Syllabus

# Science 7, Semester B

## Course Overview

Science is the study of the natural world. It relies on investigations and evidence to describe the natural events that occur around us. Science 7B is about matter and energy. It discusses chemical changes that occur in matter, and it teaches how to identify different forms of energy. The course also covers force fields and the factors that affect their strength. In the first unit, you'll apply the law of conservation of energy to the products and reactants in a chemical reaction. In the second unit, you'll be introduced to gravitational, electric, and magnetic force fields. In the third unit, you'll learn more about energy transformations in objects and systems as you study kinetic energy, potential energy, and thermal energy.

## Course Goals

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

- Compare properties of reactants and products to determine whether a chemical reaction has occurred.
- Develop a model to show that atoms are conserved in chemical reactions.
- Describe energy changes that occur during a chemical reaction.
- Describe the properties and uses of synthetic materials and how they affect society.
- 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, test, and modify a device that relies on a transfer of thermal energy.

# 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.
- Complete basic operations with presentation software, such as Microsoft PowerPoint or Google Docs presentation.
- 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

Science 7B 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: Chemical Reactions

**Summary**

This unit focuses on chemical reactions between substances. You'll learn to determine whether a chemical reaction has occurred by comparing properties of reactants and products. You'll also develop a model to show that atoms are conserved in chemical reactions and describe the energy changes that have taken place. You'll apply ideas on chemical reactions to design, construct, test, and modify a device that releases or absorbs thermal energy. Finally, you'll see how inventors use chemical reactions to create synthetic materials and how the products affect society.

| Day | Activity/*Objective* | Type |
|---|---|---|
| 1 day: 1 | **Syllabus and Plato Student Orientation**<br>*Review the Plato Student Orientation and Course Syllabus at the beginning of this course.* | Course Orientation |
| 2 days: 2–3 | **Observing a Chemical Reaction**<br>*Plan and carry out an investigation to compare properties of reactants and products in a chemical reaction.* | Course Activity |
| 4 days: 4–7 | **Properties and Chemical Reactions**<br>*Determine whether a chemical reaction has occurred by comparing properties of reactants and products.* | Lesson |
| 4 days: 8–11 | **Atoms in Chemical Reactions**<br>*Develop a model that shows that atoms are conserved in chemical reactions.* | Lesson |
| 4 days: 12–15 | **Energy Changes in Chemical Reactions**<br>*Describe energy changes that occur during a chemical reaction.* | Lesson |
| 4 days: 16–19 | **Building a Device That Uses Energy from Chemical Reactions**<br>*Design, construct, test, and modify a device that uses a chemical reaction to release or absorb thermal energy.* | Course Activity |
| 3 days: 20–22 | **Synthetic Materials**<br>*Describe the properties and uses of synthetic materials and how they affect society.* | Lesson |
| 4 days: 23–26 | **Unit Activity and Discussion—Unit 1** | Unit Activity/ Discussion |
| 1 day: 27 | **Posttest—Unit 1** | Assessment |

# Unit 2: 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 |
|---|---|---|
| 3 days: 28–30 | **Gravity**<br>*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: 31–34 | **Electricity and Magnetism**<br>*Identify factors that determine the strength of forces created by electric charge and by magnets.* | Lesson |
| 3 days: 35–37 | **Finding Evidence of Force Fields**<br>*Carry out an investigation to report evidence of force fields acting between objects.* | Course Activity |
| 4 days: 38–41 | **Electric Circuits**<br>*Identify series and parallel circuits, and explain how current flows through them.* | Lesson |
| 3 days 42–44 | **Conserving Electricity at Home**<br>*Calculate how much electricity you use in your home, and propose ways to save electricity.* | Course Activity |
| 4 days: 45–48 | **Electromagnets, Generators, and Motors**<br>*Differentiate between electromagnets, generators, and motors, and describe how they work.* | Lesson |

| Day | Activity/*Objective* | Type |
|---|---|---|
| 4 days: 49–52 | **Unit Activity and Discussion—Unit 2** | Unit Activity/ Discussion |
| 1 day: 53 | **Posttest—Unit 2** | Assessment |

