

General Chemistry Credit by Examination

Topics for CHEM 106 General Chemistry II

The CHEM 106 credit exam covers the topics that are typically covered in the second semester of a two-semester General Chemistry sequence. These topics include principles and applications of chemical equilibrium, electrochemistry, thermodynamics, kinetics, and organic chemistry.

It is recommended that students review the material before taking the exam. Almost any college-level general chemistry textbook will serve as a satisfactory resource for review. Example textbooks include:

Moore, J. W.; Stanitski, C. L.; *Chemistry: The Molecular Science*, 5th edition; Cengage Learning, 2015.
(See Chapters 10-12, 14-17.)

Brown, T. E.; LeMay, H. E.; Bursten, B. E.; *Chemistry: The Central Science*, 12th edition; Pearson, 2012.
(See Chapters 14-17, 19-20, 24.)

Other textbooks will serve equally well for review. A more detailed list of topics follows.

Chemical Kinetics

- Reaction rate
- Effect of concentration on reaction rate
- Rate law and order of reaction
- Integrated rate laws
- Arrhenius equation
- Rate laws for elementary reactions
- Reaction mechanisms
- Catalysts and reaction rates

Chemical Equilibrium

- Characteristics of equilibrium
- Equilibrium constant and writing equilibrium constant expressions
- Equilibrium concentrations and determining the equilibrium constant
- Reactant-favored, product-favored and the meaning of the equilibrium constant
- Using equilibrium constants
- Le Chatelier's principle and effects of changing concentrations, volume, pressure, and temperature

Acids and Bases

- Bronsted-Lowry acids and bases
- Conjugate acid-base pairs and relative strength of acids and bases
- Autoionization of water
- pH scale and measuring pH
- Ionization constants for acids and bases, K_a and K_b
- Carboxylic acids and amines
- Calculations and problem-solving with K_a and K_b

- Salts of acids and bases
- Lewis acids and bases
- Buffers
- Acid-base titrations
- Henderson-Hasselbalch equation
- Solubility and K_{sp}

Thermodynamics

- Reactant-favored and product-favored processes
- Entropy – understanding concept, predicting entropy changes and calculating entropy changes
- Second law of thermodynamics
- Gibbs free energy
- Connecting Gibbs free energy changes with equilibrium constants
- Thermodynamic and kinetic stability

Electrochemistry

- Redox reactions
- Half-reactions and redox reactions
- Voltaic cells and batteries
- Standard reduction potentials
- Nernst equation
- Electrolysis

Fundamental Organic Chemistry

- Functional groups
- Organic reactions: condensation; addition reactions to alkenes/alkynes; oxidation of alcohols and aldehydes; ester and amide formation; hydrolysis
- Isomers
- Polymers