|  |
| --- |
| CENTRAL FLORIDA ASSESSMENT COLLABORATIVE |
| Individual Test Item Specifications |
| Environmental Science |
| 2014 |

*The contents of this document were developed under a grant from the United States Department of Education. However, the content does not necessarily represent the policy of the United States Department of Education, and you should not assume endorsement by the federal government.*

Table of Contents

[I. Guide to the Individual Benchmark Specifications 1](#_Toc362246932)

[Benchmark Classification System 1](#_Toc362246933)

[Definitions of Benchmark Specifications 3](#_Toc362246934)

[II. Individual Benchmark Specifications 4](#_Toc362246935)

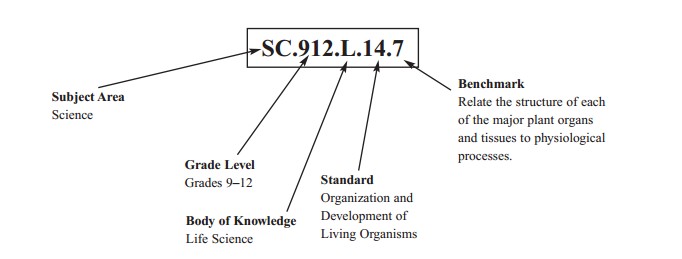
I. Guide to the Individual Benchmark Specifications

Content specific guidelines are given in the *Individual Benchmark Specifications* for each course. The *Specifications* contains specific information about the alignment of items with the NGSSS and the Florida Standards. It identifies the manner in which each benchmark is assessed, provides content limits and stimulus attributes for each benchmark, and gives specific information about content, item types, and response attributes.

## Benchmark Classification System

Each NGSSS benchmark is labeled with a system of letters and numbers.

* The two letters in the *first position* of the label identify the **Subject Area**.
* The number(s) in the *second position* represents the **Grade Level**.
* The letter in the *third position* represents the **Strand** or **Body of Knowledge.**
* The number in the *fourth position* represents the **Standard**.
* The number in the *last position* identifies the specific **Benchmark**.



Each MAFS benchmark is labeled with a system of letters and numbers.

* The four letters in the *first position* of the label identify the **Subject**.
* The number(s) in the *second position* represents the **Grade Level**.
* The letter(s) in the *third position* represents the **Category**.
* The number in the *fourth position* shows the **Domain**.
* The number in the *fifth position* identifies the **Cluster**.
* The number in the *last position* identifies the specific **Benchmark**.



**Definitions of Benchmark Specifications**

The *Individual Benchmark Specifications* provides standard-specific guidance for assessment item development for CFAC item banks. The following information is provided for each benchmark assessed.

|  |  |
| --- | --- |
| **Reporting Category** | is a grouping of related benchmarks that can be used to summarize and report achievement. |
| **Standard** | refers to the standard statement presented in the NGSSS or in the Florida Standards. |
| **Benchmark**  **Also Assesses** | refers to the benchmark statement presented in the NGSSS or standard statement in the Florida Standards. In some cases, two or more related benchmarks are grouped together because the assessment of one benchmark addresses another benchmark. Such groupings are indicated in the Also Assesses statement.  refers to the benchmarks that are closely related to the benchmark (see description above) |
| **Item Types**  **Cognitive**  **Complexity** | are used to assess the benchmark or group of benchmark.  ideal level at which item should be assessed. |
| **Benchmark Clarifications** | explain how achievement of the benchmark will be demonstrated by students. In other words, the clarification statements explain what the student will do when responding to questions. |
| **Content Limits** | define the range of content knowledge and that should be assessed in the items for the benchmark. |
| **Stimulus Attributes** | define the types of stimulus materials that should be used in the items, including the appropriate use of graphic materials and item context or content. |
| **Response Attributes**  **Content Focus** | define the characteristics of the answers that a student must choose or provide.  defines the content measured by each test item. Content focus addresses the broad content and skills associated with the examples found in the standards, benchmarks, or benchmark clarifications. |
| **Sample Items** | are provided for each type of question assessed. The correct answer for all sample items is provided. |

