Pearson

Earth Science Honors

Semester A Summary:

Honors Earth Science A is designed to give the student a strong basis for understanding the world. This course is also designed to prepare the student to confidently enter and complete college-level Earth Science courses. The course consists of a varied curriculum that provides the student the opportunity to explore, compare, research, reflect, and make real-world connections. The curriculum, which meets Next Generation Science Standards (NGSS), engages students in problem solving and scientific investigation, and provides opportunities for both hands-on exploration and virtual simulation.
During this course, the student will learn about natural resources and explore issues surrounding human management of resources. Topics of study include water resources, energy resources, and rock, mineral, and land resources. The student will investigate the impact of resource consumption on humans and the environment. The student will also explore Earth's processes of rock and mineral formation and plate tectonics.
In the honors-level course, the student will have opportunities to delve further into some topics and engage with enhanced assessments.

Semester A Outline

1. **Course Overview**
    1. Launch into Earth and Space Science
        - In this section, you will identify and describe the features of lessons, useful study skills, and how assessments are handled throughout the course
2. **Astronomy: The Stars**
    1. Stars and Constellations
        - In this section, you will identify composition and characteristics of stars and explain how astronomers identify and describe constellations.
    2. Spectroscopy
        - In this section, you will define and differentiate between visible and non-visible light on the electromagnetic spectrum.
        - In this section, you will identify how spectroscopy provides information about the composition and properties of objects.
    3. Star Types
        - In this section, you will classify stars by their physical and chemical properties.
        - In this section, you will analyze data from light spectra to classify stars.
    4. Star Elements
        - In this section, you will define light and heavy elements and explain how they are created within stars.
    5. Star Evolution
        - In this section, you will identify, describe, and illustrate the life cycle of a star.
        - In this section, you will investigate the process by which a supernova can

lead to the formation of successive generation stars and planets.
    - In this section, you will interpret diagrams of stellar evolution.
6. Star Comparisons
    - In this section, you will compare the composition, stage of life, size, energy generated, and luminosity of our sun to other stars.
7. The Stars Unit Review
    - In this section, you will review what you have learned about the stars.
8. Star Composition Lab
    - In this lab, you will use spectroscopy information to identify elements by their emissions spectra and analyze light spectra of stars to determine star composition.

3. **Astronomy: The Sun**
    1. Sun's Layers
        - In this section, you will identify and describe the layers of the sun.
        - In this section, you will trace the release of energy from the nuclear fusion at the sun’s core to space and to Earth.
    2. Sun's Magnetism
        - In this section, you will identify and describe the magnetic properties of the sun, including causes of sunspots, solar flares, and coronal mass ejections.
    3. Solar Weather
        - In this section, you will identify, describe, and evaluate the effect of solar weather on Earth’s magnetosphere.
    4. Solar Weather Impact
        - In this lesson, you will learn to predict the potential impact of severe solar weather on Earth’s communication systems.
    5. Solar Weather and Climate
        - In this section, you will identify and evaluate the effect of solar weather on climate change.
    6. The Sun Unit Review
        - In this section, you will review what you have learned about the sun.
    7. Solar Weather Preparation
        - In this section, you will learn analyze methods for mitigating potential impacts of severe solar weather.
    8. Solar Weather Preparation Discussion
4. **Astronomy: Orbital Motion**
    1. Aristotle and Ptolemy
        - In this section, you will identify and describe Aristotle’s and Ptolemy’s models of the solar system.
    2. Copernicus
        - In this section, you will identify and describe Copernicus’s heliocentric model of the solar system and how it was developed.
        - In this section, you will compare the geocentric and heliocentric models of the solar system.
    3. Kepler's Second Law
        - In this section, you will define and describe Kepler’s second law of motion and how it was developed.
    4. Kepler's First and Third Laws
        - In this section, you will identify and explain the development of Kepler’s first law of orbital motion.
        - In this section, you will identify and explain Kepler’s third law of orbital motion.

5. Universal Gravitation
    - In this section, you will define and explain Newtonian theory of universal gravitation and its development.
6. Eccentric Orbits
    - In this section, you will identify the eccentricity of orbits of various orbiting bodies.
7. Orbits of Planetary Bodies
    - In this section, you will learn to apply Kepler's laws to the solar system.
    - In this section, you will apply the Newtonian theory of universal gravitation to mathematically describe the motion of planets and moons.
    - In this section, you will compare extra-solar planets with planets in our solar system and describe how such planets are detected.
8. Orbits of Satellites
9. Orbital Motion Unit Review
    - In this section, you will review what you have learned about orbital motion.
10. Orbital Motion Unit Test.

