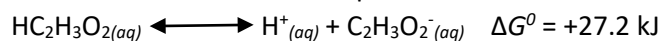


- 1) Organ pipes in unheated churches develop “tin disease”, in which white tin is converted to gray tin. Given the below information, calculate the equilibrium temperature for the transition:

White Sn: $\Delta H_f^0 = 0.00$ kJ/mol; $S^0 = 51.55$ J/mol · K

Gray Sn: $\Delta H_f^0 = -2.09$ kJ/mol; $S^0 = 44.14$ J/mol · K

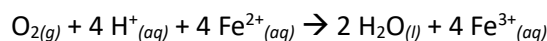
- 2) Show by calculation whether the reaction is spontaneous at 25°C



a. When $[\text{H}^+] = [\text{C}_2\text{H}_3\text{O}_2^-] = 0.85 \text{ M}$; $[\text{HC}_2\text{H}_3\text{O}_2] = 0.15 \text{ M}$

b. When $[\text{H}^+] = [\text{C}_2\text{H}_3\text{O}_2^-] = 2.0 \times 10^{-3} \text{ M}$; $[\text{HC}_2\text{H}_3\text{O}_2] = 1.0 \text{ M}$

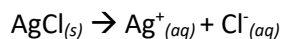
- 3) . For the reaction:



a) Calculate ΔG^0 at 25°C.

b) Calculate ΔG^0 at 25°C when $[\text{Fe}^{2+}] = [\text{Fe}^{3+}] = 0.250 \text{ M}$, $P_{\text{O}_2} = 0.755 \text{ atm}$, and the pH of the solution is 3.12.

- 4) Consider the reaction:



a. Calculate ΔG^0 at 25°C.

b. What should the concentrations of Ag^+ and Cl^- be so that $\Delta G^0 = -1.0$ kJ (just spontaneous)?

Take $[\text{Ag}^+] = [\text{Cl}^-]$.

c. The K_{sp} for AgCl is 1.8×10^{-10} . Is the answer to b) above reasonable? Explain.