Earth and Geological Science

Chapter 1 Earth Introduction

Estimated Time Frame	Big Ideas	Essential Question	Concept (Know)	Competency (Do)	Suggested Resources	Vocabulary	PA Content / Keystone Standard	Suggested Lessons and Activities
6 days	Earth Scientists use specific methods to investigate Earth and beyond.	What is Earth Science?	Earth Science encompasses five areas of study: astronomy, meteorology, geology, oceanography, and environmental science	Students will be able to compare the areas of study within Earth Science. Students will be able to identify Earth's systems. Students will be able to explain the relationships among Earth's Systems. Students will be able to explain why technology is important.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	Astronomy Meteorology Geology Oceanography environmental science geosphere atmosphere hydrosphere biosphere	**3.3.12.A1:** **3.3.12.A7:**	Collins writing on both videos and ideas
	Earth Scientists use specific methods to investigate Earth and beyond.	What are the methods that scientist use?	Scientists use the scientific methods to structure their experiments and investigations.	Students will be able to compare and contrast independent and dependent variables. Students will be able to compare and contrast	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth	scientific method hypothesis independent variable dependent variable control Le system International of Unites (SI)	**3.3.10.A8:** **3.3.12.A8:**	Virtual lab on Scientific method Collins writing on both videos and ideas Web site on mass vs weight on different

				experimentations and investigation Students will be able to identify the differences between mass and weight. Explain what scientific notation is and how it is used.	and Space science.	scientific notation		planets. Exercises on scientific notion.
	Earth Scientists use specific methods to investigate Earth and beyond.	How do we communicate in science?	Precise communications is crucial for scientists to share their results effectively with each other and with society.	Students will be able to explain why precise communication is crucial in science. Students will be able to compare and contrast scientific theories and scientific laws. Students will be able to identify when it is appropriate to use a graph or model.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	scientific model scientific theory scientific law	**3.3.10.B3:** **3.3.12.B3**	Collins writing explaining the difference between a theory and a law.

Unit 1 Space

Chapter 27 Earth Moon and Sun System

Estimated Time Frame	Big Ideas	Essential Question	Concept (Know)	Competency (Do)	Suggested Resources	Vocabulary	PA Content / Keystone Standard	Suggested Lessons and Activities
20 days	The Sun, the Moon and the Earth form a dynamic	How have we learned information about our universe?	Radiation emitted of reflected by distant objects	Students will be able to define electromagnetic radiation.	Glencoe Science Earth Science Geology, the	electromagnetic spectrum refracting telescopes	**3.3.10.B2:** **3.3.10.B3:**	Five paragraph paper on telescopes.

	system that influences all life on Earth.	Why is the electromagnetic spectrum important in our search for questions? What limitation do we find when studying space?	allows scientists to study the universe	Students will be able to explain how telescopes work. Students will be able to describe how space exploration helps scientists learn about the universe.	Environment, and the Universe Walch's Top shelf Earth and Space science.	reflecting telescopes interferometry	**3.3.12.A7:**	Collins writing Anticipatory reading
	The Sun, the Moon and the Earth form a dynamic system that influences all life on Earth	What does our Moon look like? How was it created? What features are located on our Moon and how have did they form?	The Moon, Earth's nearest neighbor in space is unique among the moons in our solar system	Students will be able to describe the history of lunar exploration. Students will be able to recognize lunar properties and structures. Students will be able to identify features of the Moon. Students will be able to explain the theory of how the Moon formed.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	albedo highland mare impact crater ejecta ray rille regolith	**3.3.10.B2:** **3.3.10.B3:** **3.3.12.A7:**	Surface feature of the Moon lab. Origin of the moon project Collins writing Anticipatory readings
	The Sun, the Moon and the Earth form a dynamic system that influences all life on Earth	How has our sense of time been influenced by the movement of the Earth, Moon and Sun? Why do we have	Motions of the Sun- Moon-Earth system define Earth's day, month, and year.	Students will be able to identify the relative position and motions of the Sun, Earth and Moon.	Glencoe Science Earth Science Geology, the Environment, and the Universe	ecliptic plane solstice equinox synchronous rotation solar eclipse perigee apogee	**3.3.10.B2:** **3.3.10.B3:** **3.3.12.A7:**	Angle of insolation lab Formal lab write up Moon phase lab Moon rotation

