AP CHEMISTRY CHAPTER 4 OUTLINE

TYPES OF CHEMICAL REACTIONS AND SOLTUION STOICHIOMETRY

4.1-WATER, THE COMMON SOLVENT

Aqueous solutions

Polar molecules

Hydration



NH4NO3(s) →

Solubility

Hydrating nonionic substances



4.2-THE NATURE OF AQUEOUS SOLUTIONS: STRONG AND WEAK ELECTROLYTES

Solute/Solvent

Electrolytes

* Strong
* Weak
* Nonelectrolyte

4.3-THE COMPOSITION OF SOLUTIONS

Performing stoichiometric calculations with solutions

Molarity

IN CLASS CHECK: Formalin is an aqueous solution of formaldehyde (HCHO). At high concentrations it is used as a preservative for biologic specimens. How many grams of formaldehyde are contained in 2.5 L of 12.3 M formalin?

Standard solutions and their preparation

Stock solution

Dilution

4.4-TYPES OF CHEMICAL REACTIONS

* Precipitation reactions
* Acid-base reactions
* Oxidation-reduction reactions

4.5-PRECIPITATION REACTIONS

Precipitate

Determining the species present in solution in order to find the precipitate

K2CrO4(aq) + Ba(NO3)2(aq) →

Soluble and slightly soluble

4.6- DESCRIBING REACTIONS IN SOLUTION

Formula equation

Complete ionic equation

Spectator Ions

Net Ionic equations

4.7-STOICHIOMETRY OF PRECIPITATION REACTIONS

Problem Solving Strategy

4.8-ACID-BASE REACTION

Bronsted-Lowry

* Acid
* Base

Neutralization Reaction

Acid-Base titrations

Volumetric Analysis

Titration

Titrant

Equivalence Point/Stoichiometric Point

Endpoint

Requirements for a successful titration

1. The exact reaction between the titrant and analyte must be known (and rapid)
2. The stoichiometric (equivalence) point must be marked accurately
3. The volume of titrant required to reach the stoichiometric point must be know accurately

Indicator

Standardizing the solution

4.9-OXIDATION-REDUCTION REACTIONS

Oxidation States (Numbers)

Where does the + go?

Rules for Assigning Oxidation States (See page 171)

The Characteristics of Oxidation-Reduction Reactions

2Na(s)  + Cl2(aq) → 2NaCl(s)

CH4(g) + 2O2(g) → CO2(g) + 2H2O(g)

Oxidation

Reduction

Oxidizing Agent

Reducing Agent

IN CLASS CHECK: When powdered aluminum metal is mixed with pulverized iodine crystals and a drop of water is added to help the reaction get started, the resulting reaction produces a great deal of energy. The mixture bursts into flames, and a purple smoke of I2 vapor is produced from the excess iodine. The equation for the reaction is

2Al(s) + 3I2(s) → 2AlI3(s)

For this reaction, identify the atoms that are oxidized and reduced, and specify the oxidizing and reducing agents.

4.10-BALANCING OXIDATION-REDUCTION EQUATIONS

Oxidation States Method of Balancing Oxidation-Reduction Reactions

Cu(s) + Ag+(aq) → Ag(s) + Cu2+(aq)

H+(aq) + Cl-(aq) + Sn(s) + NO3-(aq) → SnCl62-(aq) + NO2(aq) + H2O(l)

STEPS:

1.

2.

3.

4.

5.

6.