Texas High School Science
Curriculum Standards

Earth and Space Science	Boardworks High School Earth Science Presentations
(4) Earth in space and time. The student knows how Earth-based and space-based astronomical observations reveal differing theories about the structure, scale, composition, origin, and history of the universe. The student is expected to:	
A) evaluate the evidence concerning the Big Bang model such as red shift and cosmic microwave background radiation and current theories of the evolution of the universe, including estimates for the age of	Doppler Effect Observing the Universe
(B) explain how the Sun and other stars transform matter into energy through nuclear fusion; and	Nuclear Fusion The Life Cycle of Stars Properties of Stars
(C) investigate the process by which a supernova can lead to the formation of successive generation stars and planets.	The Life Cycle of Stars Properties of Stars
(5) Earth in space and time. The student understands the solar nebular accretionary disk model. The student is expected to:	
(A) analyze how gravitational condensation of solar nebular gas and dust can lead to the accretion of planetesimals and protoplanets;	Planets of the Solar System
(B) investigate thermal energy sources, including kinetic heat of impact accretion, gravitational compression, and radioactive decay, which are thought to allow protoplanet differentiation into layers;	Planets of the Solar System
C) contrast the characteristics of comets, asteroids, and meteoroids and their positions in the solar system, including the orbital regions of the terrestrial planets, the asteroid belt, gas giants, Kuiper Belt, and Oort	–
(D) explore the historical and current hypotheses for the origin of the Moon, including the collision of Earth with a Mars-sized planetesimal;	–
(E) compare terrestrial planets to gas-giant planets in the solar system, including structure, composition, size, density, orbit, surface features, tectonic activity, temperature, and suitability for life; and	Gravity and Orbits Planets of the Solar System
F) compare extra-solar planets with planets in our solar system and describe how such planets are detected.	–
(6) Earth in space and time. The student knows the evidence for how Earth's atmospheres, hydrosphere, and geosphere formed and changed through time. The student is expected to:	
(A) analyze the changes of Earth's atmosphere that could have occurred through time from the original hydrogen-helium atmosphere, the carbon dioxide-water vapor-methane atmosphere, and the current nitrogen-	The Atmosphere
(B) evaluate the role of volcanic outgassing and impact of water-bearing comets in developing Earth's atmosphere and hydrosphere;	The Atmosphere Planets of the Solar System
(C) investigate how the formation of atmospheric oxygen and the ozone layer impacted the formation of the geosphere and biosphere; and	The Atmosphere
(D) evaluate the evidence that Earth's cooling led to tectonic activity, resulting in continents and ocean basins.	–

7) Earth in space and time. The student knows that scientific dating methods of fossils and rock sequences are used to construct a chronology of Earth's history expressed in the geologic time scale. The student is expected to:	
(A) evaluate relative dating methods using original horizontality, rock superposition, lateral continuity, cross-cutting relationships, unconformities, index fossils, and biozones based on fossil succession to determine	–
(B) calculate the ages of igneous rocks from Earth and the Moon and meteorites using radiometric dating methods; and	Planets of the Solar System Radioactive Dating
(C) understand how multiple dating methods are used to construct the geologic time scale, which represents Earth's approximate 4.6-billion-year history.	–
(8) Earth in space and time. The student knows that fossils provide evidence for geological and biological evolution. Students are expected to:	
(A) analyze and evaluate a variety of fossil types such as transitional fossils, proposed transitional fossils, fossil lineages, and significant fossil deposits with regard to their appearance, completeness, and alignment with scientific explanations in light of this fossil data;	Fossil Record
(B) explain how sedimentation, fossilization, and speciation affect the degree of completeness of the fossil	Fossil Record
(C) evaluate the significance of the terminal Permian and Cretaceous mass extinction events, including adaptive radiations of organisms after the events.	–
(9) Solid Earth. The student knows Earth's interior is differentiated chemically, physically, and thermally. The student is expected to:	
(A) evaluate heat transfer through Earth's subsystems by radiation, convection, and conduction and include its role in plate tectonics, volcanism, ocean circulation, weather, and climate;	Conduction and Convection Heat Transfer and Global Interactions Plate Tectonics The Rock Cycle
(B) examine the chemical, physical, and thermal structure of Earth's crust, mantle, and core, including the lithosphere and asthenosphere;	Earth's Structure
(C) explain how scientists use geophysical methods such as seismic wave analysis, gravity, and magnetism to interpret Earth's structure; and	–
(D) describe the formation and structure of Earth's magnetic field, including its interaction with charged solar particles to form the Van Allen belts and auroras.	–
(10) Solid Earth. The student knows that plate tectonics is the global mechanism for major geologic processes and that heat transfer, governed by the principles of thermodynamics, is the driving force. The student is expected to:	
(A) investigate how new conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics;	Plate Tectonics
(B) describe how heat and rock composition affect density within Earth's interior and how density influences the development and motion of Earth's tectonic plates	Plate Tectonics Earth's Structure

