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| CENTRAL FLORIDA ASSESSMENT COLLABORATIVE |
| Individual Test Item Specifications |
| Marine Science 1 |
| 2014 |

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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. For each benchmark assessed, the following information is provided:

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| **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

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| **Reporting Category** | Earth & Space Science |
| **Standard** | Earth Structures |
| **Benchmark Number** | SC.912.E.6.3  |
| **Benchmark** | Analyze the scientific theory of plate tectonics and identify related major processes and features as a result of moving plates. |
| **Also Assesses** | SC.912.N.2.4 Explain that scientific knowledge is both durable and robust and open to change. Scientific knowledge can change because it is often examined and re-examined by new investigations and scientific argumentation. Because of these frequent examinations, scientific knowledge becomes stronger, leading to its durability.  |
| **Item Type** | Selected Response |
| **Cognitive Complexity**  | High |
| **Benchmark Clarification** | The student will explain the development of plate tectonic theory, which is derived from the combination of two theories: continental drift and seafloor spreading. The student will compare and contrast the three primary types of plate boundaries (convergent, divergent, and transform). The student will explain the origin of geologic features and processes that result from plate tectonics (e.g. earthquakes, volcanoes, trenches, mid-ocean ridges, island arcs and chains, hot spots, earthquake distribution, tsunamis, mountain ranges).The student will explain that the theory of plate tectonics has been developed over a long period by a large number of scientists with a large number of observations. The theory of plate tectonics is durable but is continually subjected to change in the face of new evidence. |
| **Content Limits** | Items may include the three major types of plate boundaries, the process of seafloor spreading, the hot spot theory, and the ring of fire. Items may include features that arise from plate tectonics such as volcanoes, mountain ranges, trenches, and canyons.Items will not require knowing specific names of boundaries or plates. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | plate tectonic theory, continental drift, seafloor spreading, plate boundary convergent boundary, divergent boundary, transform boundary, hot spot, ring of fire, volcanoes, earth quakes, trenches, ridges, island arcs, mountain range, tsunamis, asthenosphere, lithosphere , continental crust, oceanic crust, subduction  |
| **Sample Item** | A break in the earth’s crust may create a fault line that runs between two plates. This may result in a transform fault boundary. Which of the following **best** explains the action of the two plates at a transform boundary? A) Plates slide next to each other at the boundary. B) New volcanic islands will be formed at the boundary. C) Large mountains form at the boundary of the two plates. D) Deep sea trenches form at the boundary of the two plates. Correct Answer: A |

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| **Reporting Category** | Earth & Space Science |
| **Standard** | Earth Structures |
| **Benchmark Number** | SC.912.E.6.5  |
| **Benchmark** | Describe the geologic development of the present day oceans and identify commonly found features. |
| **Item Type** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will describe instances in which scientists' varied backgrounds, talents, interests, and goals influence the inferences and thus the explanations that they make about observations of natural phenomena. The student will describe how competing interpretations of scientists are a strength of science as they are a source of new, testable ideas that have the potential to add new evidence to support one or another of the explanations. |
| **Content Limits** | Items may include the movement of continents from Pangaea to present day continents, as well as the development of the present day oceans from Panthalassa. Items may include ocean floor features, such as trenches, mid-ocean ridges, rift valley, seamounts, abyssal plain, and continental shelf. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | lithosphere, magma , mid-ocean ridge, ocean crust, Pangaea Panthalassa transform boundary, trenches, rift valley, seamounts, abyssal plain, andcontinental shelf, ocean floor, seamount |
| **Sample Item** | Scientists have shown that present day Africa, North America and South America where once joined together and over millions of years have moved apart to form the present day Atlantic Ocean. These plates are still moving and the Atlantic Ocean is still getting larger. What feature in the middle of the Atlantic Ocean helps explain this movement of plates away from each other? A) a mid-ocean ridge  B) a mid-ocean trench C) seamounts over a hot spot D) the flat abyssal plainCorrect Answer: A |

