = 25.0\,mL$

$(0.520\,M)(V_1) = (0.112\,M)(25.0\,mL)$

$V_1 = 5.38\,mL$

Pipette 5.38 mL of the stock solution into a 25-mL volumetric flask and fill with water to the line. Mix thoroughly.

5 A) A solution is prepared by dissolving 160. g of citric acid ($H_3C_6H_5O_7$) in 500. g of water. What is the mass percent of citric acid in the resulting solution?

$$\%\text{ by mass} = \frac{160\,g\ CA}{(160\,g + 500\,g)} \times 100\% =$$

$$24.2\%$$

B) If the solution has a density of 1.10 g/mL, express the concentration of citric acid as a molarity.

$$\frac{24.2\,g\,CA}{100\,g\,soln}\left|\frac{1.10\,g\,soln}{1\,mL}\right|\frac{1000\,mL}{1\,L}\left|\frac{1\,mol\,CA}{192.12\,g\,CA}\right. =$$

$$[CA] = 1.39\,M$$