The Nature of Science

- E1.1A
  - Generate new questions that can be investigated in the laboratory or field.
- E1.1B
  - Evaluate the uncertainties or validity of scientific conclusions using an understanding of sources of measurement error, the challenges of controlling variables, accuracy of data analysis, logic of argument, logic of experimental design, and/or the dependence on underlying assumptions.
- E1.1C
  - Conduct scientific investigations using appropriate tools and techniques (e.g., selecting an instrument that measures the desired quantity—length, volume, weight, time interval, temperature—with the appropriate level of precision).
- E1.1D
  - Identify patterns in data and relate them to theoretical models.
- E1.1E
  - Describe a reason for a given conclusion using evidence from an investigation.
- E1.2A
  - Critique whether or not specific questions can be answered through scientific investigations.
- E1.2B
  - Identify and critique arguments about personal or societal issues based on scientific evidence.
- E1.2C
  - Develop an understanding of a scientific concept by accessing information from multiple sources. Evaluate the scientific accuracy and significance of the information.
- E1.2D
  - Evaluate scientific explanations in a peer review process or discussion format.
- E1.2E
  - Evaluate the future career and occupational prospects of science fields.

Resources: ck12.org, Earth Science (red book), Earth Science-Geology the Environment and the Universe (green book), Dr. Arts Guide to Science, Sciencesaurus, Internet Resources, and Schoology

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Atmosphere and Water Cycle

- E.FE.07.11**
  - Describe the atmosphere as a mixture of gases.
- E.FE.07.12**
  - Compare and contrast the composition of the atmosphere at different elevations.
- E.ES.07.81
  - Explain the water cycle and describe how evaporation, transpiration, condensation, cloud formation, precipitation, infiltration, surface runoff, ground water, and absorption occur within the cycle.
- E4.1A
  - Compare and contrast surface water systems (lakes, rivers, streams, wetlands) and groundwater in regard to their relative sizes as Earth's freshwater reservoirs and the dynamics of water movement (inputs and outputs, residence times, sustainability).
- E4.1B
  - Explain the features and processes of groundwater systems and how the sustainability of North American aquifers has changed in recent history (e.g., the past 100 years) qualitatively using the concepts of recharge, residence time, inputs, and outputs.
- E4.1C
  - Explain how water quality in both groundwater and surface systems is impacted by land use decisions

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Weather, Severe Weather

- E.ES.07.71
  - Compare and contrast the difference and relationship between climate and weather.
- E.ES.07.72
  - Describe how different weather occurs due to the constant motion of the atmosphere from the energy of the sun reaching the surface of the Earth.
- E.ES.07.74
  - Describe weather conditions associated with frontal boundaries (cold, warm, stationary, and occluded) and the movement of major air masses and the jet stream across North America using a weather map.
- E4.3A
  - Describe the various conditions of formation associated with severe weather (thunderstorms, tornadoes, hurricanes)
- E4.3B
  - Describe the damage resulting from, and the social impact of thunderstorms, tornadoes, hurricanes, and floods.
- E4.3D
  - Describe the seasonal variations in severe weather.
- E4.3E
  - Describe conditions associated with frontal boundaries that result in severe weather.
- E4.3F
  - Describe how mountains, convection, and convergence form clouds and precipitation.

****Remediate from heat transfer unit.**

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Climate

- E.ES.07.73
  - Explain how the temperature of the oceans affects the different climates on Earth because water in the oceans holds a large amount of heat.
- E4.2B
  - Explain how interactions between the oceans and the atmosphere influence global and regional climate. Include the major concepts of heat transfer by ocean currents, evaporation, precipitation, climatic zones, and the ocean as a major CO2 reservoir.
- E5.4B
  - Describe natural mechanisms that could result in significant changes in climate (e.g., major volcanic eruptions, changes in sunlight received by the earth, greenhouse effect and meteorite impacts).
- E5.4C
  - Analyze the relationship between the emissions of carbon dioxide, atmospheric carbon dioxide levels, and the average global temperature over the past 150 years.
- E5.4D
  - Based on evidence of observable changes in recent history and climate change models, explain the consequences of warmer oceans (including the results of increased evaporation, shoreline and estuarine impacts, oceanic algae growth, and coral bleaching) and changing climatic zones.

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Geologic Time and History of the Earth

- E5.3A
  - Explain how the solar system formed from a nebula of dust and gas in a spiral arm of the Milky Way Galaxy about 4.6 Ga (billion years ago).
- E5.3B
  - Describe the process of radioactive decay and explain how radioactive elements are used to date the rocks that contain them.
- E5.3C
  - Relate major events in the history of the Earth to the geologic time scale, including formation of the Earth, formation of an oxygen atmosphere, rise of life, Cretaceous-Tertiary (K-T) and Permian extinctions, and Pleistocene ice age.
- E5.3D
  - Describe how index fossils can be used to determine time sequence.

Solid Earth

- E3.1A
  - Discriminate between igneous, metamorphic, and sedimentary rocks and describe the processes that change one kind of rock into another.
- E3.2C
  - Describe the difference between oceanic and continental crust. (including density, age and composition)
- E3.3A
  - Explain how plate tectonics account for the features and processes (sea floor spreading, mid-ocean ridges, subduction zones, earthquakes and volcanoes, mountain ranges) that occur on or near the Earth's surface.
- E3.3B
  - Explain why tectonic plates move using the concept of heat flowing through mantle convection, coupled with the cooling and sinking of aging ocean plates that result from their increased density.
- E3.4A
  - Use the distribution of earthquakes and volcanoes to locate and determine the types of plate boundaries.

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Energy Transfer on Earth

- MS-ESS2-1.
  - Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process.
- MS-ESS2-4.
  - Develop a model to describe the cycling of water through Earth's systems driven by energy from the sun.
- MS-ESS2-6
  - Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.
- MS-ESS3-1
  - Construct a scientific explanation based on evidence for how the uneven distributions of Earth's energy resources are the result of past and current geoscience processes.
- MS-PS1-4
  - Develop a model that predicts and describes changes in particle motion, temperature, and state of a pure substance when thermal energy is added or removed.
- MS-PS3-4.
  - Plan an investigation to determine the relationships among the energy transferred, the type of matter, the mass, and the change in the average kinetic energy of the particles as measured by the temperature of the sample.
- E.ES.07.11*
  - Demonstrate, using a model or drawing, the relationship between the warming by the sun of the Earth and the water cycle as it applies to the atmosphere (evaporation, water vapor, warm air rising, cooling, condensation, clouds).
- E.ES.07.12*
  - Describe the relationship between the warming of the atmosphere of the Earth by the sun and convection within the atmosphere and oceans.
- E.ES.07.13
  - Describe how the warming of the Earth by the sun produces winds and ocean currents
- E2.2A
  - Describe the Earth’s principal sources of internal and external energy (e.g., radioactive decay, gravity, solar energy).
- E2.2C
  - Describe natural processes in which heat transfer in the Earth occurs by conduction, convection, and radiation.

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- E3.3B*
    - Explain why tectonic plates move using the concept of heat flowing through mantle convection, coupled with the cooling and sinking of aging ocean plates that result from their increased density.

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