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| **Reporting Category** | Earth & Space Science |
| **Standard** | Earth Systems & Patterns |
| **Benchmark Number** | SC.912.E.7.4 |
| **Benchmark** | Summarize the conditions that contribute to the climate of a geographic area, including the relationships to lakes and oceans. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will demonstrate that the high heat capacity of water results in moderating temperatures in areas adjacent to large lakes or oceans. |
| **Content Limits** | Items may include the worldwide four climate zones, tropical, temperate, subpolar, and polar.Items may identify Florida as having a subtropical climate.Items may include Florida’s raining season, May- October and Florida’s dry season November - April.Items may assess the concept of heat capacity.  Items will not assess how to measure heat capacity. Items will not assess the heat capacity of other substances besides water. Items may assess the hydrological cycle. Items may assess how currents affect the climate of a geographic area. Items may assess how El Nino Southern Oscillation affect worldwide climate.   |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |

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| **Content Focus** | Global wind patterns, Ekman Transport(spirals), EL Nino. La Nina, countercurrents, deep currents, tropical climate, subtropical climate, temperate climate, sub-polar climate, polar climate, wet season, dry season, convective storms |
| **Sample Item** | In Florida, how does the heat capacity of water affect the climate of a city located along the shore of an ocean or large lake as compared to a city further inland?

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| A) | Cities along the shore have cooler daytime temperatures and cooler nighttime temperatures as compared to inland cities. |
| B) | Cities along the shore have warmer daytime temperatures and cooler nighttime temperatures as compared to inland cities. |
| C) | Cities along the shore have cooler daytime temperatures and warmer nighttime temperatures as compared to inland cities. |
| D) | Cities along the shore have warmer daytime temperatures and warmer nighttime temperatures as compared to inland cities.Correct Answer: C |

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| **Reporting Category** | Earth & Space Science |
| **Standard** | Earth Systems & Patterns |
| **Benchmark Number** | SC.912.E.7.6 Honors Only |
| **Benchmark** | Relate the formation of severe weather to the various physical factors. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | The student will relate how the physical attributes of the ocean contributes to the formation of severe weather in coastal regions.  |
| **Content Limits** | Items may assess how monsoons and cyclones are formed. Items may assess wind patterns and the Coriolis effect. Items may assess the formation of tsunamis. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | Weather, monsoons, cyclones, hurricanes, Coriolis effect, tsunamis, airpressure, cold front, warm front, Convection, intertropical convergencezone (ITCZ), extratropical cyclones, troposphere, circulation cell  |
| **Sample Item** | Which factor contributes to the growth and intensity of hurricanes?  A) cool air mass  B) increased air pressure  C) mountain ranges D) warm, tropical waterCorrect Answer: D |

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| **Reporting Category** | Earth & Space Science |
| **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** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | High |
| **Benchmark Clarification** | The student will explain how the oceans act as sources/sinks of heat energy.The student will explain how the oceans absorb and store carbon dioxide, converting the CO2 into dissolved HCO3– and then into CaCO3 as precipitate or biogenic carbonate deposits, which have an impact on climate change.The student will explain how worldwide ocean currents influence climate and how disruptions in global currents can cause global climate change. |
| **Content Limits** | Items may assess the hydrological cycle and the carbon cycle. Items may assess surface currents, deep ocean circulation, and the ocean conveyor belt. Items may assess vertical current movement such as upwellings and downwellings.Items may assess how El Niño and La Niña affect global climate.Items will not assess how climate change is measured.  |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |

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| **Content Focus** | Currents, upwellings, downwellings, hydrologic (water) cycle, carbon cycle, surface currents, counter currents, deep ocean currents, Ocean Conveyor Belt, EL Nino, La Nina, geostrophic currents, undercurrents, climate change, carbonic acid |
| **Sample Item** | The global ocean conveyor belt serves as the Earth’s air conditioning system. Which statement **best** describes how this interconnected flow of currents moderates the world’s climate? A) It keeps surface water cool. B) It helps to cool temperatures in the tropic. C) It moderates world climate by moving water through ocean currents. D) It moderates world climate by redistributing heat away from the  tropics.Correct Answer: D |

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| **Reporting Category** | Classification/Heredity/Evolution |
| **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 results in differential reproductive success. |
| **Also Assesses** | 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.  |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | The student will explain and/or describe the conditions required for natural selection that result in differential reproductive success.The student will identify ways in which a scientific claim is evaluated (e.g., through scientific argumentation, critical and logical thinking, and consideration of alternative scientific explanations to explain the data presented). |
| **Content Limits** | Items will be limited to addressing overproduction of offspring, inherited variation, and struggle to survive which results in differential reproductive success.Items assessing a scientific claim are limited to topics discussed in SC.9.12.L.15.13. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | natural selection (overproduction of offspring, inherited variation, and the struggle to survive), differential reproductive success, Fossils, adaptation, fitness, genetic variation, survival of the fittest, mutation, observations, inferences, critical thinking, theory, science and society, logical thinking, scientific claims, alternative scientific explanations |
| **Sample Item** | Which of the following is an essential component of the Theory of Natural Selection? 1. antibiotic resistance
2. genetic mutation
3. inherited variation
4. transitional species

Correct Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will explain that the distribution and abundance of marine life is determined by the interspecific and intraspecific interactions and between organisms and the non-living environment. |
| **Content Limits** | Items may assess the concept of carrying capacity. Items may assess how population dynamics affect the population and pattern of distribution of marine life. Items may assess the types of population density, such as uniform, clumped, or random distribution. Items will not assess endangered species. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | Population, density, age structure, distribution patterns, birth rate, death rate, growth rate, immigration, emigration, interspecific interactions, intraspecific interactions, carrying capacity, exponential growth, logistic growth, limiting factors |
| **Sample Item** | Which of the following does **not** affect the carrying capacity of a species?  A) available space  B) food supply C) predation D) water supplyCorrect Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.2 |
| **Benchmark** | Explain the general distribution of life in aquatic systems as a function of chemistry, geography, light, depth, salinity, and temperature. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | High |
| **Benchmark Clarification** | The student will explain how different marine life forms are adapted to various ocean life zones and that their distribution and abundance is a function of the chemistry, geography, light, depth, salinity, and temperature of the life zone. |
| **Content Limits** | Items may assess how the chemistry of water, light availability, depth, salinity, temperature, and geography affect the distribution of marine life. Items will not assess how to calculate salinity. Items may assess the ocean life zones, such as photic zone, benthic zone, aphotic zone, oceanic zone, and neritic zone. Items may assess the marine lifestyles, such as neuston, plankton, nekton, and benthos. Items will not assess compensation depth. Items will not assess the Principle of Constant Proportions, dissolved solids in seawater, acidity, or why the seas are salty. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | ocean zones, benthic, pelagic, neritic, oceanic, epipelagic, mesopelagic, bathypelagic, abyssal pelagic, hadelpalagic,benthic photic zone, aphotic zone, supralittoral, littoral, sublitoral, bathyal, abyssal, hadal, epifauna, epiflora, infauna, neuston, nekton, benthos, plankton  |
| **Sample Item** | Because phytoplankton is a photosynthetic autotroph, where would you find the greatest abundance of phytoplankton? A) aphotic zone  B) benthic zone C) photic zone  D) transition zone Correct Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.3 |
| **Benchmark** | Discuss how various oceanic and freshwater processes, such as currents, tides, and waves affect the abundance of aquatic organisms. |
| **Also Assesses** | SC.912.N.1.6: Describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. 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** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will explain how the coastal ecosystems are effected by both marine and freshwater inputs and how the interactions of currents, tides and waves create highly productive coastal and estuarine environmentsThe student will describe why human activities on these fragile ecosystems have wide-ranging effects on the coastal ecosystems The student will describe how scientific inferences are drawn from scientific observations and provide examples from the content being studied. The student 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. |

