2. Answer the following questions about voltaic cells.

(a) A voltaic cell is set up using Al/Al^{3+} as one half-cell and Sn/Sn^{2+} as the other half-cell. The half-cells contain equal volumes of solutions and are at standard conditions.

(i) Write the balanced net-ionic equation for the spontaneous cell reaction.

(ii) Determine the value, in volts, of the standard potential, $E°$, for the spontaneous cell reaction.

(iii) Calculate the value of the standard free-energy change, $\Delta G°$, for the spontaneous cell reaction. Include units with your answer.

(iv) If the cell operates until $[Al^{3+}]$ is $1.08\ M$ in the Al/Al^{3+} half-cell, what is $[Sn^{2+}]$ in the Sn/Sn^{2+} half-cell?

(b) In another voltaic cell with Al/Al^{3+} and Sn/Sn^{2+} half-cells, $[Sn^{2+}]$ is $0.010\ M$ and $[Al^{3+}]$ is $1.00\ M$. Calculate the value, in volts, of the cell potential, E_{cell}, at $25°C$.