Syllabus

Earth and Space Science, Semester B

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 B explains how convection shapes the weather, climate, and movement of ocean currents on Earth. The course takes an in-depth look at climate change and the greenhouse effect in Earth's atmosphere. It draws attention to severe weather events and describes how technology plays a role in keeping communities safe. It also explores how the growing human population poses challenges for the distribution of Earth's natural resources today and in the future.

Course Goals

By the end of this course, you will:

- Use modeling of ocean currents to explain geological processes in the ocean.
- Describe how the uneven heating of Earth affects its weather and climate.
- Use data from weather maps to explain the motion of air masses.
- Use data collection tools to draw conclusions about current weather conditions.
- Collect data to show how the mixing of air masses causes weather changes.
- Develop and use a model to explain how landforms affect the weather and climate.
- Model the greenhouse effect using temperature as a dependent variable.
- Explain how current trends in carbon dioxide levels affect Earth's climate.
- Analyze evidence of climate change, and present your findings.
- Determine the effectiveness of different methods of addressing climate change.
- Build a model of an ocean, and design features to protect shorelines from a tsunami.
- Use historical evidence of natural hazards to determine the disaster risk of a region.
- Build a seismograph model and engineer a model building that can withstand an earthquake.
- Analyze data to explain how technology can limit the risk of damage from natural hazards.
- Explain how the growing number of humans and their use of natural resources affect Earth's systems.
- Design methods to reduce the negative impact that humans have on the environment.

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 B 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: The Weather and Climate

Summary

In this unit, you will model ocean currents and convection. Then you'll learn about the effect that the uneven heating of Earth has on different materials and how this leads to different climates on Earth. You will explore the relationship between weather and the movement of air and water in Earth's atmosphere. After building your own data collection tools, you will use them to gather data on current weather conditions. You'll see how professional data collection tools track weather changes and the properties of air masses. At the end of the unit, you will explore how landforms affect weather and climate and compare the weather and climate of two locations at the same latitude.

Day	**Activity/***Objective*	Type
1 day: 1	**Syllabus and Plato Student Orientation** *Review the Plato Student Orientation and Course Syllabus at the beginning of this course.*	Course Orientation
3 days: 2–4	**Modeling Ocean Currents** *Develop a model of ocean currents using household tools, and explain how your model relates to larger geological processes in the ocean.*	Course Activity
5 days: 5–9	**The Uneven Heating of Earth** *Develop and use a model to show how the uneven heating of Earth determines its climates.*	Lesson
5 days: 10–14	**The Mechanics of Weather** *Use data from weather maps to explain the motion of air masses.*	Lesson
3 days: 15–17	**Tools for Collecting Weather Data** *Use data collection tools to draw conclusions about current weather conditions. (Task 1 requires gathering a week's worth of weather data.)*	Course Activity
5 days: 18–22	**Collecting Data about Weather** *Collect data to show how the mixing of air masses causes weather changes.*	Lesson
4 days: 23–26	**Earth's Structures and Climate** *Develop and use a model to explain how landforms affect regional climates.*	Lesson
1 day: 27	**Tools for Collecting Weather Data, Follow Up** *Task 1: Analyze temperatures collected in sunlight and shade.*	Course Activity
5 days: 28–32	**Unit Activity and Discussion—Unit 1**	Unit Activity/ Discussion
1 day: 33	**Posttest—Unit 1**	Assessment

Unit 2: Earth's Changing Climate

Summary

In this unit, you will model the greenhouse effect using temperature as a dependent variable. Then you'll learn about the processes that fuel climate change. After researching the causes of climate change, you will deliver your findings in a media presentation. You'll study the evidence of climate change and learn how to pose formal

questions to uncover truths about it. You'll also investigate commercial and residential methods and technologies for addressing climate change. In the unit activity, you will explore the effects of climate change on Earth's oceans.

