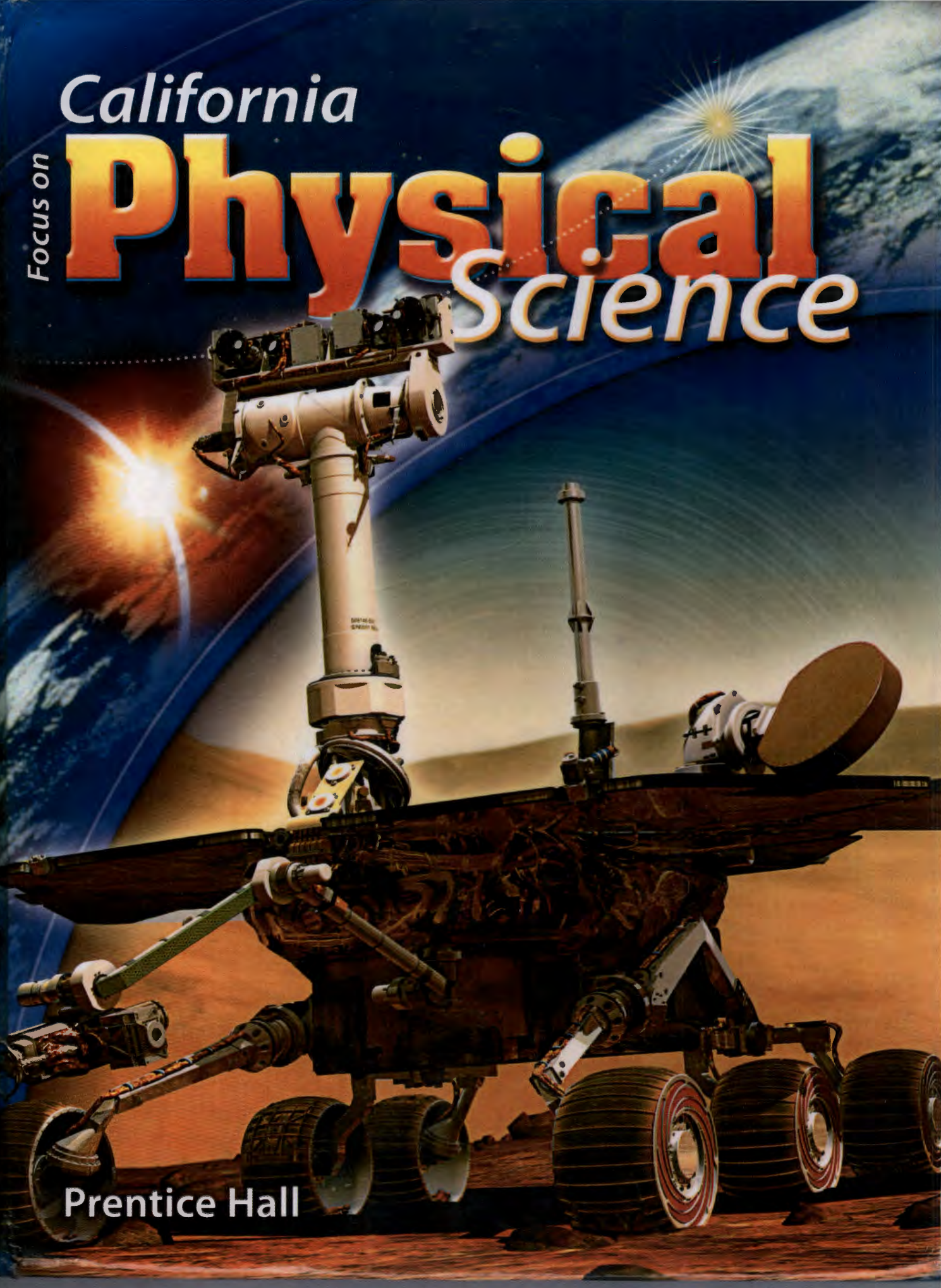
Focus on
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Safety Symbols

These symbols appear in laboratory activities. They warn of possible dangers in the laboratory and remind you to work carefully.