		seasons? How do seasons influence our climate? What is an eclipse and how does it occur?		Students will be able to describe and explain the phases of the Moon. Students will be able to distinguish between solstices and equinoxes. Students will be able to explain eclipse of the Sun and Moon.	Walch's Top shelf Earth and Space science.	lunar eclipse		lab Demo on solar and lunar eclipses Anticipatory reading

Unit 1 Space

Chapter 28 Solar System

Estimated Time Frame	Big Ideas	Essential Question	Concept (Know)	Competency (Do)	Suggested Resources	Vocabulary	PA Content / Keystone Standard	Suggested Lessons and Activities
27 days	Using the laws of motion and gravity, astronomers can understand the orbits and the properties of the planets and other objects in the solar system.	How did the solar system form?	The solar system formed from the collapse of an interstellar cloud.	Students will be able to explain how the solar system formed. Students will be able to describe early concepts of the structure of the solar system. Students will be able to describe how our current knowledge of the solar system developed.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	planetesimal retrograde motion ellipse astronomical unite eccentricity	**3.3.10.B1:** **3.3.10.B3:**	Ellipse lab Planetary motion lab Formal lab write up Motor source spinning Collins writing on both videos and ideas

				Students will be able to relate gravity to the motions of the object in the solar system.				
	Using the laws of motion and gravity, astronomers can understand the orbits and the properties of the planets and other objects in the solar system.	Compare and contrast characteristics of the terrestrial planets. How have we discovered most of our information about our solar system?	The inner planets have high densities and rocky surfaces.	Students will be able to compare the characteristics of the inner planets. Students will be able to survey some of the space robe used to explore the solar system. Students will be able to explain the differences among the terrestrial planets.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	inner planet terrestrial planet scarp	**3.3.10.B1:** **3.3.10.B3:**	Collins writing on videos and ideas Hard to see demo Air pressure demos Retrograde motion demo
	The oceans and the atmosphere formed and life began during the three eons of the Precambrian, which spans nearly 90% of Earth's history.	Describe the evidence that indicates that Earth is about 4.56 billion years old. Describe the heat sources of early Earth. Glencoe Ear	Several lines of evidence indicate that Earth is about 4.56 billion years old.	Students will be able to describe the evidence that indicates Earth is 4.56 billion years old. Students will be able to describe the heat sources of early Earth.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.		3.3.10.B1 3.3.12.A4:	Formation of the Earth project nonlinguistic project Text rending Word splash
	The oceans and the atmosphere formed and life	Compare and contrast characteristics of the Jovian planets.	The outer planets have large masses, low densities,	Students will be able to compare and contrast the gas giant	Glencoe Science Earth Science Geology, the	gas giant planet Jovian planet liquid metallic hydrogen	**3.3.10.B1:** **3.3.10.B3:** **3.3.12.B2:**	Collins writing on videos and ideas