# II. Individual Benchmark Specifications

|  |  |
| --- | --- |
| **Reporting Category** | Global Climate |
| **Standard** | Earth Systems & Patterns |
| **Benchmark Number** | SC.912.E.7.7 |
| **Benchmark** | Identify, analyze, and relate the internal (Earth system) and external (astronomical) conditions that contribute to global climate change. |
| **Also Assesses** | SC.912.E.7.9 Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.  SC.912.N.1.3 Recognize that the strength or usefulness of a scientific claim is evaluated through scientific argumentation, which depends on critical and logical thinking, and the active consideration of alternative scientific explanations to explain the data presented.  SC.912.N.3.5 Describe the function of models in science, and identify the wide range of models used in science. |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will relate the conditions in the geosphere, hydrosphere, and lithosphere to patterns in global climate change.  Students will recognize that weather (climate) is different in different locations.  Students will recognize that global climate change occurs over a long period of time.  Students will explain the possible effects of natural and anthropogenic mechanisms on global climate change. |
| **Content Limits** | Items may address possible natural mechanisms such as global temperature, El Niño, wildfires, volcanic dust and natural disasters and anthropogenic mechanism such as air pollution, acid rain, greenhouse gases and the burning of fossil fuels.  Items will not assess specific local natural or anthropogenic mechanisms.  Items will not assess specific historical temperature data in relation to global climate change.  Items may include charts and graphs of climatic data. |
| **Stimulus Attributes** | Scenarios referring to specific natural mechanisms will include a description of the event in relation to the context of the item.  Possible Item Context: El Niño, ocean conveyer system, tilt, seasons |
| **Response Attributes** | None Specified |
| **Content Focus** | global warming, El Niño, ocean systems, Earth’s tilt, seasons |
| **Sample Item** | Global warming is most likely to directly cause which of the following?   1. increased number and size of glaciers 2. increased coastal flooding of low-lying areas 3. decreased amount of water vapor in the atmosphere 4. decreased concentrations of heavy metals in a local pond   Correct Answer: B |

|  |  |
| --- | --- |
| **Reporting Category** | Global Climate |
| **Standard** | Earth Systems & Patterns |
| **Benchmark Number** | SC.912.E.7.8 |
| **Benchmark** | Explain how various atmospheric, oceanic, and hydrologic conditions in Florida have influenced and can influence human behavior, both individually and collectively. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate; High |
| **Benchmark Clarification** | Students will explain how atmospheric conditions in Florida, such as humidity levels, weather phenomena (thunderstorms, tropical storms, hurricanes) influence human behavior both individually and collectively.  Students will explain how oceanic conditions in Florida, such as rip currents and the Gulf Stream, influence human behavior both individually and collectively.  Students will explain how hydrologic conditions in Florida, such as overdrawing of aquifer and the abundance of wetlands, influence human behavior both individually and collectively. |
| **Content Limits** | Items referring to atmospheric, oceanic, and hydrologic conditions in Florida will focus on how these conditions affect human behavior and will not assess atmospheric conditions or human behavior independently.  Items will not require knowledge of specific legislation or policies with regard to natural phenomena in Florida. |
| **Stimulus Attributes** | Scenario involving atmospheric, ocean, and hydrologic conditions in Florida may refer to floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, sinkholes, and wetlands. |
| **Response Attributes** | None Specified |
| **Content Focus** | floods, droughts, wildfires, thunderstorms, hurricanes, rip currents, sinkholes, wetlands, humidity |
| **Sample Item** | In many parts of Central Florida, insurance agencies have begun dropping homeowners’ insurance policies due to what increasing phenomena associated with excessive water consumption?   1. drought 2. flooding 3. sinkholes 4. wild fires   Correct Answer: C |