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| **Content Limits** | Items may assess erosion from waves and the zonation patterns along a beach. Items may assess intertidal, estuary, salt marsh, and mangrove community interactions.Items may assess how sea surface temperature, salinity, and ocean currents affect marine life. Items may assess the merits and alternative strategies for development on coastal ecosystemsItems will not assess the causes of currents, tides, and waves. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus**  | Currents, waves, tides, estuarine ecosystems, mangroves, salt marshes, • Detritus, halophytes, littoral zone, intertidal zones, active coast, barrier islands, beach, beach renourishment, erosion, lagoon , longshore current, longshore drift, stratified estuary, high tide, low tide, waves, forebeach, beach, low energy beach, high energy beach, human impacts on coastal ecosystems including development, seawalls, groins, jetties |
| **Sample Item** | What types of aquatic organisms would be expected in the intertidal zone?  A) no organisms B) all types of organisms C) Organisms that could survive the harsh environment  D) varied organisms during high tide but none during low tideCorrect Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **Standard** | Interdependence |
| **Benchmark Number** | SC.912.L.17.4 |
| **Benchmark** | Describe changes in ecosystems resulting from seasonal variations, climate change and succession. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark** **Clarification** | The student will identify that the tilt of the Earth’s axis and orbit makes the Earth heat unevenly, resulting in seasonal changes in the biological communities of the Earth’s oceans.The student will identify that over geologic time the earth’s climate has changed many times, resulting in the rise and fall of sea levels on several occasions.The student will explain that on newly exposed rock or sediment, marine communities undergo a series of predictable successional changes over time. |
| **Content Limits** | Items may include primary and secondary succession in marine communities.Items may include natural and human generated sources of greenhouse gases, which result in climate change.The student is not required to know specific knowledge of the Earth’s eras, periods or epochs. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus**  | Climate change, successional changes, primary succession, secondarysuccession, seasonal variation, greenhouse effect, polar climate, temperateclimate, tropical climate, sea level changes, carbon dioxide, albedo, ozone,CFC’s  |
| **Sample Item** | Changes in climate have a major impact on biological communities. Which of the following would **not** be an effect from increased global temperatures? A) Ocean sea levels will fall. B) Ocean currents will change. C) Coastal wetlands may flood. D) Whale migration patterns will change.Correct Answer: A |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The will explain the primary ways that organisms interact with each other in the natural environment. |
| **Content Limits** | Items will assess the relationships among organisms, which include predation, parasitism, competition, commensalism, and mutualism. Items will not assess the food web.  |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Contact Focus** | Symbiosis, mutualism, commensalism, parasitism, predator, prey, tolerance, habitat, niche |