	began during the three eons of the Precambrian, which spans nearly 90% of Earth's history	How have we discovered most of our information about our solar system? How do ring systems form around planets? What are the Jovian planets made out of? What are the major moons of the Jovian planets?	and many moons and rings.	planets. Students will be able to identify the major moons. Students will be able to explain the formation of moons and rings. Students will be able to compare the composition of the gas giant planets to the composition of the Sun.	Environment, and the Universe Walch's Top shelf Earth and Space science.	belt zone		Rhyoscopic fluid demo Fan demo Talc power demo Lighting demo Word splash Text rendering
	The oceans and the atmosphere formed and life began during the three eons of the Precambrian, which spans nearly 90% of Earth's history	What is a dwarf planet? Why was Pluto reclassified? What are the oldest members of the solar systems and what can we learn from them? What is the difference between a meteor, meteoroid, and a meteorite? What is a comet and why is it such a spectacular sight?	Other solar system objects contain dust, rocks and ice composing the remaining 2% of the solar system	Students will be able to distinguish between planets and dwarf planets. Students will be able to identify the oldest members of the solar system. Students will be able to escribe meteoroids, meteors, and meteorites. Students will be able to determine the structure and	Environment, and the Universe Walch's Top shelf Earth and Space science.	dwarf planet meteoroid meteor meteorite Kuiper belt comet meteor shower Oort cloud	**3.3.12.B2:**	Collins writing on videos and ideas Comet lab Creative writing through the solar system Anticipatory reading Word splashes Text rendering

				behavior of comets.				
Unit 1 Space								
Chapter 29 Stars								
Estimated Time Frame	**Big Ideas**	**Essential Question**	**Concept (Know)**	**Competency (Do)**	**Suggested Resources**	**Vocabulary**	**PA Content / Keystone Standard**	**Suggested Lessons and Activities**
22 days	The life cycle of every star is determined by its mass, luminosity, magnitude, temperature and composition.	Where does most of the energy of the solar system come from? How is energy created in the Sun? How do we know information about the Sun when we cannot get close to it to extract data? What is the Sun made up of?	The Sun contains most of the mass of the solar system and has many features typical of other stars.	Students will be able to describe the layers and features of the Sun. Students will be able to explain the process of energy production in the Sun. Students will be able to define the three types of spectra.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	photosphere chromosphere corona solar wind sunspot solar flare prominence fusion fission	**3.3.12.B1:** **3.3.10.B2:**	Sun spot lab Hydrostatic equilibrium demo Anticipatory reading Word splash Collins writing Test rending
	The life cycle of every star is determined by its mass, luminosity, magnitude, temperature and composition	How do we determine the distance between stars when we cannot empirically measure it? What is magnitude? What is luminosity? What can we	Stellar classification is based on measurement of light spectra, temperature, and composition.	Students will be able to determine how distance between stars are measured. Students will be able to distinguish between magnitude and luminosity.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	constellation binary star parsec parallax apparent magnitude absolute magnitude luminosity Hertzsprung-Russel diagram main sequence	**3.3.12.B1:** **3.3.10.B2:**	Constellation project Anticipatory reading Collins reading Anticipatory reading Text rendering Spectroscopic generators Tubes of gases

		determine if we know both magnitude and luminosity?		Students will be able to identify the properties used to classify stars.				
	The life cycle of every star is determined by its mass, luminosity, magnitude, temperature and composition	What does the mass of a star have to do with its death? What is stellar evolution? When a large mass star dies what happens to the elements that it has created?	The Sun and other stars follow similar life cycles, leaving the galaxy enriched with heavy elements.	Students will be able to determine the effect of mass on a star's evolution. Students will be able to identify the features of massive and regular star life cycles Students will be able to explain how the universe is affected by the life cycles of stars.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	Nebula protostar giant star super giant planetary nebula nova black dwarf white dwarf neutron star pulsar supernova black hole	**3.3.12.B1:** **3.3.10.B2:**	Stellar evolution book Text rendering Word splash Collins writing

