

Virtual Learning Academy
Jefferson County Educational Service Center
Academic Content Standards
Environmental/Ecology Differentiated 11

Lesson 01: History & Science

History and Science

Standard Benchmark and Indicator
S01. Earth and Space Sciences
D. Summarize the historical development of scientific theories and ideas and describe emerging issues in the study of Earth and space sciences. (11-12)
15. Use historical examples to show how new ideas are limited by the context in which they are conceived; are often rejected by the social establishment; sometimes spring from unexpected findings; and usually grow slowly through contributions from many different investigators (e.g., global warming, Heliocentric Theory and Theory of Continental Drift). (11)
S06. Scientific Ways of Knowing
A. Explain how scientific evidence is used to develop and revise scientific predictions, ideas or theories. (11-12)
04. Explain why scientists can assume that the universe is a vast single system in which the basic rules are the same everywhere. (11)
07. Explain how theories are judged by how well they fit with other theories, the range of included observations, how well they explain observations and how effective they are in predicting new findings. (11)

Lesson 02: Isotopes

Isotopes

Standard Benchmark and Indicator
S03. Physical Sciences
A. Explain how variations in the arrangement and motion of atoms and molecules form the basis of a variety of biological, chemical and physical phenomena. (11-12)
01. Explain that elements with the same number of protons may or may not have the same mass and those with different masses (different numbers of neutrons) are called isotopes. Some of these are radioactive. (11)

Lesson 03: Versatility of Carbon

Versatility of Carbon

Standard Benchmark and Indicator
S03. Physical Sciences
E. Summarize the historical development of scientific theories and ideas within

the study of physical sciences. (11-12)
02. Explain that humans have used unique bonding of carbon atoms to make a variety of molecules (e.g., plastics). (11)

LESSON 04: MOTORS & GENERATORS

Motors and Generators

Standard Benchmark and Indicator
S03. Physical Sciences
D. Apply principles of forces and motion to mathematically analyze, describe and predict the net effects on objects or systems. (11-12)
04. Explain how electric motors and generators work (e.g., relate that electricity and magnetism are two aspects of a single electromagnetic force). Investigate that electric charges in motion produce magnetic fields and a changing magnetic field creates an electric field. (11)

LESSON 05: ENTROPY

Entropy

Standard Benchmark and Indicator
S03. Physical Sciences
C. Describe how atoms and molecules can gain or lose energy only in discrete amounts. (11-12)
03. Describe real world examples showing that all energy transformations tend toward disorganized states (e.g., fossil fuel combustion, food pyramids and electrical use). (11)

LESSON 06: MOON PHASES, TIDES & SEASONS

Moon Phases, Tides, and Seasons

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
02. Analyze how the regular and predictable motions of Earth, sun and moon explain phenomena on Earth (e.g., seasons, tides, eclipses and phases of the moon). (11)

LESSON 07: THE ATMOSPHERE

The Atmosphere

Standard Benchmark and Indicator

S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
07. Describe the effects of particulates and gases in the atmosphere including those originating from volcanic activity. (11)

LESSON 08: HEAT ENERGY & THE ATMOSPHERE

Heat Energy and the Atmosphere

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
03. Explain heat and energy transfers in and out of the atmosphere and its involvement in weather and climate (radiation, conduction, convection and advection). (11)

LESSON 09: WEATHER MAPS

Weather Maps

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
10. Interpret weather maps and their symbols to predict changing weather conditions worldwide (e.g., monsoons, hurricanes and cyclones). (11)
D. Summarize the historical development of scientific theories and ideas and describe emerging issues in the study of Earth and space sciences. (11-12)
16. Describe advances in Earth and space science that have important long-lasting effects on science and society (e.g., global warming, Heliocentric Theory and Plate Tectonics Theory). (11)
S06. Scientific Ways of Knowing
C. Explain how societal issues and considerations affect the progress of science and technology. (11-12)
10. Describe costs and trade-offs of various hazards - ranging from those with minor risk to a few people, to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations. (11)

