

APPLIED BIOLOGICAL SYSTEMS

1st Quarter

Benchmark Blueprint

Strand 1: Inquiry Process

Inquiry Process establishes the basis for students' learning in science. Students use scientific processes: questioning, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, and communicating results.

CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 1: Observations, Questions, and Hypotheses Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources.	1.0 Demonstrate laboratory procedures and safety practices.	PO 1. Evaluate scientific information for relevance to a given problem.	
		PO 2. Develop questions from observations that transition into testable hypotheses.	
		PO 3. Formulate a testable hypothesis.	
		PO 4. Predict the outcome of an investigation based on prior evidence, probability, and/or modeling (not guessing or inferring).	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 2: Scientific Testing (Investigating and Modeling) Design and conduct controlled investigations.	1.0 Demonstrate laboratory procedures and safety practices.	PO 1. Demonstrate safe and ethical procedures (e.g., use and care of technology, materials, organisms) and behavior in all science inquiry.	
		PO 2. Identify the resources needed to conduct an investigation.	
		PO 3. Design an appropriate protocol (written plan of action) for testing a hypothesis: <ul style="list-style-type: none"> • Identify dependent and independent variables in a controlled investigation. • Determine an appropriate method for data collection (e.g., using balances, thermometers, microscopes, spectrophotometer, using qualitative changes). • Determine an appropriate method for recording data (e.g., notes, sketches, photographs, videos, journals (logs), charts, computers/calculators). 	

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Concept 2: Scientific Testing (Investigating and Modeling) Design and conduct controlled investigations.	1.0 Demonstrate laboratory procedures and safety practices.	PO 4. Conduct a scientific investigation that is based on a research design.	
		PO 5. Record observations, notes, sketches, questions, and ideas using tools such as journals, charts, graphs, and computers.	

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<p>Concept 3: Analysis, Conclusions, and Refinements Evaluate experimental design, analyze data to explain results and propose further investigations. Design models.</p>	<p>1.0 Demonstrate laboratory procedures and safety practices.</p>	<p><i>PO 1. Interpret data that show a variety of possible relationships between variables, including:</i></p> <ul style="list-style-type: none"> • <i>positive relationship</i> • <i>negative relationship</i> • <i>no relationship</i> 	
		<p>PO 2. Evaluate whether investigational data support or do not support the proposed hypothesis.</p>	
		<p>PO 3. Critique reports of scientific studies (e.g., published papers, student reports).</p>	
		<p>PO 4. Evaluate the design of an investigation to identify possible sources of procedural error, including:</p> <ul style="list-style-type: none"> • sample size • trials • controls • analyses 	

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<p>Concept 3: Analysis, Conclusions, and Refinements Evaluate experimental design, analyze data to explain results and propose further investigations. Design models.</p>	<p>1.0 Demonstrate laboratory procedures and safety practices.</p> <p>4.0 Examine the interaction of biological systems within the environment.</p>	<p>PO 5. Design models (conceptual or physical) of the following to represent "real world" scenarios:</p> <ul style="list-style-type: none"> • carbon cycle • water cycle • phase change • collisions 	
		<p>PO 6. Use descriptive statistics to analyze data, including:</p> <ul style="list-style-type: none"> • mean • frequency • range <p>(See MHS-S2C1-10)</p>	
		<p>PO 7. Propose further investigations based on the findings of a conducted investigation.</p>	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 4: Communication Communicate results of investigations.	1.0 Demonstrate laboratory procedures and safety practices.	PO 1. For a specific investigation, choose an appropriate method for communicating the results.	
		PO 2. Produce graphs that communicate data. (See MHS-S2C1-02)	
		PO 3. Communicate results clearly and logically.	
		PO 4. Support conclusions with logical scientific arguments.	

APPLIED BIOLOGICAL SYSTEMS
1st Quarter
Benchmark Blueprint

Strand 3: Science in Personal and Social Perspectives

Science in Personal and Social Perspectives emphasizes developing the ability to design a solution to a problem, to understand the relationship between science and technology, and the ways people are involved in both. Students understand the impact of science and technology on human activity and the environment. This strand affords students the opportunity to understand their place in the world – as living creatures, consumers, decision makers, problem solvers, managers, and planners.

CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 2: Science and Technology in Society Develop viable solutions to a need or problem.	4.0 Examine the interaction of biological systems within the environment.	PO 1. Analyze the costs, benefits, and risks of various ways of dealing with the following needs or problems: <ul style="list-style-type: none"> • various forms of alternative energy • storage of nuclear waste • abandoned mines • greenhouse gases • hazardous wastes 	
	9.0 Discuss bioethical issues.	PO 2. Recognize the importance of basing arguments on a thorough understanding of the core concepts and principles of science and technology.	
		PO 3. Support a position on a science or technology issue.	