Unit 1 Space

Chapter 30 Galaxies and the Universe

Estimated Time Frame	**Big Ideas**	**Essential Question**	**Concept (Know)**	**Competency (Do)**	**Suggested Resources**	**Vocabulary**	**PA Content / Keystone Standard**	**Suggested Lessons and Activities**
13 days	Observations of galaxy expansion, cosmic background radiation, and the Big Bang Theory	What is our galaxy's name? What type of galaxy is it? What is a galaxy?	Stars with varying light output allowed astronomers to map the Milky Way, which has a halo, spiral arms, and a	Students will be able to determine the size and shape of our galaxy. Distinguish the different kinds	Glencoe Science Earth Science Geology, the Environment, and the Universe	Variable star RR Lyrae variable Cepheid variable halo Population I stars Population II stars	**3.3.12.B1:**	Anticipatory reading Text rendering Word splash Collins writing

	describe and expanding universe that is about 14 billion years old.	Where are old stars and young stars located and what does this indicate about galaxies?	massive galactic black hole at its center,	of variable stars. Students will be able to identify the different kinds of stars in a galaxy and their locations.	Walch's Top shelf Earth and Space science.	spiral density wave		
	Observations of galaxy expansion, cosmic background radiation, and the Big Bang Theory describe and expanding universe that is about 14 billion years old.	How are galaxies classified? Edwin Hubble discovered that the farther away a galaxy is the faster it is moving away. How does this support the expansion of the universe.	Finding galaxies with different shapes reveals the past, present, and future of the universe.	Students will be able to describe how astronomers classify galaxies. Students will be able to identify how galaxies are organized into clusters and superclusters. Students will be able to describe the expansion of the universe.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	Dark matter Superclusters Dark energy Hubble constant radio galaxy active galactic nucleus quasar	**3.3.12.B1:** **3.3.10.B2:**	Collins writing Anticipatory reading Text rendering
	Observations of galaxy expansion, cosmic background radiation, and the Big Bang Theory describe and expanding universe that is about 14 billion years old.	What is the evidence that supports the Big Bang Theory? What are the three models that explain the expansions of the universe? Why do we believe that our universe will continue to expand?	The Big Bang theory was formulated by comparing evidence and models to describe the beginning of the universe.	Students will be able to distinguish the different models of the universe. Students will be able to compare and contrast how expansion is relative to each of the models. Students will be able to explain the importance of the Hubble constant.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	Cosmology Big Bang Theory Cosmic background radiation Steady state theory.	**3.3.12.B3.** **3.10.B1: 1:** **3.3.10.A8:**	Big bang lab Collins writing Text rendering Word splash

Unit 2 Earth Science

Chapter 2 Mapping our World

Estimated Time Frame	Big Ideas	Essential Question	Concept (Know)	Competency (Do)	Suggested Resources	Vocabulary	PA Content / Keystone Standard	Suggested Lessons and Activities
	Earth's scientists use mapping technologies to investigate and describe the world	How do we navigate our planet?	Lines of latitude and longitude are used to locate places on Earth.	Students will be able to describe the difference between latitude and longitude. Students will be able to explain why it is important to give a city's coordinates when describing its location. Students will be able to explain why there are different time zones from one geographic area to the next.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	cartography equator latitude longitude Prime meridian International Date Line Tropic of Cancer Tropic of Capricorn.	3.3.10.A7:	Mapping lab packet Anticipatory reading Text rendering Compose rose
	Earth's scientists use mapping technologies to investigate and describe the world	What types of maps do we use? How are they created? Why do we have different types of maps?	Maps are flat projections that come in many different forms.	Students will be able to compare and contrast different types of maps. Students will be able to explain why different maps are used for different purposed. Calculate	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	Mercator projection conic projection gnomonic projection topographic map contour line contour interval geologic map map legend map scale	3.3.10.A7:	Mapping lab packet Sea gull rock map Chippwea falls

				gradients on a topographic map.				
	Earth's scientists use mapping technologies to investigate and describe the world	How have we gathered the information about our planet? Why are satellites useful?	New technologies have changed the appearance and use of maps,	Students will be able to compare and contrast different types of remote sensing. Students will be able to discuss how satellites and sonar are used to map Earth's surface and its oceans. Students will be able to describe the Global Positioning System and how it works.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science	remote sensing Landsat satellite TOPEX/Poseidon satellite sonar Global Positioning system Geographic Information System.	3.3.10.A7:	Weather bug Collins writing Anticipatory reading

