

Contra Costa College

Course Outline

Department & Number: BIOSC 110

Course Title: Introduction to Biological
Science

Pre-requisite: None

Corequisite: None

Advisory: None

Entry Skill: None

Lecture Hours: 54.00 - 54.00

Lab Hours: 54.00 - 54.00

Composition Hours: 0.00

Activity Hours: 0.00

Lecture Hours By Arrangement: 0.00

Lab Hours By Arrangement: 0.00

Units: 4.00 - 4.00

Course/Catalog Description:

This course covers the principles and concepts of general biology through a study of the cell and its molecular nature, genetics, evolution, and a brief survey of the plant and animal kingdoms.

Requisites

There are no requisites to display.

Course Objectives:

At the completion of the course the student will be able to:

1. Define, explain, and interpret characteristics of life.
2. Demonstrate knowledge of the purpose and history of classification systems. Define and give examples of the Kingdoms of life; know the major phyla in the living world. Identify and explain the other units (including the biological and typological species) used in classification.
3. Explain the structure of atoms, ions, isotopes. Use the periodic table and determine atomic stability. Describe and distinguish between ionic bonds, covalent bonds, polar covalent bonds, and hydrogen bonds. Distinguish between ionic and covalent compounds and understand ionic dissociation reactions. Interpret the pH scale and distinguish between acids and bases. Understand and write empirical and structural formulae for basic biological molecules. Write and interpret basic chemical equations as they relate to biological processes. Identify, and discuss the structures and functions of the four major classes of biological molecules: carbohydrates, lipids, proteins, and nucleic acids.
4. Demonstrate knowledge of the Cell Theory. Identify, explain, and interpret the distribution, structure, and function of the organelles found in Eukaryotic cells (including animals and plants). Compare and contrast the distribution, structure, and functions of Eukaryotic and Prokaryotic cells. Diagram and discuss the macromolecular structure of cell membranes. Define, and interpret the various kinds of passive and active transport across cell membranes.
5. Demonstrate knowledge of the functions of ATP, NADH, and NADPH in cellular energetics. Interpret the general equation for photosynthesis. Demonstrate knowledge of the roles played by chlorophyll and diverse accessory pigments and how they are arranged in chloroplasts and leaves. Interpret the absorption spectrum of photosynthesis. Discuss the differences between the light-dependent and light independent reactions. Demonstrate knowledge of various environmental factors limiting photosynthesis.
6. Interpret the general equation for cellular respiration. Discuss the events of glycolysis, Krebs Cycle, Electron Transport, and the production ATP within mitochondria. Interpret the total yield of ATP molecules in respiration. Explain the process of fermentation in animal, plant, and fungal cells. Compare and contrast the products and energy yields with cellular respiration. Evaluate the roles of gas exchange organs, digestive systems, and circulatory systems in organismal energy metabolism.
7. Define and explain cellular reproduction in prokaryotes and eukaryotes. Understand the structure of chromosomes. Recognize and explain the phases and events of mitosis; compare and contrast cytokinesis in plants and animals. compare and contrast mitosis and its events with meiosis and its events. Demonstrate knowledge of the products of and the significance of meiosis in the living world.
8. Interpret the life-cycles of various plants and animals. Define, explain and discuss floral anatomy,

pollination, seeds, fruit, and seed dispersal. Understand the difference between sporophyte and gametophyte. Explain and interpret, compare and contrast diverse animal cycles. Demonstrate knowledge of the evolutionary purpose of sexual reproduction. Demonstrate knowledge of human reproductive anatomy and hormonal control of human reproduction.

9. Explain and discuss how genetic material is encoded in molecules of DNA and later expressed through the processes of transcription and translation. Demonstrate knowledge of and interpret the process of DNA replication. Evaluate when these events occur in the cell cycle.
10. Define and apply the basic vocabulary of genetics. Demonstrate knowledge of and interpret the pea-breeding experiments of Gregor Mendel. Interpret and solve genetics problems involving mono- and di-hybrid crosses (and more). Interpret and solve genetics problems in non-Mendelian genetics, including linkage, and sex-linkage. Explain the molecular aspects of genetics and mutations. Explain the lac operon model of gene regulation. Know and explain recent advances in genetic engineering and biotechnology involving the introduction of new or modified genetic material into the organismal genome and the cloning of organisms.
11. Define, explain, and interpret evolution and natural selection. Evaluate the contributions of Darwin, Wallace, and others. Interpret various evidences for evolution; explain and interpret the action of natural selection. Compare and contrast micro- and macro-evolution. Distinguish and interpret diverse isolating mechanisms and the process of speciation.
12. Evaluate the importance of the Second Law of Thermodynamics and how it's relevant to the movement of energy through ecosystems. Understand pyramids of numbers and biomass. Explain and interpret the cyclic nature of materials movement in ecosystems.
13. Discuss the location and significant characteristics of the major global ecosystems, both terrestrial and aquatic.
14. List and interpret those factors defining the growth rate of a population and other factors limiting population growth. Know and interpret demographic data. List and explain relevant statistics of human populations and their growth.
15. Evaluate and understand diverse ecological phenomena, including interspecific interactions, succession, and niches. Interpret how these factors lend structure to nature. Explain the historical and current magnitude of extinctions, and those factors making organisms more (or less) vulnerable to extinctions.