# Unit 3: 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: 54–56 | **Describing the Movement of Energy**<br>*For an event that involves energy, describe what the energy did, where it came from, and where it went.* | Course Activity |
| 3 days: 57–59 | **Forms of Energy**<br>*Identify examples of different forms of energy.* | Lesson |
| 3 days: 60–62 | **Investigating Gravity and Potential Energy**<br>*Design an investigation that explores the relationship between position and gravitational potential energy.* | Course Activity |
| 4 days: 63–66 | **Potential Energy**<br>*Explain how the position of an object in a force field is related to the amount of its potential energy.* | Lesson |

| Day | **Activity/***Objective* | Type |
|---|---|---|
| 4 days<br>67–70 | **Kinetic Energy**<br>*Explain how the speed and mass of a moving object are related to the object's kinetic energy.* | Lesson |
| 4 days<br>71–74 | **Energy Transfer and Transformation**<br>*Explain that when the kinetic energy of an object changes, energy is transferred to or from the object.* | Lesson |
| 5 days<br>75–79 | **Investigating Temperature Changes in Materials**<br>*Plan and carry out an investigation to identify factors that affect an object's change in temperature.* | Course Activity |
| 4 days<br>80–83 | **Thermal Energy and Heat**<br>*Analyze models that illustrate how heat flows between objects at different temperatures.* | Lesson |
| 4 days:<br>84–87 | **Unit Activity and Discussion—Unit 3** | Unit Activity/ Discussion |
| 1 day:<br>88 | **Posttest—Unit 3** | Assessment |
| 1 day<br>89 | **Semester Review** | |
| 1 day<br>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: Observing a Chemical Reaction | Task 1: Deciding Whether a Reaction Occurs | • safety goggles<br>• ½-teaspoon measuring spoon<br>• 1 teaspoon baking soda<br>• 2 large containers of similar size and shape; must hold at least 2 cups (suggestion: tall glasses, large mugs, or bowls)<br>• pen<br>• sticky notes for labeling<br>• 2 small containers (suggestion: small cups or snack bowls)<br>• ¼-cup measuring cup (equal to 4 tablespoons)<br>• ¼ cup water at room temperature (set out 1 hour before the activity so it reaches room temperature)<br>• ¼ cup white vinegar at room temperature |
| | | Task 2: Changing Ratios of Reactants | • safety goggles<br>• baking soda<br>• white vinegar at room temperature<br>• set of measuring spoons<br>• 1-cup graduated measuring cup<br>• 3 or more large containers of similar size and shape; must hold at least 2 cups (suggestion: tall glasses, large mugs, or bowls)<br>• tray, rimmed cookie sheet, or large sink to hold containers and contain overflow<br>• paper towels |

| Unit | Activity Name | Task | Equipment List |
|---|---|---|---|
| 1 | Course Activity: Building a Device That Uses Energy from Chemical Reactions | Task 1: Carry Out an Endothermic Reaction | • safety goggles<br>• measuring cup for liquids<br>• water<br>• small container (about 1 cup)<br>• thermometer that measures between 0°C and 30°C (32°F and 86°F)<br>• 1-teaspoon measuring spoon (or a regular-size spoon)<br>• 2 teaspoons baking soda<br>• 2 teaspoons citric acid (also called sour salt, available at grocery, health food, or hardware stores)<br>• foam cup<br>• spoon or stirrer |
| | | Task 2: Design, Build, and Test a Prototype of the Cup | • safety goggles<br>• scrap cardboard of different thicknesses, such as cereal boxes, tag board, and shipping boxes<br>• 2 paper towel tubes<br>• 2 toilet paper tubes<br>• scissors<br>• tape<br>• ½-cup and 1-cup measuring cups<br>• 2½ cups shredded paper |

