

Course Outline
Chemistry Review

Course Description

BI105. Chemistry Review (BIO). 1 hour credit. Highly recommended for BI240 and BI250 students. Lecture/discussion. Scheduled to be completed prior to traditional semesters. This course reviews the major chemical concepts needed for the 200 level biology courses BI240 and BI250.

Required Textbook (for traditional courses)

None.

* - For complete textbook information, refer to <http://www.butlercc.bkstr.com>

Course Objectives

At the successful completion of this course, the student should be able to:

1. Apply the periodic table and the metric system

- a. Name first 20 elements and give their symbols
- b. Identify the atomic number, atomic mass number of protons, neutrons, and electrons
- c. Apply scientific notation and metric system.

2. Explain chemical bonding

- a. Analyze valence electrons
- b. Ascertain ionic bonds
- c. Apply covalent bonds
- d. Evaluate polyatomic ions
- e. Deduce polarity of molecules
- f. Explain hydrogen bonds
- g. Derive chemical species
- h. Calculate the mole.

3. Apply the characteristics of water to living systems

- a. Explain water molecule
- b. Describe hydrogen bonds and the physical properties of water
- c. Explain water as a solvent
- d. Develop ionization reactions
- e. Calculate the pH of aqueous solutions
- f. Explain buffer systems
- g. Describe electrolytes.

4. Explain organic molecules

- a. Explain carbon bonds
- b. Describe three-dimensional carbon atom

- c. Describe hydrocarbon chain compounds
 - d. Identify hydrocarbon derivatives
 - e. Name carbon ring compounds
 - f. Name the carbon compounds.
5. Analyze carbohydrate molecules
- a. Explain monosaccharides
 - b. Explain disaccharides
 - c. Explain polysaccharides
 - d. Describe hydrolysis and dehydrolysis.
6. Analyze lipid molecules
- a. Explain structure of lipids
 - b. Differentiate between saturated and unsaturated fatty acids
 - c. Explain phospholipids and glycolipids
 - d. Describe steroids
 - e. Explain fat-soluble vitamins
 - f. Describe the prostaglandins.
7. Analyze protein molecules
- a. explain amino acids: the building blocks
 - b. describe formation of proteins: the peptide bond
 - c. describe protein molecules.
8. Analyze solutions and the movement of substances across a biologic membrane
- a. Explain true solutions
 - b. Explain colloidal solutions
 - c. Explain suspensions
 - d. Describe movement of substances through membranes.
9. Analyze enzymes
- a. Name the properties of enzymes
 - b. Explain how enzymes act: the lock-and-key concept
 - c. Explain naming of enzymes
 - d. Explain digestive enzymes
 - e. Explain secretion of proteolytic enzymes.
10. Investigate energy in biologic systems
- a. Outline metabolism
 - b. Explain chemical bond energy
 - c. Define energy units
 - d. Identify high-energy compounds of the cell
 - e. Explain cell respiration.
11. Analyze nucleic acids

- a. Compare pyrimidine and purine nitrogen bases
- b. Compare the pentose sugars in DNA and RNA
- c. Ascertain the structure and function of the phosphate group in nucleotides
- d. Describe nucleosides
- e. Describe nucleotides
- f. Identify other biologically important nucleotides
- g. Explain formation of the polynucleotide chain
- h. Explain structure of the DNA molecule
- i. Explain structure of RNA.

12. Ascertain the function nucleic acids

- a. Describe replication of DNA
- b. Explain transcription
- c. Explain the genetic code
- d. Explain translation of the genetic code.

Topical Outline of Units

I. Introduction to Chemistry for Biology Students

- a. Element names and symbols
- b. The Periodic Table
- c. Scientific Notation and the Metric System.

II. Chemical Bonds and Compounds

- a. Valence electrons
- b. Ionic bonds
- c. Covalent bonds
- d. Polyatomic ions
- e. Polarity of molecules
- f. Hydrogen bonds
- g. Chemical species
- h. The Mole.

III. Properties of Water

- a. Structure of the water molecule
- b. Hydrogen bonds and their relationship to the physical properties of water
- c. Water as a solvent
- d. Ionization reactions
- e. pH
- f. Buffer systems
- g. Electrolytes.

IV. Carbon Compounds

- a. Carbon bonds
- b. Three-dimensional carbon atom
- c. Hydrocarbon chain compounds
- d. Hydrocarbon derivatives
- e. Ring compounds

f. Naming Carbon compounds.

V. Carbohydrates

- a. Monosaccharides
- b. Disaccharides
- c. Polysaccharides
- d. Hydrolysis and Dehydration Synthesis of carbohydrates.

VI. Lipids

- a. Fatty acids and Glycerol
- b. Saturated and Unsaturated fats
- c. Phospholipids and glycolipids
- d. Steroids
- e. Fat-soluble vitamins
- f. The prostaglandins.

VII. Proteins

- a. Amino Acids
- b. Formation of proteins and the peptide bond
- c. Protein molecular structure

VIII. Solutions and the Movement of substances across biological membranes

- a. Solutions
- b. Colloidal solutions
- c. Suspensions
- d. Movement of substances through membranes.

IX. Enzyme

- a. Properties of enzymes
- b. The lock-and-key concept
- c. Naming of enzymes
- d. Digestive enzymes
- e. Secretion of proteolytic enzymes.

X. Cellular Energy

- a. Metabolism
- b. Chemical bond energy
- c. Energy units
- d. High-energy compounds of the cell
- e. Cell respiration.

XI. Nucleic Acids

- a. Nitrogen bases
- b. Pentose sugars
- c. Phosphate group

- d. Nucleosides
- e. Nucleotides
- f. Biologically important nucleotides
- g. Formation of the polynucleotide chain
- h. Structure of the DNA molecule
- i. Structure of RNA.

XII. Function of Nucleic Acids

- a. Replication of DNA
- b. Synthesis of RNA
- c. Genetic code
- d. Protein synthesis.

Methods of Instruction

The following teaching/learning activities will assist students to achieve course objectives: lecture, instructor-led class discussion, demonstration, and textbook reading assignments.

Methods of Evaluation

Total points earned of the total points possible will determine the grade for the class.

Online Course:

Text (Required for Online Course):

Creager, J. (1993). Basic Health Science Chemistry: A Review and Workbook.

Dubuque, IA: Wm. C. Brown Publishers.

Method of Instruction for Online Course

The following online teaching/ learning activities will assist students to achieve course objectives: posted web pages, threaded discussions, written assignments, assigned reading, and interaction with instructor through e-mail and discussion boards.