CHEM II - Solutions
Practice Test

① $1.11\ \cancel{g}/\cancel{mL} \times \frac{1000\ \cancel{mL}}{1\ L} \times \frac{22\ \cancel{g}\ H_2O_2}{100\ \cancel{g}\ \text{Solution}} \times \frac{1\ \cancel{mol}}{34.02\ \cancel{g}} = 7.178130511\ \frac{mol}{L}$

(7.2 M)

② 1.2 mol sucrose $\quad 100\ \cancel{g}\ H_2O \times \frac{1\ mol}{18.02\ \cancel{g}} = 5.549\ mol$

$$\chi_{H_2O} = \frac{(5.549\ mol)}{(5.549\ mol + 1.2\ mol)} = 0.822$$

$P = 0.822 \cdot 48\ torr = 39.465\ torr$ (39 torr)

③ $\Pi = iMRT = (2)(0.458\ \cancel{M})(0.08206\ \frac{\cancel{K}\cdot atm}{\cancel{mol}\cdot\cancel{K}})(298\ \cancel{K}) = 22.39975408$

(22.4 atm)

④ NaCl (Precipitates Hg^{2+}), NaOH (Precipitates Ba^{2+}),
any of: Na_2SO_4, H_2SO_4, Na_2S, H_2S, Na_2CO_3, H_2CO_3, Na_3PO_4, H_3PO_4 (will precip. Ca^{2+})

⑤ $3Ba(OH)_2 + 2H_3PO_4 \rightarrow 6H_2O + Ba_3(PO_4)_2$

⑥ $\overset{+7\ -2}{MnO_4^-} + \overset{+4\ -2}{SO_2} \rightarrow \overset{+2}{Mn^{2+}} + \overset{+6\ -2}{SO_4^{2-}}$

Mn is reduced, so MnO_4^- is the oxidizing agent

S is oxidized, so SO_2 is the reducing agent

$$2 \times (5e^- + 8H^+ + MnO_4^- \rightarrow Mn^{2+} + 4H_2O)$$

$$5 \times (2H_2O + SO_2 \rightarrow SO_4^{2-} + 4H^+ + 2e^-)$$

$$\cancel{10e^-} + \cancel{16H^+} + 2MnO_4^- \rightarrow 2Mn^{2+} + \cancel{8H_2O}$$

$$\cancel{2 \times 8}H_2O + 5SO_2 \rightarrow 5SO_4^{2-} + \cancel{2 \times 8}H^+ + \cancel{10e^-}$$

$$40H^- + \cancel{2H_2O} + 5SO_2 + 2MnO_4^- \rightarrow 5SO_4^{2-} + 2Mn^{2+} + \underbrace{4H^+}_{\cancel{4H_2O}} + 4OH^-$$

$$\boxed{4OH^- + 5SO_2 + 2MnO_4^- \rightarrow 5SO_4^{2-} + 2Mn^{2+} + 2H_2O}$$

AP Chem - Solutions Practice Test (cont.)

⑦ $2HNO_3 + Ca(OH)_2 \rightarrow 2H_2O + Ca(NO_3)_2$

$\frac{8.06\,g\ Ca(OH)_2}{} \times \frac{1\,mol}{74.10\,g} \times \frac{2\,HNO_3}{1\,Ca(OH)_2} = 0.217543859\,6\,mol\,HNO_3$

$0.55\,M = \frac{0.2175\,mol}{x\,L}$ $\quad x = \frac{}{0.55\,M} = 0.395534290\,3\,L$

39.6 mL HNO_3

⑧ $\Delta t = m K_f$

$0.82^\circ C = m \cdot (5.12^\circ C\ kg/mol)$

$m = \frac{0.82^\circ C}{(5.12^\circ C\ kg/mol)} = 0.160156\,25\,\frac{mol}{kg}$

$0.000\,160.156\,25\,\frac{mol}{g} \times 250.0\,g = 0.040\,039\,063\,mol$ in 5.0 g

374.63 g/mol

370 g/mol

⑨ $\pi = iMRT$

$= (3)(0.0875\,M)(0.08206\,\frac{L\,atm}{mol\,K})(297\,K)$

$= 6.397\,602\,75\,atm$ $\quad$ 6.39 atm

⑩ $0.50\,M = \frac{x}{1.25\,L}$ $\quad x = 0.625\,mol$ $\quad 12.0\,M = \frac{0.625\,mol}{y\,L}$

$y = 0.052\,083\,333\,3\,L$

$= 52.1\,mL$

⑪ $3Ca(OH)_2 + 2Al(NO_3)_3 \rightarrow 3Ca(NO_3)_2 + 2Al(OH)_3$

CIE $3Ca^{2+} + 6OH^- + 2Al^{3+} + 6NO_3^- \rightarrow 3Ca^{2+} + 6NO_3^- + 2Al(OH)_3$

NIE $6\,OH^- + 2Al^{3+} \rightarrow 2\,Al(OH)_3$

or $3\,OH^- + Al^{3+} \rightarrow Al(OH)_3$

SPEC. IONS: NO_3^-, Ca^{2+}

AP Chem – Solutions Prac. Test (cont.)

(12) $M = \frac{mol}{L}$ $\quad 0.100\,M = \frac{x}{0.0285\,L}$ $\quad x = 0.00285\,mol$

$M = \frac{0.00285\,mol}{0.0172\,L} =$ **0.166 M** Assuming a monoprotic acid.

(13) $60\,g\ CH_2Cl_2 \times \frac{1\,mol}{84.93\,g} = 0.706\,mol \quad \chi = \frac{0.706\,mol}{(0.956\,mol)} = 0.738$

$40\,g\ CH_2Br_2 \times \frac{1\,mol}{159.8\,g} = 0.250\,mol \quad \chi = \frac{0.250\,mol}{(0.956\,mol)} = 0.262$

$P_{sol} = 0.738 \cdot 133\,torr + 0.262 \cdot 11.4\,torr$

$= 98.2\,torr + 2.99\,torr$

$=$ **101.2 torr**