Day	**Activity/***Objective*	Type
3 days: 34–36	**Modeling the Greenhouse Effect** *Model the greenhouse effect using temperature as a dependent variable.*	Course Activity
4 days: 37–40	**The Mechanics of Climate Change** *Use data of carbon dioxide levels to explain how current trends affect Earth's climate.*	Lesson
5 days: 41–45	**Presenting Facts about Climate Change** *Analyze evidence of climate change, and develop a presentation that communicates the causes of this change.*	Course Activity
4 days: 46–49	**Evidence of a Changing Climate** *Ask questions to clarify evidence of the causes of changing global temperatures over the past century.*	Lesson
4 days: 50–53	**Confronting Climate Change** *Develop scientific questions to determine the effectiveness of different methods of addressing climate change, including using alternative fuels, recycling, and preserving natural habitats.*	Lesson
4 days: 54–57	**Unit Activity and Discussion—Unit 2**	Unit Activity Discussion
1 day: 58	**Posttest—Unit 2**	Assessment

Unit 3: Human Impacts on Earth

Summary

In this unit, you will build a model of a tsunami and design ways to protect communities against damage. You'll learn about the causes of natural hazards on Earth, such as tornadoes, hurricanes, and floods. In another hands-on activity, you'll build a model seismograph and engineer a model building that can withstand an earthquake. Then you will explore how technology can limit the effects of natural hazards and how the growing human population and their use of natural resources affect Earth's systems. At the end of this unit, you'll examine design methods that reduce the negative impact that humans have on the environment.

Day	**Activity/***Objective*	Type
3 days: 59–61	**Modeling Tsunamis** *Construct a model of an ocean, and design features for houses along the shore to withstand the force of a tsunami.*	Course Activity
4 days: 62–65	**Natural Hazards** *Use historical evidence of natural hazards to determine the disaster risk for a region.*	Lesson
3 days: 66–68	**Earthquake Tools and Engineering** *Build a seismograph model and engineer a model building that can withstand an earthquake.*	Course Activity
5 days: 69–73	**Technology and the Changing Earth** *Analyze and interpret data on natural hazards to explain how technology can limit the risk of damage.*	Lesson
5 days: 74–78	**The Human Population** *Explain how the growing number of humans and their use of natural resources affect Earth's systems.*	Lesson
4 days: 79–82	**Taking Care of Our Planet** *Design methods to reduce the negative impact that humans have on the environment.*	Lesson
5 days: 83–87	**Unit Activity and Discussion—Unit 3**	Unit Activity/ Discussion
1 day: 88	**Posttest—Unit 3**	Assessment
1 day: 89	**Semester Review**	
1 day: 90	**End-of-Semester Test**	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 Ocean Currents	Task 1: Evaporation of Salt Water	• 1 sheet of colored construction paper • clear plastic or glass container, just large enough to hold the construction paper • large drinking glass • 3 teaspoons of salt • teaspoon • ¼ cup water at room temperature
		Task 2: Salinity of Water and Density	• food coloring (1 color) • 1-cup measuring cup • 1 sheet of colored construction paper • clear plastic or glass container, large enough to hold 4 cups of water • drinking glass • 8 teaspoons salt • teaspoon • 4 cups water at room temperature
		Task 3: Build a Model of the Ocean Currents	• 2 drinking glasses or small snack bowls • food coloring (2 different colors) • measuring cup • clear plastic or glass container, about 6 × 10 inches and 2.5 inches deep • water (1 cup hot, 1 cup cold, and enough room temperature water to fill half the container)
1	Course Activity: Tools for Collecting Weather Data	Task 1: Monitoring Temperature in Sun and Shade	• 2 alcohol thermometers (preferably the same model). Double-check that the thermometers measure the range of temperatures your area regularly experiences.

