

Topic: Astronomy

Days: 30

Subject(s): Science

Grade(s): 11th, 12th

S11.A.3.1.3 - Unranked

Use appropriate quantitative data to describe or interpret a system (e.g., biological indices, electrical circuit data, automobile diagnostic systems data).

S11.A.3.1.2 - Important

Analyze and predict the effect of making a change in one part of a system on the system as a whole.

S11.A.3.2.3 - Important

Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).

S11.A.3.3.3 - Essential

Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).

S11.A.3.3.1 - Important

Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.

S11.D.3.1.2 - Unranked

Describe the structure, formation, and life cycle of stars.

S11.D.3.1.3 - Unranked

Explain the current scientific theories of the origin of the solar system and universe (big bang theory, solar nebular theory, stellar evolution).

S11.D.3.1.1 - Unranked

Describe planetary motion and the physical laws that explain planetary motion.

3.4.10.D - Essential

Explain essential ideas about the composition and structure of the universe.

- Compare the basic structures of the universe (e.g., galaxy types, nova, black holes, neutron stars).
- Describe the structure and life cycle of star, using the Hertzsprung-Russell diagram.
- Describe the nuclear processes involved in energy production in a star.
- Explain the "red-shift" and Hubble's use of it to determine stellar distance and movement.
- Compare absolute versus apparent star magnitude and their relation to stellar distance.
- Explain the impact of the Copernican and Newtonian thinking on man's view of the universe.
- Identify and analyze the findings of several space instruments in regard to the extent and composition of the solar system and universe.

Refer to Technology Standard Category 3.6 for applied uses of these concepts and principles.

S11.A.1.1.1 - Essential

Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).

S11.A.1.1.2 - Compact

Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.

S11.A.1.1.4 - Essential

Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, gas laws, processing and feedback systems).

S11.A.1.1.5 - Compact

Analyze or compare the use of both direct and indirect observation as means to study the world and the universe (e.g., behavior of atoms, functions of cells, birth of stars).

S8.A.2.1.1 - Essential

Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

Topic: Atmospheric Science

Days: 10

Subject(s):

Grade(s):

3.5.10.C - Essential
Interpret meteorological data.

- Analyze information from meteorological instruments and online sources to predict weather patterns.
- Describe weather and climate patterns on global levels.
- Evaluate specific adaptations plants and animals have made that enable them to survive in different climates.

Topic: Geology

Days: 88

Subject(s): Science

Grade(s): 11th, 12th

S11.A.1.1.4 - Essential

Explain how specific scientific knowledge or technological design concepts solve practical problems (e.g., momentum, Newton's laws of universal gravitation, tectonics, conservation of mass and energy, cell theory, theory of evolution, atomic theory, theory of relativity, Pasteur's germ theory, relativity, heliocentric theory, gas laws, processing and feedback systems).

S8.A.2.1.1 - Essential

Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

S11.A.3.2.2 - Important

Describe advantages and disadvantages of using models to simulate processes and outcomes.

S11.A.3.2.3 - Important

Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).

S11.A.3.3.1 - Important

Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.

S11.A.3.3.2 - Important

Compare stationary physical patterns (e.g., crystals, layers of rocks, skeletal systems, tree rings, atomic structure) to the object's properties.

S11.A.3.3.3 - Essential

Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).

S11.D.1.1.3 - Unranked

Analyze features created by the interaction of processes that change Earth's surface (e.g., wind and moving water help break down rock into soil; plate movement, earthquakes, and volcanic activity help cause mountains and valleys to form; flowing water and deposition of material help form deltas).

S11.D.1.1.1 - Essential

Classify and describe major types of rocks (igneous - granite, basalt, obsidian, pumice; sedimentary - limestone, sandstone, shale, coal; and metamorphic - slate, quartzite, marble, gneiss) and minerals (quartz, calcite, dolomite, clay, feldspar, mica, halite, pyrite) by their origin and formation.

S11.D.1.1.2 - Essential

Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).

Topic: Hydrology

Days: 10

Subject(s): Science

Grade(s): 10th, 11th, 12th

S11.A.3.3.1 - Unranked

Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.

S11.A.3.3.3 - Unranked

Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).

S11.B.3.1.1 - Important

Explain the significance of diversity in ecosystems.

S11.D.1.1.2 - Essential

Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).

S11.D.1.1.3 - Essential

Analyze features created by the interaction of processes that change Earth's surface (e.g., wind and moving water help break down rock into soil; plate movement, earthquakes, and volcanic activity help cause mountains and valleys to form; flowing water and deposition of material help form deltas).

S11.D.1.1.1 - Important

Classify and describe major types of rocks (igneous - granite, basalt, obsidian, pumice; sedimentary - limestone, sandstone, shale, coal; and metamorphic - slate, quartzite, marble, gneiss) and minerals (quartz, calcite, dolomite, clay, feldspar, mica, halite, pyrite) by their origin and formation.

S11.D.1.3.1 - Important

Explain the multiple functions of different water systems in relation to landforms (e.g., buffer zones, nurseries, food production areas, habitat, water quality control, biological indicators).

S11.D.1.3.2 - Unranked

Explain relationships among physical characteristics, vegetation, topography, and flow as it relates to water systems.

Topic: Meteorology

Days: 25

Subject(s): Science

Grade(s): 11th, 12th

3.5.10.C - Essential
Interpret meteorological data.

