

# Earth and Space Science, Semester A

## Course Overview

Science is the study of the natural world. It relies on experimentation and physical evidence to describe the natural events that occur around us. Earth and Space Science A begins with space. You will observe the phases of the Moon and use scientific evidence to understand how Earth, the Sun, and the Moon interact. You'll also examine other celestial objects in our solar system. This course describes the history of Earth through the study of energy flow, weathering and erosion, the rock cycle, and tectonic plate movements. You will apply an understanding of the three states of matter to explain the water cycle and other systems on Earth. The course ends with a discussion of Earth's natural resources.

## Course Goals

By the end of this course, you will:

- Develop and use a three-dimensional model of the Moon phases.
- Apply the scientific method to Earth and space science investigations.
- Construct a model of the solar system, and explain how its parts interact.
- Develop and use a model to describe the role of gravity in the universe.
- Explain the cyclic patterns of the seasons, the lunar phases, and eclipses of the Sun and Moon.
- Compare and contrast properties of planets, moons, stars, asteroids, and comets.
- Describe the interactions of energy between the four spheres of Earth.
- Develop a model to describe the cycling of Earth's materials during weathering and erosion.
- Explain the role of water and wind in shaping Earth's surface.
- Compare the physical properties of minerals: hardness, color, luster, and streak.
- Develop a model that describes the cycling of Earth's materials and flow of energy during the rock cycle.
- Use historical data to explain the positions of the continents and the formation of volcanoes.
- Explain particle motion of matter and the composition of substances.
- Develop a model of the water cycle and use it to explain larger geological processes.
- Use evidence to explain that natural geological processes result in uneven distribution of Earth's natural resources.

## General Skills

To participate in this course, you should be able to do the following:

- Complete basic operations with word-processing software, such as Microsoft Word or Google Docs.
- Perform online research using various search engines and library databases.
- Communicate through email and discussion boards.

*For a complete list of general skills that are required for participation in online courses, refer to the Prerequisites section of the Plato Student Orientation document, found at the beginning of this course.*

## Credit Value

Earth and Space Science A is a 0.5-credit course.

## Course Materials

- notebook
- computer with Internet connection and speakers or headphones
- Microsoft Word or equivalent
- Microsoft PowerPoint or equivalent
- equipment listed in Appendix B

## Course Pacing Guide

This course description and pacing guide is intended to help you stay on schedule with your work. Note that your course instructor may modify the schedule to meet the specific needs of your class.

## Unit 1: Earth and Space

### Summary

This unit begins with a course activity in which you will study the phases of the Moon over the course of three weeks. Afterward, you'll build a three-dimensional model of the phases. In an introductory lesson, you'll learn about the scientific method, units of measurement, and tools important to Earth scientists. You'll explore what natural systems are in the context of our solar system. You'll create and use a model to show how gravity holds planets and moons in orbit and the entire universe together. Later, you'll study the interactions between Earth, the Moon, and the Sun. You'll also analyze data to find the properties of celestial objects in space, which include planets, moons, stars, asteroids, and comets.

<b>Day</b>	<b>Activity/Objective</b>	<b>Type</b>
1 day: 1	<b>Syllabus and Plato Student Orientation</b> <i>Review the Plato Student Orientation and Course Syllabus at the beginning of this course.</i>	Course Orientation
1 day: 2	<b>Modeling the Moon Phases, Task 1</b> <i>Observe the phases of the Moon for three weeks. (One day is used for preparation.)</i>	Course Activity
4 days: 3–6	<b>What Is Science?</b> <i>Apply the scientific method to an Earth and space science investigation.</i>	Lesson
5 days: 7–11	<b>Earth and Space Systems</b> <i>Develop a model of the solar system, and explain how the parts of the solar system interact.</i>	Lesson
5 days: 12–16	<b>Gravity's Role in the Universe</b> <i>Develop and use a model to describe the role of gravity in the motions within galaxies and the solar system.</i>	Lesson
2 days: 17–18	<b>Modeling the Moon Phases, Tasks 2–3</b> <i>Develop and use a model of Moon phases to draw conclusions about the positions of the Earth, Moon, and Sun during various times of the lunar cycle. (This follows three weeks of observations).</i>	Course Activity
3 days: 19–21	<b>Interactions of the Earth, Moon, and Sun</b> <i>Develop and use models to describe the cyclic patterns of the seasons, the lunar phases, and eclipses of the Sun and Moon.</i>	Lesson
4 days: 22–25	<b>Planets and Moons</b> <i>Analyze and interpret data to compare and contrast properties of planets and moons.</i>	Lesson
4 days: 26–29	<b>Stars, Asteroids, and Comets</b> <i>Analyze and interpret data to compare and contrast properties of stars, asteroids, and comets.</i>	Lesson
4 days: 30–33	<b>Unit Activity and Discussion—Unit 1</b>	Unit Activity/ Discussion
1 day: 34	<b>Posttest—Unit 1</b>	Assessment

