

Student Learning Outcomes Library

Office of Assessment & Accreditation

Indiana State University

BA/BS Biology

Spring 2020

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Outcome	Related Foundational Studies or Graduate Goal
Explain and Illustrate the Fundamental Concepts of Biology	
1.1 Explain and illustrate energy and matter in biology	
1.2 Explain and illustrate cells and genetics	
1.3 Explain and illustrate living organisms	
1.4 Explain and illustrate normal physiology of organisms	
1.5 Explain and illustrate growth and behavior of organisms	
1.6 Illustrate and examine relationships among organisms	
1.7 Explain biological phenomena using evolutionary theory	
Quantitative Reasoning, Laboratory Skills, Analysis, and Interpretation	
2.1 Use quantitative skills and reasoning	
2.2 Use modeling/simulations to understand biological processes	
2.3 Use appropriate equipment to solve biological problems	
Scientific Communication and Literacy	
3.1 Recognize the interdisciplinary nature of science	
3.2 Communicate and collaborate effectively	
3.3 Recognize and explain the role of a biologist	
3.4 Recognize and act on ethical challenges in science	

Goal 1: Develop Knowledge and Understanding of Core Content in Biology

Outcome	Related Foundational Studies or Graduate Goal
Illustrate and Examine Relationships Among Organisms—Illustrate and examine phylogenetic relationships among organisms, and characterize and differentiate the evolutionary processes that yield such relationships	
1.1 Apply concepts of natural selection and evolution: Apply concepts of natural selection and evolution in understanding any aspect of biology, ranging from genes to speciation.	
1.2 Map key events in biological evolution: Map key events in biological evolution onto the broad phylogenetic tree of life	
1.3 Summarize biological information: Summarize biological information in the context of phylogenetic trees.	
1.4 Construct a basic phylogenetic tree: Construct a basic phylogenetic tree from biological data.	
Explain and Illustrate Cells—Explain and illustrate the basic structure and function of cells	
2.1 Explain cell functions: Explain how internal membranes and organelles contribute to cell functions.	
2.2 Describe the molecular properties of cell membranes: Describe the molecular properties of cell membranes, and relate these properties to the selective permeability of membranes.	
2.3 Explain how cell size/shape affect nutrient intake: Explain how cell size and shape affect the overall rate of nutrient intake and the rate of waste elimination.	
2.4 Explain how cells use energy to maintain homeostasis: Explain how cellular molecules and organelles generate and utilize energy in cells to maintain homeostasis.	
2.5 Explain the differences between cells: Explain the differences between prokaryotic and eukaryotic cells with regard to macromolecules, membranes, and organelles, and evaluate the significance of these differences.	
2.6 Explain mitotic and meiotic division: Explain mitotic and meiotic division, and regulation of cell growth.	
2.7 Explain and illustrate how cells respond: Explain and illustrate how cells respond to their internal and external environments.	

Explain and Illustrate Normal Physiology of Organisms—Explain and illustrate how the normal physiology of organisms' functions in different taxa to maintain homeostasis in various environments	
3.1 Explain functional units: Explain how functional units at different levels of biological organization permit diverse organisms to maintain relatively constant internal environments.	
3.2 Explain how organisms sense and respond: Explain how organisms sense and respond to their external environment.	
3.3 Compare and contrast the differences in physiology: Compare and contrast the differences in physiology among organisms, both within and between taxa, that allow them to cope with differences in their abiotic and biotic environments.	
Explain and Illustrate Growth and Behavior of Organisms—Explain and illustrate how the growth and behavior of organisms are activated and regulated through the expression of genetic information in context	
4.1 Explain the relationship between phenotype and genotype: Explain and illustrate the relationship between phenotype and genotype.	
4.2 Explain various modes of genetic action: Explain and illustrate the various modes of genetic action, including Mendelian genetics, quantitative genetics, and epigenetics.	
4.3 Explain the applications of genomics: Explain and illustrate the applications of genomics in science and society.	
4.4 Explain how genetic information is stored and expressed: Explain and illustrate how genetic information is stored and expressed.	
Explain and Illustrate Energy and Matter in Biology—Explain and illustrate the pathways and transformations of energy and matter in biological systems	
5.1 Describe the structure and function of molecules: Describe the structure and function of biological molecules, including carbohydrates, proteins, and lipids, that are involved in anabolic and catabolic processes in living organisms.	
5.2 Describe pathways involved in photosynthesis: Describe the regulation of pathways involved in photosynthesis.	
5.3 Describe pathways involved in cellular respiration: Describe the regulation of pathways involved in cellular respiration and explain how these pathways utilize energy from carbohydrates, proteins, and lipids.	
5.4 Explain how grow and reproduce: Explain how biological systems use free energy and nutrient availability to grow and reproduce.	