LESSON 10: SEVERE WEATHER

Severe Weather

Standard Benchmark and Indicator

S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
10. Interpret weather maps and their symbols to predict changing weather conditions worldwide (e.g., monsoons, hurricanes and cyclones). (11)
D. Summarize the historical development of scientific theories and ideas and describe emerging issues in the study of Earth and space sciences. (11-12)
16. Describe advances in Earth and space science that have important long-lasting effects on science and society (e.g., global warming, Heliocentric Theory and Plate Tectonics Theory). (11)
S06. Scientific Ways of Knowing
C. Explain how societal issues and considerations affect the progress of science and technology. (11-12)
10. Describe costs and trade-offs of various hazards - ranging from those with minor risk to a few people, to major catastrophes with major risk to many people. The scale of events and the accuracy with which scientists and engineers can (and cannot) predict events are important considerations. (11)

LESSON 11: CLIMATE

Climate

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
04. Explain the impact of oceanic and atmospheric currents on weather and climate. (11)
05. Use appropriate data to analyze and predict upcoming trends in global weather patterns (e.g., el Niño and la Niña, melting glaciers and icecaps and changes in ocean surface temperatures). (11)

LESSON 12: NATURAL RESOURCES

Natural Resources

Standard Benchmark and Indicator
S01. Earth and Space Sciences
C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future. (11-12)
14. Conclude that Earth has finite resources and explain that humans deplete some resources faster than they can be renewed. (11)

LESSON 13: ENERGY ALTERNATIVES

Energy Alternatives

Standard Benchmark and Indicator
S01. Earth and Space Sciences
C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future. (11-12)
11. Analyze how materials from human societies (e.g., radioactive waste and air pollution) affect both physical and chemical cycles of Earth. (11)
12. Explain ways in which humans have had a major effect on other species (e.g., the influence of humans on other organisms occurs through land use, which decreases space available to other species and pollution, which changes the chemical composition of air, soil and water). (11)
13. Explain how human behavior affects the basic processes of natural ecosystems and the quality of the atmosphere, hydrosphere and lithosphere. (11)
S06. Scientific Ways of Knowing
C. Explain how societal issues and considerations affect the progress of science and technology. (11-12)
08. Explain that the decision to develop a new technology is influenced by societal opinions and demands and by cost benefit considerations. (11)
09. Explain how natural and human-induced hazards present the need for humans to assess potential danger and risk. Many changes in the environment designed by humans bring benefits to society as well as cause risks. (11)

LESSON 14: GLOBAL WARMING

Global Warming

Standard Benchmark and Indicator
S01. Earth and Space Sciences
B. Describe how Earth is made up of a series of interconnected systems and how a change in one system affects other systems. (11-12)
06. Explain how interactions among Earth's lithosphere, hydrosphere, atmosphere and biosphere have resulted in the ongoing changes of Earth's system. (11)
C. Explain that humans are an integral part of the Earth's system and the choices humans make today impact natural systems in the future. (11-12)
09. Explain the effects of biomass and human activity on climate (e.g., climatic change and global warming). (11)

LESSON 15: PLATE TECTONICS

Plate Tectonics

Standard Benchmark and Indicator

humans. Recognize that humans live at the interface between the atmosphere

come to value aspects of the environment, vulnerability to natural processes of change has increased. (11)

D. Summarize the historical development of scientific theories and ideas and describe emerging issues in the study of Earth and space sciences. (11-12)

16. Describe advances in Earth and space science that have important long-lasting effects on science and society (e.g., global warming, Heliocentric Theory and Plate Tectonics Theory). (11)

LESSON 16: ETHICS

Ethics

Standard Benchmark and Indicator

S06. Scientific Ways of Knowing

B. Explain how ethical considerations shape scientific endeavors. (11-12)

05. Recognize that bias affects outcomes. People tend to ignore evidence that challenges their beliefs but accept evidence that supports their beliefs. Scientist attempt to avoid bias in their work. (11)

06. Describe the strongly held traditions of science that serve to keep scientists within the bounds of ethical professional behavior. (11)

LESSON 17: TECHNOLOGY & CAREERS IN SCIENCE

Technology and Careers in Science

Standard Benchmark and Indicator

S06. Scientific Ways of Knowing

C. Explain how societal issues and considerations affect the progress of science and technology. (11-12)

LESSON 18

Environmental/Ecology Science (D)

MIDTERM EXAM

****This is the midterm exam covering one half of the Differentiated Science Virtual Learning course for the 11th grade level.**

Material covered on this exam includes all of the indicators for standards EARTH and SPACE SCIENCES and PHYSICAL SCIENCES.

It also includes indicators 4-11 for standard SCIENTIFIC WAYS OF KNOWING.

These were covered in Lessons 1-17 of the General Science Course.

