



06-10-05

Common Course Number: BSC-1000

Course Title: Fundamentals of Biology

Catalog Course Description:

This course is meant to familiarize students with the major principles of chemistry and cell biology. It may be used to fulfill the general education requirements and as a preparatory course for upper level biology courses such as BSC 2010 (Principles of Biology) and MCB 2013 (Microbiology).

Credit Hours: 3

Prerequisites: None

Corequisites: None

Course Competencies:

Competency 1: Upon successful completion of this course, the student will demonstrate knowledge of the nature of life and the nature of science by:

- a. describing the basic characteristics of living things.
- b. identifying the major levels of organization of life, starting with the atom and ending with ecosystems.
- c. describing the steps involved in the scientific method.
- d. explaining the terms independent variable, dependent variable, controlled variables, control, hypothesis, and theory.

Competency 2: Upon successful completion of this course, the student will demonstrate knowledge of the basic principles of chemistry by:

- a. explaining the nature of atoms and describing the major subatomic particles.
- b. identifying and describing the major types of chemical interactions; non-polar and polar covalent bonds, ionic bonds, hydrogen bonds, and van der Waals interactions.
- c. defining atomic number, mass number, atomic weight, isotope, ion, and molecular weights.
- d. defining the terms valence and valence shell electrons.
- e. using valence shell theory to determine covalent bonding interactions.
- f. describing the nature of molecules and ionic compounds.
- g. differentiating between structural and molecular formulas.
- h. reading and writing chemical formulas and reactions, including dehydration synthesis, hydrolysis, acid-base, and redox.
- i. describing the properties of water and aqueous solutions.
- j. defining molarity and concentration.

Competency 3: Upon successful completion of this course, the student will demonstrate knowledge of acids, bases, and pH by:

- a. explaining the Bronsted-Lowry (protic) theory of acids and bases.
- b. explaining the concept of pH and the relationship between H^+ concentration and pH.
- c. determining the pH of a solution based on either H^+ or OH^- concentration.
- d. describing the action of buffers and explaining the concept of pH control.

Competency 4: Upon successful completion of this course, the student will demonstrate knowledge of organic compounds by:

- a. naming and drawing the structures of functional groups found in the four major classes of organic macromolecules (carbohydrates, proteins, lipids, and nucleic acids).
- b. describing the chemical properties imparted to macromolecules by these functional groups.
- c. classifying organic molecules as polar or non-polar, soluble or insoluble.
- d. describing the properties and giving examples of carbohydrates, lipids, proteins, and nucleic acids.
- e. describing high-energy compounds and their properties.
- f. explaining the functions of enzymes and their role in organisms.
- g. explaining enzyme regulation and control in mammalian metabolism.

Competency 5: Upon successful completion of this course, the student will demonstrate knowledge of cell structure and function by:

- a. distinguishing between prokaryotic and eukaryotic cells.
- b. distinguishing between plant and animal cells.
- c. identifying the components of the cell, including organelles and other cellular structures.
- d. describing the functions of all organelles and other cellular structures.

Competency 6: Upon successful completion of this course, the student will demonstrate knowledge of the plasma membrane and membrane transport by:

- a. defining the term amphipathic, and explaining the significance of amphipathic molecules in membrane structure and function.
- b. describing the plasma (cell) membrane, its functions and components: lipids, carbohydrates, and proteins.
- c. recognizing the main types of membrane proteins.
- d. explaining diffusion and identifying the factors that influence diffusion rate.
- e. explaining the concepts of osmosis and osmotic pressure.
- f. explaining the concept of transmembrane potential.
- g. describing the mechanisms by which materials move into and out of cells.

Competency 7: Upon successful completion of this course, the student will show an understanding of protein synthesis and heredity by:

- a. describing the process of DNA replication.
- b. explaining the relationship between genes and proteins.
- c. describing and explaining the process of protein synthesis.
- d. analyzing the molecular basis of heredity, and correlating molecular events with organismal/phenotypic outcomes.
- e. defining terminology associated with classical genetics, and calculating probable outcomes of mono- and dihybrid crosses.
- f. differentiating between autosomal and sex-linked modes of inheritance.

Competency 8: Upon successful completion of this course, the student will demonstrate knowledge of the cell life cycle and embryology by:

- a. describing the cell cycle and listing and describing the events occurring during mitosis and meiosis.
- b. distinguishing between somatic cells and sex cells.
- c. discussing the concept of differentiation and its relation to formation of tissues.
- d. explaining the molecular mechanisms whereby embryological development of an organism occurs.

Competency 9: Upon successful completion of this course, the student will demonstrate

knowledge of cellular respiration and energy utilization by:

- a. explaining the first and second laws of thermodynamics.
- b. explaining how thermodynamics influences chemical equilibrium and differentiating between exergonic and endergonic reactions.
- c. defining metabolism, anabolism, and catabolism.
- d. describing carbohydrate metabolism, including the basic steps of glycolysis, the Krebs cycle, and the electron transport chain.
- e. summarizing the energy yield of aerobic cellular respiration.
- f. describing the process of fermentation.
- g. describing metabolism of lipids and proteins and its relationship to the Krebs cycle and the electron transport chain.
- h. describing the biosynthesis of carbohydrates, lipids, and proteins.

Competency 10: Upon successful completion of this course, the student will demonstrate knowledge of histology by:

- a. identifying the four fundamental tissues types of the human body and their primary functions.
- b. explaining the characteristic cellular organization and functions of epithelial tissue.
- c. describing the organization and function of loose, fibrous, supportive, and fluid connective tissues.
- d. listing the characteristics of muscle tissue and distinguishing between smooth and striated muscle.
- e. describing the molecular basis of muscle contraction.
- f. identifying the characteristics of neural tissue.
- g. describing a membrane potential and its relation to the transmission of nerve impulses.
- h. explaining the relationship of tissues, organs, and organ systems.

Competency 11: Upon successful completion of this course, the student will demonstrate knowledge of scientific terminology by:

- a. using academic and scientific terminology.
- b. demonstrating the principles of academic reading and writing: analyzing and organizing ideas, drafting, and revising scientific reports.
- c. making oral and/or written presentations of scientific material.