

Standing Requirements

Outcomes Library

BA/BS in Biology outcome set - revised 2015

1. Explain and illustrate the fundamental concepts of biology

Outcome	Mapping
1a. Explain and illustrate energy and matter in biology	No Mapping
1b. Explain and illustrate cells and genetics	No Mapping
1c. Explain and illustrate living organisms	No Mapping
1d. Explain and illustrate normal physiology of organisms	No Mapping
1e. Explain and illustrate growth and behavior of organisms	No Mapping
1f. Illustrate and examine relationships among organisms	No Mapping
1g. Explain biological phenomena using evolutionary theory	No Mapping

2. Quantitative reasoning, laboratory skills, analysis, and interpretation

Outcome	Mapping
2a. Use quantitative skills and reasoning	No Mapping
2b. Use modeling/simulations to understand biological processes	No Mapping
2c. Use appropriate equipment to solve biological problems	No Mapping

3. Scientific communication and literacy

Outcome	Mapping
3a. Recognize the interdisciplinary nature of science	No Mapping
3b. Communicate and collaborate effectively	No Mapping
3c. Recognize and explain the role of a biologist	No Mapping
3d. Recognize and act on ethical challenges in science	No Mapping

Goal 1: Develop knowledge and understanding of core content in biology

1: Illustrate and examine relationships among organisms

1: Illustrate and examine phylogenetic relationships among organisms, and characterize and differentiate the evolutionary processes that yield such relationships.

Outcome	Mapping
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.	No Mapping
1.2: Map key events in biological evolution	No Mapping

Map key events in biological evolution onto the broad phylogenetic tree of life.

1.3: Summarize biological information No Mapping

Summarize biological information in the context of phylogenetic trees.

1.4: Construct a basic phylogenetic tree No Mapping

Construct a basic phylogenetic tree from biological data.

2: Explain and illustrate cells

2: Explain and illustrate the basic structure and function of cells.

Outcome

Mapping

2.1: Explain cell functions.

No Mapping

Explain how internal membranes and organelles contribute to cell functions.

2.2: Describe the molecular properties of cell membranes

No Mapping

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

No Mapping

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

No Mapping

Explain how cellular molecules and organelles generate and utilize energy in cells to maintain homeostasis.

2.5: Explain the differences between cells

No Mapping

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

No Mapping

Explain mitotic and meiotic division, and regulation of cell growth.

2.7: Explain and illustrate how cells respond

No Mapping

Explain and illustrate how cells respond to their internal and external environments.

3: Explain and illustrate normal physiology of organisms

3: Explain and illustrate how the normal physiology of organisms functions in different taxa to maintain homeostasis in various environments.

Outcome

Mapping

3.1: Explain functional units

No Mapping

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

No Mapping

Explain how organisms sense and respond to their external environment.

3.3: Compare and contrast the differences in physiology

No Mapping

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.

4: Explain and illustrate growth and behavior of organisms

4: Explain and illustrate how the growth and behavior of organisms are activated and regulated through the expression of genetic information in context.

Outcome	Mapping
4.1: Explain the relationship between phenotype and genotype Explain and illustrate the relationship between phenotype and genotype.	No Mapping
4.2: Explain various modes of genetic action Explain and illustrate the various modes of genetic action, including Mendelian genetics, quantitative genetics, and epigenetics.	No Mapping
4.3: Explain the applications of genomics Explain and illustrate the applications of genomics in science and society.	No Mapping
4.4: Explain how genetic information is stored and expressed Explain and illustrate how genetic information is stored and expressed.	No Mapping

5: Explain and illustrate energy and matter in biology

5: Explain and illustrate the pathways and transformations of energy and matter in biological systems.

Outcome	Mapping
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.	No Mapping
5.2: Describe pathways involved in photosynthesis. Describe the regulation of pathways involved in photosynthesis.	No Mapping
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.	No Mapping
5.4: Explain how grow and reproduce Explain how biological systems use free energy and nutrient availability to grow and reproduce.	No Mapping
5.5: Predict how changes affect organisms Predict how changes in free energy and nutrient availability affect organisms, populations, and ecosystems.	No Mapping

6: Explain and illustrate living organisms

6: Explain and illustrate how living organisms are interconnected and interacting at multiple functional scales.

