

**Jefferson County ESC
Virtual Learning Academy
Academic Content Standards
Differentiated Life Science 10**

Lesson 01 Introduction
N/A

Lesson 02 Organisms and their Environment

Organisms and their Environment

Standard Benchmark and Indicator
S02. Life Sciences
F. Explain the structure and function of ecosystems and relate how ecosystems change over time. (09-10)
16. Relate how distribution and abundance of organisms and populations in ecosystems are limited by the ability of the ecosystem to recycle materials and the availability of matter, space and energy. (10)

Lesson 03 Nutrition and Energy Flow

Nutrition and Energy Flow

Standard Benchmark and Indicator
S02. Life Sciences
D. Explain the flow of energy and the cycling of matter through biological and ecological systems (cellular, organismal and ecological). (09-10)
09. Describe how matter cycles and energy flows through different levels of organization in living systems and between living systems and the physical environment. Explain how some energy is stored and much is dissipated into the environment as thermal energy (e.g., food webs and energy pyramids). (10)
10. Describe how cells and organisms acquire and release energy (photosynthesis, chemosynthesis, cellular respiration and fermentation). (10)
11. Explain that living organisms use matter and energy to synthesize a variety of organic molecules (e.g., proteins, carbohydrates, lipids and nucleic acids) and to drive life processes (e.g., growth, reacting to the environment, reproduction and movement). (10)

Lesson 04 Climate and Weather

Climate and Weather

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Explain that many processes occur in patterns within the Earth's systems. (09-10)
02. Explain climate and weather patterns associated with certain geographic locations and features (e.g., tornado alley, tropical hurricanes and lake effect snow). (10)

Lesson 05 Biomes

Biomes

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Explain that many processes occur in patterns within the Earth's systems. (09-10)
01. Summarize the relationship between the climatic zone and the resultant biomes. (This includes explaining the nature of the rainfall and temperature of the mid-latitude climatic zone that supports the deciduous forest.) (10)

Lesson 06 Biodiversity

Biodiversity

Standard Benchmark and Indicator
S01. Earth and Space Sciences
D. Describe the finite nature of Earth's resources and those human activities that can conserve or deplete Earth's resources. (09-10)
05. Explain how the acquisition and use of resources, urban growth and waste disposal can accelerate natural change and impact the quality of life. (10)
06. Describe ways that human activity can alter biogeochemical cycles (e.g., carbon and nitrogen cycles) as well as food webs and energy pyramids (e.g., pest control, legume rotation crops vs. chemical fertilizers). (10)

Lesson 07 Cells

Cells

Standard Benchmark and Indicator
S02. Life Sciences
A. Explain that cells are the basic unit of structure and function of living organisms, that once life originated all cells come from pre-existing cells, and that there are a variety of cell types. (09-10)
01. Explain that living cells (10)
01. are different from viruses (10)
01. are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur) (10)
01. are the basic unit of structure and function of all living things (10)
01. come from pre-existing cells after life originated, and (10)
02. Compare the structure, function and interrelatedness of cell organelles in eukaryotic cells (e.g., nucleus, chromosome, mitochondria, cell membrane, cell wall, chloroplast, cilia, flagella) and prokaryotic cells. (10)
B. Explain the characteristics of life as indicated by cellular processes and describe the process of cell division and development. (09-10)
03. Explain the characteristics of life as indicated by cellular processes including (10)
03. disposal of wastes (10)
03. synthesis of new molecules (10)
03. homeostasis (10)
03. energy transfers and transformation (10)
03. transportation of molecules (10)

Lesson 08 Cell Growth and Reproduction

Cell Growth and Reproduction

Standard Benchmark and Indicator
S02. Life Sciences
B. Explain the characteristics of life as indicated by cellular processes and describe the process of cell division and development. (09-10)
04. Summarize the general processes of cell division and differentiation, and explain why specialized cells are useful to organisms and explain that complex multicellular organisms are formed as highly organized arrangements of differentiated cells. (10)

Lesson 09 DNA

DNA

Standard Benchmark and Indicator
S02. Life Sciences
C. Explain the genetic mechanisms and molecular basis of inheritance. (09-10)
05. Illustrate the relationship of the structure and function of DNA to protein synthesis and the characteristics of an organism. (10)

Lesson 10 Heredity

Heredity

Standard Benchmark and Indicator
S02. Life Sciences
C. Explain the genetic mechanisms and molecular basis of inheritance. (09-10)
06. Explain that a unit of hereditary information is called a gene, and genes may occur in different forms called alleles (e.g., gene for pea plant height has two alleles, tall and short). (10)
08. Use the concepts of Mendelian and non-Mendelian genetics (e.g., segregation, independent assortment, dominant and recessive traits, sex-linked traits and jumping genes) to explain inheritance. (10)

Lesson 11 The Human Genome

The Human Genome

Standard Benchmark and Indicator
S02. Life Sciences
J. Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of life sciences. (09-10)
28. Analyze and investigate emerging scientific issues (e.g., genetically modified food, stem cell research, genetic research and cloning). (10)

Lesson 12 The Record of Life

The Record of Life

Standard Benchmark and Indicator
S02. Life Sciences

B. Explain the characteristics of life as indicated by cellular processes and describe the process of cell division and development. (09-10)
03. Explain the characteristics of life as indicated by cellular processes including (10)
03. disposal of wastes (10)
03. synthesis of new molecules (10)
03. homeostasis (10)
03. energy transfers and transformation (10)
03. transportation of molecules (10)
04. Summarize the general processes of cell division and differentiation, and explain why specialized cells are useful to organisms and explain that complex multicellular organisms are formed as highly organized arrangements of differentiated cells. (10)

