Year 11 Chemistry Test **_ANSWERS_**

Mixtures and Solutions

1.

(a) (i) polar, (ii) non-polar

(b) Octane is non-polar therefore not soluble in water. Detergent molecules have a polar end which dissolves in water and a non-polar end which dissolves in octane. This increases octane's miscibility in water (it mixes better).

2.

(a) Ion-dipole

(b) Endothermic, since it requires energy to break the bonds.

(c) Releases.

(d) $\Delta H_{solution} = \Delta H_{LD} + \Delta H_{hydration}$ = 772 + -769 = +3 kJ/mol

(e) $NaCl_{(s)} \rightarrow Na^+_{(aq)} + Cl^-_{(aq)}$ ΔH = +3 kJ/mol

(f) $n = \frac{m}{M} = \frac{50}{58.44} = 0.86\,\text{mol}$

$Q = n \times \Delta H = 0.86 \times 3 = 2.6\ \text{kJ absorbed}$

3.

(a) copper carbonate ($CuCO_3$)

(b) $CuSO_{4\,(aq)} + K_2CO_{3\,(aq)} \rightarrow K_2SO_{4\,(aq)} + CuCO_{3\,(s)}$

$\therefore Cu^{2+}_{(aq)} + SO_4^{2-}{}_{(aq)} + K^+_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow K^+_{(aq)} + SO_4^{2-}{}_{(aq)} + CuCO_{3\,(s)}$

$\therefore Cu^{2+}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow CuCO_{3\,(s)}$

4.

(a) $Mg(NO_3)_2 + 2NaOH \rightarrow 2NaNO_3 + Mg(OH)_2$

(b) $\rho = \frac{m}{V} = \frac{5.0}{0.100} = 50\ \text{g/L}$

(c) $M_{Mg(NO_3)_2} = 148.33\ \text{g/mol}$

$C = \rho \div M = 50 \div 148.33 = 0.34\ \text{mol/L}$

(d) $n = C \times V = 0.075 \times 0.50 = 0.038\ \text{mol}$

(e) $\frac{n_{Mg(OH)_2}}{n_{NaOH}} = \frac{1}{2}$

$\therefore n_{Mg(OH)_2} = \frac{1}{2} \times n_{NaOH} = \frac{1}{2} \times 0.038 = 0.019\ \text{mol}$

$M_{Mg(OH)_2} = 58.33\ \text{g/mol}$

$m = n \times M = 0.019 \times 58.33 = 1.1\ \text{g}$

5.

(a) (must be an appropriate improvement that would work, and explains sufficient chemistry)

(b) $Q = mc\Delta T$

$= 100 \times 4.18 \times (46.3 - 10.5)$

$= 14964\ \text{J}$

$\frac{Q}{\Delta m} = \frac{14964}{90.2 - 88.7} = 9976.3 = 9.98 \times 10^3\ \text{J/g}$