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| **Sample Item** | Description: Description: seaanemoneclown.jpgIn the above diagram, a clownfish lives within the deadly stinging tentacles of a sea anemone. It is able to produce special mucus that causes the anemone not to release its stings. In return for the anemone's protection, the clownfish brings scraps to it, and lures larger fish into the anemone's tentacles. This is a form of what type of a relationship? A) commensalism  B) mutualism C) parasitism  D) predator-prey  Correct Answer: B |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will define the biotic and abiotic components of terrestrial systems, lakes, rivers, and ocean and how the differences in the components characterize the types of organisms found in each. |
| **Content Limits** | Items will address the biotic and abiotic components of estuaries, delta, and barrier islands.Items will not address freshwater or terrestrial systems in isolation. Items referring to abiotic factors are limited to temperature, salinity, pH, amount of sunlight, ocean currents, wave action, and sediments.  |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus**  |  environment, biotic, abiotic, components of ecosystems (physical, chemical and biological), terrestrial, lakes, river, community, detritus, sand, silt, clay, fresh water, brackish water, temperature, turbidity, pH, sunlight |
| **Sample Item** | Which of the following is an abiotic factor that might influence the health of a coastal ecosystem? A) an increase in the fish population B) a change in the bacteria in the water C) a change in the salinity of the water D) a decrease in the phytoplankton populationCorrect Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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 or non-native species. |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | High |
| **Benchmark Clarification** | The student will explain that human activities and natural catastrophic events can have profound effects on populations, biodiversity and ecosystem processes. |
| **Content Limits** | Items may include examples of catastrophic events such as tsunamis, volcanic eruptions, asteroid impact, hurricanes and earthquakes.Items on climate change may include natural and human induced changes.Items on human activities may include overexploitation of a biological resource, habitat destruction and pollution. Items on the introduction of invasive species will focus on their effect on biodiversity, not assessing specific knowledge of these. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | Biodiversity, ecosystems, overexploitation, hurricanes, tsunamis, volcanic eruptions, asteroid impacts, earthquakes, native species, exotic species, sewage, toxic wastes, radioactive wastes , global warming, climate change, ozone depletion, habitat destruction  |

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| **Sample Item** | Caulerpa is green marine algae that are native to the Caribbean and Indian Ocean. It has grown rapidly in areas where it has been introduced, such as the Mediterranean. Which of the following describes the most likely impact of Caulerpa on an ecosystem?A) The native algae loses habitat due to the growth of the nonnative algae.B) The native algae becomes stronger and out-competes the nonnative algae.C) The nonnative algae increases the population of consumers that depend  on the native algae.D) The nonnative algae increases the biodiversity of the area due to the  increase in biomass.Correct Answer: A |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will use a marine food web to identify and distinguish producers, consumers, and decomposers. The student will describe the energy pathways and energy loss through the different trophic levels of a marine food web or energy pyramid. |
| **Content Limits** | Items will not require knowledge of specific organisms or their feeding habits. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus**  | Food chains, food webs, producers, consumers, decomposers, trophic levels, energy pyramid, autotroph, heterotroph,, omnivore, ecological pyramids, biomass Ecology, herbivore, carnivore, detritivore, niche |

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| **Sample Item** | In a marine ecosystem phytoplankton, zooplankton, small fish, and shark make up a food chain, in which the shark eats the fish, the fish eats the zooplankton, and the zooplankton eats the phytoplankton. If disease reduced the population of small fish, how would the flow of energy in the system be affected?A) The energy flow between the phytoplankton and the sun will decrease.B) The energy flow between the phytoplankton and the shark will increase.C) The energy flow between the phytoplankton and the shark will decrease.D) The energy flow between the phytoplankton and the small fish will increase.Correct Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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** | SC.912.E. 7.1 |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | Moderate |
| **Benchmark Clarification** | The student will analyze the movement of matter through biogeochemical cycles. |
| **Content Limits** | Items assessing biogeochemical cycles are limited to the water, carbon and nitrogen cycle.Items will be limited to the role of the marine ecosystem or ecosystems linked to the ocean in the biogeochemical cycle. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus**  | Biogeochemical cycle, nutrients, nitrogen fixation, denitrification, limiting nutrients, water cycle, peculation, evaporation, condensation, precipitation, photosynthesis, respiration, carbon dioxide, fossil fuels, carbonate rocks  |
| **Sample Item** | Which of the following describes a significant role that the oceans play in the movement of carbon through the ecosystem? A) Carbon dioxide is absorbed by deep-sea sediments.  B) Carbon dioxide is released by the shells of marine animals. C) Carbon dioxide is used by phytoplankton during photosynthesis.  D) Carbon dioxide is taken in by marine bacteria during decomposition.Correct Answer: C |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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.N.1.5: Describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome.  |
| **Item Types** | Selected Response |
| **Cognitive Complexity** | Moderate |
| **Benchmark****Clarification** | The student will evaluate the cost/benefits of exploitation of renewable and nonrenewable resources The student will evaluate examples of ineffective and effective management of the oceans renewable and nonrenewable resources.The student will describe and provide examples of how similar investigations conducted in many parts of the world result in the same outcome. |
| **Content Limits** | Items assessing renewable and nonrenewable resources will be limited to resources from the oceans or those that directly impact the marine environment. Items may include renewable biological resources such as fisheries, and nonrenewable ocean resources such as oil, gas, sediments, mineral deposits. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus**  | Tragedy of the commons, renewable, nonrenewable, fisheries, natural gas, coal, oil, nuclear, hydropower, wave, tidal, geothermal, wind, solar, biomass, sand, mineral deposits. |
| **Sample Item** | What are the benefits of using tidal or wave power instead of fossil fuels? A) Tidal and wave power are renewable. B) Tidal and wave power produce toxic waste. C) Tidal and wave power initial costs are very low. D) Tidal and wave power can be harnessed anywhere in the ocean. Correct Answer: A |

