Chapter 4

AP MC Review Questions – p. 188 A + B

1. (C) $\overset{0}{Mg}_{(s)} + 2\overset{+1\ -1}{HCl}_{(aq)} \rightarrow \overset{+2\ -1}{MgCl_2}_{(aq)} + \overset{0}{H_2}_{(g)}$

2. (C) Mg is oxidized : $0 \rightarrow +2$

H^{1+} is reduced : $+1 \rightarrow 0$

3. (B) $200.\text{mL } MgCl_2 \times \frac{0.60 \text{ mol } MgCl_2}{1000 \text{ mL}} = 0.12 \text{ mol } MgCl_2$

$[Mg^{2+}] = \frac{0.12 \text{ mol } Mg^{2+}}{.200\text{L} + .400\text{L}} = \boxed{.20 \text{ M } Mg^{2+}}$

$[Cl^-] = \frac{0.24 \text{ mol } Cl^-}{.200\text{L} + .400\text{L}} = \boxed{0.40 \text{ M } Cl^-}$

4. (C) $20.0\text{mL HCl} \times \frac{12.0 \text{ mol HCl}}{1000 \text{ mL}} = 0.240 \text{ mol HCl}$

$\frac{0.240 \text{ mol HCl}}{.0200\text{L} + x} = \frac{0.500 \text{ mol HCl}}{1\text{ L}}$

$.240 = .0100 + .500x$

$x = .460\text{ L}$

$= \boxed{460.\text{ mL}}$

5. (D) PbI_2 is a precipitate, K^+ and NO_3^- are in solution.

$\underline{2}Pb^{2+}_{(aq)} + 4NO_3^-{}_{(aq)} + 5K^+_{(aq)} + \underline{5}I^-_{(aq)} \rightarrow 2PbI_{2(s)} + I^-_{(aq)} + 4NO_3^-{}_{(aq)} + 5K^+_{(aq)}$

6. (A) K^+ and NO_3^- are exclusively spectator ions.

7. (B) $20.\text{mL} \times \frac{.20\text{mol } KMnO_4}{1000\text{mL}} \times \frac{1\text{mol } MnO_4^-}{1\text{mol } KMnO_4} \times \frac{3\text{mol } ClO_2^-}{4\text{mol } MnO_4^-} = .0030 \text{ mol } ClO_2^-$ (stoich.)

$M\,ClO_2^- = \frac{0.0030\text{ mol}}{.015\text{ L}} = \boxed{0.20\,M}$

8. (B) $\_\,Ca(OH)_{2(aq)} + \underline{2}\,HCl_{(aq)} \rightarrow \underline{2}\,H_2O_{(l)} + \_\,CaCl_{2(aq)}$

$.0250\text{L } Ca(OH)_2 \times \frac{.120\text{mol } Ca(OH)_2}{1\text{L}} \times \frac{2\text{mol HCl}}{1\text{mol } Ca(OH)_2} \times \frac{1\text{L HCl } (M^{-1})}{.150\text{mol HCl}} = .0400\text{L}$

$= \boxed{40.0\text{mL HCl}}$

9. (D) $3K^+_{(aq)} + 3Cl^-_{(aq)} + 3Ag^+_{(aq)} + 3NO_3^-{}_{(aq)} \rightarrow 3AgCl_{(s)} + 3K^+_{(aq)} + 3NO_3^-{}_{(aq)}$

$Ag^+_{(aq)} + Cl^-_{(aq)} \rightarrow AgCl_{(s)}$

10. (A) K^+ and NO_3^- are spectators

11. (D) $\overset{+2\ -2}{NO}$, $\overset{+4\ -2}{NO_2}$, $\overset{+1\ -2}{N_2O}$, $\overset{+5\ -2}{N_2O_5}$

12. (A) NaCl is a strong electrolyte because it completely ionizes

13. (B) $M_1V_1 = M_2V_2$

$(100.0\text{mL})(1.00\,M) = (1.33\,M)$

$V_2 = 75.2\text{mL}$

$\therefore \sim 25.0\text{mL}$ evaporated

14. (C) $(.2000\text{ L})\left(1.00\frac{\text{mol NaCl}}{\text{L}}\right) = .200\text{mol NaCl}$

$(.3000\text{L})\left(1.00\frac{\text{mol } MgCl_2}{\text{L}}\right) = .300\text{mol } MgCl_2$

$[Cl^-] = \frac{(.200 + .600)\text{mol}}{(.2000 + .3000)\text{L}} = \boxed{1.6\,M}$

15. (A) $H_2SO_4 + \underline{2}\,KOH \rightarrow 2H_2O + K_2SO_4$

$.8000\text{ L KOH} \times \frac{0.100\text{ mol KOH}}{1\text{L}} \times \frac{1\text{mol } H_2SO_4}{2\text{mol KOH}} \times \frac{1000\text{mL}}{.2000\text{mol } H_2SO_4} = \boxed{200.0\text{mL}}$