5. **Astronomy: Galaxies**
    1. Nebulae
        - In this section, you will define and describe nebulae and how they form.
        - In this section you will identify types of nebulae based on their characteristics.
    2. Galaxy Types
        - In this lesson, you will identify how galaxies are organized and distributed within the universe.
        - In this section, you will differentiate and describe the types of galaxies within the universe
    3. Black Holes
        - In this section, you will define black holes and categorize them by size.
        - In this section, you will explain how black holes form.
    4. Galaxy Evolution
        - In this section, you will describe the evolution of galaxies.
    5. What's in a Universe?
        - In this section, you will identify and describe composition and characteristics of a universe.
    6. Colliding Galaxies
        - In this section, you will identify and explain the effects of collisions between galaxies.
    7. Galaxy Formation
        - In this section, you will identify and compare theories of galaxy formation.
    8. Galaxies Unit Review
        - In this section you will review what you have learned about galaxies.
    9. Coloring the Universe Lab
        - In this lab, you will analyze data by color coding images based on light spectra emissions.
6. **Astronomy: The Universe**
    1. Redshift and Blueshift
        - In this section, you will define and explain redshift and blueshift, and how they are applied in astronomy.
    2. Investigating Redshift and Blueshift Lab
        - In this lab, you will analyze light spectra for redshift or blueshift.
    3. Origins of the Universe

- In this section, you will identify and compare nuclear fission and nuclear fusion.
- In this section, you will learn about the big bang theory and explore different types of evidence that support it.

4. Expanding Universe
    - In this section, you will cite evidence of universe expansion to support the big bang theory.
5. In the Dark
    - In this section, you will define dark matter and describe the observations which led to theories of its existence.
6. Big Bang Theory
    - In this section, you will relate theories about dark matter and energy to the big bang theory.
7. The Universe Unit Review
    - In this section you will review what you have learned about the universe and its origins.
8. The Universe Unit Test.

7. **Earth's Processes: Rocks**
    1. The Composition of Earth's Layers
        - In this section, you will learn how to identify the layers of Earth.
        - In this section, you will learn how to describe the traits and composition of Earth’s layers.
    2. Determining Earth's Interior Structure
        - In this section, you will learn to explain how scientists determine the structure and composition of Earth.
    3. Rock Types and Cycle
        - In this section, you will classify rock as one of three major types (metamorphic, sedimentary, and igneous) and identify characteristics of each type.
        - In this section, you will invesitgate the causes and history of sea-level changes that have resulted in transgressive and regressive sedimentary rock sequences.
        - In this section, you will examine how to interpret and complete diagrams of the rock cycle.
    4. Minerals
        - In this section, you will learn how to identify properties of minerals used in mineral identification.
    5. Age of Rock
        - In this section, you will identify methods scientists use to determine the age of crustal rock.
    6. Rocks Unit Review
        - In this section, you will review what you have learned about rocks.
    7. Geologic Age Lab
        - In this section, you will explain how scientists use understanding of half-life of isotopes to determine the geologic age of rocks.
        - In this section, you will communicate valid conclusions supported by data using several formats, including data tables, a line graph, data analysis, and your conclusion.
8. **Earth's Processes: Tectonic Plates**
    1. Plate Tectonic Theory
        - In this section, you will identify and describe how the theory of plate

tectonics developed.
    - In this section, you will analyze changes in continental plate configurations, such as Pangaea, for their impact on the biosphere, atmosphere, and hydrosphere through time
    - In this section, you will 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.
2. Fossils and Plate Tectonics
    - In this section, you will identify and describe fossil evidence supporting continental drift and the later theory of plate tectonics.
3. Magnetism and Plate Tectonics
    - In this section, you will identify and describe paleomagnetic evidence to support the theory of plate tectonics.
4. Age of Rock and Plate Tectonics
    - In this section, you will analyze data about the age of crustal rock to further support the theory of plate tectonics.
    - In this section, you will analyze changes in continental plate configurations, such as Pangaea, for their impact on the biosphere, atmosphere, and hydrosphere through time.
    - In this section, you will 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.
5. Investigating Thermal Convection Lab
    - In this section, you will develop a model to describe the cycling of matter through thermal convection.
6. Volcanoes
    - In this section, you will identify and describe the different types of volcanoes.
7. Plates and Volcanoes
    - In this section, you will identify and describe the relationship between the movement of Earth’s plates and the locations and types of volcanoes.
8. Plates and Earthquakes
    - In this section, you identify and describe the relationship between the movement of Earth’s plates and the location and severity of earthquakes.
9. Tectonic Plates Unit Review
    - In this section, you will review what you have learned about tectonic plates.
10. Tectonic Plates Unit Test.