Unit 3 Composition of the Earth

Chapter 3 Chemistry

Estimated Time Frame	Big Ideas	Essential Question	Concept (Know)	Competency (Do)	Suggested Resources	Vocabulary	PA Content / Keystone Standard	Suggested Lessons and Activities
8 days	The variety of substances on Earth results for the way that atoms are arranged and combined.	What is matter? How do we change it from one form to another? What are the subatomic parts of and atom, their charges and their locations?	Atoms are the basic building blocks of all matter.	Students will be able to describe and atom and its components. Students will be able to relate energy levels of atoms to the chemical properties of	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space	matter element nuclease proton neutron electron atomic number mass number isotope ion quark	3.2.10.A1: 3.2.10.A2: 3.2.10.A3: 3.2.10.A4: 3.2.10.A5:	Chemistry exercise packet Text rendering Anticipatory reading Collins writing

				elements. Students will be able to define the concept of isotopes.	science.			
	The variety of substances on Earth results for the way that atoms are arranged and combined.	Why do atoms and molecules combine the way they do? When balancing an equations why do the molecules need to be equal?	Atoms combine through electric forces forming molecules and compounds.	Students will be able to describe the chemical bonds that unite atoms to form compounds. Students will be able to relate the nature of chemical bonds that hold compounds together to the physical structures of compounds. Students will be able to distinguish among different types of mixtures and solutions.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	compound chemical bond covalent bond molecule ionic bond metallic bond chemical reaction solution acid base valence electron conservation of mass/energy	3.2.10.A1: 3.2.10.A2: 3.2.10.A3: 3.2.10.A4: 3.2.10.A5	Chemistry exercise packet Test rendering Anticipatory reading Collins writing
	The variety of substances on Earth results for the way that atoms are arranged and combined.	What are the states of matter? What is plasma? Which state of matter is most prevelant?	All matter on Earth and in the universe occurs in the form of a solid, a liquid, a gas, or plasma.	Students will be able to describe the states of matter on Earth. Students will be able to explain the reason that matter exists in these states.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth	crystalline structure glass evaporation plasma condensation sublimation percolation precipitation	3.2.10.A1: 3.2.10.A2: 3.2.10.A3: 3.2.10.A4: 3.2.10.A5	Collins writing Text rending

				Students will be able to relate the role of thermal energy to changes in the states of matter.	and Space science.			
Unit 3 Composition of the Earth								
Chapter 4 Minerals								
Estimated Time Frame	**Big Ideas**	**Essential Question**	**Concept (Know)**	**Competency (Do)**	**Suggested Resources**	**Vocabulary**	**PA Content / Keystone Standard**	**Suggested Lessons and Activities**
11 days	Minerals are an integral part of daily life.	What is a mineral?	Minerals are naturally occurring, solid, inorganic compounds or elements.	Students will be able to define a mineral. Students will be able to describe how minerals form. Students will be able to classify minerals according to their physical and chemical properties.	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	mineral crytal luster hardness cleavage fracture streak specific gravity color effervescence double refraction magnetism iridescence fluorescence phosphorescence texture	**3.3.12.A2:** **3.3.12.A2:**	Collins writing Anticipatory reading
	Minerals are an integral part of daily life.	What are the types of minerals?	Minerals are classified based on their chemical properties and characteristics.	Students will be able to identify different groups of minerals Students will be able to illustrate the silica tetrahedron. Students will be able to discuss	Glencoe Science Earth Science Geology, the Environment, and the Universe Walch's Top shelf Earth and Space science.	silicate tetrahedron ore gem	**3.3.12.A2:** **3.3.12.A2:**	Color, luster, streak lab Hardness lab Specific gravity lab Cleavage fracture lab Special

				how mineral are used.				properties lab Crystal shape lab