Outcome	Mapping
6.1: Interpret coevolutionary and symbiotic relationships Interpret coevolutionary and symbiotic relationships and illustrate mutualism, antagonism and commensalism.	No Mapping
6.2: Describe ecological interactions Examine and describe ecological interactions within and between populations and species, including competitive and exploitative relationships.	No Mapping
6.3: Describe generation & maintenance of biological divers Describe and explain the generation and maintenance of biological diversity, and its role in ecosystem function.	No Mapping

Goal 2: Develop core competencies in scientific inquiry

7: Apply science to understand biological phenomena

Apply the process of science to understand biological phenomena.

Outcome	Mapping
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.	No Mapping
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.	No Mapping

8: Use quantitative skills and reasoning

Use quantitative skills and reasoning to solve biological problems.

Outcome	Mapping
8.1: Creating or expanding data sets for analysis. Use multiple biological databases as information sources for creating or expanding data sets for analysis.	No Mapping
8.2: Calculate appropriate indices needed to solve problems Calculate appropriate indices needed to solve biological problems.	No Mapping
8.3: Interpret appropriate statistical analyses Select, compute, and interpret appropriate statistical analyses for analyzing biological data.	Foundational Studies: IIIa. Quantitative Literacy

9: Use modeling/simulations to understand biological process

Use modeling and simulations to understand biological processes.

Outcome	Mapping
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.	No Mapping
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.	No Mapping
9.3: Gain a comprehensive understanding of biological proces Explain the value of combining models and simulations with empirical studies to gain a more comprehensive understanding of biological processes.	No Mapping

10: Use appropriate equipment to solve biological problems

Use appropriate equipment to solve biological problems.

Outcome	Mapping
10.1: Choose appropriate equipment to use in investigation	No Mapping

Choose the appropriate equipment to use in a biological investigation.

10.2: Use proper equipment to gather valid data No Mapping

Use the proper equipment correctly to gather valid data for a biological investigation.

11: Recognize the interdisciplinary nature of science

Recognize the interdisciplinary nature of science and demonstrate the ability to connect biology with other disciplines.

Outcome

Mapping

11.1: Apply basic concepts of cognate courses to phenomena

No Mapping

Apply basic concepts of cognate courses in chemistry, physics, and mathematics to biological phenomena.

11.2: Integrate key biological concepts

No Mapping

Integrate key biological concepts across levels of biological organization.

11.3: Use tools and techniques from interdisciplinary work

No Mapping

Use tools and techniques emerging from interdisciplinary work involving the combination of biology, computer science, and informatics.

12: Communicate and collaborate effectively

Communicate and collaborate effectively with other biologists and with scientists in other disciplines.

Outcome

Mapping

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

Foundational Studies: 2. Critically evaluate the ideas of others.

Evaluate and critique scientific writing and presentations.

12.3: Work effectively with peer groups

No Mapping

Work effectively with peer groups to accomplish a collaborative task, such as a lab report, group presentation, or analysis of data.

13: Recognize and explain the role of the biologist

Recognize and explain the role of the biologist in the world and society.

Outcome

Mapping

13.1: Explain how biological knowledge relates to technology, political issues, and society.

No Mapping

13.2: Explain the challenges that societal concerns present

No Mapping

Explain the challenges that societal concerns present to science.

14: Students recognize and act on ethical challenges

Students recognize and act on ethical challenges that arise in their discipline.

Outcome

Mapping

14.1: Biological ethics of working with research subjects

No Mapping

Describe and demonstrate the biological ethics of working with research subjects.

14.2: Explain the ethical implications

No Mapping

Explain the ethical implications of biological issue for society.

Goal 3: Develop an understanding of career opportunities in biology

15: Develop a career plan

Develop a career plan.

Outcome	Mapping
15.1: Set a career goal Set a career goal with the help of biology faculty advisors and the Career Center.	No Mapping
15.2: Create a timeline of events Create a timeline of events, courses, and activities designed to prepare for a chosen career goal.	No Mapping
15.3: Explain connection between areas of biology and career Explain the connection between specific areas of biology and specific careers.	No Mapping

16: Use the resources at the Career Center to improve skills

Use the resources at the Career Center to improve career skills.

Outcome	Mapping
16.1: Discuss career plans and planning Discuss career plans and planning with a career counselor.	No Mapping
16.2: Participate in Career Center activities Participate in Career Center activities that prepare students for their likely careers.	No Mapping
16.3: Develop a resume Develop a resume.	No Mapping
16.4: Demonstrate the skills to network effectively Demonstrate the skills to network effectively.	No Mapping

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