9. **Earth's Processes: History, Weathering, and Erosion**
    1. Weathering
        - In this section you will categorize examples of weathering as either chemical or physical.
        - In this section, you will identify and explain the role of water in physical weathering of rock.
    2. Physical Weathering, Erosion, and Water Lab
        - In this section, you will conduct an investigation in order to describe how volume and speed of water flow affect the size, shape, and flow of streams and rivers. You will draw conclusions about how Earth’s materials and its surface interact with the flow of water.
        - In this section, you will use empirical evidence, logical reasoning, and experimental and observational testing to analyze, evaluate, and critique the scientific explanation of weathering, erosion, and water.
    3. Chemical Weathering and Water

        - In this section, you will identify and explain the role of water in the chemical weathering of rock.
    4. Weathering and Erosion Impact
        - In this section, you will identify and describe how weathering and erosion act to redistribute earth materials over geologic time.
    5. Geologic Time
        - In this section, you will identify geologic time periods and the characteristics that define each one.
        - In this section, you will trace the relationship between the development of photosynthetic life, changes in the composition of Earth's atmosphere, and subsequent development of animal life.
    6. Life on Land
        - In this section, you will trace the relationship between the development of microbial life, soil formation, and the subsequent development of land plants.
    7. Evolution of New Life
        - In this section, you will trace the relationship between the evolution of corals creating reef, alterations of patterns of erosion and deposition along coastlines, and the evolution of new life forms.
    8. History, Weathering, and Erosion Unit Review
        - In this section, you will review what you have learned about history, weathering, and erosion.
    9. History, Weathering, and Erosion Unit Test.
10. **Semester Review**
    1. Semester A Review
        - In this section, you will review what you have learned about Earth's processes of weathering and erosion, and of climate and weather, as well as astronomy topics.
    2. Semester A Test

Semester B Summary:

Honors Earth Science B is designed to give the student a strong basis for understanding the world. This course is also designed to prepare the student to confidently enter and complete college-level Earth Science courses. The course consists of a varied curriculum that provides the student the opportunity to explore, compare, research, reflect, and make real-world connections. The curriculum, which meets Next Generation Science Standards (NGSS), engages students in problem solving and scientific investigation, and provides opportunities for both hands-on exploration and virtual simulation.
During this course, the student will learn about space sciences, including topics like the sun and stars, orbital motion, galaxies, and the universe. The student will also explore Earth's processes involving the atmosphere, hydrosphere, and geosphere. Topics of study include meteorology and geologic history.
In the honors-level course, the student will have opportunities to delve further into some topics and engage with enhanced assessments.

Semester B Outline

1. **Course Overview**
    1. Launch Into Earth and Space Science
        - In this section, you will identify and describe the features of lessons, useful study skills, and how assessments are handled throughout the course.

2. **Earth's Processes: Climate and Weather**
    1. The Atmosphere
        - In this section, you will identify the layers and composition of the atmosphere.
        - In this section, you will identify and describe the role of the atmosphere in reflection, absorption, storage, and redistribution of the electromagnetic energy from the sun, impacting weather and climate.
    2. Continents and Climate
        - In this section, you will identify and describe the role of continental land masses in reflection, absorption, storage, and redistribution of the electromagnetic energy from the sun, impacting weather and climate.
    3. Oceans and Climate
        - In this section, you will identify and describe the role of the ocean in reflection, absorption, storage, and redistribution of the electromagnetic energy from the sun, impacting weather and climate.
    4. Ocean Currents
        - In this section, you will identify and analyze ways that the ocean moves heat and water through currents, affecting climate and weather.
    5. Air Pressure and Weather
        - In this section, you will infer how variations in air pressure create weather.
    6. Climate Systems
        - In this section, you will use a model to describe how variations in the flow of energy into and out of Earth’s systems result in changes in climate.
    7. Weather Modeling
        - In this section, you will compare European and American weather modeling in order to correlate multiple interpretations of weather data.
    8. Climate and Weather Unit Review
        - In this section, you will review what you have learned about climate and weather.
    9. Virtual Meteorologist Lab
        - In this section, you will play the role of a meteorologist. You will collect and analyze data to make predictions about weather.
3. **Earth's Processes: Climate Change**
    1. Carbon Cycle and the Ocean
        - In this section, you will explain and model the carbon cycle.
        - In this section, you will identify and describe, using evidence, the ocean’s influence on climate change.
    2. Climate Change Over Time
        - In this section, you will categorize natural causes of climate change by the timescale over which they occurred.
    3. Climate Change Tests
        - In this section, you will identify scientific tests and tools used to measure climate changes throughout Earth’s history.
    4. Atmosphere and Climate Change
        - In this section, you will identify and use examples to explain that the composition of the atmosphere has a significant influence on climate change.
    5. Greenhouse Gases and Ozone
        - In this section, you will define greenhouse gases and identify sources.
        - In this section, you will define ozone and describe the distribution of ozone in the atmosphere
    6. Carbon Cycle Changes Lab

