

Science

BIOLOGY

STANDARD 1

The student understands and uses scientific concepts and principles.

To meet this standard, the student will:

Benchmark B.1.1: Use properties to identify, describe, and categorize substances, materials, and objects

Indicators:

N/A

Benchmark B.1.2: Identify, describe, and categorize living things based on their characteristics

Indicators:

- B.1.2.1 Distinguish between living and non-living things
- B.1.2.2 Identify the principle characteristics used to classify living things
- B.1.2.3 Recognize basic characteristics of living things including cellular, biochemical and genetic characteristics
- B.1.2.4 Recognize the basic parts of cells
- B.1.2.5 Distinguish between animal, plant cells and bacterial cells
- B.1.2.6 Distinguish between carbohydrates, proteins, and key organic compounds by chemical composition
- B.1.2.7 Distinguish between characteristics which can and cannot be inherited
- B.1.2.8 Explain defining characteristics of various biomes
- B.1.2.9 Recognize and understand the importance of the following for life: the chemical characteristics of water and air, the structure and function of macromolecules, the nature of enzymes
- B.1.2.10 Classify living things using basic characteristics including structural similarities, developmental stages, protein similarities, and DNA sequences
- B.1.2.11 Examine and classify local flora and fauna

Benchmark B.1.3: Measure properties and characteristics

Indicators:

- B.1.3.1 Be able to properly use a microscope and other tools to obtain accurate information about objects and events
- B.1.3.2 Use multiple measures to derive a best value and range of uncertainty for measurements
- B.1.3.3 Use and manipulate different units of measurement

Benchmark B.1.4: Recognize the components, structure, and organization of systems and the interconnections within and among them

Indicators:

- B.1.4.1 Recognize that reproduction is essential to the continuation of a species
- B.1.4.2 Recognize that characteristics of organisms are determined genetically and influenced environmentally
- B.1.4.3 Describe the components of cells and their functions
- B.1.4.4 Explain the organizational hierarchy from cells, tissues, organs, and systems, up to organisms (with special emphasis on human systems and the human organism)
- B.1.4.5 Understand the processes of cell division and sex cell formation
- B.1.4.6 Predict the inheritance of traits based on the laws of heredity
- B.1.4.7 Explain matter and energy cycles in nature

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- B.1.4.8 Describe how balance among producers, consumers, and decomposers is achieved and how it affects ecosystems
- B.1.4.9 Recognize that each organism is suited for survival in a particular environment
- B.1.4.10 Understand that the term evolution refers to gradual changes in characteristics over time
- B.1.4.11 Investigate how variation of traits, reproductive strategies, and environmental pressures impact the survival of populations and the emergence of new species
- B.1.4.12 Identify the basic needs of living things
- B.1.4.13 Describe how the structural and functional body systems of organisms operate to keep the organism alive
- B.1.4.14 Understand that traits and patterns of development are specified by hereditary information contained in genes

Benchmark B.1.5: Understand that interactions within and among systems cause changes in matter and energy

Indicators:

- B.1.5.1 Explain how reproduction, death, and the interdependence of organisms and their environment are involved in the process of extinction
- B.1.5.2 Examine evidence from the fossil record of changes in populations over time
- B.1.5.3 Understand interactions within and among populations including carrying capacities, limiting factors, and growth curves
- B.1.5.4 Understand the biotic and abiotic factors which can affect the environment
- B.1.5.5 Investigate processes of diffusion, osmosis, and active transport
- B.1.5.6 Explain the interaction among nutrient cycles, energy from the sun, photosynthesis, respiration, and the energy needs of living organisms
- B.1.5.7 Research the scientific, technological, and mathematical knowledge and training requirements in career fields
- B.1.5.8 Identify an educational pathway which meets personal interest, aspirations, and abilities

Benchmark B.1.6: Construct and use models to predict, test, and understand scientific phenomena

Indicators:

- B.1.6.1 Construct and interpret scale drawings and three-dimensional models of biological systems
- B.1.6.2 Identify limitations of various models
- B.1.6.3 Understand how models serve as representations of objects, processes, or events

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STANDARD 2

The student conducts scientific investigations to expand understanding of the natural world.

