

BIOLOGY II

**Performance Indicators
Essential Questions
Suggested Activities
Suggested Resources**

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Facilitators:

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BIOLOGY II
UNIT I
COMPARATIVE ANATOMY AND ZOOLOGY
(25%)

Performance Indicators

1. Phylogeny of Animals:

- (E) (1.3) a. The student will be able to investigate the progression of animals from the simplest to the most complex with regard to their evolutionary history.

2. Protection, Support, and Movement:

- (E) (3.2) a. The student will be able to identify major bones and muscles of the musculoskeletal system.
- (E) (3.2) b. The student will be able to investigate the physiology of muscle movement.
- (I) (3.2) c. The student will be able to compare human support and movement mechanisms to those found in other animals, such as the earthworm, crayfish, frog, and fetal pig.

3. Integration and Regulation:

- (C) (3.2) a. The student will be able to examine the ways that the endocrine system, nervous system, and sense organs assist in monitoring an organism's environment.
- (C) (3.2) b. The student will be able to relate the growth and development of organisms to genetic, hormonal, and environmental controls.

4. Transportation:

- (I) (3.2) a. The student will be able to compare and contrast the circulatory systems of representative vertebrates and invertebrates.
- (I) (2.3) b. Using preserved specimens, the student will be able to examine the differences among vertebrate hearts.

- (I) (3.2) c. The student will be able to relate methods of respiration to the anatomy and habitat of an animal.
5. Absorption and Excretion:
- (I) (3.2) a. The student will be able to investigate the increasing complexity of methods of excretion utilized by animals.
- (I) (3.2) b. The student will be able to identify animals with differing methods of digestion including intracellular, one-way, and two-way.
- (I) (3.2) c. The student will be able to identify digestive adaptations found in herbivores, carnivores, and omnivores.
6. Reproduction, Growth, and Development:
- (E) (3.2) a. The student will be able to distinguish among animals that reproduce sexually and asexually.
- (E) (3.2) b. The student will be able to distinguish among animals that perform internal and external fertilization.

Essential Questions

1. How do the simplest animal phyla differ from the most complex animal phyla in regards to anatomical differences, embryological development, and evolutionary history?
2. How do animals accomplish functions such as ingestion and digestion, transportation of materials, respiration, excretion, movement, reproduction, and development?
3. What is the relationship between the increasing complexity of organisms and the structure and function of their anatomy?

BIOLOGY II
UNIT II
EMBRYOLOGY
(10%)

Performance Indicators

1. Gametogenesis:

- (E) (2.2) a. The student will be able to relate the process of meiosis to the formation of haploid cells from diploid cells.
- (I) (2.2) b. The student will be able to label diagrams representing the formation of egg and sperm.

2. Fertilization:

- (I) (1.1) a. The student will be able to examine and describe the behavior of egg and sperm during fertilization.
- (E) (3.2) b. The student will be able to differentiate between internal and external fertilization.

3. Development:

- (I) (3.2) a. The student will be able to research how the endoderm, mesoderm, and ectoderm develop to form the major body systems.
- (C) (1.1) b. The student will be able to contrast blastula formation in a variety of animals including frogs, chickens, and humans.
- (C) (2.2) c. The student will be able to sequence a series of diagrams depicting gastrulation of a frog, chicken and human embryo.
- (C) (2.2) d. The student will be able to contrast normal and abnormal differentiation of cells in amphibians, chickens, and mammals.
- (C) (5.3) e. The student will be able to describe the process of cloning and debate its ethical and social implications.

Essential Questions

1. How are the anatomy and production of eggs and sperm similar and different?
2. How do internal and external fertilization lead to zygote formation?
3. How do cleavage, gastrulation, and differentiation compare in the embryological development of organisms such as frogs, chickens, and humans?

BIOLOGY II

UNIT III GENETICS (20%)

Performance Indicators

1. DNA Structure and Function:

- (E) (1.1) a. The student will be able to describe the events of transcription and translation in protein synthesis/gene expression.
- (I) (1.1) b. The student will be able to distinguish among nuclear DNA and the DNA of bacteria, organelles, and bacteriophages.
- (C) (2.4) c. The student will be able to investigate the editing of mRNA, including the removal of introns and its translation into a protein.
- (I) (3.2) d. The student will be able to explain the relationship between environmental conditions and changes in the DNA sequences.
- (C) (3.2) e. The student will be able to research DNA mutations relating to environmental influences.
- (I) (2.4) f. The student will be able to interpret data from a model of crossing-over, and explain how crossing-over increases genetic diversity.

2. Heredity:

- (E) (2.4) a. The student will be able to use the Hardy-Weinberg Law to relate the process of speciation and the ability of a population to undergo evolutionary divergence to allele frequencies.
- (I) (5.2) b. The student will be able to determine when and how karyotypes are made and be able to use them to predict the presence of a genetic disorder.