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Concept 2: Science and Technology in Society Develop viable solutions to a need or problem.	4.0 Examine the interaction of biological systems within the environment.	PO 4. Analyze the use of renewable and nonrenewable resources in Arizona: <ul style="list-style-type: none">• water• land• soil• minerals• air	
		PO 5. Evaluate methods used to manage natural resources (e.g., reintroduction of wildlife, fire ecology).	

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Benchmark Blueprint

Strand 4: Life Science

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 1: The Cell Understand the role of the cell and cellular processes.	5.0 Describe principles of plant growth and production	PO 1. Describe the role of energy in cellular growth, development, and repair.	
	6.0 Describe principles of animal growth and production	PO 2. Compare the form and function of prokaryotic and eukaryotic cells and their cellular components.	
		PO 3. Explain the importance of water to cells.	
		PO 4. Analyze mechanisms of transport of materials (e.g., water, ions, macromolecules) into and out of cells: <ul style="list-style-type: none"> • passive transport • active transport 	
		PO 5. Describe the purposes and processes of cellular reproduction.	

APPLIED BIOLOGICAL SYSTEMS

2nd Quarter

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
<p>Concept 1: Changes in Environments Describe the interactions between human populations, natural hazards, and the environment.</p>	<p>2.0 Describe mammal health needs.</p> <p>4.0 Examine the interaction of biological systems within the environment.</p>	PO 1. Evaluate how the processes of natural ecosystems affect, and are affected by, humans.	
		PO 2. Describe the environmental effects of the following natural and/or human-caused hazards: <ul style="list-style-type: none"> • flooding • drought • earthquakes • fires • pollution • extreme weather 	
		PO 3. Assess how human activities (e.g., clear cutting, water management, tree thinning) can affect the potential for hazards.	
		PO 4. Evaluate the following factors that affect the quality of the environment: <ul style="list-style-type: none"> • urban development • smoke • volcanic dust 	
		PO 5. Evaluate the effectiveness of conservation practices and preservation techniques on environmental quality and biodiversity.	
		PO 5H. Explain the causes and effects of an example of a loc	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 3: Human Population Characteristics Analyze factors that affect human populations.	4.0 Examine the interaction of biological systems within the environment.	PO 1. Analyze social factors that limit the growth of a human population, including: <ul style="list-style-type: none">• affluence• education• access to health care• cultural influences	
		PO 2. Describe biotic (living) and abiotic (nonliving) factors that affect human populations.	
		PO 3. Predict the effect of a change in a specific factor on a human population.	

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2nd Quarter

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Strand 4: Life Science

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT	
Concept 2: Molecular Basis of Heredity Understand the molecular basis of heredity and resulting genetic diversity.	5.0 Describe principles of plant growth and production	PO 1. Analyze the relationships among nucleic acids (DNA, RNA), genes, and chromosomes.		
	6.0 Describe principles of animal growth and production	PO 2. Describe the molecular basis of heredity, in viruses and living things, including DNA replication and protein synthesis.		
		PO 3. Explain how genotypic variation occurs and results in phenotypic diversity.		
		PO 4. Describe how meiosis and fertilization maintain genetic variation.		

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
<p>Concept 5: Matter, Energy, and Organization in Living Systems (Including Human Systems) Understand the organization of living systems, and the role of energy within those systems.</p>	4.0 Examine the interaction of biological systems within the environment.	PO 1. Compare the processes of photosynthesis and cellular respiration in terms of energy flow, reactants, and products.	
	5.0 Describe principles of plant growth and production.	PO 2. Describe the role of organic and inorganic chemicals (e.g., carbohydrates, proteins, lipids, nucleic acids, water, ATP) important to living things.	
	6.0 Describe principles of animal growth and production.	PO 3. Diagram the following biogeochemical cycles in an ecosystem: <ul style="list-style-type: none"> • water • carbon • nitrogen 	
		PO 4. Diagram the energy flow in an ecosystem through a food chain.	
		PO 5. Describe the levels of organization of living things from cells, through tissues, organs, organ systems, organisms, populations, and communities to ecosystems.	

APPLIED BIOLOGICAL SYSTEMS

3rd Quarter

Benchmark Blueprint

Strand 2: History and Nature of Science

Scientific investigation grows from the contributions of many people. History and Nature of Science emphasizes the importance of the inclusion of historical perspectives and the advances that each new development brings to technology and human knowledge. This strand focuses on the human aspects of science and the role that scientists play in the development of various cultures.

CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 1: History of Science as a Human Endeavor Identify individual, cultural, and technological contributions to scientific knowledge.	7.0 Describe food safety and processing practices.	PO 1. Describe how human curiosity and needs have influenced science, impacting the quality of life worldwide.	
	8.0 Describe advances in technology.	<i>PO 2. Describe how diverse people and/or cultures, past and present, have made important contributions to scientific innovations.</i>	
	9.0 Discuss bioethical issues.	PO 3. Analyze how specific changes in science have affected society.	
		PO 4. Analyze how specific cultural and/or societal issues promote or hinder scientific advancements.	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 2: Nature of Scientific Knowledge Understand how science is a process for generating knowledge.	1.0 Demonstrate laboratory procedures and safety practices.	PO 1. Specify the requirements of a valid, scientific explanation (theory), including that it be: <ul style="list-style-type: none"> • logical • subject to peer review • public • respectful of rules of evidence 	
		PO 2. Explain the process by which accepted ideas are challenged or extended by scientific innovation.	
		PO 3. Distinguish between pure and applied science.	
		PO 4. Describe how scientists continue to investigate and critically analyze aspects of theories.	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 3: Interdependence of Organisms Analyze the relationships among various organisms and their environment.	5.0 Describe principles of plant growth and production.	PO 1. Identify the relationships among organisms within populations, communities, ecosystems, and biomes.	
	6.0 Describe principles of animal growth and production.	PO 2. Describe how organisms are influenced by a particular combination of biotic (living) and abiotic (nonliving) factors in an environment.	
		PO 3. Assess how the size and the rate of growth of a population are determined by birth rate, death rate, immigration, emigration, and carrying capacity of the environment.	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 4: Biological Evolution Understand the scientific principles and processes involved in biological evolution.	5.0 Describe principles of plant growth and production.	PO 1. Identify the following components of natural selection, which can lead to speciation: <ul style="list-style-type: none"> • potential for a species to increase its numbers • genetic variability and inheritance of offspring due to mutation and recombination of genes • finite supply of resources required for life • selection by the environment of those offspring better able to survive and produce offspring 	
	6.0 Describe principles of animal growth and production.	PO 2. Explain how genotypic and phenotypic variation can result in adaptations that influence an organism's success in an environment.	
		PO 3. Describe how the continuing operation of natural selection underlies a population's ability to adapt to changes in the environment and leads to biodiversity and the origin of new species.	

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CONCEPT	ABS COMPETENCIES	PERFORMANCE OBJECTIVE	ASSESSMENT
Concept 4: Biological Evolution Understand the scientific principles and processes involved in biological evolution.	5.0 Describe principles of plant growth and production.	PO 4. Predict how a change in an environmental factor (e.g., rainfall, habitat loss, non-native species) can affect the number and diversity of species in an ecosystem.	
	6.0 Describe principles of animal growth and production.	PO 5. Analyze how patterns in the fossil record, nuclear chemistry, geology, molecular biology, and geographical distribution give support to the theory of organic evolution through natural selection over billions of years and the resulting present day biodiversity.	
		PO 6. Analyze, using a biological classification system (i.e., cladistics, phylogeny, morphology, DNA analysis), the degree of relatedness among various species.	

APPLIED BIOLOGICAL SYSTEMS

Quarter 4

Benchmark Blueprint

Comprehensive Health Education Standards

STANDARD 1

Students comprehend concepts related to health promotion and disease prevention

CONCEPT	PERFORMANCE OBJECTIVE
1CH-P2. Explain the interrelationships among the mental, emotional, psychological and physical realities that occur throughout the life cycle	PO 1. Identify the different stages of the human life cycle (conception, prenatal, infant, toddler, preschool, school)
	PO 2. Identify the characteristics and developmental needs related to each stage of the life cycle
	PO 3. Relate the principles of healthy living to each stage of the life cycle
1CH-P8. Identify the location and function of the reproductive organs, the fertility cycle, and the process of conception, and emphasize factors that contribute to the birth of a healthy child	PO 1. Describe male and female reproductive organs and understand the location and basic function of each (to include menstrual cycle)
	PO 2. Describe the association of conception to the fertility cycle
	PO 3. Describe the economic impact of substance abuse on worker productivity and national health care cost
	PO 4. Describe the major factors in family planning (e.g., personal goal setting, number of children desired, importance of timing of pregnancy, identification of available resources and family education)