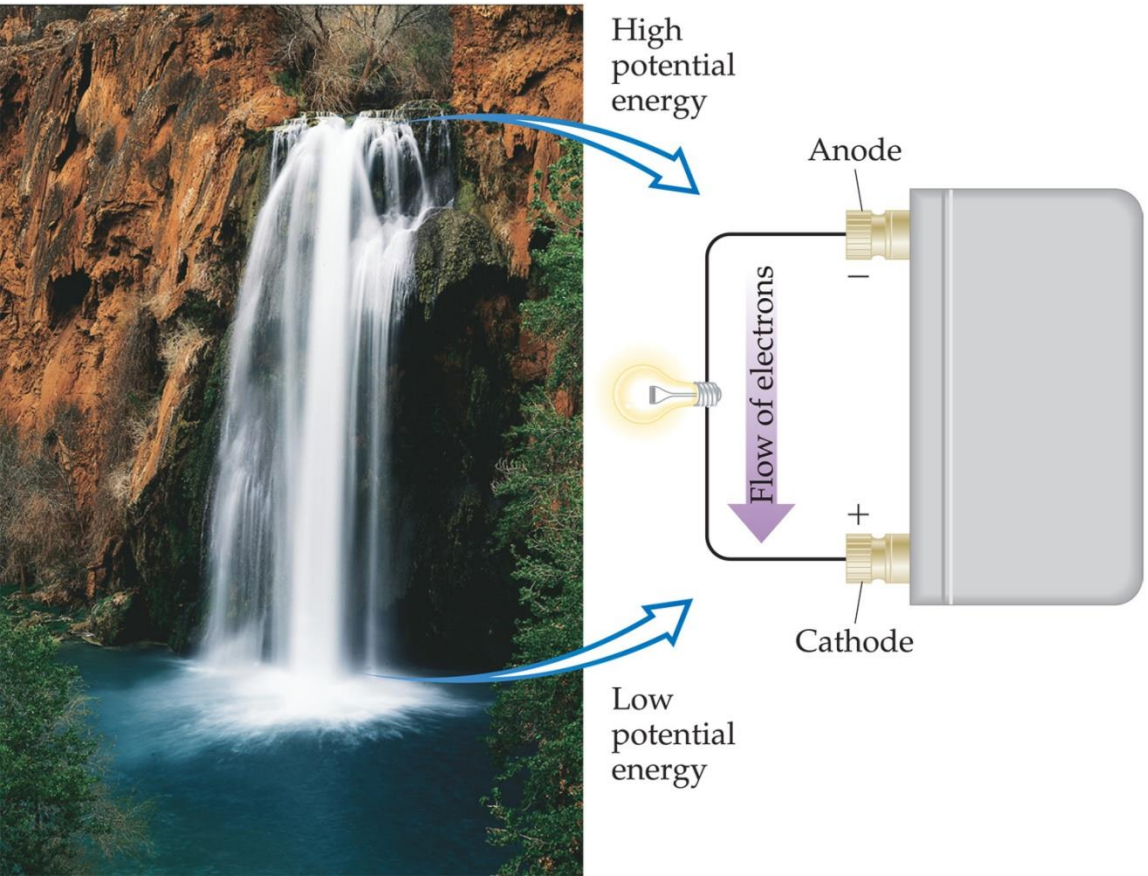
DETERMINATION OF STANDARD CELL POTENTIAL (STANDARD e.m.f)

Electromotive Force (emf)