## Unit 2: The History of Earth

### Summary

In this unit, you will study the energy flow among the four spheres of Earth. You'll explore the effects of weathering and erosion, with a focus on how water and wind shape Earth's surface. You'll describe the rock cycle and build a model to show how magma flow can affect Earth's surface. You'll use historical data to study plate movement on Earth, and compare plate tectonic theory with past theories on continental drift. You'll use evidence from relative dating of rock layers and fossils to explain how plate movement affects Earth's surface. Finally, you'll learn about the geologic time scale, a method used to track the history of Earth.

Day	Activity/Objective	Type
4 days: 35–38	<b>Energy Flow</b> <i>Use a model to explain the flow of energy within a system, and describe the interactions of energy between the four spheres of Earth.</i>	Lesson
4 days: 39–42	<b>Modeling Weathering and Erosion</b> <i>Develop a model to describe the cycling of Earth's materials and the flow of energy during the processes of weathering and erosion.</i>	Course Activity
3 days: 43–45	<b>Weathering and Erosion</b> <i>Use evidence to explain the role of water and wind in shaping Earth's surface.</i>	Lesson
2 days: 46–47	<b>Properties of Rocks and Minerals</b> <i>Compare the physical properties of minerals, including hardness, color, luster, and streak.</i>	Course Activity
3 days: 48–50	<b>The Rock Cycle</b> <i>Develop a model that describes the cycling of Earth's materials and the flow of energy during the rock cycle.</i>	Lesson
2 days: 51–52	<b>Magma and Lava Flow</b> <i>Construct a model of a volcano, and investigate the effects of viscosity on lava flow. (Task 3 requires about a week to yield results.)</i>	Course Activity
4 days: 53–56	<b>Plate Tectonics</b> <i>Use historical data to explain the positions of the continents and the formation of volcanoes.</i>	Lesson

<b>Day</b>	<b>Activity/Objective</b>	<b>Type</b>
4 days: 57–60	<b>Earth’s Changing Surface</b> <i>Use evidence to explain how plate movement affects Earth’s surface.</i>	Lesson
1 day: 61	<b>Magma and Lava Flow</b> <i>Task 3: Analyze the rock candy model to explain how igneous rocks form.</i>	Course Activity
4 days: 62–65	<b>Unit Activity and Discussion—Unit 2</b>	Unit Activity/ Discussion
1 day: 66	<b>Posttest—Unit 2</b>	Assessment

## Unit 3: Earth Systems

### Summary

This unit begins with an exploration of matter at the atomic level and analyzes how substances, such as water, go through three phases of solid, liquid, and gas. In this unit, you will build a model of the water cycle and describe the cycles of Earth, including the carbon cycle. You’ll build a model of a watershed and examine the processes that change the distribution of Earth’s natural resources. Finally, you’ll explain how Earth’s systems affect the distribution of natural resources from place to place.

<b>Day</b>	<b>Activity/Objective</b>	<b>Type</b>
4 days: 67–70	<b>Matter and Energy</b> <i>Use models to explain particle motion of matter and the composition of mixtures, compounds, and elements.</i>	Lesson
3 days: 71–73	<b>Modeling the Water Cycle</b> <i>Develop a model of the water cycle using household tools, and use it to explain larger geological processes.</i>	Course Activity
4 days: 74–77	<b>The Cycles of Earth</b> <i>Develop a model that shows how gravity and the Sun’s energy drive the cycling of water through Earth’s systems.</i>	Lesson
2 days: 78–79	<b>Modeling a Watershed</b> <i>Construct and use a model to explain how water flow in a watershed relates to the water cycle on Earth.</i>	Course Activity
4 days: 80–83	<b>Natural Resources</b> <i>Use evidence to explain that natural geological processes result in uneven distributions of natural resources across the globe.</i>	Lesson