Student Learning Outcomes

1. Students will demonstrate their knowledge of basic chemistry for biology.
2. Students will demonstrate their knowledge of cell structures and functions.
3. Students will demonstrate their knowledge of energy flow through photosynthesis and cellular respiration.
4. Students will demonstrate their understanding of cellular reproduction and genetic inheritance.
5. Students will demonstrate their understanding of natural selection and how it impacts ecology and ecosystems.

Course Content

Course Content (Lecture):

Characterizing life

Diversity and classification Ecosystem function and ecosystem diversity

Populations and their growth

Basic chemistry, chemical bonding, and biological molecules

Cells, organelles, membrane structure, function, and mechanisms of transport

Photosynthesis: organismal and molecular events

Cellular reproduction: mitosis and meiosis

Organismal reproduction and life cycles

Structure and function of viruses

Chromosomal genetics, gene regulation, and genetic engineering

Evolution, natural selection, and population genetics

Environmental physiology

Principles of ecology

Course Content (Lab):

Collecting and characterizing data

Using the scientific method to perform and analyze experiments.

Enzymes and their activity

Microscopes and viewing prokaryotic and eukaryotic cells and tissues

Osmosis and diffusion

Cellular energetics: photosynthesis and cellular respiration

DNA replication, transcription, and translation

Dividing cells: mitosis and meiosis

Organismal reproduction in plants and animals

Genetics

Populations and their growth

Human population growth

Ecosystems

Field trip(s) to view local ecosystems and ecological interactions.

Methods Of Instruction:

1. Lecture
2. Lab
3. Activity

Instructional Materials

Note: To be UC/CSU transferable, the text must be dated within the last 7 years OR a statement of justification for a text beyond the last 7 years must be included

Textbooks

Title: Essential Biology

Author: E. Simon, J. Reece, and J. Dickey

Publisher: Benjamin Cummings Publishing

Edition: 5th edition

Date: 2012

Manuals

Title: Lab Manual for General Biology

Author: K. Krolkowski

Date: 12/31/2009 12:00:00 AM

Publisher: CCC Bookstore

Title: Bio 110 Lab Manual

Author: Tarp, Chris

Date: 8/15/2015 12:00:00 AM

Publisher: CCC bookstore

Outside of Class Weekly Assignments

Title 5, section 55002.5 establishes that a range of 48 -54hours of lecture, study, or lab work is required for one unit of credit. For each hour of lecture, students should be required to spend an additional two hours of study outside of class to earn one unit of credit.

- State Mandates that sample assignments must be included on the Course Outline of Record

Outside of Class Weekly Assignments

Hours Per Week

Weekly Reading (*Include detailed assignment below, if applicable*)

3.00

Virtually all lecture and many lab topics have assigned reading in the textbook. Here is one week's reading from Spring 2014: 3/3 M Photosynthesis: sun's energy is used to create energy rich molecules T: Ch 6; LN:18-19 3/7 F Photosynthesis (as above) + T: 376-377 + 385

Weekly Writing (*Include detailed assignment below, if applicable*)

1.00

Article summaries are one kind of out-of-class assignment. This is from Spring 2014: ARTICLE SUMMARIES: from a recent (published since 6/12) and appropriate science journal or magazine, choose an article relevant to this class. In your own words, summarize the article in about 350 words. Plagiarism is unacceptable. Additionally, your summary must include the article's title, author(s), source, and date. On-line sources require the same information, plus the relevant URL. Obviously, you must choose an article long enough to be summarized. Two summaries are required, with a maximal value of 20 points each. Spelling, grammar, and writing style count.

Lab or Software Application (*Include detailed assignment below, if applicable*)

2.00

Virtually all lab assignments require outside work answering questions and analyzing experiments. For example, a lab on how concentration and temperature affect enzyme activity would have an out-of-class write-up that included an experimental question, a hypothesis, an experimental procedure, results (only available at the end of this lab), and an analysis and interpretation.

Student Evaluation

Lecture exams

Quizzes

Other assignments, such as summaries of scientific articles.

Laboratory write-ups of exercises and experiments.

Grading Policy

Letter Grade

90% - 100% = A

80% - 89% = B

70% - 79% = C

60% - 69% = D

Below 59% = F

Prepared by Ellen Coatney

Date 1/1/0001