

Unit	Topic	Lesson	Objectives
The Planet Earth			
	Introduction to Earth Science		
	What Is Science?		
			Identify the skills and attitudes that scientists use to learn about the world.
			Explain what scientific inquiry involves.
			Differentiate between a scientific theory and a scientific law.
	The Study of Earth Science		
			Explain the big ideas, or main concepts of Earth Science.
			Identify the branches of Earth Science.
			Explain what a model is in science and why models are important in Earth Science.
	Measurement		
			Explain the importance of the International System of Units.
			Determine appropriate units to use for particular measurements.
	Mapping the Earth		
	Landforms		
			Discuss differences between plains and plateaus.
			Describe folded, upwarped, fault-block, and volcanic mountains.
	You Are Here		
			Explain how a magnetic compass can be used to find directions on Earth.
			Explain the difference between true north and magnetic north.
			Compare latitude and longitude.
			Explain how latitude and longitude are used to locate places on Earth.
	Topographical Maps		
			Explain how contour lines show elevation and landforms on a map.
			Explain how the relief of an area determines the contour interval used on a map.
			List the rules of contour lines.
	Maps and Computers		
			Explain how computer mapping differs from earlier methods of making maps.
			Describe the types of data that are used for making computer maps.
	Minerals		
	Properties of Minerals		
			Define a mineral.
			Explain how minerals are identified.

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		How Minerals Form	
			Explain how minerals form from magma and lava.
			Explain how minerals form from water solutions.
		Uses of Minerals	
			Describe characteristics of gems that make them more valuable than other minerals.
			Identify useful elements that are contained in minerals.
	Rocks		
		The Rock Cycle	
			Describe two ways rocks have been used by humans.
			Describe four processes that shape Earth's features.
			Describe how each type of rock changes into another type as it moves through the rock cycle.
			List two characteristics of rock that are used to help classify it.
		Igneous Rocks	
			Recognize magma and lava as the materials that cool to form igneous rocks.
			Contrast the formation of intrusive and extrusive igneous rocks.
			Contrast granitic and basaltic igneous rocks.
		Metamorphic Rocks	
			Describe the conditions in Earth that cause metamorphic rocks to form.
			Classify metamorphic rocks as foliated or nonfoliated.
		Sedimentary Rocks	
			Explain how sedimentary rocks form from sediments.
			Classify sedimentary rocks as detrital, chemical, or organic in origin.
			Summarize the rock cycle.
		Rocks from Reefs	
			Describe the formation of coral reefs.
			Explain how limestone deposits from coral reefs provide information about Earth's history.
	Earth's Energy Resources		
		Nonrenewable Energy Resources	
			Identify examples of nonrenewable energy resources.
			Describe the advantages and disadvantages of using fossil fuels.
			Explain the advantages and disadvantages of using nuclear energy.
		Renewable Energy Resources	
			Compare and contrast inexhaustible and renewable energy resources.
			Explain why inexhaustible and renewable resources are used less than nonrenewable resources.

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		Nuclear Energy	
			Describe what happens during a nuclear fission reaction.
			Explain how a nuclear power plant produces electricity.
			Describe what takes place in a nuclear fusion reaction.
		Energy Conservation	
			What are two ways to preserve our current energy sources?
Changing Earth			
		Plate Tectonics	
		Earth's Interior	
			Explain how geologists learn about Earth's inner structures.
			Identify the characteristics of Earth's crust, mantle, and core.
		Convection and Mantle	
			Explain how heat is transferred.
			Identify what causes convection currents.
			Describe convection currents in Earth's mantle.
		Restless Continents	
			Describe Wegner's hypothesis of continental drift.
			Explain how sea-floor spreading provides a way for continents to move.
			Describe how new oceanic lithosphere forms at mid-ocean ridges.
			Explain how magnetic reversals provide evidence for sea-floor spreading.
		Theory of Plate Tectonics	
			Compare and contrast different types of plate boundaries.
			Explain how heat inside Earth causes plate tectonics.
			Recognize features caused by plate tectonics.
		Deforming the Earth's Crust	
			Describe two types of stress that deform rocks.
			Describe three major types of folds.
			Explain the differences between the three major types of faults.
			Identify the most common types of mountains.
			Explain the difference between uplift and subsidence.