|  |  |
| --- | --- |
| **Reporting Category** | Global Climate |
| **Standard** | Earth Systems & Patterns |
| **Benchmark Number** | SC.912.E.7.9 |
| **Benchmark** | Cite evidence that the ocean has had a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Low; Moderate |
| **Benchmark Clarification** | Students will identify the various means by which oceans regulate global temperatures.  Students will explain how the oceans act as sources/sinks of heat energy.  Students will evaluate the impact of oceans on climate change. |
| **Content Limits** | Items will assess the concept of heat capacity but not how to measure heat capacity.  Items will assess the hydrological cycle and the carbon cycle.  Items will assess surface currents, deep ocean circulation, and the ocean conveyor belt.  Items will not assess how climate change is measured.  Items will not assess the effects of climate change. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | climate changes, water cycle, carbon cycle, carbon sinks/reservoirs, ocean currents, convection |
| **Sample Item** | What role do our oceans play in global climate change?   1. Oceans absorb harmful ozone molecules. 2. Oceans absorb heat and sequester carbon. 3. As ocean temperatures rise, prehistoric carbon dioxide is emitted back into the atmosphere. 4. The large oceanic gyres work to bring cool water to tropical regions to slow increasing temperatures.   Correct Answer: B |

|  |  |
| --- | --- |
| **Reporting Category** | Populations |
| **Standard** | Organization & Development of Living Organisms |
| **Benchmark Number** | SC.912.L.14.6 |
| **Benchmark** | Explain the significance of genetic factors, environmental factors, and pathogenic agents to health from the perspectives of both individual and public health. |
| **Also Assesses** | HE.912.C.1.3 Evaluate how environment and personal health are interrelated. |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate; High |
| **Benchmark Clarification** | Students will explain how human health is affected by environmental factors.  Students will differentiate between individual and public health.  Students will evaluate how the environment and personal health are interrelated. |
| **Content Limits** | Items should only refer to environmental factors limited to pollution that causes negative impact on human health; however, the assessment should be on the overall impact of pollution, not specific terminology. |
| **Stimulus Attributes** | Possible Item Context: El Niño Southern Oscillation (ENSO), antibiotic resistance, overpopulation, pollution, environmental hazards |
| **Response Attributes** | None Specified |
| **Content Focus** | ENSO, antibiotic resistance, overpopulation, pollution, environmental hazards |
| **Sample Item** | It has been argued that the cases of seasonal infectious diseases such as malaria are higher in tropical countries that are subject to El Niño Southern Oscillation (ENSO) events. Which factor supports this argument?   1. El Niño disrupts breeding cycles for mosquito predators. 2. El Niño often brings excessive rainfall to warm tropical latitudes. 3. El Niño makes it more difficult to provide medicine to disease stricken countries. 4. El Niño causes excessive dry weather in northern latitudes forcing disease-carrying insects to travel south.   Correct Answer: B |

|  |  |
| --- | --- |
| **Reporting Category** | Populations |
| **Standard** | Diversity & Evolution of Living Organisms |
| **Benchmark Number** | SC.912.L.15.3 |
| **Benchmark** | Describe how biological diversity is increased by the origin of new species and how it is decreased by the natural process of extinction. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will analyze the factors that contribute to biodiversity within different ecosystems.  Students will assess how biological diversity in aquatic and terrestrial systems is increased by the origin of new species and how it is decreased by the natural process of extinction.  Students will explain the mechanisms of speciation including the types of isolation that lead to new organisms in a given ecosystem.  Students will identify the causes of a loss of a species and the effects on a given ecosystem.  Students will distinguish between the natural rate of extinction and the accelerated rate due to human impact. |
| **Content Limits** | Items referring to an increase in biodiversity should include natural selection, environmental changes and anthropogenic effects.  Items referring to a decrease in biodiversity should include extinction as a result of natural selection, environmental changes and anthropogenic effects.  Items will not require memorization of the names of specific species.  Items referring to extinction and speciation should focus on biodiversity rather than the definition of the terms. |
| **Stimulus Attributes** | Possible Item Context: invasive species, native species, endangered species, climate change, human impact, natural selection |
| **Response Attributes** | None Specified |
| **Content Focus** | invasive species, native species, endangered species, climate change, human impact, natural selection, biodiversity |
| **Sample Item** | Which would lead to a **decrease** in species biodiversity?   1. introduction of marine protected areas 2. introduction of anti-pollution legislation 3. introduction of captive breeding programs 4. introduction of exotic and invasive species   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Ecology |
| **Standard** | Diversity & Evolution of Living Organisms |
| **Benchmark Number** | SC.912.L.15.13 |
| **Benchmark** | Describe the conditions required for natural selection, including overproduction of offspring, inherited variation, and the struggle to survive, which result in differential reproductive success. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will explain and/or describe the conditions required for natural selection that result in differential reproductive success. |
| **Content Limits** | Items addressing differential reproductive success in relation to natural selection must be assessed in the context of the conditions not the process.  Items will not require students to recall specific examples of natural selection. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | natural selection, reproduction, specialist species, generalist species |
| **Sample Item** | Which event describes a condition required for natural selection of a wolf population?   1. Humans relocated the problem wolves to a new habitat. 2. Two different colored wolves mated and had offspring with a variety of coat colors. 3. A wolf taught her pups how to catch rabbits, and the pups grew up and taught their offspring. 4. A wolf pup with poor eyesight was unable to keep up with its mother and was eaten by a predator.   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Populations |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.1 |
| **Benchmark** | Discuss the characteristics of populations, such as number of individuals, age structure, density, and pattern of distribution. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Low |
| **Benchmark Clarification** | Students will use data and information about population dynamics (number of individuals, age structure, density, pattern of distribution) to analyze their impact on ecosystems. |
| **Content Limits** | Items must focus on the general characteristics of populations that are related to the environmental quality of an ecosystem.  Items will not require knowledge of specific populations or organisms. |
| **Stimulus Attributes** | Possible Item Context: Age Structure Diagrams, Population Distribution Patterns |
| **Response Attributes** | None Specified |
| **Content Focus** | age structure diagrams, age cohort, zero growth, rapid growth, negative growth, population distribution patterns (clumped, uniform, random) |
| **Sample Item** | A population of fish decreases from 800 species to 600 species. Which of the following could explain this change in population size?   1. The population size of the fish’s predators increased. 2. The emigration rate of the fish population decreased. 3. The number of fish in the reproductive age increased. 4. The number of species competing with the fish for food decreased.   Correct Answer: A |

