

2009 MAST Workshop, Dauphin Island Sea Lab  
Alabama Course of Study: Science Objectives Met

**7<sup>th</sup> Grade, Life Science, Content Standard 1**

Describe characteristics common to living things, including growth and development, reproduction, cellular organization, use of energy, exchange of gases, and response to the environment.

**7<sup>th</sup> Grade, Life Science, Content Standard 4**

Describe organisms in the six-kingdom classification system by their characteristics.

**7<sup>th</sup> Grade, Life Science, Content Standard 6**

Describe evidence of species variation due to climate, changing landforms, interspecies interaction

**7<sup>th</sup> Grade, Life Science, Content Standard 7**

Describe biotic and abiotic factors in the environment.

**7<sup>th</sup> Grade, Life Science, Content Standard 12**

Classify waves as mechanical or electromagnetic.

**7<sup>th</sup> Grade, Mathematics, Content Standard 4**

Express a pattern shown in a table, graph, or chart as an algebraic equation.

**7<sup>th</sup> Grade, Mathematics, Content Standard 8**

Recognize geometric relationships among two-dimensional and three-dimensional objects.

**7<sup>th</sup> Grade, Mathematics, Content Standard 9**

Solve problems involving circumference and area of circles.

**8<sup>th</sup> Grade, Life Science, Content Standard 1**

Identify steps within the scientific process.

**9<sup>th</sup> – 12<sup>th</sup>, Biology Core, Content Standard 1**

Select appropriate laboratory glassware, balances, time measuring equipment, and optical instruments to conduct an experiment.

**9<sup>th</sup> – 12<sup>th</sup>, Biology Core, Content Standard 13**

Trace the flow of energy as it decreases through the trophic levels from producers to the quaternary level in food chains, food webs, and energy pyramids.

**9<sup>th</sup> – 12<sup>th</sup>, Biology Core, Content Standard 14**

Trace biogeochemical cycles through the environment, including water, carbon, oxygen, and nitrogen.

**9<sup>th</sup> – 12<sup>th</sup>, Biology Core, Content Standard 16**

Identify density-dependent and density-independent limiting factors that affect populations in an ecosystem.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 1**

Select appropriate equipment for scientific field investigations in marine environments.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 2**

Describe physical characteristics of oceans, including wave motion, and depth.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 3**

Recognize interactions between the atmosphere and the ocean.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 4**

Recognize interactions between the atmosphere and the ocean.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 5**

Discuss physical and chemical properties of saltwater.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 6**

Describe components of major marine ecosystems, including estuaries and benthic communities.

**9<sup>th</sup> – 12<sup>th</sup>, Marine Biology Elective Core, Content Standard 9**

Arrange various forms of marine life from most simple to most complex.

1. The Earth has one big ocean with many features.
  - a. The ocean is the dominant physical feature on our planet Earth – covering approximately 70% of the planet's surface. There is one ocean with many ocean basins, such as the North Pacific, South Pacific, North Atlantic, South Atlantic, Indian and Arctic.
  - b. An ocean basin's size, shape and features (islands, trenches, mid-ocean ridges, rift valleys) vary due to the movement of Earth's lithospheric plates. Earth's highest peaks, deepest valleys and flattest vast plains are all in the ocean.
  - c. Throughout the ocean there is one interconnected circulation system powered by wind, tides, the force of the Earth's rotation (Coriolis Effect), the Sun, and water density differences. The shape of the ocean basins and adjacent land masses influence the path of circulation.
  - d. Sea level is the average height of the ocean relative to the land, taking into account the differences caused by tides. Sea level changes as plate tectonics cause the volume of ocean basins and the height of the land to change. It changes as ice caps on land melt or grow. It also changes as sea water expands and contracts when ocean water warms and cools.
  - e. Most of Earth's water (97%) is in the ocean. Seawater has unique properties: it is saline, its freezing point is slightly lower than fresh water, its density is slightly higher, its electrical conductivity is much higher, and it is slightly basic. The salt in seawater comes from eroding land, volcanic emissions, reactions at the seafloor, and atmospheric deposition.
  - f. the ocean is an integral part of the water cycle and is connected to all of the earth's water reservoirs via evaporation and precipitation processes.
  - g. The ocean is connected to major lakes, watersheds, and waterways because all major watersheds on Earth drain to the ocean. Rivers and streams transport nutrients, salts, sediments and pollutants from watersheds to estuaries and to the ocean.
  - h. Although the ocean is large, it is finite and resources are limited.
2. The ocean and life in the ocean shape the features of the Earth.
  - c. Erosion – the wearing away of rock, soil and other biotic and abiotic earth materials – occurs in coastal areas as wind, waves, and currents in rivers and the ocean move sediments.
  - d. Sand consists of tiny bits of animals, plants, rocks and minerals. Most beach sand is eroded from land sources and carried to the coast by rivers, but sand is also eroded from coastal sources by surf. Sand is redistributed by waves and coastal currents seasonally.

- e. Tectonic activity, sea level changes, and force of waves influence the physical structure and landforms of the coast.
3. The ocean is a major influence on weather and climate.
- a. The ocean controls weather and climate by dominating the Earth's energy, water and carbon systems.
  - b. The ocean absorbs much of the solar radiation reaching Earth. The ocean loses heat by evaporation. This heat loss drives atmospheric circulation when, after it is released into the atmosphere as water vapor, it condenses and forms rain. Condensation of water evaporated from warm seas provides the energy for hurricanes and cyclones.
  - c. The El Nino Southern Oscillation causes important changes in global weather patterns because it changes the way heat is released to the atmosphere in the Pacific.
  - d. Most rain that falls on land originally evaporated from the tropical ocean.
  - e. The ocean dominates the Earth's carbon cycle. Half the primary productivity on Earth takes place in the sunlit layers of the ocean and the ocean absorbs roughly half of all carbon dioxide added to the atmosphere.
  - f. The ocean has had, and will continue to have, a significant influence on climate change by absorbing, storing, and moving heat, carbon, and water.
5. The ocean supports a great diversity of life and ecosystems.
- f. Ocean habitats are defined by environmental factors. Due to interactions of abiotic factors such as salinity, temperature, oxygen, pH, light, nutrients, pressure, substrate and circulation, ocean life is not evenly distributed temporally or spatially, i.e., it is "patchy". Some regions of the ocean support more diverse and abundant life than anywhere on Earth, while much of the ocean is considered a desert.
  - g. There are deep ocean ecosystems that are independent of energy from sunlight and photosynthetic organisms. Hydrothermal vents, submarine hot springs, methane cold seeps, and whale falls rely only on chemical energy and chemosynthetic organisms to support life.
  - i. Estuaries provide important and productive nursery areas for many marine and aquatic species.
6. The ocean and humans are inextricably interconnected.
- f. Coastal regions are susceptible to natural hazards (tsunamis, hurricanes, cyclones, sea level change, and storm surges).