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	Earthquakes		
		Forces in Earth's Crust	
			Explain how stress in the crust changes Earth's surface.
			Describe where faults are usually found and why they form.
			Identify the land features that result from plate movement.
		Earthquakes and Seismic Waves	
			Describe how the energy of an earthquake travels through Earth.
			Identify the scales used to measure the strength of an earthquake.
			Explain how scientists locate the epicenter of an earthquake.
		Monitoring Earthquakes	
			Explain how seismographs work.
			Describe how geologists monitor faults.
			Explain how seismographic data are used.
		Earthquake Safety	
			Explain how geologists determine earthquake risk.
			Identify the kinds of damage an earthquake can cause.
			Provide suggestions to increase earthquake safety and reduce earthquake damage.
	Volcanoes		
		Volcanoes and Plate Tectonics	
			Identify where Earth's volcanic regions are located and explain why they are found there.
			Explain how hot spot volcanoes form.
		Properties of Magma	
			Identify some physical and chemical properties of matter.
			Explain why some liquids flow more easily than others.
			Explain what factors determine the viscosity of magma.
		Volcanic Eruptions	
			Explain what happens when a volcano erupts.
			Describe the two types of volcanic eruptions.
			Identify a volcano's stages of activity.
		Volcanic Landforms	
			List the landforms that lava and ash create.
			Explain how the magma that hardens beneath Earth's surface creates landforms.
			Identify other distinct features that occur in volcanic areas.

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	Weathering and Soil Formation		
	Weathering		
			Explain how mechanical weathering and chemical weathering differ.
			Describe how weathering affects Earth's surface.
			Explain how climate affects weathering.
	Rates of Weathering		
			Explain how the composition of rock affects the rate of weathering.
			Describe how a rock's total surface area affects the rate at which the rock weathers.
			Describe how differences in elevation and climate affect the rate of weathering.
	The Nature of Soil		
			Explain how soil forms.
			Describe soil characteristics.
			Describe factors that affect the development of soil.
	Soil Erosion		
			Explain why soil is important.
			Evaluate ways that human activity has affected Earth's soil.
			Describe ways to reduce soil erosion.
	Soil Conservation		
			Explain why soil is a valuable resource.
			List ways that soil can lose its value.
			Identify ways that soil can be conserved.
	Erosion and Deposition		
	Changing the Earth's Surface		
			Describe the processes that wear down and build up Earth's surface.
			Identify the causes of the different types of mass movement.
	Water Erosion		
			Explain how water erosion is mainly responsible for shaping the surface of the land.
			Describe some of the land features that are formed by water erosion and deposition.
			Describe the cause of groundwater erosion.
	The Force of Moving Water		
			Describe how water is able to do work.
			Explain how sediment enters rivers and streams.
			List the factors that affect a river's ability to erode and carry sediment.