- In this section, you will compare and contrast carbon loads within the carbon cycle from pre-Industrial Revolution to today.

7. Fossil Fuels and Climate Change
    - In this section, you will identify and analyze how burning fossil fuels affects atmosphere composition and influences climate change.
8. Industry and Climate Change
    - In this section, you will identify and analyze how farming and industry affect atmosphere composition and influence climate change.
9. Impacts of Climate Change
    - In this section, you will identify and analyze impacts of climate change in the current century.
10. Climate Change Unit Review
    - In this section you will review what you have learned about causes and impacts of climate change.
11. Climate Change Unit Test.

4. **Natural Resources: Rocks and Minerals**
    1. Rock and Mineral Properties
        - In this section, you will identify properties of rocks and minerals.
        - In this section, you will examine how rock and mineral types and properties influence human activity.
    2. Rock and Mineral Properties Lab
        - In this section, you will evaluate the use of mineral resources based on their properties.
    3. Mining Methods
        - In this section, you will compare and contrast the environmental impacts of deep mining methods and surface mining methods.
    4. Land Reclamation
        - In this section, you will analyze land reclamation as mitigation of the environmental impact of surface mining.
    5. Health and Safety of Mining Methods
        - In this section, you will compare and contrast the health and safety of different mining methodologies.
        - In this section, you will analyze, evaluate, and make inferences from data.
    6. Metal Resources
        - In this section, you will compare and contrast the location and accessibility of various metal ores.
        - In this section, you will identify current availability and use rates of a metal resource and analyze its future availability, sustainability, and management.
        - In this section, you will discriminate between renewable and nonrenewable resources based upon their rate of formation and use
    7. Impacts of Metal Resources
        - In this section, you will compare and contrast the environmental impact and cost-benefit considerations of various methods for extracting metal resources.
    8. Metals and Minerals in Smart Devices I
        - In this section, you will identify mineral and metal resources, the availability of those resources, and the impact those resources have on human activity today.
        - In this section, you will evaluate the environmental costs of resource extraction for key resources used in technological devices.
    9. Metals and Minerals in Smart Devices II

- In this section, you will evaluate the human costs of resource extraction for key resources used in technological devices.

10. Rocks and Minerals Unit Review
    - In this section, you will review what you have learned about rocks and minerals as natural resources.
11. Supply Chain Responsibility
    - In this section, you will evaluate a large company's responsibility for supply line conditions, both human and environmental, involving rock and mineral resources.
    - In this section, you will draw inferences based on data related to promotional materials for products and services.
12. Supply Chain Responsibility Discussion

5. **Natural Resources: Land Resources**
    1. Changing Shorelines
        - In this section, you will identify several causes and effects of beach erosion and shifting shorelines.
    2. Shoreline Management Strategies
        - In this section, you will compare and contrast different strategies employed to manage beach erosion and shifting shorelines.
    3. Analyzing Shoreline Management Effectiveness
        - In this section, you will analyze the long term effectiveness of beach nourishment as a means of managing beach erosion.
    4. Farming Land Use
        - In this section, you will identify and categorize various sustainable farming practices by climate region.
        - In this section, you will demonstrae an understanding of the use and conservation of resources.
    5. Sustainable Farming Practices
        - In this section, you will analyze the costs and benefits of sustainable farming practices for a particular climate region.
    6. Soil Testing Lab
        - In this section, you will collect, organize, and analyze data about soil to make decisions about soil additives to produce the highest yield and lowest environmental impact for agricultural crops.
    7. Urban Greening
        - In this section, you will identify some benefits and challenges of green spaces in an urban environment.
        - In this section, you will evaluate a land management practice intended to address urban greening.
    8. Flooding Impacts
        - In this section, you will identify and describe the socioeconomic and environmental impacts of floods.
    9. Flood Mitigation Options
        - In this section, you will identify and describe some of the flood mitigation techniques used in different areas.
    10. Flood Mitigation Management
        - In this section, you will analyze the costs and benefits of flood mitigation options for specific sites.
    11. Land Resource Unit Review
        - In this section, you will review what you have learned about land resources.
    12. Land Resources Unit Test.

