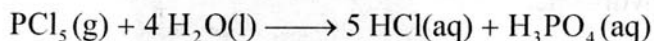


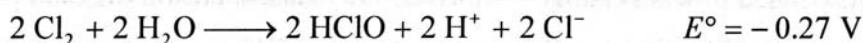
15.12 First we balance the equation:



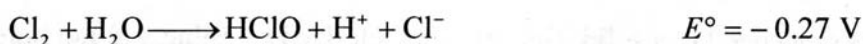
$$\begin{aligned}\Delta G^\circ_r &= 5(-131.23 \text{ kJ} \cdot \text{mol}^{-1}) + (-1142.54 \text{ kJ} \cdot \text{mol}^{-1}) \\ &\quad - [(-305.0 \text{ kJ} \cdot \text{mol}^{-1}) + 4(-237.13 \text{ kJ} \cdot \text{mol}^{-1})] \\ &= -545.17 \text{ kJ} \cdot \text{mol}^{-1}\end{aligned}$$

The reaction is spontaneous.

15.42 Because there is no data available for the free energy of formation of HClO , we must turn to the electrochemical data in Appendix 2B. The appropriate half-reactions are



The E° will be the same for the reaction balanced as



but n will be 1e^- rather than 2e^- as in the previous equation.

$$\Delta G^\circ_r \text{ can now be calculated from } \Delta G^\circ_r = -nFE^\circ$$

$$\Delta G^\circ_r = -(1)(96\,485 \text{ J} \cdot \text{V}^{-1} \cdot \text{mol}^{-1})(-0.27 \text{ V}) = +26 \text{ kJ} \cdot \text{mol}^{-1}$$

(b) The equilibrium constant can be calculated from $\Delta G^\circ_r = -RT \ln K$

$$K = e^{\frac{\Delta G^\circ_r}{RT}} = e^{\frac{26\,000 \text{ J} \cdot \text{mol}^{-1}}{(8.314 \text{ J} \cdot \text{K}^{-1} \cdot \text{mol}^{-1})(298 \text{ K})}} \cong 2.8 \times 10^{-5}$$

15.84 The balanced chemical equation is:



The amount, in moles, of F_2 produced is found by:

$$\frac{125 \text{ g K}_2\text{MnF}_6}{247.14 \text{ g} \cdot \text{mol}^{-1}} \left(\frac{1 \text{ mol F}_2}{2 \text{ mol K}_2\text{MnF}_6} \right) = 0.253 \text{ mol F}_2$$

The volume of this amount of fluorine gas is:

$$\begin{aligned}V &= \frac{nRT}{P} = \frac{(0.253 \text{ mol})(0.08206 \text{ L} \cdot \text{atm} \cdot \text{K}^{-1} \cdot \text{mol}^{-1})(298 \text{ K})}{1 \text{ atm}} \\ &= 6.18 \text{ L}\end{aligned}$$