<p>5.5 Predict how changes affect organisms: Predict how changes in free energy and nutrient availability affect organisms, populations, and ecosystems.</p>	
<p>Explain and Illustrate Living Organisms—Explain and illustrate how living organisms are interconnected and interacting at multiple functional scales.</p>	
<p>6.1 Interpret coevolutionary and symbiotic relationships: Interpret coevolutionary and symbiotic relationships and illustrate mutualism, antagonism and commensalism.</p>	
<p>6.2 Describe ecological interactions: Examine and describe ecological interactions within and between populations and species, including competitive and exploitative relationships.</p>	
<p>6.3 Describe generation & maintenance of biological diversity: Describe and explain the generation and maintenance of biological diversity, and its role in ecosystem function.</p>	

Goal 2: Develop Core Competencies in Scientific Inquiry

Outcome	Related Foundational Studies or Graduate Goal
Apply Science to Understand Biological Phenomena—Apply the process of science to understand biological phenomena.	
7.1 Review, summarize, and critique: Review, summarize, and critique scientific literature relevant to a specific biological question.	Foundational Studies 1: Locate, critically read, and evaluate information to solve problems.
7.2 Formulate a testable hypothesis: Formulate a testable hypothesis, and design and perform a study to test it.	
7.3 Analyze data to test a hypothesis: Analyze data to address a question or test the hypothesis of a study.	Foundational Studies IIIa: Quantitative Literacy
7.4 Reach defensible conclusions: Reach defensible conclusions based on results of data analyses.	Foundational Studies IIIa: Quantitative Literacy
7.5 Synthesize and integrate information: Synthesize and integrate information to conceptualize and formulate ideas about biology.	
Use Quantitative Skills and Reasoning—Use quantitative skills and reasoning to solve biological problems.	
8.1 Creating or expanding data sets for analysis: Use multiple biological databases as information sources for creating or expanding data sets for analysis.	
8.2 Calculate appropriate indices needed to solve problems: Calculate appropriate indices needed to solve biological problems.	
8.3 Interpret appropriate statistical analyses: Select, compute, and interpret appropriate statistical analyses for analyzing biological data.	Foundational Studies IIIa: Quantitative Literacy
Use Modeling/Simulations to Understand Biological Processes	

9.1 Describe the range of applications of specific models: Describe the critical assumptions and range of application of specific models used to investigate biological processes.	
9.2 Investigate the results of changing parameter values: Investigate the results of changing parameter values, or initial or boundary conditions, or simplifying assumptions in models and simulations, and interpret the biological relevance of those results.	
9.3 Gain a comprehensive understanding of biological processes: Explain the value of combining models and simulations with empirical studies to gain a more comprehensive understanding of biological processes.	
Use Appropriate Equipment to Solve Biological Problems	
10.1 Choose appropriate equipment to use in investigation: Choose the appropriate equipment to use in a biological investigation.	
10.2 Use proper equipment to gather valid data: Use the proper equipment correctly to gather valid data for a biological investigation.	
Recognize the Interdisciplinary Nature of Science—Recognize the interdisciplinary nature of science and demonstrate the ability to connect biology with other disciplines	
11.1 Apply basic concepts of cognate courses to phenomena: Apply basic concepts of cognate courses in chemistry, physics, and mathematics to biological phenomena.	
11.2 Integrate key biological concepts: Integrate key biological concepts across levels of biological organization.	
11.3 Use tools and techniques from interdisciplinary work: Use tools and techniques emerging from interdisciplinary work involving the combination of biology, computer science, and informatics.	
Communicate and Collaborate Effectively—Communicate and collaborate effectively with other biologists and with scientists in other disciplines.	
12.1 Use verbal and oral communication professionally: Use both verbal and oral communication in a professional manner.	Foundational Studies 10: Express themselves effectively, professionally, and persuasively both orally and in writing.

12.2 Evaluate/critique scientific writing and presentations: Evaluate and critique scientific writing and presentations.	Foundational Studies 2: Critically evaluate the ideas of others.
12.3 Work effectively with peer groups: Work effectively with peer groups to accomplish a collaborative task, such as a lab report, group presentation, or analysis of data.	
Recognize and Explain the Role of the Biologist	
13.1 Explain how biological knowledge relates to technology, political issues, and society.	
13.2 Explain the challenges that societal concerns present: Explain the challenges that societal concerns present to science.	
Students Recognize and Act on Ethical Challenges—Students recognize and act on ethical challenges that arise in their discipline.	
14.1 Biological ethics of working with research subjects: Describe and demonstrate the biological ethics of working with research subjects.	
14.2 Explain the ethical implications: Explain the ethical implications of biological issue for society.	

Goal 3: Develop an Understanding of Career Opportunities in Biology

Outcome	Related Foundational Studies or Graduate Goal
Develop a Career Plan	
15.1 Set a career goal: Set a career goal with the help of biology faculty advisors and the Career Center.	
15.2 Create a timeline of events: Create a timeline of events, courses, and activities designed to prepare for a chosen career goal.	
15.3 Explain connection between areas of biology and career: Explain the connection between specific areas of biology and specific careers.	
Use the Resources at the Career Center to Improve Skills	
16.1 Discuss career plans and planning: Discuss career plans and planning with a career counselor.	
16.2 Participate in Career Center activities: Participate in Career Center activities that prepare students for their likely careers.	
16.3 Develop a resume	
16.4 Demonstrate the skills to network effectively	