- (I) (5.2) c. Using pedigrees, the student will be able to analyze and predict the modes of inheritance.
 - (I) (2.2) d. Using Punnett squares, the student will be able to solve monohybrid and dihybrid genetic problems to illustrate autosomal, sex-linked, multiple alleles, multiple gene, codominance, incomplete dominance, gene-linkage, and epistatic modes of inheritance.
3. Genetic Technology:
- (E) (5.3) a. The student will be able to describe methods of genetic engineering, including recombinant DNA and cloning.
 - (C) (5.3) b. Using the results from the Human Genome Project, the student will be able to research the role of the environment on the expression of genes, such as cancer.

Essential Questions

1. What are the different modes of inheritance and examples of each?
2. What role does the environment play on gene expression (transcription and translation)?
3. What are the similarities and differences in chromosomal structure, gene expression, and regulation of gene expression in prokaryotes and eukaryotes?
4. What are some applications of recombinant DNA technology, including cloning?
5. How can the Hardy-Weinberg Law be used to predict allele frequencies in a population?

BIOLOGY II
UNIT IV
IMMUNOLOGY
(10%)

Performance Indicators

1. Immune Response:

- (E) (3.2) a. The student will be able to describe the role of lymphocytes in an immune response.
- (E) (3.2) b. The student will be able to compare and contrast passive and active immunity and provide examples of each.
- (E) (3.2) c. The student will be able to describe the effects of AIDS and other immunodeficiency diseases on the immune response and the social well-being of the afflicted.
- (I) (3.2) d. The student will be able to describe the effect of environmental and genetic factors on immune response.
- (I) (3.2) e. The student will be able to investigate the types and roles of the major antibodies found in human serum.
- (I) (2.1) f. The student will be able to describe the development of and the role of the environment in the increasing incidence of allergies.

2. Research and Technological Application:

- (E) (3.2) a. The student will be able to compare autoimmune diseases (such as lupus, rheumatoid arthritis, and multiple sclerosis) to other diseases.
- (E) (5.3) b. The student will be able to describe the process for the FDA approval of experimental drugs, including the use of other species for research studies.
- (C) (5.3) c. The student will be able to describe the process and factors involved in vaccination production.

Essential Questions

1. What are the stages of the immune response at the cellular and molecular level?
2. What are some immune system disorders?
3. How do active and passive immunity differ?

BIOLOGY II
UNIT V
MICROBIOLOGY
(10%)

Performance Indicators

1. Diversity:
 - (E) (3.2) a. The student will be able to distinguish among microorganisms (bacterial, fungal, viral and other microscopic parasites), using indicators such as morphology, staining characteristics, habitat, reproduction, growth, and nutrition patterns.
 - (I) (3.2) b. The student will be able to describe and provide examples of symbiotic relationships involving microbes.
2. Impact and Uses of Microorganisms:
 - (E) (3.2) a. The student will be able to describe examples of diseases caused by microorganisms.
 - (I) (5.2) b. The student will be able to describe how humans use microbes, such as in mycology, food industries, water purification, genetic engineering, and parasitology.
 - (C) (5.3) c. The student will be able to discuss the use of biological weapons.
 - (C) (5.3) d. The student will be able to investigate epidemiology of emerging infectious diseases.

Essential Questions

1. What are examples of microbes and their distinguishing characteristics?
2. What are ways that microbes are used in society?
3. What are examples of pathogenic and parasitic microbes and the diseases they cause?

BIOLOGY II

UNIT VI BOTANY (25%)

Performance Indicators

1. Classification:

- (E) (3.2) a. Using diagrams, models, or specimens, the student will be able to identify a plant as vascular or nonvascular, spore-bearing or seed producing, gymnosperm or angiosperm (monocot or dicot).
- (E) (3.2) b. The student will be able to explain the life cycle of plants.
- (E) (3.2) c. The student will be able to describe the evolutionary history of plants, including adaptations and specialization necessary for survival in a variety of habitats.
- (I) (3.2) d. The student will be able to distinguish between the use of seeds and spores and explain the advantages and disadvantages of each.
- (C) (2.2) e. The student will be able to use a dichotomous key to identify various species of plants.

2. Anatomy and Physiology:

- (E) (3.2) a. The student will be able to identify, describe, and label the major organs of vascular plants to be the roots, stems, leaves, or reproductive structures, and explain how these parts may be helpful or harmful to other organisms.
- (E) (3.2) b. The student will be able to identify, describe, and label the major structures contained within the flowers and seeds of angiosperms, and explain the processes of pollination, fertilization, and germination.

- (E) (1.1) c. The student will be able to explain transpiration, tension-cohesion (adhesion-cohesion), and pressure flow models to describe the transport of materials in vascular plants.
- (I) (2.4) d. The student will be able to describe how hormonal and environmental factors affect the growth and development of plants, and predict what occurs when these factors are changed.

Essential Questions

1. What is the evolutionary history of plants and why did they evolve in this manner?
2. How do the anatomical and physiological differences among plants explain how plants grow and reproduce in their particular habitats?
3. What are examples of plants that can be harmful or useful to animals, particularly humans?