|  |  |
| --- | --- |
| **Reporting Category** | Ecology |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.4 |
| **Benchmark** | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will describe potential changes in aquatic and terrestrial ecosystems resulting from seasonal variations.  Students will describe potential changes in aquatic and terrestrial ecosystems resulting from climate change.  Students will compare the process of ecological succession in aquatic and terrestrial ecosystems. |
| **Content Limits** | Items will assess the impact of seasonal variations, climate change, and/or succession on ecosystems, but will not assess specific knowledge of the type of ecosystem.  Items addressing climate change are limited to biodiversity, population dynamics, and ecosystem contexts. |
| **Stimulus Attributes** | Possible Item Context: climatographs, succession diagrams |
| **Response Attributes** | None Specified |
| **Content Focus** | climate, primary succession, secondary succession, seasons, pioneer species, climax community, biodiversity |
| **Sample Item** | Which **best** explains ecological succession of a bare field to a forest climax community?   1. Succession proceeds as the height of plants increase until the climax stage. 2. Succession occurs more rapidly in the later stages than in the beginning stages. 3. Succession typically begins with small trees and then the growth of shrubs and weeds. 4. Succession occurs with the replacement of one plant community by another until the climax community is reached.   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Populations |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.5 |
| **Benchmark** | Analyze how population size is determined by births, deaths, immigration, emigration, and limiting factors (biotic and abiotic) that determine carrying capacity. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will use data and information about population dynamics, abiotic factors, and/or biotic factors to explain and/or analyze a change in carrying capacity and its effect on population size in an ecosystem.  Students will analyze how population size is determined by births, deaths, immigration, emigration.  Students will distinguish between the abiotic and biotic factors in an ecosystem.  Students will describe limiting factors (biotic and abiotic) that determine carrying capacity. |
| **Content Limits** | Items referring to limiting factors are limited to food, water, light, nutrients, and space. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | abiotic, biotic, limiting factors, carrying capacity, density-independent factors, density-dependent factors, births, deaths, immigration, emigration |
| **Sample Item** | Scientists studying squirrels in a forest observed that the squirrel population decreased over a period of five years. Which statement is the **most** likely explanation for the decrease in the population?   1. The death rate was greater than the birth rate. 2. The birth rate was equal to the death rate. 3. The rate of immigration was equal to the rate of emigration. 4. The rate of emigration was less than the rate of immigration.   Correct Answer: A |