<b>Day</b>	<b>Activity/Objective</b>	<b>Type</b>
4 days: 84–87	<b>Unit Activity and Discussion—Unit 3</b>	Unit Activity/ Discussion
1 day: 88	<b>Posttest—Unit 3</b>	Assessment
1 day: 89	<b>Semester Review</b>	
1 day: 90	<b>End-of-Semester Test</b>	Assessment

## Appendix A: Safety Notes and Disclaimer

Each Course Activity and Unit Activity that includes a lab/experiment component will highlight key safety guidelines using the safety icon (⚠️), which appears directly in the activity. In addition to adhering to those guidelines, you must ensure that you follow these general safety practices:

- Work slowly and safely at all times, and abide by the safety notes and icons.
- Pay attention and be alert at all times. Limit any distractions.
- Keep your hands away from your nose, eyes, mouth, and skin. Wash your hands before and after experiments.
- If you don't understand something, ask a teacher or an adult before proceeding.
- Wear the required protective gear.
- Adult supervision is required for all activities involving an experiment/lab component.
- Do not perform experiments that have not been approved. Follow the procedure.
- Follow good housekeeping practices. Keep your work area clean.
- Abide by all disposal instructions and icons to protect yourself and our planet.
- Report any problems or complications to an adult.

**NOTE:** *Edmentum assumes no liability for personal injury, death, property damage, equipment damage, or financial loss resulting from the instruction included in this course.*

## Appendix B: Equipment List for Course Activities and Unit Activities

Unit	Activity Name	Task	Equipment List
1	Course Activity: Modeling the Moon Phases	Task 2: Simulating the Phases of the Moon	<ul style="list-style-type: none"> <li>• 1 small, white foam ball (or equivalent)</li> <li>• 1 pencil</li> <li>• 1 black marker</li> <li>• 1 pen</li> <li>• 1 notebook or 10 sheets of paper</li> <li>• 1 lamp with the shade removed</li> </ul>
2	Course Activity: Modeling Weathering and Erosion	Task 1: Modeling the Effects of Weathering and Erosion	<ul style="list-style-type: none"> <li>• 2 cake pans</li> <li>• 10 cups of sand</li> <li>• spray bottle with water</li> <li>• 4–6 ice cubes</li> <li>• straw</li> <li>• pair of goggles</li> <li>• blow-dryer</li> <li>• newspaper or other table covering</li> </ul>
		Task 2: Modeling Landforms	<ul style="list-style-type: none"> <li>• spatula</li> <li>• pen</li> <li>• cup</li> <li>• 12 tooth picks</li> <li>• 10 cups of sand</li> <li>• water</li> <li>• spray bottle with water</li> <li>• textbook</li> </ul>
2	Course Activity: Properties of Rocks and Minerals	Task 1: Testing the Properties of Rocks	<ul style="list-style-type: none"> <li>• 3 different rocks</li> <li>• 1 wire nail</li> <li>• 1 masonry nail</li> <li>• 1 white ceramic tile or plate (must have an unglazed side)</li> <li>• 1 copper penny</li> <li>• desk lamp</li> </ul>
		Task 2: Testing Common Household Minerals	<ul style="list-style-type: none"> <li>• ½ cup of rock salt (used for deicing)</li> <li>• ½ cup of 100% talcum powder, no perfume (baby powder)</li> <li>• 1 piece of white chalk (not molded chalk)</li> <li>• water</li> <li>• clear plastic cup</li> <li>• vinegar</li> <li>• knife</li> <li>• spoon</li> </ul>



