



Science

High School Earth Science

	What students will know and be able to do:	Standard
Matter and Energy in the Earth System	<ul style="list-style-type: none"> Identify Earth's principal sources of internal and external energy, such as radioactive decay, gravity, and solar energy. Describe the characteristics of electromagnetic radiation and give examples of its impact on life and Earth's systems. Explain how the transfer of energy through radiation, conduction, and convection contributes to global atmospheric processes, such as storms, winds, and currents. Provide examples of how the unequal heating of Earth and the Coriolis effect influence global circulation patterns, and show how they impact Massachusetts weather and climate (e.g., global winds, convection cells, land/sea breezes, mountain/valley breezes). Explain how the revolution of Earth around the Sun and the inclination of Earth on its axis cause Earth's seasonal variations (equinoxes and solstices). Describe the various conditions associated with frontal boundaries and cyclonic storms (e.g., thunderstorms, winter storms [nor'easters], hurricanes, tornadoes) and their impact on human affairs, including storm preparations. Explain the dynamics of oceanic currents, including upwelling, deep-water currents, the Labrador Current and the Gulf Stream, and their relationship to global circulation within the marine environment and climate. Read, interpret, and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections. 	1.1-1.8
Energy Resources in the Earth System	<ul style="list-style-type: none"> Recognize, describe, and compare renewable energy resources (e.g., solar, wind, water, biomass) and nonrenewable energy resources (e.g., fossil fuels, nuclear energy). Describe the effects on the environment and on the carbon cycle of using both renewable and nonrenewable sources of energy. 	2.1-2.2
Earth Processes	<ul style="list-style-type: none"> Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments, and creates various types of 	3.1-3.12

<p>and Cycles</p>	<p>landscapes. Give examples that show the effects of physical and chemical weathering on the environment.</p> <ul style="list-style-type: none"> • Describe the carbon cycle. • Describe the nitrogen cycle. • Explain how water flows into and through a watershed. Explain the roles of aquifers, wells, porosity, permeability, water table, and runoff. • Describe the processes of the hydrologic cycle, including evaporation, condensation, precipitation, surface runoff and groundwater percolation, infiltration, and transpiration. • Describe the rock cycle, and the processes that are responsible for the formation of igneous, sedimentary, and metamorphic rocks. Compare the physical properties of these rock types and the physical properties of common rock-forming minerals. • Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships. • Trace the development of a lithospheric plate from its growth at a divergent boundary (mid-ocean ridge) to its destruction at a convergent boundary (subduction zone). Recognize that alternating magnetic polarity is recorded in rock at mid-ocean ridges. • Explain the relationship between convection currents in Earth's mantle and the motion of the lithospheric plates. • Relate earthquakes, volcanic activity, tsunamis, mountain building, and tectonic uplift to plate movements. • Explain how seismic data are used to reveal Earth's interior structure and to locate earthquake epicenters. • Describe the Richter scale of earthquake magnitude and the relative damage that is incurred by earthquakes of a given magnitude. 	
<p>The Origin and Evolution of the Universe</p>	<ul style="list-style-type: none"> • Explain the Big Bang Theory and discuss the evidence that supports it, such as background radiation and relativistic Doppler effect (i.e., "red shift"). • Describe the influence of gravity and inertia on the rotation and revolution of orbiting bodies. Explain the Sun-Earth-moon relationships (e.g., day, year, solar/lunar eclipses, tides). • Explain how the Sun, Earth, and solar system formed from a nebula of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 billion years ago. 	<p>4.1-4.3</p>