You should go back and review the material in each of these lessons before attempting the completion of this exam. **

Lesson 19: The Importance of Homeostasis for the Continuation of Life

(D) The Importance of Homeostasis for the Continuation of Life

Standard Benchmark and Indicator
S02. Life Sciences
A. Explain how processes at the cellular level affect the functions and characteristics of an organism. (11-12)
01. Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (11)

Lesson 20: How the Food We Eat is Used for Energy

(D) How the Food We Eat is Used for Energy

Standard Benchmark and Indicator
S02. Life Sciences
A. Explain how processes at the cellular level affect the functions and characteristics of an organism. (11-12)
02. Recognize that chemical bonds of food molecules contain energy. Energy is released when the bonds of food molecules are broken and new compounds with lower energy bonds are formed. Some of this energy is released as thermal energy. (11)

Lesson 21: The Technology of Genetic Engineering

(D) The Technology of Genetic Engineering

Standard Benchmark and Indicator
S04. Science and Technology
A. Predict how human choices today will determine the quality and quantity of life on Earth. (11-12)
03. Explore and explain any given technology that may have a different value for different groups of people and at different points in time (e.g., new varieties of farm plants and animals have been engineered by manipulating their genetic instructions to reproduce new characteristics). (11)
04. Explain why basic concepts and principles of science and technology should be a part of active debate about the economics, policies, politics and ethics of various science-related and technology-related challenges. (11)

Lesson 22: Population Ecology

(D) Population Ecology

Standard Benchmark and Indicator
S02. Life Sciences
B. Explain how humans are connected to and impact natural systems. (11-12)
05. Investigate the impact on the structure and stability of ecosystems due to changes in their biotic and abiotic components as a result of human activity. (11)
E. Explain the interconnectedness of the components of a natural system. (11-12)
06. Predict some possible impacts on an ecosystem with the introduction of a non-native species. (11)
07. Show how populations can increase through linear or exponential growth with corresponding effects on resource use and environmental pollution. (11)
08. Recognize that populations can reach or temporarily exceed the carrying capacity of a given environment. Show that the limitation is not just the availability of space but the number of organisms in relation to resources and the capacity of earth systems to support life. (11)

Lesson 23: Different types of Fuels: Advantages and Disadvantages

(D) Different Types of Fuels: Advantages and Disadvantages

Standard Benchmark and Indicator
S04. Science and Technology
A. Predict how human choices today will determine the quality and quantity of life on Earth. (11-12)
05. Investigate that all fuels (e.g., fossil, solar and nuclear) have advantages and disadvantages; therefore society must consider the trade-offs among them (e.g., economic costs and environmental impact). (11)

Lesson 24: Alternative Energy Sources

(D) Alternative Energy Sources

Standard Benchmark and Indicator
S04. Science and Technology
A. Predict how human choices today will determine the quality and quantity of life on Earth. (11-12)
06. Research sources of energy beyond traditional fuels and the advantages, disadvantages and trade-offs society must consider when using alternative sources (e.g., biomass, solar, hybrid engines, wind and fuel cells). (11)

Lesson 25: Using the Scientific Process

(D) Using the Scientific Process

Standard Benchmark and Indicator
S05. Scientific Inquiry
A. Make appropriate choices when designing and participating in scientific investigations by using cognitive and manipulative skills when collecting data and formulating conclusions from the data. (11-12)
01. Formulate testable hypotheses. Develop and explain the appropriate procedures, controls and variables (dependent and independent) in scientific experimentation. (11)
02. Evaluate assumptions that have been used in reaching scientific conclusions. (11)
03. Design and carry out scientific inquiry (investigation), communicate and critique results through peer review. (11)
04. Explain why the methods of an investigation are based on the questions being asked. (11)
05. Summarize data and construct a reasonable argument based on those data and other known information. (11)

Lesson 26: The Relationship Between Science and Technology in Society

(D) The Relationship Between Science and Technology in Society

Standard Benchmark and Indicator
S04. Science and Technology
A. Predict how human choices today will determine the quality and quantity of life on Earth. (11-12)
01. Identify that science and technology are essential social enterprises but alone they can only indicate what can happen, not what should happen. Realize the latter involves human decisions about the use of knowledge. (11)
02. Predict how decisions regarding the implementation of technologies involve the weighing of trade-offs between predicted positive and negative effects on the environment and/or humans. (11)

