Earth Science CR

State Standard Number	State Standard Area / Description	Unit Name	Course Topic Description
E	Earth and Space Science		
E.I	Content Standards		
E.I.1.1.A	The entire Earth system and its various cycles are driven by energy. Earth has both internal and external sources of energy. Two fundamental energy concepts included in the Earth system are gravity and electromagnetism.		
E.I.1.A.1.1	Identify Earth's principal sources of internal and external energy, such as radioactive decay, gravity, and solar energy.		
E.I.1.A.1.2	Describe the characteristics of electromagnetic radiation and give examples of its impact on life and Earth's systems.	Astronomy	Section 1, Part J
E.I.1.A.1.3	Explain how the transfer of energy through radiation, conduction, and convection contributes to global atmospheric processes, such as storms, winds, and currents.	World of Weather	Section 1, Part G
E.I.1.A.1.4	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).		
E.I.1.A.1.5	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).	Astronomy	Section 1, Parts B-C
E.I.1.A.1.6	Describe the various conditions associated with frontal boundaries and cyclonic storms (e.g., thunderstorms, winter storms [nor'easters], hurricanes, tornadoes) and their impact on		

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	human affairs, including storm preparations.		
E.I.1.A.1.7	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.		
E.I.1.A.1.8	Read, interpret, and analyze a combination of ground-based observations, satellite data, and computer models to demonstrate Earth systems and their interconnections.		
E.I.2.2.A	Energy resources are used to sustain human civilization. The amount and accessibility of these resources influences their use and their impact on the environment.	Earth's Environment	Section 2, Parts E-G
E.I.2.A.2.1	Recognize, describe, and compare renewable energy resources (e.g., solar, wind, water, biomass) and nonrenewable energy resources (e.g., fossil fuels, nuclear energy).	Earth's Environment	Section 2, Parts E-G
E.I.2.A.2.2	Describe the effects on the environment and on the carbon cycle of using both renewable and nonrenewable sources of energy.		
E.I.3.3.A	Earth is a dynamic interconnected system. The evolution of Earth has been driven by interactions between the lithosphere, hydrosphere, atmosphere, and biosphere. Over geologic time, the internal motions of Earth have continuously altered the topography and geography of the continents and ocean basins by both constructive and destructive processes.		

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E.I.3.A.3.1	Explain how physical and chemical weathering leads to erosion and the formation of soils and sediments, and creates various types of landscapes. Give examples that show the effects of physical and chemical weathering on the environment.	Surface of the Earth	All of section 2 covers this standard
E.I.3.A.3.2	Describe the carbon cycle.		
E.I.3.A.3.3	Describe the nitrogen cycle.		
E.I.3.A.3.4	Explain how water flows into and through a watershed. Explain the role of aquifers, wells, porosity, permeability, water table, and runoff.		
E.I.3.A.3.5	Describe the processes of the hydrologic cycle, including evaporation, condensation, precipitation, surface runoff and groundwater percolation, infiltration, and transpiration.		
E.I.3.A.3.6	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.	Earth's Materials	All of Section 3 covers this standard.

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E.I.3.A.3.7	Describe the absolute and relative dating methods used to measure geologic time, such as index fossils, radioactive dating, law of superposition, and crosscutting relationships.	Geologic Time	Section 3, Part B
E.I.3.A.3.8	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.		
E.I.3.A.3.9	Explain the relationship between convection currents in Earth's mantle and the motion of the lithospheric plates.	Interior of the Earth	Section 1, Part Q
E.I.3.A.3.10	Relate earthquakes, volcanic activity, tsunamis, mountain building, and tectonic uplift to plate movements.	Interior of the Earth	All of Section 1 covers this standard.
E.I.3.A.3.11	Explain how seismic data are used to reveal Earth's interior structure and to locate earthquake epicenters.	Interior of the Earth	Section 2, Parts G-I
E.I.3.A.3.12	Describe the Richter scale of earthquake magnitude and the relative damage that is incurred by earthquakes of a given magnitude.	Interior of the Earth	Section 2, Part K
E.I.4.4.A	The origin of the universe, between 14 and 15 billion years ago, still remains one of the greatest questions in science. Gravity influences the formation and life cycles of galaxies, including our own Milky Way Galaxy; stars;		

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	planetary systems; and residual material left from the creation of the solar system.		
E.I.4.A.4.1	Explain the Big Bang Theory and discuss the evidence that supports it, such as background radiation, and relativistic Doppler effect (i.e., "red shift").		
E.I.4.A.4.2	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).	Astronomy	Section 1, Parts D-F
E.I.4.A.4.3	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.		
E.II	Scientific Inquiry Skills Standards		
E.II.SIS1	Make observations, raise questions, and formulate hypotheses.	Atmosphere and Climate	Lab
E.II.SIS1.1	Observe the world from a scientific perspective.	Atmosphere and Climate	Lab

