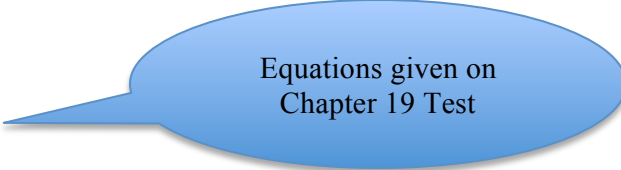


Review List for Electrochemistry

- 1) Balancing Redox reactions: (in acidic or basic conditions)
 - Know steps.
 - Know oxidation numbers, half reactions, oxidizing agents and reducing agents.
- 2) Concepts of Galvanic Cells (Voltaic Cells)
 - drawing and labeling diagrams with anode, cathode, movement of electrons and movement of ions.
 - purpose of salt bridge
 - changes in the mass of electrodes (cathode gains, anode loses)
 - Spontaneous reactions because E_{cell}° is positive
- 3) Determining E_{cell}° from standard reduction potentials.
 - $E_{\text{cell}} = E_{\text{red}}^{\circ}(\text{cathode}) - E_{\text{ox}}^{\circ}(\text{anode})$
 - Concept of E_{cell} as cell potential or electromotive force (emf): force electrons are “pushed” through a wire
 - Determining what reaction will occur if you are given the substances in the cell.
- 4) Spontaneity of Redox Reactions:
 - Spontaneous when E_{cell} is positive, ΔG is negative, and $K > 1$.
 - $\Delta G = -nFE_{\text{cell}}$ (on reference sheet)
 - $\Delta G = -RT \ln K$ (on reference sheet)
 - $$E_{\text{cell}}^{\circ} = \frac{RT}{nF} \ln K = \frac{0.0257 \text{ V}}{n} \ln K @ 25^{\circ}\text{C}$$
- 5) Effect of concentration:
 - $$E_{\text{cell}} = E_{\text{cell}}^{\circ} - \frac{RT}{nF} \ln Q = E_{\text{cell}}^{\circ} - \frac{0.0257 \text{ V}}{n} \ln Q @ 25^{\circ}\text{C}$$
 - At equilibrium $E_{\text{cell}} = \text{zero}$
 - Set E_{cell} equal to zero when you want to determine the “Q value” when the reaction becomes spontaneous.
 - Concentration cells: cells with both half cells consisting of the same substances, but at different concentrations.
 - Reaction always proceeds from concentrated to dilute
 - $E_{\text{cell}}^{\circ} = \text{zero}$ ($E_{\text{red}}^{\circ} = E_{\text{ox}}^{\circ}$)
 - $E_{\text{cell}} = -\frac{0.0257 \text{ V}}{n} \ln \frac{[\text{dilute}]}{[\text{concentrated}]} @ 25^{\circ}\text{C}$
 - E_{cell}° always positive, small, and decreasing as reaction proceeds
- 6) Batteries: self-contained galvanic cells
 - be familiar with general types of batteries and what it means to be rechargeable.
- 7) Fuel Cells: know concept and advantages and disadvantages
- 8) Corrosion: definition, how caused, how to protect metals from corrosion, and how most metal oxides provide protection from oxidation.
- 9) Electrolytic Cells: Use external power source to force a non-spontaneous reaction to occur.
 - E_{cell} is negative because reaction is non-spontaneous
 - How to determine what reaction takes place.
 - Look for easiest species present to reduce and to oxidize (closest in E°)
 - Drawing and labeling diagrams of an electrolytic cell.
 - Quantitative aspects of electrolysis: calculating coulombs of charge, time, current or amount of product.



Equations given on
Chapter 19 Test