

<i>National Science Education Standards (9-12)</i>	<i>Florida Sunshine State Standards</i>	<i>Sunshine State Standard Benchmarks</i>	<i>Marine Science Topics</i>
<p>Physical Science</p> <ul style="list-style-type: none"> - Structure of atoms - Structure and properties of matter - Chemical reactions - Motions and forces - Conservation of energy and increase in disorder - Interactions of energy and matter 	<p><i>The Nature of Matter</i></p> <p>The student understands that all matter has observable, measurable properties. (SC.A.1.4)</p> <p>The student understands the basic principles of atomic theory. (SC.A.2.4)</p>	<ul style="list-style-type: none"> • Knows the number and configuration of electrons will equal the number of protons in an electrically neutral atom and when and atom gains or loses electrons, the charge in unbalanced. • Knows the difference between an element, a molecule, and a compound. • Knows that elements are arranged into groups and families based on similarities in electron structure and that their physical and chemical properties can be predicted. 	<p>Properties of water</p> <p>Periodic table</p> <p>Water molecule</p> <p>Polar nature of water</p> <p>Dissolving ability of water</p> <p>Dissolved solids and gases</p> <p>Alkalinity and pH</p> <p>Biogeochemical cycles</p> <p>Chemical factors affecting marine life (biochemistry) – osmosis, diffusion, salinity, acids/bases, dissolved nutrients, and dissolved gases</p>
	<p><i>Energy</i></p> <p>The student understands that energy may be changed in form with varying efficiency. (SC.B.1.4)</p> <p>The student understands the interaction of matter and energy. (SC.B.2.4)</p>	<ul style="list-style-type: none"> • Understands how knowledge of energy is fundamental to all the scientific disciplines (e.g., the energy required for biological processes in living organisms and the energy required for the building, erosion, and rebuilding of the Earth. 	<p>Heat properties of water</p> <p>Phases of water and energy</p> <p>Cohesion, surface tension, viscosity</p> <p>Density</p> <p>Hydrostatic pressure</p> <p>Transmission of heat, light, and sound</p> <p>Physical factors affecting marine life (biophysics) – light, sound, pressure, temperature, buoyancy, and viscosity</p>

