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TX.112.36.	Earth and Space Science (One Credit).	
(11-12.1)	Scientific processes. The student conducts laboratory and field investigations, for at least 40% of instructional time, using safe, environmentally appropriate, and ethical practices. The student is expected to:	
11-12.1 (A)	Demonstrate safe practices during laboratory and field investigations.	Safety in Science
11-12.1 (B)	Demonstrate an understanding of the use and conservation of resources and the proper disposal or recycling of materials.	Energy on Earth Land Resources Air Resources Water Resources Human Impact on Resources
11-12.1 (C)	Use the school's technology and information systems in a wise and ethical manner.	Tools and Technology
(11-12.2)	Scientific processes. The student uses scientific methods during laboratory and field investigations. The student is expected to:	
11-12.2 (A)	Know the definition of science and understand that it has limitations, as specified in subsection (b)(2) of this section.	Scientific Methods Hypotheses, Theories, and Laws
11-12.2 (B)	Know that scientific hypotheses are tentative and testable statements that must be capable of being supported or not supported by observational evidence. Hypotheses of durable explanatory power which have been tested over a wide variety of conditions are incorporated into theories.	Scientific Methods Hypotheses, Theories, and Laws
11-12.2 (C)	Know that scientific theories are based on natural and physical phenomena and are capable of being tested by multiple independent researchers. Unlike hypotheses, scientific theories are well-established and highly-reliable explanations, but may be subject to change as new areas of science and new technologies are developed.	Hypotheses, Theories, and Laws
11-12.2 (D)	Distinguish between scientific hypotheses and scientific theories.	Hypotheses, Theories, and Laws
11-12.2 (E)	Demonstrate the use of course equipment, techniques, and procedures, including computers and web-based computer applications.	Tools and Technology

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11-12.2 (F)	Use a wide variety of additional course apparatuses, equipment, techniques, and procedures as appropriate such as satellite imagery and other remote sensing data, Geographic Information Systems (GIS), Global Positioning System (GPS), scientific probes, microscopes, telescopes, modern video and image libraries, weather stations, fossil and rock kits, bar magnets, coiled springs, wave simulators, tectonic plate models, and planetary globes.	Tools and Technology
11-12.2 (G)	Organize, analyze, evaluate, make inferences, and predict trends from data.	Analyzing Data
11-12.2 (H)	Use mathematical procedures such as algebra, statistics, scientific notation, and significant figures to analyze data using the International System (SI) units.	Experimental Design Principles
11-12.2 (I)	Communicate valid conclusions supported by data using several formats such as technical reports, lab reports, labeled drawings, graphic organizers, journals, presentations, and technical posters.	Analyzing Data Evaluating Scientific Explanations
(11-12.3)	Scientific processes. The student uses critical thinking, scientific reasoning, and problem solving to make informed decisions within and outside the classroom. The student is expected to:	
11-12.3 (A)	In all fields of science, analyze, evaluate, and critique scientific explanations by using empirical evidence, logical reasoning, and experimental and observational testing, including examining all sides of scientific evidence of those scientific explanations, so as to encourage critical thinking by the student.	Analyzing Data Evaluating Scientific Explanations
11-12.3 (B)	Communicate and apply scientific information extracted from various sources such as current events, news reports, published journal articles, and marketing materials.	Scientific Methods
11-12.3 (C)	Draw inferences based on data related to promotional materials for products and services.	Evaluating Scientific Explanations
11-12.3 (D)	Evaluate the impact of research on scientific thought, society, and public policy.	The Expanding Universe The Solar System Biological Evidence and the Fossil Record Plate Tectonics Human Impact on the Environment Climate Change Human Impact on Resources
11-12.3 (E)	Explore careers and collaboration among scientists in Earth and space sciences.	Introduction to Earth Science