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		Glaciers	
			Identify the two kinds of glaciers.
			Describe how a valley glacier forms and moves.
			Explain how glaciers cause erosion and deposition.
		Waves	
			Identify what gives ocean waves their energy.
			Describe how ocean waves erode a coast.
			Identify features that result from deposition by waves.
		Wind	
			Explain how wind causes erosion.
			Identify features resulting from deposition by wind.
A Trip through Geologic Time			
		Fossils	
			List the conditions necessary for fossils to form.
			Describe several processes of fossil formation.
			Explain how fossil correlation is used to determine rock ages.
			Determine how fossils can be used to explain changes in Earth's surface, life forms, and environments.
		Relative Ages of Rocks	
			Describe methods used to assign relative ages to rock layers.
			Interpret gaps in the rock record.
			Give an example of how rock layers can be correlated with other rock layers.
		Absolute Ages of Rocks	
			Identify how absolute age differs from relative age.
			Describe how the half-lives of isotopes are used to determine a rock's age.
		Life and Geologic Time	
			Explain how geologic time can be divided into units.
			Relate changes of Earth's organisms to divisions on the geologic time scale.
			Describe how plate tectonics affects species.
		Early Earth History	
			Identify characteristic Precambrian and Paleozoic life-forms.
			Draw conclusions about how species adapted to changing environments in Precambrian time and the Paleozoic Era.
			Describe changes in Earth and its life-forms at the end of the Paleozoic Era.

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		Middle and Recent Earth History	
			Compare and contrast characteristic life-forms in the Mesozoic and Cenozoic Eras.
			Explain how changes caused by plate tectonics affected organisms during the Mesozoic Era.
			Identify when humans first appeared on Earth.
		Earth's Waters	
		Fresh Water	
		Water on Earth	
			Describe how Earth's water is distributed.
			Explain how Earth's water moves through the water cycle.
		Surface Water	
			Tell what a river system is.
			Describe the characteristics of ponds and lakes.
			List three types of wetlands and explain why wetlands are important.
		Water Underground	
			Describe how water moves through underground layers of soil and rock.
			Explain how people obtain water from an aquifer.
		Using Freshwater Resources	
			Identify ways that people use water.
			Describe some ways to conserve available fresh water.
			Discuss how scientists classify sources of water pollution.
		Water to Drink	
			Identify factors that affect water quality.
			Explain why drinking water is often treated before people drink it.
		Ocean Motions	
		Currents	
			Describe surface currents.
			List the three factors that control surface currents.
			Describe deep currents.
			Identify the three factors that form deep currents.
		Currents and Climate	
			Explain how currents affect climate.
			Describe the effects of El Nino.
			Explain how scientists study and predict the pattern of El Nino.

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		Waves	
			Identify the parts of a wave.
			Explain how the parts of a wave relate to wave movement.
			Describe how ocean waves form and move.
			Classify types of waves.
		Tides	
			Explain tides and their relationship with the Earth, sun, and moon.
			Describe four different types of tides.
			Analyze the relationship between tides and coastal land.
		Ocean Water Chemistry	
			Describe the salinity of ocean water.
			Explain how the temperature and gas content of ocean water varies.
			Describe how conditions in the ocean change with depth.
		Ocean Zones	
		Earth's Oceans	
			List the major divisions of the global ocean.
			Describe the history of Earth's oceans.
			Identify the properties of ocean water.
			Describe the interactions between the ocean and the atmosphere.
		The Seafloor	
			Differentiate between a continental shelf and a continental slope.
			Describe a mid-ocean ridge, an abyssal plain, and an ocean trench.
			Identify the mineral resources found on the continental shelf and in the deep ocean.
		Ocean Habitats	
			Describe how marine organisms are classified.
			Describe the conditions that organisms in the intertidal zone must tolerate.
			Describe the conditions in the neritic zone.
			Describe the conditions in the open ocean.
		Resources from the Ocean	
			List two ways of harvesting the ocean's living resources.
			Identify three nonliving resources in the ocean.
			Describe the ocean's energy resources.