- Analyze information from meteorological instruments and online sources to predict weather patterns.
- Describe weather and climate patterns on global levels.
- Evaluate specific adaptations plants and animals have made that enable them to survive in different climates.

3.4.10.B - Unranked
Analyze energy sources and transfers of heat.

- Determine the efficiency of chemical systems by applying mathematical formulas.
- Use knowledge of chemical reactions to generate an electrical current.
- Evaluate energy changes in chemical reactions.
- Use knowledge of conservation of energy and momentum to explain common phenomena (e.g., refrigeration system, rocket propulsion).
- Explain resistance, current and electro-motive force (Ohm's Law).

S11.A.1.3.2 - Important
Describe or interpret dynamic changes to stable systems (e.g., chemical reactions, human body, food webs, tectonics, homeostasis).

S8.A.2.1.1 - Essential
Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

S11.A.2.2.1 - Important
Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).

S11.A.3.1.2 - Important
Analyze and predict the effect of making a change in one part of a system on the system as a whole.

S11.A.3.3.3 - Essential
Analyze physical patterns of motion to make predictions or draw conclusions (e.g., solar system, tectonic plates, weather systems, atomic motion, waves).

Topic: Nature of Science

Days: 10

Subject(s): Science

Grade(s): 11th, 12th

3.2.10.B - Essential

Apply process knowledge and organize scientific and technological phenomena in varied ways.

- Describe materials using precise quantitative and qualitative skills based on observations.
- Develop appropriate scientific experiments: raising questions, formulating hypotheses, testing, controlled experiments, recognizing variables, manipulating variables, interpreting data, and producing solutions.
- Use process skills to make inferences and predictions using collected information and to communicate, using space / time relationships, defining operationally.

3.2.10.C - Essential

Apply the elements of scientific inquiry to solve problems.

- Generate questions about objects, organisms and/or events that can be answered through scientific investigations.
- Evaluate the appropriateness of questions.
- Design an investigation with adequate control and limited variables to investigate a question.
- Conduct a multiple step experiment.
- Organize experimental information using a variety of analytic methods.
- Judge the significance of experimental information in answering the question.
- Suggest additional steps that might be done experimentally.

3.2.10.A - Important

Apply knowledge and understanding about the nature of scientific and technological knowledge.

- Compare and contrast scientific theories and beliefs.
- Know that science uses both direct and indirect observation means to study the world and the universe.
- Integrate new information into existing theories and explain implied results.

3.2.10.D - Compact

Identify and apply the technological design process to solve problems.

- Examine the problem, rank all necessary information and all questions that must be answered.
- Propose and analyze a solution.
- Implement the solution.
- Evaluate the solution, test, redesign and improve as necessary.
- Communicate the process and evaluate and present the impacts of the solution.

S11.A.1.1.2 - Compact

Analyze and explain how to verify the accuracy of scientific facts, principles, theories, and laws.

S11.A.1.1.1 - Essential

Compare and contrast scientific theories, scientific laws, and beliefs (e.g., the law of gravity, how light travels, formation of moons, stages of ecological succession).

S8.A.2.1.1 - Essential

Use evidence, observations, or a variety of scales (e.g., time, mass, distance, volume, temperature) to describe relationships.

S8.A.2.1.2 - Compact

Use space/time relationships, define concepts operationally, raise testable questions, or formulate hypotheses.

S11.A.2.2.1 - Important

Evaluate appropriate methods, instruments, and scale for precise quantitative and qualitative observations (e.g., to compare properties of materials, water quality).

S11.A.3.2.3 - Important

Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).

S11.A.3.3.1 - Important

Describe or interpret recurring patterns that form the basis of biological classification, chemical periodicity, geological order, or astronomical order.

Topic: Oceanography

Days: 8

Subject(s): Science

Grade(s): 11th, 12th

3.5.10.A - Essential

Relate earth features and processes that change the earth.

- Illustrate and explain plate tectonics as the mechanism of continental movement and sea floor changes.
- Compare examples of change to the earth's surface over time as they related to continental movement and ocean basin formation (e.g., Delaware, Susquehanna, Ohio Rivers system formations, dynamics).
- Interpret topographic maps to identify and describe significant geologic history/structures in Pennsylvania.
- Evaluate and interpret geologic history using geologic maps.
- Explain several methods of dating earth materials and structures.
- Correlate rock units with general geologic time periods in the history of the earth.
- Describe and identify major types of rocks and minerals.

3.2.10.A - Important

Apply knowledge and understanding about the nature of scientific and technological knowledge.

- Compare and contrast scientific theories and beliefs.
- Know that science uses both direct and indirect observation means to study the world and the universe.
- Integrate new information into existing theories and explain implied results.

S11.A.3.1.2 - Important

Analyze and predict the effect of making a change in one part of a system on the system as a whole.

S11.A.3.2.3 - Important

Describe how relationships represented in models are used to explain scientific or technological concepts (e.g., dimensions of the solar system, life spans, size of atomic particles, topographic maps).

S11.D.1.1.2 - Essential

Explain the processes that take place at plate boundaries and how these processes continue to shape Earth (e.g., volcanic activity, earthquakes, mountain building, mid-ocean ridges, deep-sea trenches, new land being formed).

S11.D.1.1.3 - Unranked

Analyze features created by the interaction of processes that change Earth's surface (e.g., wind and moving water help break down rock into soil; plate movement, earthquakes, and volcanic activity help cause mountains and valleys to form; flowing water and deposition of material help form deltas).