Chemistry 3.7
Redox Chemistry

Spontaneous and Non-spontaneous

Spontaneous

- A reaction is “spontaneous” when the reaction occur naturally without external energy input (other than activation energy)
- If the $E^{o}_{red} – E^{o}_{ox} = + V$, then the reaction is spontaneous
- If the $E^{o}_{red} – E^{o}_{ox} = - V$, then the reaction is not spontaneous

Example

- $E^o(Ag^+/Ag) = 0.80$ V $E^o(Br_2,Br^-) = 1.09$ V
- The possible **oxidants** are **Ag^+** and **Br_2**
- The possible **reductants** are **Ag** and **Br^-**
- Reaction would occur when Br_2 reacts with Ag
  - Red – ox 1.09 V – 0.80 V = +0.29 V
- No reaction between
  - Ag^+ with Br_2 because they are both oxidant
  - Ag with Br^- because they are both reductant
  - Br^- with Ag^+ 0.80 V – 1.09 V = -0.29V (negative)

Experiments

- Using the E^o values, calculate the $E^o_{(reaction)}$ and predict is the reaction going to occur or not

$Zn(s) + Cu^{2+}$

$Cu(s) + Fe^{3+}$

$I^-(aq) + Fe^{3+}$

$Fe^{2+}(aq) + I_2$

$Cu^{2+}(aq) + I^-$

$Fe^{2+}(aq) + Zn^{2+}$