Unit	Activity Name	Task	Equipment List
2	Course Activity: Magma and Lava Flow	Task 1: Modeling Lava Flow	<ul style="list-style-type: none"> <li>• 1 container: a clear jar, a plastic bottle, or a plastic cup</li> <li>• modeling clay, enough to mold a cone around the container</li> <li>• vinegar</li> <li>• dish soap</li> <li>• paper towels</li> <li>• baking soda</li> <li>• pan or tray large enough to hold the container and modeling clay</li> <li>• water</li> <li>• goggles</li> <li>• plastic gloves</li> <li>• plastic apron</li> </ul>
		Task 2: Modeling Lava Viscosity	<ul style="list-style-type: none"> <li>• tablespoon or graduated cylinder</li> <li>• 15 milliliters (1 tablespoon) each of water, cooking oil, and light corn syrup</li> <li>• 1 small block about 4 centimeters (1.5 inches) in height, or a stack of books</li> <li>• nonstick cookie sheet, at least 25 centimeters (10 inches) long</li> <li>• paper towels</li> <li>• stopwatch or timer</li> <li>• metric ruler</li> <li>• calculator</li> </ul>
		Task 3: The Rock Candy Experiment	<ul style="list-style-type: none"> <li>• wooden skewer or chopstick</li> <li>• 2 clothespins</li> <li>• clear jar or glass</li> <li>• 4 cups sugar</li> <li>• 2 cups water</li> <li>• saucepan or small pot</li> <li>• spoon</li> <li>• paper towels</li> <li>• stove or electric hot plate</li> <li>• oven mitt</li> <li>• magnifying glass or cell phone camera that can zoom</li> </ul>

Unit	Activity Name	Task	Equipment List
2	Unit Activity: The History of Earth	Task 1: Modeling Rock Weathering	<ul style="list-style-type: none"> <li>• 1 small balloon</li> <li>• 1 cup of plaster of Paris</li> <li>• 16-ounce freezer-safe plastic container</li> <li>• 8-ounce plastic cup</li> <li>• water at room temperature</li> <li>• 2 effervescent antacid tablets</li> <li>• stopwatch or timer</li> <li>• knife or metal spoon</li> </ul>
		Task 2: Testing Soil Composition	<ul style="list-style-type: none"> <li>• 3 cups of soil collected from your garden, a forest, a riverbed, or purchased from a garden store</li> <li>• 3 identical glasses (about 8 ounces each)</li> <li>• spoon</li> <li>• small bucket</li> <li>• ½ cup of vinegar</li> <li>• 3 tablespoons of baking soda mixed with 1 cup of water</li> <li>• fine mesh strainer or a colander lined with a large paper coffee filter</li> <li>• ½ cup of sand</li> <li>• ½ cup of pebbles</li> <li>• tablespoon</li> <li>• measuring cup</li> </ul>
3	Course Activity: Modeling the Water Cycle	Task 1: Build a Model of the Water Cycle	<ul style="list-style-type: none"> <li>• oven mitts</li> <li>• 1 clear mixing bowl or flat-bottomed container, heat-resistant so it does not melt</li> <li>• 1 small cup, heavy enough so it does not float</li> <li>• teakettle with hot water</li> <li>• stove or electric hot plate</li> <li>• plastic wrap</li> <li>• 8–12 ice cubes</li> </ul>
		Task 2: Evaporation and Area of a Surface	<ul style="list-style-type: none"> <li>• 1 tall glass or a tall, narrow vase</li> <li>• 1 shallow plastic container</li> <li>• water</li> <li>• measuring cup</li> </ul>

Unit	Activity Name	Task	Equipment List
3	Course Activity: Modeling a Watershed	Task 1: Modeling Water Flow in a Watershed	<ul style="list-style-type: none"> <li>• permanent marker (black or dark blue)</li> <li>• aluminum foil</li> <li>• scissors</li> <li>• water in a spray bottle</li> <li>• 8–10 cups peat moss or topsoil</li> <li>• clear container or small aquarium approximately 10 x 12 inches and 4 inches deep</li> <li>• 15 cups pea gravel, aquarium gravel, or small stones</li> </ul>
		Task 2: Modeling Groundwater Contamination	<ul style="list-style-type: none"> <li>• cylinder container about 4 to 5 inches in diameter</li> <li>• pitcher of water</li> <li>• 3–5 cups pea gravel, aquarium gravel, or small stones</li> <li>• 3–5 cups peat moss or topsoil</li> <li>• screen material (the width should nearly match the height of the container)</li> <li>• 2 large drinking cups</li> <li>• food coloring</li> <li>• tape</li> </ul>