Unit	Activity Name	Task	Equipment List
		Task 2: Building a Sling Psychrometer	• plastic soda or water bottle • scissors or knife • plastic soda/water bottle • string or yarn (1.5-foot) • masking tape or duct tape • 2 alcohol (not mercury) thermometers • cotton medical gauze • water • rubber band • safety goggles
		Task 3: Building an Anemometer	• two plastic straws • pencil with eraser • thumbtack or pushpin • stapler with staples • 4 paper drinking cups (3 ounce, bathroom-cup size) • permanent marker • stopwatch, timer, or cell phone stopwatch app • fan (optional) • string • scissors • ruler or tape measure
2	Course Activity: Modeling the Greenhouse Effect	Task 1: Modeling the Greenhouse Effect	• 2 empty two-liter plastic bottles (or similar-sized plastic containers), rinsed • 2 thermometers (not mercury) that will each fit inside a bottle • lamp with a 150-watt incandescent bulb (if direct sunlight is not available) • measuring cup • soil (4 cups) • roll of plastic wrap • scissors or utility knife • clear tape • 1 rubber band • 6–8 ice cubes (all the same size)

Unit	Activity Name	Task	Equipment List
		Task 2: Carbon Dioxide's Effects on Temperature	• 2 empty two-liter plastic bottles (or similar-sized plastic containers with tight-sealing lids), rinsed • 2 thermometers (not mercury) • 1 liter of water at room temperature • a ball of clay, about 2 inches in diameter (needed only if using two-liter plastic bottles) • 2 sodium bicarbonate tablets (such as Alka-Seltzer) • lamp with a 150-watt incandescent bulb (if direct sunlight is not available)
2	Unit Activity: Earth's Changing Climate	Task 1: Testing the Effect of Temperature on Carbon Dioxide Solubility in Water	• 2 (1-quart) glass bowls • hot tap water and cold tap water • 2 colors of food coloring • spoon • 2 tall, narrow drinking glasses or vases (about 14 inches high) • 2 effervescent antacid tablets
		Task 2: Testing the Effects of CO_2 on the pH of Water	• 1 measuring cup (2 cup or larger) • 1 cup of water at room temperature • pH test strips • plastic straw
		Task 3: Testing the Effects of Acidification on Seashells	• 3 (16-ounce) clear plastic cups • 2 cups of water at room temperature • 2 tablespoons of table salt • spoon • 1 cup of vinegar • pH test strips • 3 seashells (any size) or 6 tablespoons of seashell pieces
3	Course Activity: Modeling Tsunamis	Task 1: Modeling Tsunamis	• 1 piece of card stock, 8 × 11 inches • 1 sheet of printer paper, 8 × 11 inches • 1 piece of cardboard, 8 × 11 inches • long, shallow plastic container, around 30 × 15 inches and 5 inches deep • tape or glue • small plate or tray • water • ruler • small bag of sand, about 2 pounds

Unit	Activity Name	Task	Equipment List
		Task 2: Protecting Your Model Village from Tsunamis	• 2 pieces of printer paper, 8 × 11 inches • 2 pieces of card stock, 8 × 11 inches • 1 piece of cardboard, 8 × 11 inches • a long, shallow plastic container, around 30 × 15 inches and 5 inches deep • tape or glue • small plate or tray • water • ruler • small bag of sand, about 2 pounds
3	Course Activity: Earthquake Tools and Engineering	Task 1: Building a Seismograph	• cereal box or similar-size cardboard box • scissors • 6- or 12-inch ruler • roll of 2-inch-wide calculator paper • plastic, paper, or foam coffee cup with a tight-fitting lid • pencil • small wad of clay (optional) • about 2 feet of string • ½ cup of sand or a material of similar weight • sheet of cardboard about the same size as the front of the cereal box or larger • glue
		Task 2: Designing a Building to Withstand an Earthquake	• small box of toothpicks • 10.5-ounce bag of mini marshmallows
3	Unit Activity: Human Impacts on Earth	Task 1: Designing a Solar Oven	• 2 thermometers that reach at least 120°F (50°C) • 2 boxes of any size that the thermometer will fit inside Optional design materials: • plastic wrap • aluminum foil • paper • scissors or a box cutter • ruler • masking tape or clear packaging tape • glue