



06-09-05

Common Course Number: BSC-2010

Course Title: Principles of Biology I

Catalog Course Description:

This is the first in a sequence of two courses that deal with the principles of modern biology. It covers scientific process, the chemistry of life, the basics of metabolism, cell theory, cellular respiration, photosynthesis, classical, and molecular genetics.

Credit Hours: 3

Prerequisite: ENC 1101

Pre- or Corequisites: BSC 2010L, CHM 1045

Course Competencies:

Competency1: Upon successful completion of this course, the student will demonstrate knowledge of the scientific process and the nature of biology by:

- a. identifying the components of the scientific process and recognizing that testable hypotheses form the basis for all scientific inquiry.
- b. describing the hierarchical nature of life, from atoms to ecosystems and explaining the idea that each level of life has emergent properties.
- c. recognizing the cell as the basic unit of all life and that DNA is the molecule responsible for the continuity of life.
- d. explaining the idea that structure and function are correlated at all levels of biological organization.
- e. explaining that all living things interact both with the living and the non-living components of their environment.

- f. recognizing that dynamic balance is maintained in living systems through regulatory mechanisms.

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

- a. identifying the components of matter (such as atoms, elements, compounds, and molecules), recognizing that atoms are the fundamental unit of matter, and describing basic atomic structure.
- b. comparing and contrasting the basic types of bonds that occur within and between molecules and describing how bonds are made and broken in chemical reactions.
- c. describing the polar nature of water and explaining how water's properties play a role in the evolution and continuity of life on Earth.
- d. explaining the nature of organic compounds, including the basic functional groups and the relationship between monomers and polymers.
- e. analyzing the component structure of carbohydrates, lipids, proteins, and nucleic acids and understanding how these molecules function in living systems.

Competency 3: Upon successful completion of this course, the student will demonstrate knowledge of cell Structure and function by:

- a. differentiating between the two basic cell types, describing their differences and similarities, and explaining their evolutionary relationship.
- b. analyzing the importance of subcellular compartmentalization and multicellularity in the evolution of life on Earth.
- c. identifying the subcellular organelles and describing their structure and functions.
- d. explaining the fluid mosaic nature of membrane structure and the basic processes responsible for transport across membranes.
- e. explaining the function of cell division, and identifying and describing the major steps in the cell cycle including the processes of mitosis and cytokinesis.
- f. describing how cell cycles are regulated at the molecular level.

Competency 4: Upon successful completion of this course, the student will demonstrate knowledge of the nature of metabolism, photosynthesis, and cellular respiration by:

- a. describing the nature of metabolism, the types of energy available to living systems, and the basic laws that govern the transformations of energy.
- b. analyzing the relationship between entropy and free energy, and explaining how life affects both.
- c. illustrating the structure of ATP and explaining how it functions in cells to link exergonic and endergonic pathways.
- d. explaining the structure and function of enzymes as well as how they are regulated
- e. discussing the significance of cellular respiration and explaining how it relocates electrons to yield ATP.

- f. identifying the steps of cellular respiration and describing its component processes including glycolysis, the Krebs cycle, the electron transport chain, and chemiosmosis.
- g. comparing and contrasting the component chemical processes and efficiencies of cellular respiration and fermentation.
- h. explaining the function of photosynthesis, its evolutionary significance, and its importance to the continuation of life on our planet.
- i. describing the structure and function of the cellular components required for the process of photosynthesis.
- j. analyzing the steps of photosynthesis, including the light dependent reactions and the Calvin cycle, in order to understand how organic molecules are assembled from inorganic ones.

Competency 5: Upon successful completion of this course, the student will demonstrate knowledge of genetics by:

- a. summarizing the nature of heredity and explaining how it is governed by the structure and function of chromosomes.
- b. comparing and contrasting sexual and asexual reproduction, and describing the advantages and disadvantages of both.
- c. identifying and describing the steps of meiosis and explaining how meiosis increases genetic variation, the raw material for evolution.
- d. describing the work of Gregor Mendel and explaining how he derived the basic principles of heredity.
- e. paraphrasing the basic rules of probability and illustrating how they can be used to predict the outcome of genetic crosses.
- f. distinguishing between Mendelian and non-Mendelian inheritance and describing patterns resulting from both.
- g. describing the work of T. H. Morgan and how it relates to the phenomenon of gene linkage and sex linkage.

Competency 6: Upon successful completion of this course, the student will demonstrate knowledge of the structure and function of DNA by:

- a. describing the structure of DNA and the processes of replication, transcription, and translation.
- b. explaining the semi-conservative nature of DNA replication and how nitrogen base pairing and the participation of various enzymes ensure the accuracy of this process.
- c. listing and describing the steps in the process of transcription, as well as the structure and function of the molecules involved.
- d. discussing the nature of the genetic code and explaining how it governs the process of translation.
- e. listing and describing the steps in the process of translation, as well as the structure and function of the molecules involved.
- f. describing the nature and consequences of point and chromosomal mutations.
- g. comparing and contrasting the structure and function of viral and bacterial genomes .

- h. comparing and contrasting gene expression in prokaryotes and eukaryotes and analyzing the evolutionary significance of these differences and similarities.