PRECISION EXAMS

Agricultural Biology

EXAM INFORMATION

Items
55
Points
73
Prerequisites
EARTH SCIENCE
Grade Level
9-12
Course Length
ONE SEMESTER

Career Cluster
AGRICULTURE, FOOD & NATURAL RESOURCES

Performance Standards
NOT INCLUDED

Certificate Available
YES

DESCRIPTION

The Biology Core Curriculum has two primary goals: (1) students will value and use science as a process of obtaining knowledge based on observable evidence, and (2) students' curiosity will be sustained as they develop and refine the abilities associated with scientific inquiry.

EXAM BLUEPRINT

STANDARD	PERCENTAGE OF EXAM
1- Living Organisms	21%
2- Organisms & Cells	29%
3- Structure & Function	21%
4- Genetic Information/DNA	17%
5- Biological Diversity	12%

STANDARD 1

STUDENTS WILL UNDERSTAND THAT LIVING ORGANISMS INTERACT WITH ONE ANOTHER AND THEIR ENVIRONMENT

Objective 1 Summarize how energy flows through an ecosystem.

1. Arrange components of a food chain according to energy flow.
2. Compare the quantity of energy in the steps of an energy pyramid.
3. Describe strategies used by organisms to balance the energy expended to obtain food to the energy gained from the food (e.g., migration to areas of seasonal abundance, switching type of prey based upon availability, hibernation or dormancy).
4. Compare the relative energy output expended by an organism in obtaining food to the energy gained from the food (e.g., hummingbird - energy expended hovering at a flower compared to the amount of energy gained from the nectar, coyote - chasing mice to the energy gained from catching one, energy expended in migration of birds to a location with seasonal abundance compared to energy gained by staying in a cold climate with limited food).
5. Research food production in various parts of the world (e.g., industrialized societies' greater use of fossil fuel in food production, human health related to food product).

Objective 2 Explain relationships between matter cycles and organisms.

1. Use diagrams to trace the movement of matter through a cycle (e.g., carbon, oxygen, nitrogen, water) in a variety of biological communities and ecosystems.
2. Explain how water is a limiting factor in various ecosystems.
3. Distinguish between inference and evidence in a newspaper, magazine, journal, or Internet article that addresses an issue related to human impact on cycles of matter in an ecosystem and determine the bias in the article.
4. Evaluate the impact of personal choices in relation to the cycling of matter within an ecosystem (e.g., impact of automobiles on the carbon cycle, impact on landfills of processed and packaged foods).

Objective 3 Describe how interactions among organisms and their environment help shape ecosystems.

1. Categorize relationships among living things according to predator-prey, competition, and symbiosis.
2. Formulate and test a hypothesis specific to the effect of changing one variable upon another in a small ecosystem.
3. Use data to interpret interactions among biotic and abiotic factors (e.g., pH, temperature, precipitation, populations, diversity) within an ecosystem.
4. Investigate an ecosystem using methods of science to gather quantitative and qualitative data that describe the ecosystem in detail.
5. Research and evaluate local and global practices that affect ecosystems.

STANDARD 2

STUDENTS WILL UNDERSTAND THAT ALL ORGANISMS ARE COMPOSED OF ONE OR MORE CELLS THAT COME FROM PREEXISTING CELLS, ARE MADE OF MOLECULES, AND PERFORM LIFE FUNCTIONS

Objective 1 Describe the fundamental chemistry of living cells.

1. List the major chemical elements in cells (e.g., carbon, hydrogen, nitrogen, oxygen, phosphorous, sulfur).
2. Identify the function of the four major macromolecules (e.g., carbohydrates, proteins, lipids, nucleic acids).

3. Explain how the properties of water (e.g., cohesion, adhesion, heat capacity, solvent properties) contribute to the maintenance of cells and living organisms.
4. Explain the role of enzymes in cell chemistry.

Objective 2 Describe the flow of energy and matter in cellular function.

1. Distinguish between autotrophic and heterotrophic cells.
2. Illustrate the cycling of matter and the flow of energy through photosynthesis (e.g., using light energy to combine CO2 and H2O to produce oxygen and sugars) and respiration (e.g., releasing energy from sugar and O2 to produce CO2 andH2O).
3. Measure the production of one or more of the products of either photosynthesis or respiration.

Objective 3 Investigate the structure and function of cells and cell parts.

1. Explain how cells divide from existing cells through the process of mitosis.
2. Describe cell theory and relate the nature of science to the development of cell theory (e.g., built upon previous knowledge, use of increasingly more sophisticated technology).
3. Describe how the transport of materials in and out of cells enables cells to maintain homeostasis (e.g., osmosis, diffusion, active transport).
4. Describe the relationship between the organelles in a cell and the functions of that cell.
5. Experiment with microorganisms and/or plants to investigate growth and reproduction.