6. **Natural Resources: Energy Resources**
    1. Fossil Fuels
        - In this section, you will define fossil fuels and identify the steps in their formation.
        - In this section, you will identify the steps in processing coal, crude oil, and natural gas into usable fuel.
    2. Extraction and Processing of Fossil Fuels
        - In this section, you will compare and contrast the environmental impacts of acquiring and processing natural gas, oil, and coal.
    3. Virtual Fracking Lab
        - In this section, you will analyze the best of three sites for fracking based on potential output and environmental impacts.
        - In this section, you will communicate and apply scientific information from various sources.
        - In this section, you will communicate valid conclusions supported by data.
    4. Impacts of Fossil Fuels
        - In this section, you will identify how the use of fossil fuels impacts the atmosphere.
        - In this section, you will infer how the impact of fossil fuels on the atmosphere also impacts the hydrosphere (including the cryosphere) and the biosphere.
    5. Fossil Fuels and Humans
        - In this section, you will identify and explain, citing evidence, how the availability of fossil fuels has influenced human activity.
    6. Alternative Energy Resources
        - In this section, you will identify and describe benefits and challenges of major alternative energy resources.
    7. Alternative Energy Solutions
        - In this section, you will use cost-benefit ratios to evaluate competing design solutions for the development and use of alternative energy resources.
    8. Energy Resource Unit Review
        - In this section, you will review what you have learned about energy resources.
    9. Wind Turbine Development Lab
        - In this section, you will develop and investigate wind turbine rotor designs to determine which produces the most energy at given wind speeds.
        - In this section, you will communicate valid conclusions supported by data
7. **Natural Resources: Water as a Resource**
    1. Water as a Resource
        - In this section, you will identify and explain the relationship between water, food, and energy.
    2. Availability of Water
        - In this section, you will identify how geography and weather affect the availability of water.
        - In this section, you will examine the relationship and the impact of population growth on water supplies.
    3. Water and Climate Change
        - In this section, you will investigate the impact of climate change on water resources.
    4. Human Activity and Water
        - In this section, you will examine how the availability of water influences human activity.

5. Water Resource Controversies
    - In this section, you will identify and describe controversies over water usage in the United States.
6. Global Water Rights
    - In this section, you will identify and describe water rights issues around the globe.
7. Agriculture, Industry, and Water Resources
    In this section, you will relate the effects of industrial water usage to the availability and quality of water.
8. Water as a Resource Unit Review
    - In this section, you will review what you have learned about water as a resource.
9. Water as a Resource Unit Test.

8. **Natural Resources: Water Quality and Conservation**
    1. Water Pollution
        - In this section, you will describe the causes and effects of water pollution.
    2. Clean Water Regulations
        - In this section, you will identify and evaluate the environmental and economic impacts of clean water regulations.
    3. Investigating Water Quality Lab
        - In this section, you will organize and analyze data to draw conclusions and make predictions about the water quality impact on biodiversity in three major bodies of water: the Gulf of Mexico, the Chesapeake Bay, and the Great Lakes.
        - In this section, you will evaluate the impact of research on scietific thought, society, and public policy.
    4. Water Filtration
        - In this section, you will identify, describe, and evaluate different methods of water filtration used locally and globally.
    5. Flint's Water Crisis
        - In this section, you will identify and describe the failure of the Flint, Michigan water filtration system and its impact.
    6. Household Water Use
        - In this section, you will identify and evaluate household water conservation technologies.
    7. Aquaponics
        - In this section, you will evaluate long term and short term impacts of aquaponics on natural resources and humans.
    8. Career Profile: Hydrology
        - In this section, you will explain the work and impact of scientists in the field of hydrology
    9. Water Quality and Conservation Unit Review
        - In this section, you will review what you have learned about water quality and conservation.
    10. Water Quality and Conservation Unit Test.
9. **Semester Review**
    1. Semester Review
        - In this section, you will review what you have learned about Earth's processes in the geosphere and about natural resources.
    2. Semester B Test