|  |  |
| --- | --- |
| **Reporting Category** | Populations |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.6 |
| **Benchmark** | Compare and contrast the relationships among organisms, including predation, parasitism, competition, commensalism, and mutualism. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate; High |
| **Benchmark Clarification** | Students will describe the major types of species interactions.  Students will identify the type of relationship given a scenario explaining the ecological niche of each species.  Students will analyze how symbiotic relationships change over time. |
| **Content Limits** | Items will not require knowledge of specific organisms or their feeding habits.  Items referring to species interactions are limited to the relationship between the organisms.  Items will not ask students to define the terms predation, parasitism, competition, commensalism, and mutualism. |
| **Stimulus Attributes** | Possible Item Context: Food Web, Food Chain, Symbiosis, Co-Evolution |
| **Response Attributes** | None Specified |
| **Content Focus** | symbiosis, predation, predator, prey, mutualism, commensalism, parasitism |
| **Sample Item** | The organ-pipe flowering cactus depends on bats for pollination. The bats pollinate the cactus as they eat the fruit of the cactus. Recent studies show that the cacti are not producing as much fruit as they used to. Bats living near these cacti have been driven from their cave homes by local villagers.  What is the relationship between the bats and the cactus?   1. commensalism 2. competition 3. mutualism 4. predation   Correct Answer: C |

|  |  |
| --- | --- |
| **Reporting Category** | Ecology |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.7 |
| **Benchmark** | Characterize the biotic and abiotic components that define freshwater systems, marine systems, and terrestrial systems. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Low; Moderate |
| **Benchmark Clarification** | Students will summarize the biotic and abiotic components that define aquatic and terrestrial ecosystems. |
| **Content Limits** | Items referring to abiotic factors are limited to temperature, precipitation, latitude, altitude, availability of light, nutrient, and water.  Items referring to biotic factors are limited to species interactions and availability of food. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | temperature, precipitation, latitude, altitude, availability of light, nutrient, water |
| **Sample Item** | As you move towards the poles away from the equator, which abiotic factor is **most** likely to limit the productivity of terrestrial ecosystems?   1. amount of carbon dioxide 2. amount of oxygen and soil 3. amount of precipitation and light 4. amount of nitrogen and phosphorus   Correct Answer: C |

|  |  |
| --- | --- |
| **Reporting Category** | Populations |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.8 |
| **Benchmark** | Recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive, non-native species. |
| **Also Assesses** | SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically based perspective to inform society's decision making. |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will be able to recognize the consequences of the losses of biodiversity due to catastrophic events, climate changes, human activity, and the introduction of invasive species.  Students will be able to describe how scientific knowledge and reasoning provide an empirically based perspective to inform society's decision making. |
| **Content Limits** | Items may include examples of catastrophic events, climate changes, human activity, or the introduction of invasive species, but will focus on their effect on biodiversity, not assessing specific knowledge of these. |
| **Stimulus Attributes** | Possible Item Context: deforestation, mass extinction, pollution, invasive species, ozone depletion |
| **Response Attributes** | None Specified |
| **Content Focus** | deforestation, mass extinction, pollution, invasive species, ozone depletion, biodiversity |
| **Sample Item** | Which of these human activities has had the **greatest** impact on the loss of biodiversity?   1. habitat destruction 2. increased use of fossil fuels 3. introduction of invasive species 4. ozone depletion   Correct Answer: A |

|  |  |
| --- | --- |
| **Reporting Category** | Ecology |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.9 |
| **Benchmark** | Use a food web to identify and distinguish producers, consumers, and decomposers. Explain the pathway of energy transfer through trophic levels and the reduction of available energy at successive trophic levels. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Low; Moderate |
| **Benchmark Clarification** | Students will analyze a food web to identify and distinguish producers, consumers, and decomposers.  Students will describe the energy pathways through the different trophic levels of a food web or energy pyramid. |
| **Content Limits** | Items referring to organisms in food webs are limited to the impact of changes in energy within different trophic levels.  Items will not require knowledge of specific organisms or their feeding habits. |
| **Stimulus Attributes** | Scenarios will express energy in Joules (J) |
| **Response Attributes** | None Specified |
| **Content Focus** | food web, ecological efficiency, producers, consumers, decomposers, autotrophs, heterotrophs, trophic pyramid, trophic level |
| **Sample Item** | Alligators are vicious predators that are found throughout most of the Florida Everglades. They will eat anything from fish to birds to small mammals. They are known for their dietary adaptability. What **best** describes the role of the alligator in the Everglades ecosystem?   1. carnivore 2. herbivore 3. omnivore 4. producer   Correct Answer: A |

