Study Guide for Exam #2, Ch.4-5, 10

Chem1A, General Chemistry I

MEMORIZE:

- Molarity = mols solute/L solution
- Dilutions: $M_1V_1 = M_2V_2$
- Oxidation State Guidelines
- Acid-Base Neutralizations: acid + base → water + salt
- Gas Evolution Intermediates ($H_2S(g)$, $H_2CO_3(aq)$, $H_2SO_3(aq)$, $NH_4OH(aq)$)
- 1 atm = 760 mmHg = 760 torr
- Gas Laws: Boyle's, Charles's, Avogadro's, Ideal, Dalton's Law (both versions)
- R = 0.08206 L·atm/(mol·K)
- Mole Fraction (χ_A) = mols gas A/total mols mixture
- ΔE (U) = q + w ; $q = m \cdot C_s \cdot \Delta T$; $w = -P_{ext} \cdot \Delta V$
- Hess's Law: $\Delta H_{rxn} = \Delta H_1 + \Delta H_2 + \Delta H_3 + \ldots \Delta H_n$
- Enthalpies of Formation: $\Delta H_{rxn} = \Sigma\ n\ \Delta H_f^o$ (products) – $\Sigma\ m\ \Delta H_f^o$ (reactants)

Chapter 4: Aqueous Reactions and Solution Stoichiometry

I. Precipitation Reactions, Acid-Base Neutralizations, Gas Evolution Reactions (4.2-4.3): Know how to predict the products after a double displacement reaction and, using the solubility guidelines, determine their phases. Know the general form of an acid-base neutralization. Be able to recognize gas evolution intermediate compounds and replace them with their products. Know how to write the molecular, total (complete) ionic, and net ionic equations for all three.
Examples: 4.21-24, 26, 39-44, 54-54, 95

II. Oxidation-Reduction (Redox) Reactions, Oxidation States (4.4): Know how to recognize a redox reaction. Know how to determine the oxidation state for any element in any compound.
Examples: 4.48-52, 55-56, 96

III. Concentration and Solution Stoichiometry (4.5-4.6): Know how to calculate the concentration in molarity (M) for any solution. Know how to use solutions' concentrations and volumes in stoichiometric questions.
Examples: 4.61-68, 71-78, 80-90, 99-104

Chapter 10: Gases

I. Gas Laws (10.3-10.5): Know how to use the Gas Laws (Boyle's, Charles', Avogadro's, and the Ideal Gas Law) to calculate any P, V, n or T. Know how to use the Ideal Gas Law in stoichiometric calculations or to calculate the molar mass or density of a gas.
Examples: 10.26-28, 33-44, 48, 51-60

II. Dalton's Law and Mixtures of Gases (10.6): Know how to use Dalton's Law (both versions) for mixtures of gases. Know how to correct pressures of gases collected over water.
Examples: 10.61, 63-65, 67-74, 106-110, 123

III. Kinetic Molecular Theory, Root Mean Square Speed, and Graham's Law (10.7-10.8): Know how to use the equation for root mean square speed to solve for speed or molar mass, or to compare different gases. Know how to use Graham's Law to compare the speeds or molar masses of a pair of gases.
Examples: 10.75, 83-84, 89-90

Chapter 5: Thermochemistry

I. First Law of Thermodynamics (5.2): Know how to calculate ΔE (U) for a system given q and w.
Examples: 5.25-26

II. Enthalpy (5.3-5.4): Know how to use ΔH_{rxn} to determine whether a reaction is exothermic or endothermic. Know how to use ΔH_{rxn} as a conversion factor between amount and energy change.
Examples: 5.43-48

III. Calorimetry (5.5): Know how to perform calculations for constant-pressure (coffee cup) or bomb calorimetry.
Examples: 5.55-60, 100-101

IV. Hess's Law and Enthalpies of Formation (5.6-5.7): Know how to manipulate ΔH_{rxn} (reversing reactions, changing amount, etc.). Know how to use either Hess's Law for a set of reactions or the enthalpies of formation for constituent compounds to calculate ΔH for a reaction.
Examples: 5.63-66, 71, 73-78, 102, 104, 116