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| **Reporting Category** | Organisms/Populations/Ecosystems |
| **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.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.  |
| **Item Types** | Selected Response; Short Response |
| **Cognitive Complexity** | High |
| **Benchmark Clarification** | The student will be able to assess the environmental impacts on the marine environment that result when sewage, oil spills, nutrient run off, greenhouse gases, ozone depleting gases and other human anthropogenic pollutants enter the environment.  |
| **Content Limits** | Environmental impacts will pertain to the marine environment. Item specification will concentrate on waste spills, oil spills, ozone depletion and greenhouse gases. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus** | energy, material resources, consequences (costs and benefits), human consumption (e.g. mining and extraction techniques off-shore drilling petrochemical refining), health, habitat destruction, energy production, Sewage, toxic wastes, hazardous wastes, oil spills, CFC’s, ozone depletion, greenhouse gases, nutrients, anoxic, bioaccumulation, pesticides, biodegradable, biomagnifications, chlorinated hydrocarbon, coral bleaching hypoxic, pollution, sewage sludge, synthetic organic chemicals  |

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| **Sample Item** | Greenhouse gases have environmental impacts on marine ecosystems. Which environmental impact is **not** a result of greenhouse gases?  A) cooling of artic waters  B) coral bleaching  C) global warming  D) sea level rise due to glacial melting Correct Answer: A |

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| **Reporting Category** | Physical Science |
| **Standard** | Matter & Energy Transformations |
| **Benchmark Number** | SC.912.L.18.12 |
| **Benchmark** | Discuss the special properties of water that contribute to Earth's suitability as an environment for life: cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | Moderate |
| **Benchmark Clarification** | The student will be able to identify that water is a unique molecule and necessary for life because of it specific and unique properties. The student will be able to relate how the cohesive behavior of water gives it unique and special properties that contribute to its usefulness in plant life and animal life.The student will be able to explain how the density change in water when changing from a liquid to solid is essential to life on this planet. The student will be able to explain how water is able to dissolve many substances essential for life. The student understand the polar nature of a water molecule and how it relates to its special properties. |
| **Content Limits** | Items referring to the properties of water are limited to hydrogen bonding, polarity, cohesive behavior, ability to moderate temperature, expansion upon freezing, and versatility as a solvent. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | Polar molecule, Hydrogen bonds, Cohesion, Surface Tension, Viscosity, Mixture, Solution, Density, Salinity, Conductivity, Osmotic Pressure, Boiling Point, Freezing Point, Heat Capacity, Evaporation, Osmosis, Diffusion, buoyancy, Volume  |
| **Sample Item** | Water is essential for life. Its special properties make water the single most important molecule in plant life. Which property of water enables it to float when freezing thus allowing life to live in liquid water under the ice?A) Its cohesion allows air bubbles to form in ice, causing it to float.B) It contracts rather than expands when changing from a liquid to solid.C) It expands rather than contracts when changing from a liquid to a solid.D) Its cohesion prevents air bubbles from forming in ice, causing it to  float.Correct Answer: B |