|  |  |
| --- | --- |
| **Reporting Category** | Ecology |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.10 |
| **Benchmark** | Diagram and explain the biogeochemical cycles of an ecosystem, including water, carbon, and nitrogen cycle. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will compare and contrast the water, carbon and nitrogen cycle.  Students will analyze the movement of matter through biogeochemical cycles. |
| **Content Limits** | Items assessing biogeochemical cycles are limited to the water, nitrogen, or carbon cycle.  Items referring to the biogeochemical cycles may address but will not assess cellular processes such as photosynthesis and cell respiration in isolation. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | precipitation, transpiration, condensation, evapotranspiration, evaporation, photosynthesis, respiration, fossil fuels, nitrogen fixation, assimilation, ammonification, denitrification, nitrogen-fixing bacteria |
| **Sample Item** | Which process is **not** part of cycling of carbon?   1. burning of fossil fuels 2. decomposition of plants and animals 3. photosynthesis 4. transpiration   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Resources |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.11 |
| **Benchmark** | Evaluate the costs and benefits of renewable and nonrenewable resources, such as water, energy, fossil fuels, wildlife, and forests. |
| **Also Assesses** | SC.912.E.6.6 Analyze past, present, and potential future consequences to the environment resulting from various energy production technologies.  SC.912.L.17.19 Describe how different natural resources are produced and how their rates of use and renewal limit availability.  SC.912.N.4.2 Weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits, such as human, economic, and environmental. |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will evaluate the costs and benefits of renewable and nonrenewable resources.  Students will analyze past, present, and potential future consequences to the  environment resulting from various energy production technologies.  Students will describe how different natural resources are produced and how their rates of use and renewal limit availability.  Students will weigh the merits of alternative strategies for solving a specific societal problem by comparing a number of different costs and benefits,  such as human, economic, and environmental.  Students will analyze the ethics in scientific research to advance society (e.g. global climate change, historical development of medicine and medical practices).  Students will identify examples of technologies, objects, and processes that have been modified to advance society, and explain why and how they were modified. (e.g. genetically modified food) |
| **Content Limits** | Items assessing renewable and nonrenewable resources will focus on the costs and benefits of these resources, not on identifying examples.  Possible Item Context: mining and extraction techniques, off-shore drilling, petrochemical refining, pollution, health impacts, habitat fragmentation |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | mining and extraction techniques, off-shore drilling, petrochemical refining, pollution, health impacts, habitat fragmentation |
| **Sample Item** | What is an advantage of nuclear energy over the usage of fossil fuels?   1. Nuclear fuel supplies are very limited. 2. Nuclear energy is a renewable resource. 3. Nuclear waste is not as harmful to environment. 4. Nuclear power plants do not emit carbon dioxide.   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Resources |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.12 |
| **Benchmark** | Discuss the political, social, and environmental consequences of sustainable use of land. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | Students will compare and contrast unsustainable and sustainable forms of land use.  Students will summarize the political, social and environmental consequences of sustainable land use. |
| **Content Limits** | Items will not require students to recall specific examples of sustainable land use or specific political or social outcomes. |
| **Stimulus Attributes** | Possible Item Context: state and federal lands, organic farming, urbanization, landfills, agriculture |
| **Response Attributes** | None Specified |
| **Content Focus** | state and federal lands, organic farming, urbanization, landfills, agriculture |
| **Sample Item** | The Adopt an Acre Rainforest program began in 1991. This program helps protect the land by not allowing the forests to be cut down. What is the main reason rainforests should be protected?   1. to provide more land for agriculture 2. to maintain the biodiversity of the forests 3. to cause the extinction of non-native species 4. to prevent uncontrolled growth of mature trees   Correct Answer: B |