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E.II.SIS1.2	Pose questions and form hypotheses based on personal observations, scientific articles, experiments, and knowledge.		
E.II.SIS1.3	Read, interpret, and examine the credibility and validity of scientific claims in different sources of information, such as scientific articles, advertisements, or media stories.		
E.II.SIS2	Design and conduct scientific investigations.		
E.II.SIS2.1	Articulate and explain the major concepts being investigated and the purpose of an investigation.	Atmosphere and Climate	Lab
E.II.SIS2.2	Select required materials, equipment, and conditions for conducting an experiment.		
E.II.SIS2.3	Identify independent and dependent variables.	Atmosphere and Climate	Lab
E.II.SIS2.4	Write procedures that are clear and replicable.		

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E.II.SIS2.5	Employ appropriate methods for accurately and consistently	Atmosphere and Climate	Lab
E.II.SIS2.5.	making observations	Atmosphere and Climate	Lab
E.II.SIS2.5.	making and recording measurements at appropriate levels of precision		
E.II.SIS2.5.	collecting data or evidence in an organized way	Atmosphere and Climate	Lab
E.II.SIS2.6	Properly use instruments, equipment, and materials (e.g., scales, probeware, meter sticks, microscopes, computers) including set-up, calibration (if required), technique, maintenance, and storage.		
E.II.SIS2.7	Follow safety guidelines.	Atmosphere and Climate	Lab
E.II.SIS3	Analyze and interpret results of scientific investigations.	Atmosphere and Climate	Lab

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E.II.SIS3.5	Present relationships between and among variables in appropriate forms.		
E.II.SIS3.5.	Represent data and relationships between variables in charts and graphs.		
E.II.SIS3.5.	Use appropriate technology (such as graphing software, etc.) and other tools.		
E.II.SIS3.1	Use mathematical operations to analyze and interpret data results.		
E.II.SIS3.2	Identify reasons for inconsistent results, such as sources of error or uncontrolled conditions, and assess the reliability of data.	Atmosphere and Climate	Lab
E.II.SIS3.3	Use results of an experiment to develop a conclusion to an investigation that addresses the initial questions and supports or refutes the stated hypothesis.	Atmosphere and Climate	Lab
E.II.SIS3.4	State questions raised by an experiment that may require further investigation.		

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E.II.SIS4	Communicate and apply the results of scientific investigations.	Atmosphere and Climate	Lab
E.II.SIS4.1	Develop descriptions and explanations of scientific concepts that an investigation focused on.	Atmosphere and Climate	Lab
E.II.SIS4.2	Review information, explain statistical analysis, and summarize data collected and analyzed as the result of an investigation.		
E.II.SIS4.3	Explain diagrams and charts that represent relationships of variables.		
E.II.SIS4.4	Construct a reasoned argument and respond appropriately to critical comments and questions.		
E.II.SIS4.5	Use language and vocabulary appropriately, speak clearly and logically, and use appropriate technology (e.g., presentation software) and other tools to present findings.		
E.II.SIS4.6	Use and refine scientific models that simulate physical processes or phenomena.		

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E.III	Mathematical Skills		
0	Students are expected to know the content of the Massachusetts Mathematics Curriculum Framework, through grade 8. Below are some specific skills from the Mathematics Framework that students in this course should have the opportunity to apply:		
E.III.1	Construct and use tables and graphs to interpret data sets.		
E.III.2	Solve simple algebraic expressions.		
E.III.3	Perform basic statistical procedures to analyze the center and spread of data.		
E.III.4	Measure with accuracy and precision (e.g., length, volume, mass, temperature, time)		
E.III.5	Convert within a unit (e.g., centimeters to meters).		

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E.III.6	Use common prefixes such as milli- , centi-, and kilo-.		
E.III.7	Use scientific notation, where appropriate.		
E.III.8	Use ratio and proportion to solve problems.		
E.III.9	The following skills are not detailed in the Mathematics Framework, but are necessary for a solid understanding in this course:		
E.III.9.1	Determine percent error from experimental and accepted values.		
E.III.9.2	Use appropriate metric/standard international (SI) units of measurement for mass (kg); length (m); time (s); force (N); speed (m/s); acceleration (m*s-2); and frequency (Hz).		
E.III.9.3	Use the Celsius and Kelvin scales.		