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| **Reporting Category** | Nature of Science |
| **Standard** | Practice of Science |
| **Benchmark Number** | SC.912.N.1.1 |
| **Benchmark** | Define a problem based on a specific body of knowledge, for example: biology, chemistry, physics, and earth/space science, and do the following: 1. pose questions about the natural world, 2. conduct systematic observations, 3. examine books and other sources of information to see what is already known, 4. review what is known in light of empirical evidence, 5. plan investigations, 6. use tools to gather, analyze, and interpret data (this includes the use of measurement in metric and other systems, and also the generation and interpretation of graphical representations of data, including data tables and graphs), 7. pose answers, explanations, or descriptions of events, 8. generate explanations that explicate or describe natural phenomena (inferences), 9. use appropriate evidence and reasoning to justify these explanations to others, 10. communicate results of scientific investigations, and 11. evaluate the merits of the explanations produced by others. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response with diagrams |
| **Content Complexity**  | High |
| **Benchmark Clarification** | The student will design and/or evaluate a scientific investigation using evidence of scientific thinking and/or problem solving. The student will interpret and analyze data to make predictions and/or defend conclusions. The student will evaluate the merits of scientific explanations produced by others. The student will assess the reliability of sources of information according to scientific standards. The student will describe how scientific inferences are made from observations and identify examples from marine biology. |
| **Content Limits** | Item specification will focus will be on interpretation of data related to the ocean and to determine results of scientific investigations. |

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| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus**  | Scientific investigation, predictions, scientific merit, reliability, scientific standards, evidence, natural world, observations, scientific tools, graphical representations of data, empirical evidence, systematic, observation, examine, review, , graphs (area, bar graph, circle graph, line, histograph, pictograph), scatter plot, chart, fact, investigation, law, trial, control, independent variable, dependent variable  |

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| **Sample Item** | Sydney's science teacher slowly poured three different water solutions into a glass aquarium tank: (1) warm fresh water colored red (2) clear, room temperature fresh water(3) cold fresh water colored blue Which diagram illustrates the **most** likely outcome of this experiment? A) red water solution on top of the water column, blue water solution in the middle of water column, clear water solution at the bottom of the water columnB) red water on top of the water column, clear water solution in the middle of the water column, blue water solution at the bottom of the water columnC) blue water solution on top of the water column, clear water solution at the middle of the water column, red water solution at the bottom of the water column D) clear water solution at the top of the water column, red water solution at the middle of the water column, blue water solution at the bottom of the water column. Correct Answer: B |

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| **Reporting Category** | Nature of Science |
| **Standard** | Characteristics of Scientific Knowledge |
| **Benchmark Number** | SC.912.N.2.1 |
| **Benchmark** | Identify what is science, what clearly is not science, and what superficially resembles science (but fails to meet the criteria for science). |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response  |
| **Cognitive Complexity**  | High |
| **Benchmark Clarification** | The student will explain science is the systematic and organized inquiry that is derived from observations and experimentation that can be verified or tested by further investigation to explain natural phenomena (e.g. Science is testable, pseudo-science is not; science seeks falsifications, pseudo-science seeks confirmations.) |
| **Content Limits** | Items may require students to identify and distinguish topics that can be studied by science, and those that cannot. |
| **Stimulus Attributes** | None Specified |
| **Response Attributes** | None Specified |
| **Content Focus**  | science, experimentation, culmination, substantial, natural phenomena, scientific argumentation, critical thinking, logical thinking, verifiable, criteria, proposed, pre-existing tenets, pseudoscience, non-science |
| **Sample Item** | Many cultures have attached importance to astronomical events, and developed elaborate systems for predicting disasters, upheavals and other catastrophic events to the alignment of planets and other celestial observations. Astrology most often consists of a system of [horoscopes](http://en.wikipedia.org/wiki/Horoscope) purporting to explain aspects of a person's [personality](http://en.wikipedia.org/wiki/Personality) and predict future events in their life based on the positions of the sun, moon, and other celestial objects at the time of their birth. Which of the following best describes the above statements?A) systematic and organized inquiry that is repeatable and verifiable B) scientific knowledge and empirical evidence for understanding the natural  worldC) systematic and organized inquiry that is derived from observations and  experimentationD) pseudo-science which superficially resembles science, but fails to meet the  criteria for scienceCorrect Answer: D |