|  |  |
| --- | --- |
| **Reporting Category** | Human Impacts |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.13 |
| **Benchmark** | Discuss the need for adequate monitoring of environmental parameters when making policy decisions. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice; Extended Response |
| **Cognitive Complexity** | Moderate; High |
| **Benchmark Clarification** | Students will evaluate environmental policies based on scientific research and statistics that generally lead to sound and impactful policies that both protect and enhance our environment. |
| **Content Limits** | Items will not require students to recall specific environmental policies. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | Not Applicable |
| **Sample Item** | The International Whaling Commission (a group consisting of member countries that oversees commercial whaling worldwide) banned whaling globally in 1984. The government of Japan has come under attack recently because despite the ban, Japanese whaling ships continue to kill whales in the name of research and then sell the meat for food.  Which argument **best** justifies the ban?   1. The commercial whaling process is viewed as being inhumane. 2. Studies show that most people do not like the taste of whale meat. 3. Population statistics show that most whale species are near extinction. 4. A recent poll determined that most Americans want to save the whales.   Correct Answer: C |

|  |  |
| --- | --- |
| **Reporting Category** | Human Impacts |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.14 |
| **Benchmark** | Assess the need for adequate waste management strategies. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice; Extended Response |
| **Cognitive Complexity**  **Level** | Moderate |
| **Benchmark Clarification** | Students will identify the cause of solid waste pollution.  Students will compare and contrast biodegradable and non-biodegradable wastes.  Students will analyze the effect of composting on waste management.  Students will summarize methods for reducing municipal solid waste.  Students will evaluate the methods used to limit solid waste production, disposal, and storage of waste. |
| **Content Limits** | Items will not require students to know solid waste or recycling statistics.  Items may address recycling, landfill design, solid waste disposal (including incineration), hazardous waste storage, and composting.  Items will not ask questions about specific solid waste or hazardous waste accidents. |
| **Stimulus Attributes** | Possible Item Context: recycling, municipal solid waste, landfills, incineration |
| **Response Attributes** | None Specified |
| **Content Focus** | recycling, municipal solid waste, landfills, incineration |
| **Sample Item** | What is an advantage of composting?   1. increased need for fertilizers and pesticides 2. increased production of leachate formation in landfills 3. reduced amount of nutrients and organic matter in soil 4. reduced amount of waste that restaurants and animal feedlots are sending to landfills   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Human Impacts |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.16 |
| **Benchmark** | Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution. |
| **Also Assesses** | SC.912.L.17.15 Discuss the effects of technology on environmental quality.  SC.912.L.16.10 Evaluate the impact of biotechnology on the individual, society and the environment, including medical and ethical issues. |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate; High |
| **Benchmark Clarification** | Students will summarize large-scale environmental impacts resulting from human activity, including waste spills, oil spills, run off, greenhouse gases, ozone depletion, and surface and ground water pollution.  Students will analyze the effects of technology on environmental quality.  Students will evaluate the impact of biotechnology on the individual, society, and the environment, including medical and ethical issues. |
| **Content Limits** | Items related to biotechnology may assess its impact to the environment but will not require knowledge of specific biotechnologies or specific medical issues. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | oil spill, agricultural runoff, eutrophication, greenhouse gases, ozone depletion, chlorofluorocarbons (CFCs), surface and groundwater pollution, aquifer depletion, genetically modified organisms (GMO), and genetically modified food (GMF) |
| **Sample Item** | The release of chlorofluorocarbons (CFCs) into Earth’s atmosphere has led to a decrease in stratospheric ozone. Which **best** describes an environmental impact of ozone depletion?   1. increased pollution into Earth’s atmosphere 2. increased ultraviolet radiation onto Earth’s surface 3. decreased precipitation in the Earth’s polar regions 4. decreased ocean circulation of cold water towards the equator   Correct Answer: B |

