

Chapter 16 – Problems 60, 70, 72

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60. (a)

$$\begin{aligned}
 \Delta G^\circ &= \Delta H^\circ - T\Delta S^\circ \\
 \Delta G_{\text{Ag}^+} &= 77.1 \left[\frac{\text{kJ}}{\text{mol}} \right] \\
 \Delta G_{\text{Cl}^-} &= -131.2 \left[\frac{\text{kJ}}{\text{mol}} \right] \\
 \Delta G_{\text{AgCl}} &= -109.8 \left[\frac{\text{kJ}}{\text{mol}} \right] \\
 77.1 + (-131.2) - (-109.8) &= 55.7 \text{ [kJ]}
 \end{aligned} \tag{1}$$

(b)

$$\begin{aligned}
 55.7 &= -RT \ln(x^2) \\
 \ln(x^2) &= -22.5 \\
 x^2 &= e^{-22.5} \\
 x &= 1.3 \cdot 10^{-5}
 \end{aligned} \tag{2}$$

(c) It does make sense because $K_{sp} = [\text{Ag}^+][\text{Cl}^-]$, which, with the above concentration equals $1.69 \cdot 10^{-10}$

70.

$$\begin{aligned}
 [\text{H}^+] &= 10^{-10.6} = 2.51 \cdot 10^{-11} [\text{M}] \\
 [\text{OH}^-] &= 10^{-14+10.6} = 4 \cdot 10^{-4} [\text{M}] \\
 .25 - 4 \cdot 10^{-4} &= .2496 [\text{M}] \\
 K_b &= \frac{(4 \cdot 10^{-4})^2}{.2496} \\
 &= 6.36 \cdot 10^{-7} \\
 -(0.00831)(298) \ln(6.46 \cdot 10^{-7}) &= 35.3 \text{ [kJ]}
 \end{aligned} \tag{3}$$

72.