STANDARD 3

STUDENTS WILL UNDERSTAND THE RELATIONSHIP BETWEEN STRUCTURE AND FUNCTION OF ORGANS AND ORGAN SYSTEMS

Objective 1 Describe the structure and function of organs.

1. Diagram and label the structure of the primary components of representative organs in plants and animals (e.g., heart - muscle tissue, valves and chambers; lung - trachea, bronchial, alveoli; leaf - veins, stomata; stem - xylem, phloem, cambium; root - tip, elongation, hairs; skin - layers, sweat glands, oil glands, hair follicles; ovaries - ova, follicles, corpus luteum).
2. Describe the function of various organs (e.g. heart, lungs, skin, leaf, stem, root, ovary).
3. Relate the structure of organs to the function of organs.
4. Compare the structure and function of organs in one organism to the structure and function of organs in another organism.
5. Research and report on technological developments related to organs.

Objective 2 Describe the relationship between structure and function of organ systems in plants and animals.

1. Relate the function of an organ to the function of an organ system.
2. Describe the structure and function of various organ systems (e.g., digestion, respiration, circulation, protection and support, nervous) and how these systems contribute to homeostasis of the organism.
3. Examine the relationships of organ systems within an organism (e.g., respiration to circulation, leaves to roots) and describe the relationship of structure to function in the relationship.
4. Relate the tissues that make up organs to the structure and function of the organ.
5. Compare the structure and function of organ systems in one organism to the structure and function in another organism (e.g., chicken to sheep digestive system; fern to peach reproductive system).

STANDARD 4

STUDENTS WILL UNDERSTAND THAT GENETIC INFORMATION CODED IN DNA IS PASSED FROM PARENTS OF OFFSPRING BY SEXUAL AND ASEXUAL REPRODUCTION. THE BASIC STRUCTURE OF DNA IS THE SAME IN ALL LIVING THINGS. CHANGES IN DNA MAY ALTER GENETIC EXPRESSION

Objective 1 Compare sexual and asexual reproduction.

1. Explain the significance of meiosis and fertilization in genetic variation.
2. Compare the advantages/disadvantages of sexual and asexual reproduction to survival of species.
3. Formulate, defend, and support a perspective of a bioethical issue related to intentional or unintentional chromosomal mutations.

Objective 2 Predict and interpret patterns of inheritance in sexually reproducing organisms.

1. Explain Mendel's laws of segregation and independent assortment and their role in genetic inheritance.
2. Demonstrate possible results of recombination in sexually reproducing organisms using one or two pairs of contrasting traits in the following crosses: dominance/recessive, incomplete dominance, codominance, and sex-linked traits.
3. Relate Mendelian principles to modern-day practice of plant and animal breeding.
4. Analyze bioethical issues and consider the role of science in determining public policy.

Objective 3 Explain how the structure and replication of DNA are essential to heredity and protein synthesis.

1. Use a model to describe the structure of DNA.
2. Explain the importance of DNA replication in cell reproduction.
3. Summarize how genetic information encoded in DNA provides instructions for assembling protein molecules.
4. Describe how mutations may affect genetic expression and cite examples of mutagens.
5. Relate the historical events that led to our present understanding of DNA to the cumulative nature of science knowledge and technology.
6. Research, report, and debate genetic technologies that may improve the quality of life (e.g., genetic engineering, cloning, gene splicing).

STANDARD 5

STUDENTS WILL UNDERSTAND THAT BIOLOGICAL DIVERSITY IS A RESULT OF EVOLUTIONARY PROCESSES

Objective 1 Relate principles of evolution to biological diversity.

1. Describe the effects of environmental factors on natural selection.
2. Relate genetic variability to a species' potential for adaptation to a changing environment.
3. Relate reproductive isolation to speciation.
4. Compare selective breeding to natural selection and relate the differences to agricultural practices.

Objective 2 Cite evidence for changes in populations over time and use concepts of evolution to explain these changes.

1. Cite evidence that supports biological evolution over time (e.g., geologic and fossil records, chemical mechanisms, DNA structural similarities, homologous and vestigial structures).
2. Identify the role of mutation and recombination in evolution.
3. Relate the nature of science to the historical development of the theory of evolution.

4. Distinguish between observations and inferences in making interpretations related to evolution (e.g., observed similarities and differences in the beaks of Galapagos finches leads to the inference that they evolved from a common ancestor; observed similarities and differences in the structures of birds and reptiles leads to the inference that birds evolved from reptiles).
5. Review a scientific article and identify the research methods used to gather evidence that documents the evolution of a species.

Objective 3 Classify organisms into a hierarchy of groups based on similarities that reflect their evolutionary relationships.

1. Classify organisms using a classification tool such as a key or field guide.
2. Generalize criteria used for classification of organisms (e.g., dichotomy, structure, broad to specific).
3. Explain how evolutionary relationships are related to classification systems.
4. Justify the ongoing changes to classification schemes used in biology.