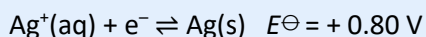


HL Questions on Electrochemical cells (1) AHL – Standard electrode potentials

(Use Section 1 of the IB Chemistry data booklet for any relevant equations and Section 24 to obtain the relevant E^\ominus values where they are not given).

1. Consider a cell made up from the following two half-cells:



- i. Deduce the spontaneous reaction that will occur when the cell is operating.
 - ii. Identify the positive and negative electrodes of the cell.
 - iii. Identify the species that is being oxidised and the species that is being reduced.
 - iv. Deduce the overall cell potential under standard conditions.
 - v. Calculate the Gibbs energy change for this reaction at standard conditions.
2. Deduce the equation for the spontaneous reaction that occurs when a dichromate half-cell, $\text{Cr}_2\text{O}_7^{2-}(\text{aq}), \text{H}^+(\text{aq})/\text{Cr}^{3+}(\text{aq}), \text{H}_2\text{O}(\text{l})$, comes into contact with an iodine half-cell, $\frac{1}{2}\text{I}_2(\text{l})/\text{I}^-(\text{aq})$.
3. Use standard redox potentials to show whether tin(II) ions can reduce iron(III) ions.
(Given: $\text{Sn}^{4+}(\text{aq})/\text{Sn}^{2+}(\text{aq}) \quad E^\ominus = +0.15 \text{ V}$)
4. Show that when copper(I) salts come into contact with water they undergo disproportionation. That is, they are spontaneously oxidized and reduced at the same time.
5. Draw a labelled diagram of a cell made up from a $\text{Mg}(\text{s})/\text{Mg}^{2+}(\text{aq})$ half-cell connected to a $\text{Mn}(\text{s})/\text{Mn}^{2+}(\text{aq})$ half-cell operating under standard conditions.
Show the direction of electron flow in the external circuit and deduce the potential of this cell in volts.