

BIOL 0010 - INTRODUCTION TO BIOLOGY

Catalog Description

Advisory: Eligibility for ENGL 1A

Hours: 54 lecture

Description: Designed for non-life science majors desiring an introductory biology course without a lab. Introduces the main concepts of biology, covering molecular and cell biology, heredity and nature of genes, biotechnology, evolution, diversity of life, and principles of ecology. Students enrolling in BIOL 11 after having taken BIOL 10 will lose credit for BIOL 10. Not recommended for students who have already completed BIOL 56. (CSU, UC-with unit limitation)

Course Student Learning Outcomes

- CSLO #1: Develop, utilize and evaluate scientific hypotheses.
- CSLO #2: Appraise the relationship between cellular respiration and photosynthesis.
- CSLO #3: Formulate the correct structure of the main types of cells and diagnose the hypotheses regarding the evolutionary development of those cells.
- CSLO #4: Assess the role of DNA in living things, construct methods to analyze the patterns of inheritance, and judge the impact of genetic engineering on living things.
- CSLO #5: Justify the role of evolution in the development of living things, the diversity of living things and judge the effects of humans on living things on earth.

Effective Term

Fall 2022

Course Type

Credit - Degree-applicable

Contact Hours

54

Outside of Class Hours

108

Total Student Learning Hours

162

Course Objectives

1. Apply the main steps of the scientific method to develop a scientific hypothesis. (Lecture 1a)
2. Identify the variables found in scientific experiments and the roles that they play in testing hypotheses. (Lecture outline 1a)
3. Outline the levels of organization of life from molecular to ecosystem level in a diagram. (Lecture outline 1)
4. Apply knowledge of the parts of an atom to construct molecules with a lower energy state than the atoms that entered into the bond. (Lecture outline 1b)

5. Describe characteristics of the main organic compounds and consider roles of various organic molecules in living organisms (Lecture outline 1c)
6. Outline the functions of the main components of prokaryotic and the components and organelles of eukaryotic cells. (Lecture outline 1d)
7. Defend why a living cell is the basic unit of life. (Lecture outline 1d)
8. Describe the behavior of molecules during diffusion both within the solution itself and across a membrane. (Lecture outline 1d)
9. Hypothesize how the structure of the cellular membrane enables cells to function. (Lecture outline 1d)
10. Differentiate between the first two laws of thermodynamics and apply them to living systems. (Lecture outline 1a)
11. Diagram how enzymes work and how they can be shut down. (Lecture outline 1b)
12. Identify the role of enzymes in organisms (Lecture outline 1b)
13. Compare and contrast the processes of photosynthesis and cellular respiration, and recognize their role in energy flow in ecosystems. (Lecture outline 11c and 11d)
14. Compare and contrast the processes of bacterial fission, mitosis and meiosis, and recognize their role in the life cycles of organisms. (Lecture outline 11a)
15. Explain the correlation between errors in the cell cycle and cancer (Lecture outline 11a).
16. Describe the structure of a DNA molecule and the process by which it replicated. (Lecture outline 11b)
17. Analyze the main steps of protein synthesis. (Lecture outline 11b)
18. Critique the role that mutations play in protein synthesis and evolution. (Lecture outline 11b)
19. Identify the main implications of DNA technology in the lives of human and other living things. (Lecture outline 11b)
20. Judge ethical issues associated with the use of biotechnology. (Lecture outline 11b)
21. Critique the adaptive significance of sexual reproduction and situations in which asexual reproduction would be preferable. (Lecture outline 11c)
22. Outline the ways by which meiosis and random fertilization contribute to biological adaptation and diversity. (Lecture outline 11c)
23. Formulate the main Mendelian rules of inheritance and utilize these rules to solve simple genetic problems (involving monohybrid and dihybrid crosses). (Lecture outline 11c)
24. Analyze the connection between genetics, heredity, epigenetics and the environment. (Lecture outline 11c)
25. Evaluate natural selection as the main mechanism of biological evolution. (Lecture outline 11a)
26. Defend the importance of variation, overproduction, and heritability in natural populations. (Lecture outline 11a)
27. Describe the history of evolutionary thought. (Lecture outline 11a)
28. Compare and contrast microevolution and macroevolution. (Lecture outline 11a)
29. Evaluate the Oparin/Miller theory of the origin of life as suggested by geological and biochemical evidence. (Lecture outline 11b)
30. Identify the Domains and Kingdoms recognized by modern taxonomy, list the main characteristics of each domain and kingdom, and give examples of the main representatives of each. (Lecture outline 11)
31. Evaluate the role that microorganisms, plants, fungi and animals play in ecosystems and in the lives of humans. (Lecture outline 11)
32. Investigate the main evolutionary adaptations found in microorganisms, plants, fungi and animals. (Lecture outline 11)
33. Examine the main components of an ecosystem and diagnose the ecological roles that organisms play within them. (Lecture outline 11f)
34. Evaluate the effect of human activities on the diversity of life on and the geological processes of Earth. (Lecture outline 11)

35. Diagnose the long-term effect of human population growth on the fate of our planet. (Lecture outline IV)

General Education Information

- Approved College Associate Degree GE Applicability
 - AA/AS - Life Sciences
- CSU GE Applicability (Recommended-requires CSU approval)
 - CSUGE - B2 Life Science
- Cal-GETC Applicability (Recommended - Requires External Approval)
- IGETC Applicability (Recommended-requires CSU/UC approval)
 - IGETC - 5B Biological Science

