CONCENTRATIONS OF SOLUTIONS ASSIGNMENT

ANSWERS

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1. m/m % = $\frac{\text{mass of solute (g)}}{\text{mass of solution (g)}} \times 100$ $m_{solution} = m_{solute} + m_{water}$ = 250 g

$= \frac{5.62\,g}{250\,g} \times 100$

$\doteq 2.25\%$

∴ the solution is 2.25% boric acid m/m.

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

$= \frac{25.0\,g}{775\,mL} \times 100$

$\doteq 3.23\%$

∴ the solution is 3.23% m/v NaCl

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

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

$= \frac{(12)(800)}{100}$

= 96 mL of ethanol

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

= 800 mL − 96 mL

$\doteq$ 704 mL

∴ 704 mL of water is required to make a 12% v/v 800 mL sol'n

4. $ppm = \frac{\text{mass of solute (g)}}{\text{mass of solution (g)}} \times 10^6$

$m_{solution} = DV$
$= (1.0\,g/mL)(1000\,mL)$
$= 1000\,g$

$= \frac{0.5\,g}{1000\,g} \times 10^6$

$= 500\,ppm$

∴ 500 mg/L represents 500 ppm of $CaCO_3$.

5. $n = CV$
$= (0.200\,mol/L)(0.400\,L)$
$= 0.08\,mol\ Al_2(SO_4)_3$

$M_{Al_2(SO_4)_3} = 342.14\,g/mol$

$m = nM$
$= (0.08\,mol)(342.14\,g/mol)$
$= 27.4\,g$

∴ 27.4 g of $Al_2(SO_4)_3$ is required to make a 0.2M 400 mL sol'n

6. ✓ $n = \frac{m}{M}$

$M_{NaOH} = 40\,g/mol$

$= \frac{(24\,g)}{(40\,g/mol)}$

✓ $= 0.6\,mol\ NaOH$

✓ $C = \frac{n}{V}$

$= \frac{(0.6\,mol)}{(0.5\,L)}$

✓ $= 1.2\,mol/L$

✓ ∴ the molarity is 1.2 mol/L.

7. $n = \frac{m}{M}$ $\qquad M_{Na_2CO_3} = 105.99\ g/mol$

$= \frac{(140\ g)}{(105.99\ g/mol)}$

$\doteq 1.32\ mol\ Na_2CO_3$

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

$= \frac{(1.32\ mol)}{(0.4\ mol/L)}$

$= 3.3L$

$\therefore$ 3.3L of solution can be made.

8. $n = cV$

$= (0.120M)(0.350L)$

$= 0.042\ mol\ AgNO_3$

$N = nN_A$

$= (0.042\ mol)(6.02 \times 10^{23}\ \text{formula units}/mol)$

$\doteq 2.53 \times 10^{22}$ formula units

$\therefore 2.53 \times 10^{22}$ formula units are required to make 350 mL 0.12M sol'n.

9. $n = cV$ $\qquad M_{Li_2SO_4} = 109.94\ g/mol$

$= (0.30\ mol/L)(0.800L)$

$= 0.24\ mol\ Li_2SO_4$

$m = nM$

$= (0.24\ mol)(109.94\ g/mol)$

$= 26.4\ g$

$\therefore$ 26.4g of Li_2SO_4 will be obtained.

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

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

$= \frac{(60)(20)}{100}$

$= 12\ mL$

$m = DV$

$= (1.61\ g/mL)(12\ mL)$

$\doteq 19.3\ g$

$n = \frac{m}{M}$ $\qquad M_{H_2SO_4} = 98.08\ g/mol$

$= \frac{(19.3\ g)}{(98.08\ g/mol)}$

$= 0.197\ mol$

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

$= \frac{(0.197\ mol)}{(0.050\ L)}$

$= 3.94\ mol/L$

$\therefore$ the molarity of the solution is $3.94\ mol/L$.