| Unit | Activity Name | Task | Equipment List |
|---|---|---|---|
| | | Task 3: Design, Build, and Test a Prototype of the Cold Pack | • safety goggles<br>• 1 toilet paper tube or a small rectangular box (depends on cold pack compartment shape from task 2)<br>• scrap cardboard of different thicknesses, such as cereal boxes, tag board, and shipping boxes<br>• scrap paper<br>• scissors<br>• glue<br>• tape<br>• thread or string<br>• paper clips<br>• plastic produce bag or similar<br>• ½-cup measuring cup<br>• 1-teaspoon measuring spoon<br>• 4 teaspoons baking soda<br>• water |
| 1 | Unit Activity: Chemical Reactions | Task 1: Planning and Creating a Presentation | None |
| 2 | Course Activity: Finding Evidence of Force Fields | Task 1: Gravitational Force Fields | • safety goggles<br>• root vegetable, such as a large carrot or potato<br>• 2 metal forks<br>• 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<br>• tabletop or desktop [optional: to protect the tabletop, use clean scrap wood or smooth cardboard 25 cm (10 inches) square] |

| Unit | Activity Name | Task | Equipment List |
|---|---|---|---|
| | | Task 3: Magnetic Force Fields | • 1 compass (available wherever science lab supplies, educational science materials, or party supplies are sold)<br>• 1 bar magnet (must be strong enough to move the compass)<br>• 2 pieces of white paper, partially overlapped and taped together to make an 11-inch square<br>• pen or pencil |
| 2 | 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 |
| 2 | Unit Activity: Force Fields | Task 1: Conducting a short research | None |
| 3 | Course Activity: Describing the Movement of Energy | Task 1: Pendulum | • goggles<br>• golf ball (or similar-size ball)<br>• plastic sandwich bag<br>• tape<br>• hole punch or scissors<br>• 1 foot of string<br>• metal lid or pan |
| | | Task 2: Toy Car Launcher | • goggles<br>• half-gallon paper milk carton (or sturdy box of similar size and weight)<br>• scissors<br>• hole punch (or use tip of scissors)<br>• rubber band<br>• paper clips<br>• toy car (or a small ball) |

| Unit | Activity Name | Task | Equipment List |
|---|---|---|---|
| | | Task 3: Heat Spiral | • goggles<br>• card stock or a thin piece of cardboard, about 8 inches square<br>• scissors<br>• pencil<br>• hole punch (or use tip of scissors)<br>• 15 inches of thread or thin string<br>• meterstick or yardstick (or stick of similar length)<br>• medium-size pot of water<br>• heat source (stove or hot plate) |
| 3 | Course Activity: Investigating Gravity and Potential Energy | Task 1: Planning | • goggles<br>• golf ball or any other small, bouncy ball<br>• 1 square meter of floor space next to a table or desk |
| | | Task 2: Hypothesis and Data Collection | • goggles<br>• golf ball or other small, bouncy ball<br>• meterstick or yardstick<br>• tape<br>• 1 square meter of floor space next to a table or desk<br>• mat, small rug, or stool to sit on while observing the bouncing ball |
| | | Task 3: Analyze and Extend | data table from task 2 |

| Unit | Activity Name | Task | Equipment List |
|---|---|---|---|
| 3 | Course Activity: Investigating Temperature Changes in Materials*<br><br>*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<br>• heat mitts<br>• 2 trays of ice cubes<br>• water<br>• 50 g of free-flowing dry sand (about enough to fill one-fourth of a small glass)<br>• mass scale that measures up to 500 g<br>• 3 thermometers that measure between 0°C and 80°C (32°F to 176°F)<br>• heat source (stove or hot plate)<br>• medium-sized pot<br>• 2 large, flat-bottom tubs with covers (or use plastic wrap or foil to cover)<br>• 3 containers for cold water and sand (100 mL beakers, glasses, or mugs)<br>• 3 containers for hot water (200 mL beakers, 250 mL beakers, or mugs)<br>• 3 mixing containers (300 mL beakers or large mugs) |
| 3 | 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<br>• thermometer that measures between 0°C and 30°C (32°F to 86°F)<br>• ½- and 1-cup measuring cups (1 cup equals 16 tablespoons; a tablespoon is about the size of a soup spoon)<br>• foam cup<br>• ceramic cup<br>• paper cup<br>• stainless steel cup<br>• cotton wool<br>• aluminum foil<br>• cardboard<br>• scissors<br>• tape<br>• plastic bags<br>• egg carton<br>• container that can hold up to 4 cups (1 quart)<br>• water<br>• 1 tray of ice cubes |