To meet this standard, the student will:

Benchmark B.2.1: Plan and implement scientific investigations

Indicators:

- B.2.1.1 Distinguish between an observation and an inference
- B.2.1.2 Draw inferences based on observations
- B.2.1.3 Develop questions and testable hypotheses in response to observations
- B.2.1.4 Use appropriate tools to collect data and test a hypothesis
- B.2.1.5 Plan and conduct a controlled experiment, individually and collaboratively
- B.2.1.6 Develop and communicate descriptions, results, explanations, conclusions, and models from evidence
- B.2.1.7 Understand and follow proper safety procedures

Benchmark B.2.2: Think logically, analytically, and creatively

Indicators:

- B.2.2.1 Approach questions and problems using several different strategies
- B.2.2.2 Distinguish between evidence, explanation, and opinion
- B.2.2.3 Make predictions and create explanations by drawing inferences and recognizing patterns and relationships (especially mathematical relationships)
- B.2.2.4 Describe the thought process associated with a particular series of actions

Benchmark B.2.3: Practice the principles of scientific inquiry

Indicators:

- B.2.3.1 Recognize the role of science as a way of looking at the world
- B.2.3.2 Evaluate and modify processes of investigation
- B.2.3.3 Accurately record and report a series of observations
- B.2.3.4 Give proper credit to informative sources
- B.2.3.5 Explain the importance of openness, honesty, and skepticism in science
- B.2.3.6 Analyze a set of knowledge and recognize what is still unknown or unanswered
- B.2.3.7 Recognize the logical process of basing conclusions on evidence
- B.2.3.8 Recognize that scientific knowledge is always changing
- B.2.3.9 Recognize that observations can be influenced by faulty procedures and by the beliefs of the observer
- B.2.3.10 Recognize that scientific understanding can come from unexpected results
- B.2.3.11 Analyze basic assumptions held by scientists

Benchmark B.2.4: Understand the relationship between evidence and scientific explanation

Indicator:

- B.2.4.1 Understand that the process of science results from inventive acts of imagination, intelligence and logical inquiry which meet certain criteria of testability, consistency, and rules of evidence

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STANDARD 3

The student *applies science knowledge and skills to solve problems and meet challenges.*

To meet this standard, the student will:

Benchmark B.3.1: Identify problems and challenges in which science knowledge and skills can be applied

Indicators:

B.3.1.1 Analyze a relevant problem or challenge which is related to science or technology

B.3.1.2 Identify the components of the problem and criteria for a suitable solution

Benchmark B.3.2: Research, design, and test a variety of ways to address problems and/or challenges

Indicators:

B.3.2.1 Use scientific tools and methods to individually and collaboratively research, design, test, and compare alternative solutions to a problem

B.3.2.2 Conduct risk-benefit analyses, investigate trade-offs and constraints, and make predictions about the consequences of implementing various solutions to a problem

Benchmark B.3.3: Evaluate solutions and consequences

Indicator:

B.3.3.1 Develop a written report which completely describes an experimental investigation

Key: 1. Discipline 1.1 Standard 1.1.1 Benchmark 1.1.1.1 Indicator

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STANDARD 4

The student uses effective communication skills and tools to build and demonstrate understanding of science.

To meet this standard, the student will:

Benchmark B.4.1: Use listening, observing, and reading skills to obtain scientific information

Indicators:

- B.4.1.1 Practice listening to and paraphrasing someone describing his/her own observations
- B.4.1.2 Read, understand, and summarize informative text

Benchmark B.4.2: Use writing and speaking skills to organize and express science ideas

Indicators:

- B.4.2.1 Construct, interpret, and utilize line graphs and other graphical displays of information
- B.4.2.2 Write informative reports that make use of formulas, symbols, diagrams, tables, and graphs
- B.4.2.3 Recognize, use, and be able to explain common science terms

Benchmark B.4.3: Use effective communication strategies and tools to prepare and present science information

Indicators:

- B.4.3.1 Utilize computer software and hardware to produce science products and conduct scientific research and investigations
- B.4.3.2 Recognize and interpret chemical equations
- B.4.3.3 Clearly present information as evidence to support a conclusion

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STANDARD 5

The student *understands how science knowledge and skills are connected to other subject areas and real-life situations.*