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11-12.3 (F)	Learn and understand the contributions of scientists to the historical development of Earth and space sciences.	The Expanding Universe The Solar System Continental Drift Plate Tectonics Earth's Climate History
(11-12.4)	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:	
11-12.4 (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 the universe.	The Expanding Universe
11-12.4 (B)	Explain how the Sun and other stars transform matter into energy through nuclear fusion.	Star Systems and Galaxies Stars
11-12.4 (C)	Investigate the process by which a supernova can lead to the formation of successive generation stars and planets.	Stars
(11-12.5)	Earth in space and time. The student understands the solar nebular accretionary disk model. The student is expected to:	
11-12.5 (A)	Analyze how gravitational condensation of solar nebular gas and dust can lead to the accretion of planetesimals and protoplanets.	Other Objects in the Solar System
11-12.5 (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 Other Objects in the Solar System
11-12.5 (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 Cloud.	Other Objects in the Solar System
11-12.5 (D)	Explore the historical and current hypotheses for the origin of the Moon, including the collision of Earth with a Mars-sized planetesimal.	

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11-12.5 (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.	Planets
11-12.5 (F)	Compare extra-solar planets with planets in our solar system and describe how such planets are detected.	
(11-12.6)	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:	
11-12.6 (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-oxygen atmosphere.	Geologic Time Structure and Composition of the Atmosphere Earth's Climate History
11-12.6 (B)	Evaluate the role of volcanic outgassing and impact of water-bearing comets in developing Earth's atmosphere and hydrosphere.	Geologic Time Earth's Climate History
11-12.6 (C)	Investigate how the formation of atmospheric oxygen and the ozone layer impacted the formation of the geosphere and biosphere.	Geologic Time Structure and Composition of the Atmosphere Earth's Climate History
11-12.6 (D)	Evaluate the evidence that Earth's cooling led to tectonic activity, resulting in continents and ocean basins.	Continental Drift Plate Tectonics Forces in Earth's Crust
(11-12.7)	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:	
11-12.7 (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 chronological order.	Fossils Relative Dating Lab: Relative and Absolute Dating

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11-12.7 (B)	Calculate the ages of igneous rocks from Earth and the Moon and meteorites using radiometric dating methods.	Absolute Dating Lab: Relative and Absolute Dating Rocks and the Rock Cycle Igneous Rocks
11-12.7 (C)	Understand how multiple dating methods are used to construct the geologic time scale, which represents Earth's approximate 4.6-billion-year history.	Fossils Relative Dating Absolute Dating Lab: Relative and Absolute Dating Geologic Time
(11-12.8)	Earth in space and time. The student knows that fossils provide evidence for geological and biological evolution. Students are expected to:	
11-12.8 (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.	Fossils
11-12.8 (B)	Explain how sedimentation, fossilization, and speciation affect the degree of completeness of the fossil record.	Fossils Relative Dating
11-12.8 (C)	Evaluate the significance of the terminal Permian and Cretaceous mass extinction events, including adaptive radiations of organisms after the events.	Geologic Time
(11-12.9)	Solid Earth. The student knows Earth's interior is differentiated chemically, physically, and thermally. The student is expected to:	
11-12.9 (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. *(Cont'd.)*	Earth's Interior Continental Drift Plate Tectonics Forces in Earth's Crust Lab: Plate Boundaries and Movement Earthquakes Volcanoes Ocean Circulation Energy in the Atmosphere

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11-12.9 (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. *(Cont'd.)*	Lab: Energy Transfer Winds Atmospheric Moisture and Precipitation Air Masses and Fronts Storms Factors That Affect Climate
11-12.9 (B)	Examine the chemical, physical, and thermal structure of Earth's crust, mantle, and core, including the lithosphere and asthenosphere.	Earth's Interior
11-12.9 (C)	Explain how scientists use geophysical methods such as seismic wave analysis, gravity, and magnetism to interpret Earth's structure.	Earth's Interior Earthquakes
11-12.9 (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.	Magnets and Magnetism
(11-12.10)	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:	
11-12.10 (A)	Investigate how new conceptual interpretations of data and innovative geophysical technologies led to the current theory of plate tectonics.	Earth's Interior Plate Tectonics
11-12.10 (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.	Earth's Interior Continental Drift Plate Tectonics Lab: Plate Boundaries and Movement Rocks and the Rock Cycle
11-12.10 (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.	Plate Tectonics Forces in Earth's Crust Lab: Plate Boundaries and Movement Earthquakes Volcanoes