|  |  |
| --- | --- |
| **Reporting Category** | Human Impacts |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.20 |
| **Benchmark** | Predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability. |
| **Also Assesses** | SC.912.L.17.18 Describe how human population size and resource use relate to environmental quality.  SC.912.L.17.19 Describe how different natural resources are produced and how their rates of use and renewal limit availability.  SC.912.N.4.1 Explain how scientific knowledge and reasoning provide an empirically based perspective to inform society’s decision making. |
| **Item Types** | Multiple Choice |
| **Cognitive Complexity** | Moderate; High |
| **Benchmark Clarification** | Students will predict the impact of individuals on environmental systems and examine how human lifestyles affect sustainability.  Students will describe how human population size and resource use relate affect sustainability.  Students will describe how different natural resources are produced and how their rates of use and renewal limit availability affect sustainability.  Students will explain how scientific knowledge and reasoning of environmental systems provide an empirically based perspective to inform society's decision-making on sustainability. |
| **Content Limits** | Items referring to renewable and nonrenewable resources will focus on the environmental costs and benefits of using those resources not on identifying examples of renewable and nonrenewable resources.  Items will focus on the environmental impact of human lifestyles, population size, and resource use. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | sustainability, renewable energy, nonrenewable energy, acid deposition, global warming, industrial smog, ozone depletion |
| **Sample Item** | Human activities affect the quality and supply of natural resources for future generations. Since the Industrial Revolution, the use of fossil fuels has greatly increased industrial productivity, but it has also caused environmental issues.  Which is **least** likely to be caused by the burning of fossil fuels?   1. acid deposition 2. global warming 3. industrial smog 4. ozone depletion   Correct Answer: D |

|  |  |
| --- | --- |
| **Reporting Category** | Resources |
| **Standard** | Energy |
| **Benchmark Number** | SC.912.P.10.1 |
| **Benchmark** | Differentiate among the various forms of energy and recognize that they can be transformed from one form to others. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice; Extended Response |
| **Cognitive Complexity**  **Level** | Moderate; High |
| **Benchmark Clarification** | Students will explain how energy cycles between living systems and the physical environment.  Students will recognize that energy cannot be created or destroyed, only transformed.  Students will differentiate between various forms of energy |
| **Content Limits** | Items addressing energy transformations are limited to environmental science context, for example the mechanical to electrical in generators or nuclear to heat in nuclear reactors. |
| **Stimulus Attributes** | Possible Item Context: energy transformations in power plants, trophic pyramid ecological efficiency, energy efficiency |
| **Response Attributes** | None Specified |
| **Content Focus** | energy transformations in power plants, trophic pyramid ecological efficiency, energy efficiency |
| **Sample Item** | In the Antarctic food web, most primary producers are phytoplankton. These are then consumed by krill, a primary consumer. Krill are eaten by both Emperor and Adelie penguins who act as secondary consumers. The penguins are eaten by the leopard seals and orca whales at the tertiary consumer level.  At which trophic level is the most energy converted into biomass?   1. primary producers 2. primary consumers 3. secondary consumers 4. tertiary consumers   Correct Answer: A |

|  |  |
| --- | --- |
| **Reporting Category** | Ecology |
| **Standard** | Energy |
| **Benchmark Number** | SC.912.P.10.2 |
| **Benchmark** | Explore the Law of Conservation of Energy by differentiating among open, closed, and isolated systems and explain that the total energy in an isolated system is a conserved quantity. |
| **Also Assesses** | Not Applicable |
| **Item Types** | Multiple Choice; Extended Response |
| **Cognitive Complexity** | Low; High |
| **Benchmark Clarification** | Students will explain that neither matter nor energy may be created or destroyed, but may be converted from one form to another.  Students will identify and/or relate the difference between an open, closed, and isolated system.  Students will explain that the total energy in an isolated system is conserved and its amount never changes. |
| **Content Limits** | Items should only assess those systems related to environmental processes such as ecological efficiency and energy efficiency of renewable and nonrenewable energy. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | open system, closed system, isolated system, Law of Conservation of Energy |
| **Sample Item** | Both the compact fluorescent light bulb (CFL) and the light-emitting diode (LED) bulb are now both readily available for purchase by local consumers. Both of these technologies show a distinct advantage in efficiency over the standard incandescent light bulb.  Why are incandescent bulbs so inefficient?   1. Most of their energy is wasted in the form of heat. 2. There is less variety; they only come in a few wattages. 3. They break easily so they must be replaced more frequently. 4. They are more expensive because of the high cost to manufacture.   Correct Answer: A |