To meet this standard, the student will:

Benchmark B.5.1: Use mathematics to enhance scientific understanding

Indicator:

B.5.1.1 Use statistical methods and estimation skills to make predictions and describe and analyze results

Benchmark B.5.2: Understand the relationship between science and technology

Indicators:

B.5.2.1 Describe workplace situations which utilize scientific inquiry and technological design processes

B.5.2.2 Explain the interdependence of science, technology, and public awareness

Benchmark B.5.3: Examine the relationship between science and history

Indicator:

B.5.3.1 Research and describe how individual contributions, various tools and techniques, and different historical periods and events have influenced the development of science

Benchmark B.5.4: Examine the relationship among science, society, and the workplace

Indicators:

B.5.4.1 Describe how the scientific enterprise is influenced by societal, environmental, economic, political, and ethical considerations

B.5.4.2 Explain how the actions of humans can affect the environment and the supply of resources

B.5.4.3 Recognize and explain some short-term and long-term consequences of science and technology

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STANDARD 6

The student *understands how science knowledge carries with it responsibility for its application.*

To meet this standard, the student will:

Benchmark B.6.1: Understand how science contributes to the treatment of diseases in the maintenance of a healthy lifestyle (Personal and Community Health)

Indicators:

- B.6.1.1 Identify the mechanisms for disease transmission
- B.6.1.2 Identify several pathogens
- B.6.1.3 Describe how HIV affects the immune system
- B.6.1.4 Describe how alcohol, tobacco and drugs affect the neural system
- B.6.1.5 Describe the neurochemistry of addiction

Benchmark B.6.2: Understand how the use of resources affects population growth and the global environment (Population)

Indicators:

- B.6.2.1 Describe how the management of resources directly affects populations
- B.6.2.2 Explain how the domestication of animals and plants has affected human population growth

Benchmark B.6.3: Understand the importance of maintaining resources and environmental quality (Environmental Quality/Resources)

Indicators:

- B.6.3.1 List at least three types of renewable resources
- B.6.3.2 List several primary pollutants and sources
- B.6.3.3 Analyze the impact of industrialization on the environment

Benchmark B.6.4: Understand the ethical issues inherent in scientific research (Ethics)

Indicators:

- B.6.4.1 Identify the components of credible scientific research
- B.6.4.2 Analyze the implications of current biological research in the areas of health and genetics
- B.6.4.3 Ensure experiments are performed without endangering animals
- B.6.4.4 Understand that the power of scientific knowledge carries with it ethical responsibilities as well

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STANDARD 7

The student *understands a Christian perspective to scientific concepts and principles.*

To meet this standard, the student will:

Benchmark B.7.1: Understand that the Bible and the findings of science do not conflict

Indicators:

- B.7.1.1 Identify that both Creationism and Evolution are faith-based viewpoints
- B.7.1.2 List several evidences for the young earth theory
- B.7.1.3 Identify that the Biblical view of evolution is *adaption* (microevolution) not *speciation* (macroevolution)

Benchmark B.7.2: Understand that the Bible teaches us that God is the creator of everything

Indicators:

- B.7.2.1 Explain the origin of life from a Biblical world view
- B.7.2.2 Verbalize the difference between the Intelligent Design and the Creationism viewpoints
- B.7.2.3 List several evidences that God created the biosphere

Benchmark B.7.3: Understand that God preserves and controls His creation, the world we study in science, so that it continues to function as He planned

Indicators:

- B.7.3.1 Understand how sin and the Fall affected the creation
- B.7.3.2 Understand how the Flood of Noah affected the biosphere

Benchmark B.7.4: Understand that God created everything for His own purpose, and creation is meant to praise and glorify God

Indicators:

- B.7.4.1 Explain how the characteristics of the biosphere display God's character
- B.7.4.3 Understand that Man is to be a responsible steward of God's creation
- B.7.4.4 Recognize the dangers of the radical environmentalist agenda

Benchmark B.7.5: Understand that God uses His creation to teach people eternal truth through the study of science

Indicators:

- B.7.5.3 Concisely verbalize God's plan of salvation using Biblical references
- B.7.5.2 Understand that creation was made for man, not man for creation

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