Articulation Information

- CSU Transferable
- UC Transferable

Methods of Evaluation

- Essay Examinations
 - Example: Answer in a one page, double-spaced essay which will be evaluated based on accuracy and development of response. Rubric grading. 1. Genetically modified organisms are those which have had their genes altered. This is not the same as selective breeding. In selective breeding agriculturalists select the plants or animals that produce the most food and then breed them together to produce offspring that produce a high amount of food. For example, due to selective breeding cows are able to produce more milk per day today than they were in the past. Genetically modified organisms, however are something different. Genetically modified organisms, or GMOs as they are commonly referred to, have genes from other species of organisms inserted into their own genome. For example, Bt corn is a type of corn that has had a gene from a bacterial species called *Bacillus thuringiensis* inserted into it. This gene makes the corn resistant to a particular corn pest species called the European corn borer. This means that farmers who grow this corn no longer need to spray their corn with pesticides to eliminate this pest. However, there are many who worry about the impact of GMOs on the environment, on humans and on other crop species. What do you think of GMOs? Find some research on-line (from an .org or .edu source) both in support and against the use of these organisms. What do you think of their arguments? Do you agree or disagree? What do you think the global impact of these organisms could be? What percentage of the average American diet is composed of GMOs? - Objectives being assessed: 1. Identify the main implications of DNA technology for the medical field and agriculture. (Lecture outline IIIb, Objective 19) 2. Judge ethical issues associated with the use of biotechnology. (Lecture outline IIIb, Objective 20) 2. What are the main lines of evidence that support current evolutionary theory? Answer in a one page, double-spaced essay which will be evaluated based on accuracy and development of response. - Objectives being assessed: 1. Describe the history of evolutionary thought. (Lecture outline IVa, Objective 27) 2. Compare and contrast microevolution and macroevolution (Lecture outline IVa, Objective 28)
- Objective Examinations
 - Example: 1. Hypertrichosis, hairiness of the outer ear, is inherited as a Y-linked recessive in humans, If a man with hypertrichosis marries a woman without the trait, what might be the phenotypes of their children? A. All of their children have hypertrichosis B.

All of the sons have hypertrichosis, but none of the daughters
 C. All of the daughters have hypertrichosis, but none of the sons
 D. None of their children have hypertrichosis 2. Tube feet of sea stars are used primarily for: A. Reproduction B. Circulation C. Movement D. Sensation

Repeatable

No

Methods of Instruction

- Lecture/Discussion
- Distance Learning

Lecture:

1. Instructor will lecture on atoms and molecules. The students will be asked to form molecules based upon the arrangement of electrons in the atom. Those molecules will need to be at a low energy state. The students will be asked to reason why those molecules are lower energy. The students will also be asked to demonstrate how the molecule will be effected by atoms that are highly electronegative. Apply knowledge of the parts of an atom to construct molecules with a lower energy state than the atoms that entered into the bond.
2. Following a lecture on transcription and translation, the students will be given a segment of DNA to transcribe into mRNA and then translate into protein. This assignment will be given as a hypothetical exercise in rebuilding a dinosaur. The students will then reflect on the issues surrounding the cloning of living things. The instructor provides feedback on common errors and facilitates students toward better understanding of concepts. Analyze the main steps of protein synthesis.

Distance Learning

1. Following a live-recorded lecture on the limitations to colonization of land, students will research reputable websites about an adaptation. They will present what they learned in a class discussion and include a link to the article. Other students will read the article and give commentary to the original poster about what they learned. The instructor will give feedback and elaborate on the discovery as needed. Investigate the main evolutionary adaptations found in microorganisms, plants, fungi and animals.

Typical Out of Class Assignments Reading Assignments

1. Discover something new in science. In the tradition of a "Today I learned" post, read about a new discovery in science. Evaluate what you read and be prepared to discuss the implications for humans and the environment of that work. 2. Review the data collected and results from a scientific experiment provided by the instructor (e.g. science surrounding vaccine acceptance). Evaluate the outcome of the experiment. Identify the hypothesis and variables that were part of that experiment.

Writing, Problem Solving or Performance

1. Complete word problems in genetics that are based in genetic terminology. 2. Evaluate the size of the human population on earth today. Use this information to determine the effects that humans have on the natural world and project their future effects. Detail your findings in a two-page essay that demonstrates critical thought.

Other (Term projects, research papers, portfolios, etc.)

1. Case Studies: Should we clone mammoths? Evaluate what the potential barriers are to cloning mammoths. Discuss the potential effects on the ecosystem of the reintroduction of mammoths into the ecosystem. Use this information to debate issues surrounding the reintroduction of mammoths or other extinct animals back into the ecosystem.

Required Materials

- Concepts of Biology
 - Author: Fowler, Roush, Wise
 - Publisher: Open Stax
 - Publication Date: 2019
 - Text Edition:
 - Classic Textbook?:
 - OER Link:
 - OER:
- Campbell Essential Biology
 - Author: Reece, Simon, Dickey
 - Publisher: Benjamin Cummings
 - Publication Date: 2018
 - Text Edition: 7th
 - Classic Textbook?:
 - OER Link:
 - OER:

Other materials and-or supplies required of students that contribute to the cost of the course.