Lesson 27: Relationship Between Populations and the Environment

(D) Relationship Between Populations and the Environment

Standard Benchmark and Indicator
S02. Life Sciences
E. Explain the interconnectedness of the components of a natural system. (11-12)
08. Recognize that populations can reach or temporarily exceed the carrying capacity of a given environment. Show that the limitation is not just the availability of space but the number of organisms in relation to resources and the capacity of earth systems to support life. (11)

Lesson 28: Natural Viruses Destroying Humanity

(D) Natural Viruses Destroying Humanity

Standard Benchmark and Indicator
S02. Life Sciences
A. Explain how processes at the cellular level affect the functions and characteristics of an organism. (11-12)
01. Describe how the maintenance of a relatively stable internal environment is required for the continuation of life, and explain how stability is challenged by changing physical, chemical and environmental conditions as well as the presence of pathogens. (11)
B. Explain how humans are connected to and impact natural systems. (11-12)
03. Relate how birth rates, fertility rates and death rates are affected by various environmental factors. (11)
F. Explain how human choices today will affect the quality and quantity of life on earth. (11-12)
09. Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences. (11)

Lesson 29: Paleontology and the Earth's History

(D) Paleontology and the Earth's History

Standard Benchmark and Indicator
S02. Life Sciences
D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future. (11-12)
13. Describe how the process of evolution has changed the physical world over geologic time. (11)
14. Describe how geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Recognize that current methods include using the known decay rates of radioactive isotopes present in rocks to measure the time since the rock was formed. (11)

Lesson 30: Evolution

(D) Evolution

Standard Benchmark and Indicator
S02. Life Sciences
D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future. (11-12)
13. Describe how the process of evolution has changed the physical world over geologic time. (11)

Lesson 31: Where Have All the Frogs Gone?

(D) Where Have All the Frogs Gone?

Standard Benchmark and Indicator
S02. Life Sciences
E. Explain the interconnectedness of the components of a natural system. (11-12)
10. Explain how environmental factors can influence heredity or development of organisms. (11)
F. Explain how human choices today will affect the quality and quantity of life on earth. (11-12)
09. Give examples of how human activity can accelerate rates of natural change and can have unforeseen consequences. (11)

Lesson 32: Fossils and Their Relationship to Geologic Time

(D) Fossils and Their Relationship to Geologic Time

Standard Benchmark and Indicator
S02. Life Sciences
D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future. (11-12)
14. Describe how geologic time can be estimated by observing rock sequences and using fossils to correlate the sequences at various locations. Recognize that current methods include using the known decay rates of radioactive isotopes present in rocks to measure the time since the rock was formed. (11)

Lesson 33: Population and Consumption

(D) Population and Consumption

Standard Benchmark and Indicator
S02. Life Sciences
B. Explain how humans are connected to and impact natural systems. (11-12)
04. Examine the contributing factors of human population growth that impact natural systems such as levels of education, children in the labor force, education and employment of women, infant mortality rates, costs of raising children, birth control methods, and cultural norms. (11)
F. Explain how human choices today will affect the quality and quantity of life on earth. (11-12)
11. Investigate issues of environmental quality at local, regional, national and global levels such as population growth, resource use, population distribution, over-consumption, the capacity of technology to solve problems, poverty, the role of economics, politics and different ways humans view the earth. (11)

Lesson 34: Population and Demographic Changes (Continuation of Lesson #33)

(D) Population and Demographic Changes (Continued)

Standard Benchmark and Indicator
S02. Life Sciences
B. Explain how humans are connected to and impact natural systems. (11-12)
04. Examine the contributing factors of human population growth that impact natural systems such as levels of education, children in the labor force, education and employment of women, infant mortality rates, costs of raising children, birth control methods, and cultural norms. (11)
F. Explain how human choices today will affect the quality and quantity of life on earth. (11-12)
11. Investigate issues of environmental quality at local, regional, national and global levels such as population growth, resource use, population distribution, over-consumption, the capacity of technology to solve problems, poverty, the role of economics, politics and different ways humans view the earth. (11)

Lesson 35: The Lands Where Species are Born

(D) The Lands Where Species are Born

Standard Benchmark and Indicator
S02. Life Sciences
D. Relate how biotic and abiotic global changes have occurred in the past and will continue to do so in the future. (11-12)
12. Recognize that ecosystems change when significant climate changes occur or when one or more new species appear as a result of immigration or speciation. (11)

LESSON 36: Differentiated Science Final Exam