**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:

**Syllabus**

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.

1

© 2016 EDMENTUM, INC.

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

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**

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.

Complete basic operations with word processing software, such as Microsoft Word or Google Docs.

Perform online research using various search engines and library databases.

notebook

computer with Internet connection and speakers or headphones

Microsoft Word or equivalent

Microsoft Power Point or equivalent

2

**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

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

Lesson

4 days: 6–9

**Electricity and Magnetism** *Identify factors that determine the strength of forces created by electric charge and by magnets.*

Lesson

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

Course Activity

4 days: 13–16

**Electric Circuits** *Identify series and parallel circuits, and explain how current flows through them.*

Lesson

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

Course Activity

5 days: 20–24

**Electromagnets, Generators, and Motors** *Differentiate between electromagnets, generators, and motors, and describe how they work.*

Lesson

Lesson

5 days: 25–29

**Unit Activity and Discussion—Unit 1** Unit Activity/

Discussion

1 day: 30

**Posttest—Unit 1** Assessment

3

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

Course Activity

4 days: 34–37

**Forms of Energy** *Identify examples of different forms of energy.*

Lesson

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

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

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

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

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

Course Activity

4

4 days: 58–61

**Thermal Energy and Heat** *Analyze models that illustrate how heat flows between objects at different temperatures.*

Lesson

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

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

Course Activity

4 days: 75–78

**Interactions of Light with Matter** *Use models to describe interactions of light and matter.*

Lesson

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

Lesson

5 days: 83–87

**Unit Activity and Discussion—Unit 3** Unit Activity/

Discussion

1 day: 88

**Posttest—Unit 3** Assessment

5

**Semester Review**

1 day: 90

**End-of-Semester Test** Assessment

1 day: 89

**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:

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.*

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.

6

**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

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

None Creating a Presentation

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

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

7

safety goggles

root vegetable, such as a large carrot or potato

two metal forks

about 127 cm (50 inches) clear sticky tape

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

**Unit Activity Name Task Equipment List**

2 Course Activity:

Describing the Movement of Energy

Task 1: Pendulum

heat source (stove or hot plate)

goggles

goggles

golf ball (or similar size ball)

plastic sandwich bag

2 Course Activity:

Investigating Gravity and Potential Energy

Task 1: Planning

metal lid or pan

goggles

goggles

golf ball or any other small, bouncy ball

Task 2: Toy Car Launcher

toy car (or a small ball)

goggles

half-gallon paper milk carton (or sturdy box of similar size and weight)

Task 3: Heat Spiral

8

tape

goggles

hole punch or scissors

1 foot of string

scissors

hole punch (or use tip of scissors)

rubber band

paper clips

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

1 square meter of floor space next to a table or desk

**Unit Activity Name Task Equipment List**

Task 2: Hypothesis and Data Collection

mat, small rug, or stool to sit on while observing the bouncing ball

goggles

golf ball or any other small, bouncy 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

3 mixing containers (300 mL beakers or large mugs)

goggles

goggles

heat mitts

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)

2 Unit Activity: Energy Task 1: Thermal

Conductivity Factors

None

9

meterstick or yardstick

tape

1 square meter of floor space next to a table or desk

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)

**Unit Activity Name Task Equipment List**

Task 2: Design, Build, and Test a Conductor or Insulator

1 tray of ice cubes

safety goggles

thermometer that measures between 0°C and 30°C (32°F to 86°F)

3 Course Activity:

Describing How Light Interacts with Matter

Task 1: Light Reflection and Absorption

flashlight

room that can be made completely dark

room that can be made completely dark

room that can be made completely dark

three pieces of construction paper: one red, one blue, and one green

three pieces of construction paper: one red, one blue, and one green

Task 2: Light Transmission

10

1⁄2- and 1-cup measuring cups (1 cup is the same as 16 tablespoons; a tablespoon is about the size of a soup spoon)

room that can be made completely dark

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

masking tape

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

masking tape

clear drinking glass or resealable plastic bag

3 Unit Activity: Waves Task 1: Writing a

Research Paper

None

11

water

pencil

small container or bowl that is opaque (not transparent)

penny