Chapter 17 – Electrochemistry

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- Electrochemistry — The transfer of electrons (oxidation-reduction). Separate the oxidation from reduction and get flow of electrons.
- Oxidation — Loss of electrons (e.g. $\text{Zn} \longrightarrow \text{Zn}^{2+} + 2\,\text{e}^-$), called the anode
- Reduction — Gain of electrons (e.g. $\text{Cu}^{2+} + 2\,\text{e}^- \longrightarrow \text{Cu}$), called the cathode
- Electrode loses mass, while plating gains mass
- Salt Bridge — Allows ions to flow to balance charge
- Standard Voltages — Measurement of cell voltage
- $E^0 = E^0(\text{reduction}) + E^0(\text{oxidation})$. If E^0 is positive, the reaction is spontaneous
- Best oxidizing agents (get reduced the most) are at the bottom left of the given chart
- Best reducing agents (get oxidized the most) are at the bottom right of the given chart
- $\Delta G = -n\mathcal{F}E^0$, where n is the amount of electrons transferred, and $\mathcal{F} = 9.648 \cdot 10^4 \left[\frac{\text{J}}{\text{mol V}}\right]$ is Faraday's constant
- $E^0 = \frac{RT}{n\mathcal{F}} \ln(k)$
- $E = E^0 - \frac{.0257V}{n} \ln(Q)$; Cell voltage and concentration. Known as the Nernst Equation.
    1. If $Q > 1$, then E is less spontaneous
    2. If $Q < 1$, then E is more spontaneous
- Electrolytic Cell — Non-spontaneous that needs electrical energy input
- Units:
    1. Charge: Coulomb (C)
    2. Current: Ampere (A)
    3. $1[\text{A}] = 1\left[\frac{\text{C}}{\text{s}}\right]$
    4. 1 mole of electrons: $9.648 \cdot 10^4[\text{C}]$