

Connecticut State Department of Education
Science – Earth Science Enrichment Standards
High School Grades 9-12

Essential Questions

Earth's Place in the Universe

What is the role of energy in our world?

Dynamic Earth Processes

Biogeochemical Cycles

How do materials cycle through the Earth's systems?

Energy in the Earth System

What is the role of energy in our world?

Structure and Composition of the Atmosphere

What processes are responsible for life's unity and diversity?

Earth Science Enrichment Standards

Earth's Place in the Universe

Earth-based and space-based astronomy reveal the structure, scale, and changes in stars, galaxies, and the universe over time

The differences and similarities among the sun, the terrestrial planets, and the gas planets may have been established during the formation of the solar system.

Evidence from Earth and moon rocks indicates that the solar system was formed from a nebular cloud of dust and gas approximately 4.6 billion years ago.

Evidence from geological studies of Earth and other planets suggest that the early Earth was very different from Earth today.

The Sun is a typical star and is powered by nuclear reactions, primarily the fusion of hydrogen to form helium.

Asteroids and meteorites had a significant role in shaping the surface of planets and their moons and in mass extinctions of life on Earth.

The solar system is located in an outer edge of the disc-shaped Milky Way galaxy, which spans 100,000 light years.

Galaxies are made of billions of stars and comprise most of the visible mass of the universe.

Evidence indicating that all elements with an atomic number greater than that of lithium have been formed by nuclear fusion in stars.

Visual, radio, and X-ray telescopes may be used to collect data that reveal those differences in stars' life cycles.

The "big bang" model suggests that the universe has been expanding for 10 to 20 billion years.

Dynamic Earth Processes

Plate tectonics operating over geologic time has changed the patterns of land, sea, and mountains on Earth's surface

Features of the ocean floor, as well as the shape and rock composition of the major plates provide evidence of plate tectonics.

Volcanic eruptions and earthquakes are the result of movement of matter and energy within the Earth.

The properties of rocks and minerals can be explained based on the physical and chemical conditions in which they were formed, including plate tectonic processes.

Energy in the Earth System

Energy enters the Earth system primarily as solar radiation and eventually escapes as heat.

The sun is a major source of energy for Earth and other planets.

Some of the solar radiation is reflected back into the atmosphere, some is absorbed by matter and photosynthetic processes.

The different atmospheric gases absorb the Earth's thermal radiation.

The greenhouse effect may cause climatic changes.

Heating of Earth's surface and atmosphere by the sun drives convection within the atmosphere and oceans, producing winds and ocean currents.

Differential heating of Earth results in circulation patterns in the atmosphere and oceans that globally distribute the heat.

The rotation of Earth influences the circular motions of ocean currents and air.

Properties of ocean water, such as temperature and salinity, can be used to explain the layered structure of the oceans, the generation of horizontal and vertical ocean currents, and the geographic distribution of marine organisms.

The interaction of wind patterns, ocean currents, and the distribution of land masses result in a global pattern of latitudinal bands of rain forests and deserts.

Climate is the long-term average of a region's weather and depends on many factors.

Weather and climate involve the transfer of energy into and out of the atmosphere.

Latitude, elevation, topography, and proximity to large bodies of water and cold or warm ocean currents affect the climate.

Earth's climate has changed over time, corresponding to changes in Earth's geography, atmospheric composition, and other factors, such as solar radiation and plate movement.

Biogeochemical Cycles

Each element on Earth moves among reservoirs, which exist in the solid earth, in oceans, in the atmosphere, and within and among organisms as part of biogeochemical cycles.

The movement of matter among reservoirs is driven by Earth's internal and external sources of energy.

Carbon cycles through the reservoirs of the atmosphere, lithosphere, hydrosphere and biosphere.

Structure and Composition of the Atmosphere

Life has changed Earth's atmosphere, and changes in the atmosphere affect conditions for life.

The atmosphere has specific thermal structure and chemical composition.

The composition of Earth's atmosphere has evolved over geologic time.

The origin of atmospheric oxygen is photosynthetic processes.

The ozone layer in the upper atmosphere absorbs ultraviolet radiation. This layer varies both naturally and in response to human activities.