Syllabus

Physical Science, Semester B

Course Overview

Science is the study of the natural world. It relies on experimentation and evidence to describe the natural events that occur around us. Physical science is the study of matter and energy. In Physical Science B, you'll investigate gravitational, electric, and magnetic force fields and identify factors that determine their strength. You'll apply concepts of electricity and magnetism to explain how motors, generators, and electromagnets work. You will discuss energy transformations in objects and systems, including how heat flows between objects that are at different temperatures. You will model how sound and light travel as waves and how they interact with different forms of matter. Finally, you'll explore how electromagnetic waves help us communicate with one another and collect information about the universe.

Course Goals

By the end of this course, you will be able to do the following:

- Construct arguments that support the law of universal gravitation.
- Identify factors that determine the strength of forces created by electric charge and by magnets.
- Describe how current flows through series and parallel electric circuits.
- Differentiate between electromagnets, generators, and motors.
- Identify different forms of energy and discuss how energy flows through systems.
- Explain how the position of an object in a force field relates to its potential energy.
- Compute the kinetic energy of moving objects.
- Define the law of conservation of energy.
- Analyze models that show how heat flows between objects at different temperatures.
- Design, build, and test a device that involves transfer of thermal energy.
- Classify waves based on their characteristics and use mathematics to model them.
- Interpret models of interactions of light and matter.
- Assess how light from objects in space provides information about their temperature, composition, and distance.
- Compare and contrast the use of digital and analog signals in communication.

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 participate in 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

Physical Science B is a 0.5-credit course.

Course Materials

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

Course Pacing Guide

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

Unit 1: Force Fields

Summary

This unit focuses on gravitational, electric, and magnetic force fields. In this unit, you will use evidence to explain the force of gravity around you and understand how the strength (force) of gravity depends on an object's mass. You'll also identify factors that determine the strength of forces created by electric charge and by magnets. You'll model series and parallel circuits and explain how a current flows through them. You'll apply your understanding of electricity and magnetism to classify devices as electromagnets, generators, and motors. You'll describe the cause of Earth's magnetic field and explain how it protects our atmosphere from charged particles. Finally, in a real-world application, you'll calculate how much electricity you use in your home and propose ways to conserve electricity.

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
4 days: 2–5	**Gravity** *Use evidence to construct arguments supporting the claim that gravity is attractive and that its strength depends on the mass of objects.*	Lesson
4 days: 6–9	**Electricity and Magnetism** *Identify factors that determine the strength of forces created by electric charge and by magnets.*	Lesson
3 days: 10–12	**Finding Evidence of Force Fields** *Carry out an investigation to report evidence of force fields acting between objects.*	Course Activity
4 days: 13–16	**Electric Circuits** *Identify series and parallel circuits, and explain how current flows through them.*	Lesson
3 days: 17–19	**Conserving Electricity at Home** *Calculate how much electricity you use in your home and propose ways to save electricity.*	Course Activity
5 days: 20–24	**Electromagnets, Generators, and Motors** *Differentiate between electromagnets, generators, and motors, and describe how they work.*	Lesson
5 days: 25–29	**Unit Activity and Discussion—Unit 1**	Unit Activity/ Discussion
1 day: 30	**Posttest—Unit 1**	Assessment

Unit 2: Energy

Summary

This unit focuses on forms of energy and energy transformations. In this unit, you'll construct energy flow diagrams to describe the movement of energy through one or more systems. You'll explain how the position of an object in a force field relates to its potential energy. You'll also discuss how speed and mass affect the kinetic energy of an object. You'll investigate how heat flows between objects at different temperatures and how that process relates to thermal energy. Finally, you will apply heat transfer ideas as you design, construct, test, and modify a device that minimizes or maximizes thermal energy transfer.

Day	**Activity/***Objective*	Type
3 days: 31–33	**Describing the Movement of Energy** *For an event that involves energy, describe what the energy did, where it came from, and where it went.*	Course Activity
4 days: 34–37	**Forms of Energy** *Identify examples of different forms of energy.*	Lesson
3 days: 38–40	**Investigating Gravity and Potential Energy** *Design an investigation that explores the relationship between position and gravitational potential energy.*	Course Activity
4 days: 41–44	**Potential Energy** *Explain how the position of an object in a force field is related to the amount of its potential energy.*	Lesson
4 days: 45–48	**Kinetic Energy** *Explain how the speed and mass of a moving object are related to the object's kinetic energy.*	Lesson
4 days: 49–52	**Energy Transfer and Transformation** *Explain that when the kinetic energy of an object changes, energy is transferred to or from the object.*	Lesson
5 days: 53–57	**Investigating Temperature Changes in Materials** *Plan and carry out an investigation to identify factors that affect an object's change in temperature.*	Course Activity

4 days: 58–61	**Thermal Energy and Heat** *Analyze models that illustrate how heat flows between objects at different temperatures.*	Lesson
5 days: 62–66	**Unit Activity and Discussion—Unit 2**	Unit Activity/ Discussion
1 day: 67	**Posttest—Unit 2**	Assessment

Unit 3: Waves

Summary

This unit focuses on the characteristics and applications of waves. In this unit, you'll learn the parts of a wave and how to represent waves mathematically. You'll explain how visible light, one type of electromagnetic wave, interacts with matter and develop a model to describe what you see. You will assess how light from objects in space gives information about their temperature, composition, and distance. Finally, you'll study a real-world application of waves as you compare and contrast the use of digital and analog signals in communication.

