Study Guide for Exam #1, Ch. 14-15

Chem1B, General Chemistry II

MEMORIZE

- Rate Law, rate = $k[A]^m[B]^n$
- K_c = ([products])/([reactants]) or $K_p = P_{products}/P_{reactants}$
- $K_p = K_c(RT)^{\Delta n}$, R = 0.08206 L*atm/mol K
- Q = ([products])/([reactants])

Chapter 14: Chemical Kinetics

I. Reaction Rates (14.1-2): Know how the physical state, concentrations, or temperatures of reactants affect reaction rate. Given the overall reaction rate, be able to use stoichiometry to calculate the rate for any species in the reaction.
Examples, Ch. 14: 15-16, 19-22, 84-85.

II. Rate Laws (14.3-4): Know how to write the complete rate law for a reaction, including determining the order of reaction for reactants from rates and initial concentrations. Know how to calculate the rate constant from a rate law. Be able to match the integrated rate laws, linear plots, and half-life equations to the overall order of reaction to calculate the changes in concentration and/or rate constant over time.
Examples, Ch. 14: 29-34, 37-40, 45-46, 86-87, 89-91.

III. Transition State Theory (14.5, 7): Know the Arrhenius Equation to be able to solve for the rate constant, activation energy, or collision frequency factor given the other two. Be able to identify the enthalpy, activation energy, and transition state on a reaction pathway diagram and the effect of a catalyst on the graph.
Examples, Ch. 14: 53-56, 58, 60, 94-95.

IV. Reaction Mechanisms (14.6): Be able to identify the rate determining step in a multistep mechanism, given an initial slow step, or fast steps followed by a slow step and propose a plausible elementary rate law. Be able to distinguish between an intermediate, a transition state, and a catalyst.
Examples, Ch. 14: 63-69, 73-74, 96-97.

Chapter 15: Chemical Equilibrium

I. Equilibrium Constants (15.1-4): Know how to write and solve the equilibrium constant expression in terms of concentration or partial pressures. Know how to convert between K_c and K_p. Know how to use the equilibrium constant value to predict whether reactants or

products are favored. Know how to manipulate the K_c value when the equilibria are changed (multiplied, reversed, etc.).
Examples, Ch. 15: 13-24, 27-34, 57, 59-60, 62.

II. ICE Tables (15.5): Given the equilibrium concentration, equilibrium constant, and one or more initial concentrations for a system, be able to calculate the rest. Given initial concentrations and an equilibrium constant, be able to calculate the equilibrium concentrations of every species in the system.
Examples, Ch. 15: 41-50, 64-68, 71, 74, 76.

III. Reaction Quotient (15.6): Given concentrations at any moment, be able to calculate the reaction quotient (Q) for a given equilibrium system and use its value compared to K_c to determine which direction the system will shift to reach equilibrium.
Examples, Ch. 15: 37-38, 69-70, 75.

IV. Le Chatelier's Principle (15.7): Be able to apply Le Chatelier's Principle to predict shifts in a disturbed system due to changes in reactant or product concentration, volume and pressure changes, temperature changes, or the effect of adding a catalyst.
Examples, Ch. 15: 51-56, 82.