	<p><i>Force and Motion</i> The student understands that types of motion may be described, measured, and predicted. (SC.C.1.4)</p> <p>The student understands that the types of force can be described, measured and predicted. (SC.C.2.4)</p>	<ul style="list-style-type: none"> • Knows that acceleration due to gravitation force is proportional to mass and inversely proportional to the square of the distance between the objects. 	Waves Wave phenomena Tides Moon and gravitational effect on oceans Ocean circulation – surface and deep currents Coriolis Effect
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<p>Life Science</p> <ul style="list-style-type: none"> -The cell -Molecular basic of heredity -Biological evolution -Interdependence of organisms -Matter, energy, and organization in living systems -Behavior of organisms 	<p><i>Processes of Life</i></p> <p>The student describes patterns of structure and function in living things. (SC.F.1.4)</p> <p>The student understands the process and importance of genetic diversity. (SC.F.2.4)</p>	<ul style="list-style-type: none"> • Knows that body structures are uniquely designed and adapted for their function. • Knows that membranes are sites for chemical synthesis and essential energy conversions. • Understands that biological systems obey the same laws of conservation as physical systems. • Knows that organisms respond to internal and external stimuli. • Knows that cell behavior can be affected by molecules from other parts of the organism or even other organisms. • Understands that mechanisms of asexual and sexual reproduction and knows the different genetic advantages and disadvantages of asexual and sexual reproduction. • Understands the mechanisms of change (e.g., mutation and natural selection) that lead to adaptations in a species and their ability to survive naturally in changing conditions and to increase species diversity. 	<p>Origins of life in oceans</p> <p>Life zones in the ocean</p> <p>Classification of marine organisms</p> <p>Biodiversity of marine organisms</p> <p>Evolution of marine organisms</p>
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	<p><i>How Living Things Interact with Their Environment</i> The student understands the competitive, interdependent, cyclic nature of living things in the environment. (SC.G.1.4)</p>	<ul style="list-style-type: none"> • Knows of the great diversity and interdependence of living things. • Understands how the flow of energy through an ecosystem made up of producers, consumers, and decomposers • Carries out the processes of life and that some energy dissipates as heat and is not recycled. • Knows that the chemical elements that make up the molecules of living things are combined and recombined in different ways. 	Primary production Nutrient availability Variation in productivity Photosynthesis Respiration Chemosynthesis Decomposition Nutrient cycling Energy flow – food chains, webs, and pyramids Marine ecosystems Marine ecology Microbial Loop
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<p>Earth and Space Science -Energy in the earth system -Geochemical cycles -Origin and evolution of the earth system -Origin and evolution of the universe</p>	<p><i>Processes that Shape the Earth</i> The student recognizes the processes in the lithosphere, atmosphere, hydrosphere, and biosphere interact to shape the earth. (S.C.D.1.4)</p> <p>The student understands the need for protection of the natural systems on Earth. (S.C.D.2.4)</p>	<ul style="list-style-type: none"> • Knows how climatic patterns on Earth result from an interplay of many factors (Earth's topography, its rotation on its axis, solar radiation, the transfer of heat energy where the atmosphere interfaces with lands and oceans, and wind and ocean currents). • Knows that the solid crust of Earth consists of slow moving, separate plates that float on a denser, molten layer of Earth and that these plates interact with each other, changing the Earth's surface in many ways (e.g., forming mountain ranges and rift valleys, causing earthquake and volcanic activity, and forming undersea mountains that can become ocean islands). • Knows that changes in Earth's climate, geological activity, and life forms may be traced and compared. • Knows that Earth's systems and organisms are the result of a long, continuous change over time. 	<p>Origins of the solar system and Earth</p> <p>Origin of atmosphere and ocean</p> <p>Solar energy and heat budget Earth's seasons</p> <p>Hydrologic cycle Winds- local - land and sea breezes and global wind patterns Surface currents Density Thermohaline circulation Hurricanes El Niño Climate – Currents and coastal climate Global Warming</p> <p>Composition of Earth Rock cycle Geological history Theory of continental drift Theory of seafloor spreading Seafloor topography Theory of plate tectonics Location of earthquakes and volcanoes Sediments</p> <p>Coastal processes</p>
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	<p><i>Earth and Space</i></p> <p>1. The student understands the interaction and organization of the Solar System and the universe and how this affects life on Earth. (SC.E.1.4)</p> <p>2. The student recognizes the vastness of the universe and Earth's place in it. (SC.E.2.4)</p>	<ul style="list-style-type: none"> • Understands the relationships between events on Earth and the movements of the Earth, its moon, the other planets, and the sun. • Knows how the characteristics of other planets and satellites are similar to and different from those of Earth. • Knows the various reasons that Earth is the only planet in our Solar System that appears to be capable of supporting life as we know it. • Knows various scientific theories on how the universe was formed. 	<p>Seasons</p> <p>Tides and the phases of the moon</p> <p>Exo-oceanography - Europa</p> <p>Unique properties of water and life on Earth</p> <p>Origin of life on Earth</p>
<p>Science and Technology</p> <p>-Abilities of technological design</p> <p>-Understandings about science and technology</p>	<p><i>The Nature of Science</i></p> <p>The student understands that science, technology, and society of interwoven and interdependent. (SC.H.3.4)</p>	<ul style="list-style-type: none"> • Knows that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science. 	<p>Diving and exploration technologies</p> <p>Fishing technologies/aquaculture</p> <p>Marine biomedical technology</p> <p>Extraction of seafloor and chemical resources</p> <p>Satellite oceanography</p> <p>Energy sources</p> <p>Transportation and recreation</p>
<p>Science in Personal and Social Perspectives</p> <p>-Personal and community health</p> <p>-Population growth</p> <p>-Natural resources</p> <p>-Environmental quality</p> <p>-Natural and human-induced hazards</p> <p>-Science and technology in local, national, and global challenges</p>	<p><i>Processes that Shape the Earth</i></p> <p>The student understands the need for protection of the natural systems on Earth. (SC.D.2.4)</p> <p><i>How Living Things Interact with Their Environment</i></p> <p>The student understands the competitive, interdependent, cyclic nature of living things in the environment.</p>	<ul style="list-style-type: none"> • Understands the interconnectedness of the systems on Earth and the quality of life. • Knows of the great diversity and interdependence of living thing. • Knows that layers of energy-rich organic materials have been gradually turned into great coal beds and oil pools (fossil fuels) to release the stored energy as heat and carbon dioxide. 	<p>History and culture</p> <p>Marine resources</p> <p>Living</p> <p>Nonliving</p> <p>Habitat destruction</p> <p>Coastal development</p> <p>Biological invaders</p> <p>Overfishing</p> <p>Water and sediment quality</p> <p>Management of the coast and oceans</p> <p>Biodiversity</p> <p>Oceans and climate change</p> <p>Natural disasters – hurricanes, tsunamis, El Niño</p>

	<p>(SC.G.1.4)</p> <p>The student understands the consequences of using limited natural resources. (SC.G.2.4)</p>	<ul style="list-style-type: none"> • Knows that the amount of life any environment can support is limited and that human activities can change the flow of energy and reduce the fertility of the Earth. • Knows the ways in which humans today are placing their environment support systems at risk (e.g., rapid human population growth, environmental degradation, and resource depletion). 	
<p>Science as Inquiry -Abilities necessary to do scientific inquiry -Understandings about scientific inquiry</p> <p>History and Nature of Science -Science as a human endeavor -Nature of scientific knowledge -Historical perspectives</p>	<p><i>The Nature of Science</i></p> <p>1. The student uses the scientific processes and habits of mind. (SC.H.1.4)</p> <p>2. The student understands that most natural events occur in comprehensible, consistent patterns. (SC. H.2.4)</p> <p>3. The student understands that science, technology, and society of interwoven and interdependent. (SC.H.3.4)</p>	<ul style="list-style-type: none"> • Knows that from time to time, major shifts occur in the scientific view of how the world works, but that more often the changes that take place in the body of scientific knowledge are small modifications of prior knowledge. • Knows that performance testing is often conducted using small-scale models, computer simulations, or analogous systems to reduce the chance of system failure. • Knows that technological problems often create a demand for new scientific knowledge and that new technologies make it possible for scientists to extend their research in a way that advances science. • Knows that scientists can bring information, insights, and analytical skills to matters of public concern and help people understand 	<p>Development of the theory of plate tectonics Discovery of hydrothermal vents</p> <p>Exploration of ocean Availability of new technologies to study the ocean – ocean observing systems, ocean drilling project, computer modeling, AUV’s and ROV’s</p> <p>Modeling</p> <p>Climate Change and the Oceans U.S. Commission on Ocean Policy Report</p>

		<p>the possible causes and effects of events.</p> <ul style="list-style-type: none">• Knows that funds for science research come from federal government agencies, industry, and private foundations and that this funding often influences the areas of discovery.	
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