Day	**Activity/***Objective*	Type
4 days: 68–71	**Exploring Waves** *Classify waves based on their characteristics, and use mathematics to model them.*	Lesson
3 days: 72–74	**Describing How Light Interacts with Matter** *Observe interactions of light and matter and develop a model that describes your observations.*	Course Activity
4 days: 75–78	**Interactions of Light with Matter** *Use models to describe interactions of light and matter.*	Lesson
4 days: 79–82	**Light and Information About the Universe** *Assess how light from objects in space provides information about their temperature, composition, and distance.*	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: Finding Evidence of Force Fields	Task 1: Gravitational Force Fields	• safety goggles • root vegetable, such as a large carrot or potato • two metal forks • an edge or thin wall to freely balance the vegetable on, such as a cardboard box with its flaps taped down
		Task 2: Electric Force Fields	• about 127 cm (50 inches) clear sticky tape • tabletop or desktop [optional: to protect the tabletop, use clean scrap wood or smooth cardboard 25 cm (10 inches) square]
		Task 3: Magnetic Force Fields	• 1 compass (available wherever science lab supplies, educational science materials, or party supplies are sold) • 1 bar magnet (must be strong enough to move the compass) • 2 pieces of white paper, partially overlapped and taped together to make an 11-inch square • pen or pencil
1	Course Activity: Conserving Electricity at Home	Task 1: Power Usage	• a small electric appliance that you can unplug to observe the appliance tag
		Task 2: Electrical Costs	None
		Task 3: Energy-Saving Tips	None
1	Unit Activity: Force Fields	Task 1: Planning and Creating a Presentation	None

Unit	Activity Name	Task	Equipment List
2	Course Activity: Describing the Movement of Energy	Task 1: Pendulum	• goggles • golf ball (or similar size ball) • plastic sandwich bag • tape • hole punch or scissors • 1 foot of string • metal lid or pan
		Task 2: Toy Car Launcher	• goggles • half-gallon paper milk carton (or sturdy box of similar size and weight) • scissors • hole punch (or use tip of scissors) • rubber band • paper clips • toy car (or a small ball)
		Task 3: Heat Spiral	• goggles • card stock or a thin piece of cardboard, about 8 inches square • scissors • pencil • hole punch (or use tip of scissors) • 15 inches of thread or thin string • meterstick or yardstick (or stick of similar length) • medium size pot of water • heat source (stove or hot plate)
2	Course Activity: Investigating Gravity and Potential Energy	Task 1: Planning	• goggles • golf ball or any other small, bouncy ball • 1 square meter of floor space next to a table or desk

Unit	Activity Name	Task	Equipment List
		Task 2: Hypothesis and Data Collection	• goggles • golf ball or any other small, bouncy ball • meterstick or yardstick • tape • 1 square meter of floor space next to a table or desk • mat, small rug, or stool to sit on while observing the bouncing ball
		Task 3: Analyze and Extend	data table from task 2
2	Course Activity: Investigating Temperature Changes in Materials* *Task 2 of this activity may need to be carried out in a school lab.	Task 1: Planning	None
		Task 2: Conducting the Experiment	• goggles • heat mitts • 2 trays of ice cubes • water • 50 g of free-flowing dry sand (about enough to fill one-fourth of a small glass) • mass scale that measures up to 500 g • 3 thermometers that measure between 0°C and 80°C (32°F to 176°F) • heat source (stove or hot plate) • medium-sized pot • 2 large, flat-bottom tubs with covers (or use plastic wrap or foil to cover) • 3 containers for cold water and sand (100 mL beakers, glasses, or mugs) • 3 containers for hot water (200 mL beakers, 250 mL beakers, or mugs) • 3 mixing containers (300 mL beakers or large mugs)
2	Unit Activity: Energy	Task 1: Thermal Conductivity Factors	None

Unit	Activity Name	Task	Equipment List
		Task 2: Design, Build, and Test a Conductor or Insulator	• safety goggles • thermometer that measures between 0°C and 30°C (32°F to 86°F) • ½- and 1-cup measuring cups (1 cup is the same as 16 tablespoons; a tablespoon is about the size of a soup spoon) • foam cup • ceramic cup • paper cup • stainless steel cup • cotton wool • aluminum foil • cardboard • scissors • tape • plastic bags • egg carton • container that can hold up to 4 cups (1 quart) • water • 1 tray of ice cubes
3	Course Activity: Describing How Light Interacts with Matter	Task 1: Light Reflection and Absorption	• room that can be made completely dark • three pieces of construction paper: one red, one blue, and one green • masking tape • flashlight
		Task 2: Light Transmission	• room that can be made completely dark • piece of white paper • masking tape • flashlight • 4-inch square piece of clear plastic wrap (or a square cut from the side of a food storage bag) • 4-inch square piece of waxed paper (or a square of sheer fabric)

Unit	Activity Name	Task	Equipment List
		Task 3: Light Refraction	• clear drinking glass or resealable plastic bag • water • pencil • small container or bowl that is opaque (not transparent) • penny • masking tape
3	Unit Activity: Waves	Task 1: Writing a Research Paper	None