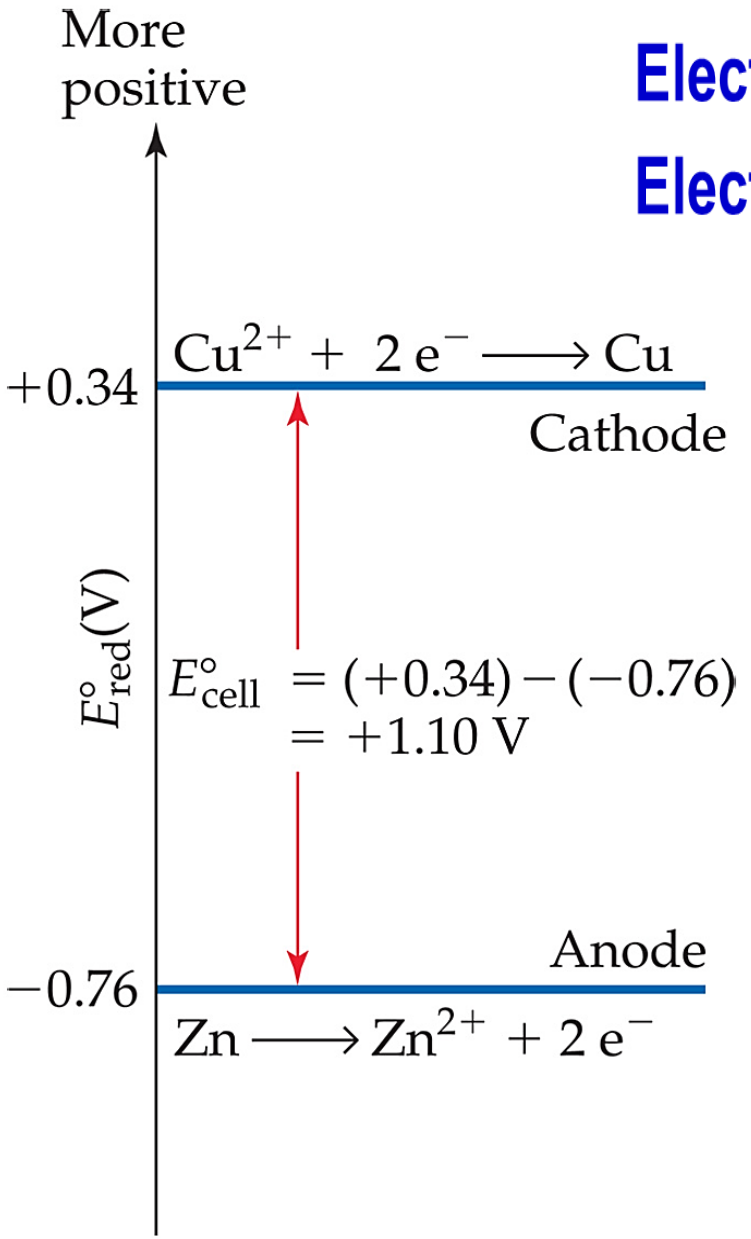


- Water only spontaneously flows one way in a waterfall.
- Likewise, electrons only spontaneously flow one way in a redox reaction—from higher to lower potential energy.

ELECTROMOTIVE FORCE (EMF)

- The potential difference between the anode and cathode in a cell is called the electromotive force (emf).
- It is also called the **cell potential**, and is designated E_{cell}.
- Cell potential at standard conditions is known as **Standard Cell Potential** and is calculated using formula:

$$E^{o}_{cell} = E^{o}_{cathode} - E^{o}_{anode}$$



Electrode with more positive E^o is cathode.

Electrode with more negative E^o is anode.

$$E^o_{cell} = E^o_{cathode} - E^o_{anode}$$

The greater the difference in E^o between the two electrodes or half-cells, the greater the voltage of the cell.

Determine the E^o_{cell} for a voltaic cell which is based on the following two standard half-reactions :

$Cd^{2+}(aq) + 2e^- \longrightarrow Cd(s)$ $\quad E^o = -0.403$ V

$Pb^{2+}(aq) + 2e^- \longrightarrow Pb(s)$ $\quad E^o = -0.126$ V

Solution

$$E^o_{cell} = E^o_{cathode} - E^o_{anode}$$

$$= E^o_{Pb^{2+}/Pb} - E^o_{Cd^{2+}/Cd}$$

$$= -0.126 - (-0.403)$$

$$= +0.277 \text{ V}$$