

Jacksonville State University
College of Arts and Sciences
Updated June 27, 2006

CY 106 GENERAL CHEMISTRY II

COURSE DESCRIPTION

Lecture/3 hours. *Prerequisite: CY 105. Concurrent enrollment in CY 108 is required.* Part II of a two-semester sequence. Continuation of CY 105. Topics include states of matter, solutions, kinetics, equilibrium, acid-base theory, thermodynamics, and electrochemistry

TEXT

Chemistry – The Central Science (Brown, LeMay, and Bursten), 9th Edition

COURSE MATERIAL

Supplementary notes and handouts will be distributed in class.

COURSE OBJECTIVES

- To equip students with a firm foundation in the fundamentals of modern chemistry
- To show the importance of modern chemistry in other branches of science (biology, physics, applied sciences) and engineering
- To prepare students for more advanced chemistry and science courses
- To prepare students to successfully take advanced examinations such as MCAT, NCLEX, GRE, etc.

COURSE OUTLINE

- **Molecular Orbitals and Chemical Bonding (Ch. 9)**
 1. The VSEPR model and molecular geometry
 2. Molecular orbitals energy diagrams for diatomic homonuclear and heteronuclear molecules
 3. Bond order and bond stability
 4. Shapes of molecular orbitals
- **Gases (Ch. 10)**
 5. Definition of pressure
 6. Gas laws
 7. Equation of state of ideal gas
 8. Determination of molecular weights of gaseous substances
 9. Overview of kinetic theory of gases
 10. Overview of real gases

- **Intermolecular forces (Ch. 11)**
 11. Intermolecular forces
 12. Phase changes and phase diagrams
 13. Bonding in solids

- **Properties of solutions (Ch. 13)**
 14. Solubility rules
 15. Review of concentrations
 16. Colligative properties

- **Reactions in Aqueous Solutions (Ch. 15)**
 17. Arrhenius and Bronsted-Lowry definitions of acids and bases
 18. Conjugate acid-base pairs
 19. Autoionization of water
 20. Salts of ternary acids in food, medicine, and home (p. 379)
 21. Amphoterism
 22. Acid and base strength and the leveling effects of water
 23. Acid-base reactions, and acidic and basic salts
 24. The Lewis theory of acids and bases
 25. Preparations of acids

- **Acid – Base reactions (Ch. 16)**
 26. Acid-base reactions (review of CY 105 material)
 27. Acid-base titrations
 28. Balancing oxidation-reduction reactions
 29. Redox titrations

- **Equilibria in aqueous solutions (Ch. 17)**
 30. Buffers
 31. Solubility equilibria
 32. Precipitation and separation of ions

- **Chemical Thermodynamics (Ch. 19)**
 33. Basic thermodynamic terms and the first law of thermodynamics
 34. Specific heat, heat capacity, molar heat capacity, and calorimetry
 35. Thermochemical equations and standard states
 36. Using standard enthalpies of formation (Hess law)
 37. Bond energies and enthalpy of a chemical reaction
 38. Internal energy and enthalpy
 39. Entropy and the second law of thermodynamics
 40. Spontaneity and free energy change

- **Introduction to chemical kinetics (Ch. 14)**
 41. The rate of a chemical reaction and the rate law expressions
 42. The integrated rate equations
 43. Using integrated rate equations to determine reaction order
 44. Activation energy and the Arrhenius equation

- **Introduction to electrochemistry (Ch. 20)**
 45. Electrolysis and electrolytic cells
 46. Faraday's law of electrolysis
 47. Voltaic cells
 48. Standard hydrogen electrode and standard electrode potentials
 49. Using standard electrode potentials
 50. The Nernst equation

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CY 108 GENERAL CHEMISTRY LAB II

COURSE DESCRIPTION

Concurrent enrollment in CY 106 is required. Topics of experimentation include qualitative analysis, exploring reaction rates, ionic equilibria, and synthesis.

TEXT

General Chemistry Lab Manual II- CY 108, by Gryko and Knight.

SUGGESTED TEXT

Chemistry the Central Science, 9th Edition by Brown, LaMay, and Bursten.

OTHER MATERIALS

Calculator, lab notebook and safety goggles.

COURSE OBJECTIVES

- To illustrate fundamental chemical principles through laboratory experiments.
- To involve the student in planning a laboratory experiment.
- To introduce basic laboratory techniques.
- To learn how to make accurate measurements using a variety of laboratory equipment.
- To illustrate the treatment and interpretation of laboratory data.
- To learn and practice the principles of laboratory safety.

COURSE OUTLINE

- Lab #0 – Review of CY 105 and CY 107 chemistry from the lab perspective and practicing basic lab skills
- Lab #1 - Finishing Lab #0 and Introduction to MS Excel
- Lab #3 – Determination of the molar mass of a volatile compound
- Lab #4 – Analysis of hydrogen peroxide
- Lab #5 – Determining the molar mass of an unknown substance from the freezing point depression of a solution
- Lab #6 – Acid-base titration
- Lab #7 - Reduction-oxidation titration – formula of iron (II) sulfate hydrate
- Lab #8 - Enthalpy of formation for Mao
- Lab #9 – Spectrophotometric determination of an equilibrium constant
- Lab #10 – Ionic equilibria in aqueous solutions

Lab #11 – Solubility product

Lab final