CONCENTRATIONS OF SOLUTIONS ASSIGNMENT

ANSWERS

1. $\sqrt{\text{m/m}} = \frac{\text{mass of solute (g)}}{\text{mass of solution (g)}} \times 100$

   $\sqrt{\text{m}} = \frac{5.62 \text{g}}{250 \text{g}} \times 100$

   $\sqrt{\text{m}} = 2.25\%$

   $\therefore$ the solution is 2.25% boric acid m/m.

2. $\text{m/V} = \frac{\text{mass of solute (g)}}{\text{volume of solution (ml)}} \times 100$

   $\text{m/V} = \frac{25.0 \text{g}}{775 \text{ml}} \times 100$

   $\text{m/V} = 3.23\%$

   $\therefore$ the solution is 3.23% m/V NaCl.

3. $\sqrt{\text{V/V}} = \frac{\text{volume of solute (ml)}}{\text{volume of solution (ml)}} \times 100$

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

   $\text{volume of solute} = \frac{(12)(800)}{100}$

   $\sqrt{\text{V/V}} = 96 \text{ml of ethanol}$

   $V_{H_2O} = V_{\text{solution}} - V_{\text{solute}}$

   $V_{H_2O} = 800 \text{ml} - 96 \text{ml}$

   $\sqrt{\text{V}} = 704 \text{ml}$

   $\sqrt{\%} 704 \text{ ml of water is required to make a 12% V/V 800ml sol'n
4. \[ \text{ppm} = \frac{\text{mass of solute (g)}}{\text{mass of solution (g)}} \times 10^6 \]

\[ = \frac{0.5 \text{ g}}{1000 \text{ g}} \times 10^6 \]

\[ = 500 \text{ ppm} \]

\( \therefore 500 \text{ mg/L represents 500 ppm of CaCO}_3. \)

5. \[ n = CV \]

\[ = (0.2 \text{ mol/L})(0.4 \text{ L}) \]

\[ = 0.08 \text{ mol Al}_2(\text{SO}_4)_3 \]

\[ m = nM \]

\[ = (0.08 \text{ mol})(342.14 \text{ g/mol}) \]

\[ = 27.4 \text{ g} \]

\( \therefore 27.4 \text{ g of Al}_2(\text{SO}_4)_3 \text{ is required to make a 0.2 M 400 mL sol'n} \)

6. \[ \sqrt{n} = \frac{m}{M} \]

\[ \sqrt{=} \frac{24 \text{ g}}{40 \text{ g/mol}} \]

\[ \sqrt{=} 0.6 \text{ mol NaOH} \]

\[ \sqrt{C} = \frac{n}{V} \]

\[ = \frac{0.6 \text{ mol}}{0.5 \text{ L}} \]

\[ \sqrt{=} 1.2 \text{ mol/L} \]

\( \therefore \) the molarity is 1.2 mol/L.
\[ n = \frac{m}{M} \]
\[ M_{\text{Na}_2\text{CO}_3} = 105.99 \text{ g/mol} \]
\[ n = \left( \frac{140.0 \text{ g}}{105.99 \text{ g/mol}} \right) \]
\[ = 1.32 \text{ mol Na}_2\text{CO}_3 \]

\[ V = \frac{n}{c} \]
\[ = \frac{(1.32 \text{ mol})}{(0.4 \text{ mol/L})} \]
\[ = 3.3 \text{ L} \]

\[ \therefore 3.3 \text{ L of solution can be made.} \]

8. \[ n = cv \]
\[ = (0.120 \text{ M})(0.35 \text{ L}) \]
\[ = 0.042 \text{ mol AgNO}_3 \]

\[ N = nNA \]
\[ = (0.042 \text{ mol})(6.02 \times 10^{23} \text{ formula units/mol}) \]
\[ = 2.53 \times 10^{22} \text{ formula units} \]

\[ \therefore 2.53 \times 10^{22} \text{ formula units} \] are required to make 350 mL 0.12 M solution.

9. \[ n = cv \]
\[ = (0.30 \text{ mol/L})(0.80 \text{ L}) \]
\[ = 0.24 \text{ mol Li}_2\text{SO}_4 \]

\[ m = nM \]
\[ = (0.24 \text{ mol})(109.94 \text{ g/mol}) \]
\[ = 26.4 \text{ g} \]

\[ \therefore 26.4 \text{ g of Li}_2\text{SO}_4 \text{ will be obtained.} \]
\[ 10. \sqrt{\text{v/v}\%} = \frac{\text{volume of solute (ml)}}{\text{volume of solution (ml)}} \times 100 \]

\[ \text{volume of solute} = \left( \frac{\text{v/v}\%}{100} \right) \times (\text{volume of solution}) \]

\[ = \left( \frac{60}{20} \right) \frac{100}{100} \]

\[ \sqrt{m} = 12 \text{ ml} \]

\[ \sqrt{m} = 0V \\
\sqrt{m} = (1.61 \text{g/ml})(12 \text{ ml}) \\
\sqrt{m} = 19.33 \text{ g} \]

\[ n = \frac{m}{M} \]

\[ = \frac{19.33 \text{ g}}{98.08 \text{ g/mol}} \]

\[ \sqrt{n} = 0.197 \text{ mol} \]

\[ C = \frac{n}{V} \]

\[ = \frac{0.197 \text{ mol}}{0.05 \text{L}} \]

\[ \sqrt{C} = 3.99 \text{ M} \text{ mol/L} \]

\[ \therefore \text{ the molarity of the solution is } 3.99 \text{ M mol/L}. \]