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| **Reporting Category** | Physical Science |
| **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** |  N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | High |
| **Benchmark Clarification** | The student will identify and/or relate the differences between an open, closed, and isolated system. The student will be able to explain that the total energy in an isolated system is conserved and its amount never changes.The student will be able to explain how the conservation of energy is important in chemical reactions with bond formation and bond breaking.  |
| **Content Limits** | Items may include the use calorimetry to illustrate conservation of energy. Items may include solving problems involving conservation of energy in simple systems.Items may include the Earth and its atmosphere as a model isolated or closed system and as a model open system to the vacuum of outer space. |
| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus** | Energy, physical change, chemical change, law of conservation of energy, transformation, entropy, bond formation, bond breaking , calorimetry |

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| **Sample Item** | The Sun is the major source of energy for the earth’s surface. It drives photosynthesis, heats the atmosphere and creates winds and currents. To maintain a balance with the energy coming from the Sun an equal amount of energy must be lost. What happens to that energy absorbed by the Earth?A) Trees trap it as chemical energy.B) It gets trapped in the deep ocean water C) It is converted into waves, currents, and winds. D) The atmosphere, land and ocean reradiates back into space as infrared radiation at night.Correct Answer: D |

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| **Reporting Category** | Physical Science |
| **Standard** | Energy |
| **Benchmark Number** | SC.912.P.10.20 |
| **Benchmark** | Describe the measurable properties of waves and explain the relationships among them and how these properties change when the wave moves from one medium to another. |
| **Also Assesses** | N/A |
| **Item Types** | Selected Response |
| **Cognitive Complexity**  | High |
| **Benchmark Clarification** | The student will describe the measurable properties of waves (velocity, frequency, wavelength, amplitude, period, reflection, refraction, and diffraction) and explain the relationships among them.The student will describe sound as a longitudinal wave whose speed depends on the properties of the medium in which it propagates.The student will explain the measurable properties of ocean waves, how they are created, and how ocean waves change as they approach shore.The student will describe that as waves moves from one medium to another the speed changes resulting in the appearance of bending called refraction.The student will describe that the amount of refraction a light wave undergoes is dependent on its wavelength thus creating the light spectrum.  |
| **Content Limits** | Items may include the transverse, longitudinal, and orbital waves.Items on constructive and destructive interference of waves will be on a conceptual level.Items may include the three factors, wind duration, speed and fetch, which determine the size of wind-generated ocean waves.Items may include the type of surf created as waves approach shore as well as the properties of deep and shallow water waves.Items will not assess how tsunamis are created. |

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| **Stimulus Attributes** | Illustrations or diagrams may be used. |
| **Response Attributes** | None Specified |
| **Content Focus**  | wave, crest, trough, height, velocity, frequency, wavelength, amplitude, period, reflection, refraction, diffraction , internal waves, destructive waves, storm surge, seiches, tsunamis |
| **Sample Item** | Diagram of waves approaching a shorelinewaves.jpgIn the above diagram, when waves approach a shoreline at an angle, the shallow water close to the shoreline causes the wave to slow down and appear to bend. What is this phenomena called?  A) diffraction  B) reflection  C) refraction  D) wavelengthCorrect Answer: C |