(C) explain how plate tectonics accounts for geologic processes and features, including sea floor spreading, ocean ridges and rift valleys, subduction zones, earthquakes, volcanoes, mountain ranges, hot spots, and hydrothermal vents;	Earthquake Causes Plate Tectonics Volcanoes
(D) calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future motions, locations, and resulting geologic features;	_
(E) distinguish the location, type, and relative motion of convergent, divergent, and transform plate boundaries using evidence from the distribution of earthquakes and volcanoes; and	Earthquake Causes Plate Tectonics
(F) evaluate the role of plate tectonics with respect to long-term global changes in Earth's subsystems such as continental buildup, glaciation, sea level fluctuations, mass extinctions, and climate change.	The Atmosphere Plate Tectonics
(11) Solid Earth. The student knows that the geosphere continuously changes over a range of time scales involving dynamic and complex interactions among Earth's subsystems. The student is	
(A) compare the roles of erosion and deposition through the actions of water, wind, ice, gravity, and igneous activity by lava in constantly reshaping Earth's surface;	Erosion, Transportation and Deposition Volcanoes Weathering
(B) explain how plate tectonics accounts for geologic surface processes and features, including folds, faults, sedimentary basin formation, mountain building, and continental accretion;	Plate Tectonics
(C) analyze changes in continental plate configurations such as Pangaea and their impact on the biosphere, atmosphere, and hydrosphere through time;	Plate Tectonics
(D) interpret Earth surface features using a variety of methods such as satellite imagery, aerial photography, and topographic and geologic maps using appropriate technologies; and	_
(E) evaluate the impact of changes in Earth's subsystems on humans such as earthquakes, tsunamis, volcanic eruptions, hurricanes, flooding, and storm surges and the impact of humans on Earth's subsystems such as population growth, fossil fuel burning, and use of fresh water.	Earthquake Effects Extreme Flooding Human Impact on the Environment Hurricane Case Studies Managing Earthquakes River Flooding Tropical Cyclones Volcanoes
(12) Solid Earth. The student knows that Earth contains energy, water, mineral, and rock resources and that use of these resources impacts Earth's subsystems. The student is expected to:	
(A) evaluate how the use of energy, water, mineral, and rock resources affects Earth's subsystems;	The Carbon Cycle The Nitrogen Cycle Recycling Nutrients The Rock Cycle The Water Cycle

(B) describe the formation of fossil fuels, including petroleum and coal;	Formation of Fossil Fuels Crude Oil
(C) discriminate between renewable and nonrenewable resources based upon rate of formation and use;	Formation of Fossil Fuels Fossil Fuels Solar Energy
(D) analyze the economics of resources from discovery to disposal, including technological advances, resource type, concentration and location, waste disposal and recycling, and environmental costs; and	The Impact of Mining
(E) explore careers that involve the exploration, extraction, production, use, and disposal of Earth's	–
(13) Fluid Earth. The student knows that the fluid Earth is composed of the hydrosphere, cryosphere, and atmosphere subsystems that interact on various time scales with the biosphere and geosphere. The student is expected to:	
(A) quantify the components and fluxes within the hydrosphere such as changes in polar ice caps and glaciers, salt water incursions, and groundwater levels in response to precipitation events or excessive	–
(B) analyze how global ocean circulation is the result of wind, tides, the Coriolis effect, water density differences, and the shape of the ocean basins;	Heat Transfer and Global Interactions
(C) analyze the empirical relationship between the emissions of carbon dioxide, atmospheric carbon dioxide levels, and the average global temperature trends over the past 150 years;	Evidence for Climate Change Greenhouse Gases
(D) discuss mechanisms and causes such as selective absorbers, major volcanic eruptions, solar luminance, giant meteorite impacts, and human activities that result in significant changes in Earth's climate;	Climate Change Greenhouse Gases The Atmosphere The Carbon Cycle
(E) investigate the causes and history of eustatic sea-level changes that result in transgressive and regressive sedimentary sequences; and	–
(F) discuss scientific hypotheses for the origin of life by abiotic chemical processes in an aqueous environment through complex geochemical cycles given the complexity of living systems.	–
(14) Fluid Earth. The student knows that Earth's global ocean stores solar energy and is a major driving force for weather and climate through complex atmospheric interactions. The student is	
(A) analyze the uneven distribution of solar energy on Earth's surface, including differences in atmospheric transparency, surface albedo, Earth's tilt, duration of insolation, and differences in atmospheric and surface	The Rotation of the Earth Weather and Climate
(B) investigate how the atmosphere is heated from Earth's surface due to absorption of solar energy, which is re-radiated as thermal energy and trapped by selective absorbers; and	Climate Change Greenhouse Gases
(C) explain how thermal energy transfer between the ocean and atmosphere drives surface currents, thermohaline currents, and evaporation that influence climate.	Heat Transfer and Global Interactions The Water Cycle
(15) Fluid Earth. The student knows that interactions among Earth's five subsystems influence climate and resource availability, which affect Earth's habitability. The student is expected to:	
(A) describe how changing surface-ocean conditions, including El Niño-Southern Oscillation, affect global weather and climate patterns;	ENSO

(B) investigate evidence such as ice cores, glacial striations, and fossils for climate variability and its use in developing computer models to explain present and predict future climates;	Evidence for Climate Change Predicting Climate Change
(C) quantify the dynamics of surface and groundwater movement such as recharge, discharge, evapotranspiration, storage, residence time, and sustainability;	–
(D) explain the global carbon cycle, including how carbon exists in different forms within the five subsystems and how these forms affect life; and	The Carbon Cycle
(E) analyze recent global ocean temperature data to predict the consequences of changing ocean temperature on evaporation, sea level, algal growth, coral bleaching, hurricane intensity, and biodiversity.	The Carbon Cycle