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11-12.10 (D)	Calculate the motion history of tectonic plates using equations relating rate, time, and distance to predict future motions, locations, and resulting geologic features.	Continental Drift Plate Tectonics Lab: Plate Boundaries and Movement
11-12.10 (E)	Distinguish the location, type, and relative motion of convergent, divergent, and transform plate boundaries using evidence from the distribution of earthquakes and volcanoes.	Plate Tectonics Forces in Earth's Crust Lab: Plate Boundaries and Movement Earthquakes Volcanoes
11-12.10 (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.	Continental Drift Earth's Climate History Climate Change
(11-12.11)	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 expected to:	
11-12.11 (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.	Weathering and Soil Erosion and Deposition Water and Wind Erosion Weathering and Erosion in Texas Lab: Modeling Water Erosion Landforms
11-12.11 (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 Forces in Earth's Crust Lab: Plate Boundaries and Movement Landforms
11-12.11 (C)	Analyze changes in continental plate configurations such as Pangaea and their impact on the biosphere, atmosphere, and hydrosphere through time.	Continental Drift

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11-12.11 (D)	Interpret Earth surface features using a variety of methods such as satellite imagery, aerial photography, and topographic and geologic maps using appropriate technologies.	Models of Earth Topographic Maps
11-12.11 (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.	Earthquakes Volcanoes Storms Environmental Changes Climate Change Energy on Earth Land Resources Air Resources Water Resources Human Impact on Resources Lab: Effects of Human Activity on Freshwater Resources
(11-12.12)	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:	
11-12.12 (A)	Evaluate how the use of energy, water, mineral, and rock resources affects Earth's subsystems.	Rocks and the Rock Cycle Igneous Rocks Sedimentary Rocks Metamorphic Rocks Energy on Earth Land Resources Air Resources Water Resources
11-12.12 (B)	Describe the formation of fossil fuels, including petroleum and coal.	Energy on Earth
11-12.12 (C)	Discriminate between renewable and nonrenewable resources based upon rate of formation and use.	Energy on Earth

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11-12.12 (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.	Land Resources Air Resources Water Resources Human Impact on Resources
11-12.12 (E)	Explore careers that involve the exploration, extraction, production, use, and disposal of Earth's resources.	Land Resources Air Resources Water Resources Human Impact on Resources
(11-12.13)	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:	
11-12.13 (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 pumping.	Surface Water Groundwater Lab: Environmental Changes in a Watershed Ocean Water Earth's Climate History Climate Change Water Resources
11-12.13 (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.	Ocean Circulation
11-12.13 (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.	Climate Change
11-12.13 (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.	Earth's Climate History

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11-12.13 (E)	Investigate the causes and history of eustatic sea-level changes that result in transgressive and regressive sedimentary sequences.	Relative Dating Geologic Time
11-12.13 (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.	Geologic Time Biological Evidence and the Fossil Record Cycles of Matter
(11-12.14)	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 expected to:	
11-12.14 (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 absorption of energy.	Energy in the Atmosphere Lab: Energy Transfer Factors That Affect Climate Lab: Absorption and Radiation by Land and Water
11-12.14 (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.	Energy in the Atmosphere Lab: Energy Transfer
11-12.14 (C)	Explain how thermal energy transfer between the ocean and atmosphere drives surface currents, thermohaline currents, and evaporation that influence climate.	Ocean Circulation Energy in the Atmosphere Lab: Energy Transfer Atmospheric Moisture and Precipitation Factors That Affect Climate
(11-12.15)	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:	
11-12.15 (A)	Describe how changing surface-ocean conditions, including El Nino-Southern Oscillation, affect global weather and climate patterns.	Ocean Circulation
11-12.15 (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.	Earth's Climate History Climate Change

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11-12.15 (C)	Quantify the dynamics of surface and groundwater movement such as recharge, discharge, evapotranspiration, storage, residence time, and sustainability.	Surface Water Groundwater
11-12.15 (D)	Explain the global carbon cycle, including how carbon exists in different forms within the five subsystems and how these forms affect life.	Cycles of Matter
11-12.15 (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.	Human Impact on the Environment