Study Guide for Exam #3, Ch. 10, 6, 8

Chem1A, General Chemistry I

MEMORIZE

- ΔE (U) = q + w ; q = m · C_s · ΔT ; w = -P_{ext} · ΔV
- 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 ΔH_f^o (products) – Σ m ΔH_f^o (reactants)
- E = hν, c = $\lambda\nu$ (h = 6.626 × 10^{-34} J·s, c = 3.00 × 10^8 m/s)
- $1/\lambda = R_H \left[\frac{1}{n_1^2} - \frac{1}{n_2^2}\right]$
- λ = h/(m v)
- Electron Configuration Order (1s 2s 2p 3s 3p 4s 3d 4p, etc…)

Chapter 10: Gases

I. 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, 32

II. Enthalpy (5.3-5.4): Know how to manipulate ΔH_{rxn} (reversing reactions, changing amount, etc.). Know how to use ΔH_{rxn} as a conversion factor between amount and energy change.
Examples: 5.37-38, 43-48, 97

III. Calorimetry (5.5): Know how to perform calculations for constant-pressure (coffee cup) or bomb calorimetry.
Examples: 5.51-53, 55-60, 100-101

IV. Hess's Law and Enthalpies of Formation (5.6-5.7): 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, 71-80, 102, 104, 110

Chapter 6: Electronic Structure of Atoms

I. Wavelength, Frequency, and Energy (6.1-6.2): Know how to convert between the wavelength, frequency, and energy for photons. Know how to relate the threshold energy for a substance to the electrons ejected.
Examples: 6.19-21, 25-34, 83, 86

II. The Hydrogen Atom (6.3): Know how to use the Rydberg Equation to solve for the energy emitted or absorbed when electrons exchange levels in a hydrogen atom.
Examples: 6.37-40

III. Wave-Particle Duality (6.4): Know how to convert between wavelength emitted, mass, and velocity for any object using the de Broglie equation.
Examples: 6.47-50, 95

IV. Atomic Orbitals and Electron Configuration (6.5-6.9): Know how to assign four quantum numbers to electrons in atoms. Know how to write the electron configuration for any element on the periodic table. Know how to differentiate between paired and unpaired, core and valence electrons.
Examples: 6.55-62, 71-80, 93

Chapter 8: Concepts of Chemical Bonding

I. Ionic Bonding (8.2): Know how to predict the formation of ionic compounds based on valence electron count.
Examples: 8.17-20

II. Covalent Bonding (8.3-8.7): Know how to draw the correct Lewis structure, including formal charges, possible resonance or exceptions to the octet rule, and dipole moments for any covalent compound.
Examples: 8.41-42, 47-48, 50-54, 61, 63-66, 90-92

III. Bond Enthalpies (8.8): Know how to use the Lewis structures and bond enthalpies of compounds in a reaction to calculate the enthalpy change.
Examples: 8.69-74, 96