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		Ocean Pollution	
			Explain the difference between point-source pollution and nonpoint-source pollution.
			Identify three different types of point-source ocean pollution.
			Describe what is being done to control ocean pollution.
		Weather and Climate	
		The Atmosphere	
		Earth's Atmosphere	
			Identify the gases in Earth's atmosphere.
			Describe the structures of Earth's atmosphere.
			Explain what causes air pressure.
		Energy Transfer in the Atmosphere	
			Describe what happens to the energy Earth receives from the Sun.
			Compare and contrast radiation, conduction, and convection.
			Explain the water cycle and its effect on weather patterns and climate.
		Air Movement	
			Explain why different latitudes on Earth receive different amounts of solar energy.
			Describe the coriolis effect.
			Explain how land and water surfaces affect the overlying air.
		Air Quality	
			Identify the major sources of air pollution.
			Identify what causes smog and acid rain.
			Describe what can be done to improve air quality.
		Understanding Weather	
		Water in the Air	
			Explain how water moves through the water cycle.
			Describe how relative humidity is affected by temperature and levels of water vapor.
			Describe the relationship between dew point and condensation.
			List three types of cloud forms.
			Identify four kinds of precipitation.
		Air Masses and Fronts	
			Identify the four kinds of air masses that influence weather in the United States.
			Describe the four major types of fronts.
			Explain how fronts cause weather changes.
			Explain how cyclones and anticyclones affect the weather.

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		Severe Weather	
			Describe how lightning forms.
			Describe the formation of thunderstorms, tornadoes, and hurricanes.
			Describe the characteristics of thunderstorms, tornadoes, and hurricanes.
			Explain how to stay safe during severe weather.
		Forecasting the Weather	
			Describe the different types of instruments used to take weather measurements.
			Explain how radar and weather satellites help meteorologists forecast the weather.
			Explain how to interpret a weather map.
	Climate		
		What Causes Climate?	
			Identify factors that influence temperature and precipitation.
			Explain what causes the seasons.
		Climate Regions	
			Identify factors used to define climates.
			Describe the six main climate regions.
		Long-term Changes in Climate	
			Explain the principle that scientists follow in studying ancient climates.
			Describe the changes that occur on Earth's surface during an ice age.
			Identify factors that can cause climate change.
	Astronomy		
		Earth, Sun, and Moon	
		Earth in Space	
			Demonstrate how Earth moves in space.
			Explain what causes the cycle of seasons on Earth.
		Gravity and Motion	
			Identify what determines the strength of the force of gravity between two objects.
			Describe two factors that keep the moon and Earth in orbit.
		Phases, Eclipses, and Tides	
			Explain what causes the phases of the moon.
			Describe solar and lunar eclipses.
			Identify what causes tides.

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		Earth's Moon	
			Describe features found on the moon's surface.
			Identify some characteristics of the moon.
			Explain how the moon formed.
		Traveling into Space	
			Demonstrate how a rocket works.
			Identify the main advantage of a multistage rocket.
			Describe the space race, and discuss the major events in the exploration of the moon.
			Compare and contrast the roles of space shuttles, space stations, and space probes in space exploration.
	The Solar System		
		The Solar System	
			Compare the Earth-centered and Sun-centered models of the solar system.
			Explain that gravity holds the planets in their orbits around the Sun.
		The Inner Planets	
			List the inner planets in order from the Sun.
			Describe each inner planet.
			Compare and contrast Venus and Earth.
		The Outer Planets	
			Describe the characteristics of Jupiter, Saturn, Uranus, and Neptune.
			Explain how Pluto differs from the other outer planets.
		Other Objects in the Solar System	
			Describe how comets change when they approach the Sun.
			Distinguish among comets, meteoroids, and asteroids.
			Explain that objects from space sometimes impact Earth.
	Stars and Galaxies		
		Stars	
			Explain why some constellations are visible only during certain seasons.
			Distinguish between absolute magnitude and apparent magnitude.
		The Sun	
			Explain that the Sun is the closest star to Earth.
			Describe the structure of the Sun.
			Describe sunspots, prominences, and solar flares.

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		Evolution of Stars	
			Describe how stars are classified.
			Compare the Sun to other types of stars on the H-R diagram.
			Describe how stars evolve.
		Galaxies and the Universe	
			Describe the Sun's position in the Milky Way Galaxy.
			Explain that the same natural laws that apply to our solar system also apply in other galaxies.