Lesson 13 The Origin of Life N/A

Lesson 14 Natural Selection

Natural Selection

Standard Benchmark and Indicator
S02. Life Sciences
E. Explain how evolutionary relationships contribute to an understanding of the unity and diversity of life. (09-10)
13. Explain that the variation of organisms within a species increases the likelihood that at least some members of a species will survive under gradually changing environmental conditions. (10)
14. Relate diversity and adaptation to structures and their functions in living organisms (e.g., adaptive radiation). (10)

Lesson 15 Evolution Theory

Evolution Theory

Standard Benchmark and Indicator

unity and diversity of past and present life forms. (09-10)
24. Analyze how natural selection and other evolutionary mechanisms (e.g. genetic drift, immigration, emigration, mutation) and their consequences provide a scientific explanation for the diversity and unity of past life forms, as depicted in the fossil record, and present life forms. (10)
25. Explain that life on Earth is thought to have begun as simple, one celled organisms approximately 4 billion years ago. During most of the history of Earth only single celled microorganisms existed, but once cells with nuclei developed about a billion years ago, increasingly complex multicellular organisms evolved. (10)

Lesson 16 Classification

Classification

Standard Benchmark and Indicator
S02. Life Sciences
E. Explain how evolutionary relationships contribute to an understanding of the unity and diversity of life. (09-10)
12. Describe that biological classification represents how organisms are related with species being the most fundamental unit of the classification system. Relate how biologists arrange organisms into a hierarchy of groups and subgroups based on similarities and differences that reflect their evolutionary relationships. (10)

Lesson 17 Viruses

Viruses

Standard Benchmark and Indicator
S02. Life Sciences
A. Explain that cells are the basic unit of structure and function of living organisms, that once life originated all cells come from pre-existing cells, and that there are a variety of cell types. (09-10)
01. Explain that living cells (10)
01. are different from viruses (10)
01. are composed of a small number of key chemical elements (carbon, hydrogen, oxygen, nitrogen, phosphorus and sulfur) (10)
01. are the basic unit of structure and function of all living things (10)
01. come from pre-existing cells after life originated, and (10)

Lesson 18 Bacteria (For lessons 18-31) All 10th grade Standards and Indicators have been covered in lessons 1-17.

N/A

Lesson 19 Protists

N/A

Lesson 20 Fungi

N/A

Lesson 21 Plants

N/A

Lesson 22 Simple Invertebrates

N/A

Lesson 23 Mollusks and Segmented Worms

N/A

Lesson 24 Arthropods

N/A

Lesson 25 Echinoderms

N/A

Lesson 26 Fish

N/A

Lesson 27 Amphibians and Reptiles

N/A

Lesson 28 Birds

N/A

Lesson 29 Mammals

N/A

Lesson 30 Immunity from Diseases

N/A

Lesson 31 Technology

N/A

Lesson 32 Safe Lab Practices and Theories

Safe Lab Practices and Theories

Standard Benchmark and Indicator
S04. Science and Technology
A. Explain the ways in which the processes of technological design respond to the needs of society. (09-10)
03. Explain that when evaluating a design for a device or process, thought should be given to how it will be manufactured, operated, maintained, replaced and disposed of in addition to who will sell, operate and take care of it. Explain how the costs associated with these considerations may introduce additional constraints on the

design. (10)
B. Explain that science and technology are interdependent; each drives the other. (09-10)
01. Cite examples of ways that scientific inquiry is driven by the desire to understand the natural world and how technology is driven by the need to meet human needs and solve human problems. (10)

Lesson 33 Inference and Observation Story

(D) Inferences and Observations Story

Standard Benchmark and Indicator
S05. Scientific Inquiry
A. Participate in and apply the processes of scientific investigation to create models and to design, conduct, evaluate and communicate the results of these investigations. (09-10)
01. Research and apply appropriate safety precautions when designing and conducting scientific investigations (e.g. OSHA, MSDS, eyewash, goggles and ventilation). (10)
03. Use mathematical models to predict and analyze natural phenomena. (10)

Lesson 34 Ethical Practices

Ethical Practices

Standard Benchmark and Indicator
S06. Scientific Ways of Knowing
C. Describe the ethical practices and guidelines in which science operates. (09-10)
05. Recognize that research involving voluntary human subjects should be conducted only with the informed consent of the subjects and follow rigid guidelines and/or laws. (10)
06. Recognize that animal-based research must be conducted according to currently accepted professional standards and laws. (10)

Lesson 35 Careers in Science

Careers in Science

Standard Benchmark and Indicator
S06. Scientific Ways of Knowing
D. Recognize that scientific literacy is part of being a knowledgeable citizen. (09-10)
07. Investigate how the knowledge, skills and interests learned in science classes apply to the careers students plan to pursue. (10)

Lesson 36 Historical Perspectives and Scientific Resolutions

Historical Perspectives and Scientific Resolutions

Standard Benchmark and Indicator

warming, depletion of resources and exponential population growth). (10)
S02. Life Sciences
J. Summarize the historical development of scientific theories and ideas, and describe emerging issues in the study of life sciences. (09-10)
26. Use historical examples to explain how new ideas are limited by the context in which they are conceived. These ideas are often rejected by the scientific establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., biological evolution, germ theory, biotechnology and discovering germs). (10)
27. Describe advances in life sciences that have important long-lasting effects on science and society (e.g., biological evolution, germ theory, biotechnology and discovering germs). (10)