AP CHEMISTRY CHAPTER 18 OUTLINE

ELECTROCHEMISTRY

18.1: BALANCING OXIDATION-REDUCTION EQUATIONS

A QUICK REVIEW OF THE HALF-REACTION METHOD

1. Write separate ½ reactions for oxidation and reduction
2. For each ½ reaction
3. balance all elements except hydrogen and oxygen
4. balance oxygen using water
5. balance hydrogen using H+
6. balance charges using electrons
7. Make electrons lost equal electron gained using common multiple
8. Add the ½ reactions and cancel identical species

\*5. If the reaction occurs in the base

a. balance H+ using OH-

b. form water

c. eliminate H2O molecules if necessary

6. Check to make sure charges and elements are balanced

18.2: GALVANIC CELLS

Electrochemistry

8H+(aq) + MnO4-(aq) + 5Fe2+(aq) → Mn2+(aq) + 5Fe3+(aq) + 4H2O(l)

Oxidation

Reduction

Oxidizing Agent

Reducing Agent

Galvanic Cell

Anode

Cathode

Salt bridge or porous disk

Cell Potential/electromotive force

Voltmeter

Potentiometer

18.3: STANDARD REDUCTION POTENTIALS

Use of half-cell potentials

Standard hydrogen electrode/what is meant by standard

Standard reduction potentials: See Table 18.1, pg 845

Combining two half reactions

1.

2.

Fe3+(aq) + Cu(s) → Cu2+(aq) + Fe2+(aq)

Line Notation

Complete description of a Galvanic Cell

1.

2.

3.

4.

18.4: CELL POTENTIAL, ELECTRICAL WORK, AND FREE ENERGY

emf = potential difference (V) = work (J)/charge (C)

ξ = -w/q

-w = q ξ

Work maximum can never be achieved-Why?

Faraday (F)

q = nF

wmax = ΔG

18.5: DEPENDENCE OF CELL POTENTIAL ON CONCENTRATION

Concentration Cells

The Nernst Equation (Derivation)

Glass Electrodes

Ion Selective Electrodes

Calculation of Equilibrium Constants for Redox Reactions

18.6: BATTERIES

Lead Storage Batteries

Other Batteries

Fuel Cells

18.7: CORROSION

Corrosion

Patina

Corrosion of iron

Prevention of Corrosion

Galvanizing

Alloying

Cathodic Protection

18.9: ELECTROLYSIS

Electrolytic Cell

Ampere

Plating

Steps in electrolysis problems

Electrolysis of water

Electrolysis of a Mixture of Ions

18.9: COMMERCIAL ELECTROLYTIC PROCESSES

Production of Aluminum

Electrorefining of Metals

Metal Plating

Electrolysis of Sodium Chloride