Safety Goggles Wear safety goggles to protect your eyes in any activity involving chemicals, flames or heating, or glassware.

Lab Apron Wear a laboratory apron to protect your skin and clothing from damage.

Breakage Handle breakable materials, such as glassware, with care. Do not touch broken glassware.

Heat-Resistant Gloves Use an oven mitt or other hand protection when handling hot materials such as hot plates or hot glassware.

Plastic Gloves Wear disposable plastic gloves when working with harmful chemicals and organisms. Keep your hands away from your face, and dispose of the gloves according to your teacher's instructions.

Heating Use a clamp or tongs to pick up hot glassware. Do not touch hot objects with your bare hands.

Flames Before you work with flames, tie back loose hair and clothing. Follow instructions from your teacher about lighting and extinguishing flames.

No Flames When using flammable materials, make sure there are no flames, sparks, or other exposed heat sources present.

Corrosive Chemical Avoid getting acid or other corrosive chemicals on your skin or clothing or in your eyes. Do not inhale the vapors. Wash your hands after the activity.

Poison Do not let any poisonous chemical come into contact with your skin, and do not inhale its vapors. Wash your hands when you are finished with the activity.

Fumes Work in a ventilated are: en harmful vapors may be involved. Avoid in: aling vapors directly. Only test an odor when directed to do so by your teacher, and use a wafting motion to direct the vapor toward your nose.

Sharp Object Scissors, scalpels, knives, needles, pins, and tacks can cut your skin. Always direct a sharp edge or point away from yourself and others.

Animal Safety Treat live or preserved animals or animal parts with care to avoid harming the animals or yourself. Wash your hands when you are finished with the activity.

Plant Safety Handle plants only as directed by your teacher. If you are allergic to certain plants, tell your teacher; do not do an activity involving those plants. Avoid touching harmful plants such as poison ivy. Wash your hands when you are finished with the activity.

Electric Shock To avoid electric shock, never use electrical equipment around water, or when the equipment is wet or your hands are wet. Be sure cords are untangled and cannot trip anyone. Unplug equipment not in use.

Physical Safety When an experiment involves physical activity, avoid injuring yourself or others. Alert your teacher if there is any reason you should not participate.

Disposal Dispose of chemicals and other laboratory materials safely. Follow the instructions from your teacher.

Hand Washing Wash your hands thoroughly when finished with the activity. Use antibacterial soap and warm water. Rinse well.

General Safety Awareness When this symbol appears, follow the instructions provided. When you are asked to develop your own procedure in a lab, have your teacher approve your plan before you go further.

California

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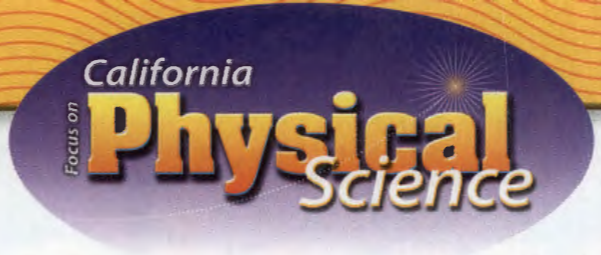
CALIFORNIA SCIENCE EXPLORER



Program Print Resources

Student Edition
Teacher's Edition
Teaching Resources
Color Transparencies
Reading and Note Taking Guide Level A
Reading and Note Taking Guide Level B
Inquiry Skills Activity Books I–III
Vocabulary Flashcards
Laboratory Manual
Laboratory Manual, Teacher's Edition
Virtual Physical Science Lab Record Sheets
Probeware Lab Manual
Standards Review Workbook
Standards Review Transparencies
Progress Monitoring Assessments
Chapter Tests Level A and B
Teaching Guidebook for Universal Access

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PresentationExpress CD-ROM
Student Express with Interactive Textbook CD-ROM
TeacherExpress™ CD-ROM
ExamView® Computer Test Bank
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Program Video Resources

Lab Activity DVD
Discovery Channel DVD Library

Spanish Program Resources

Spanish Student Edition
Spanish Reading and Note Taking Guide
Spanish Teacher's Guide with Answer Keys
Spanish Student Edition in MP3

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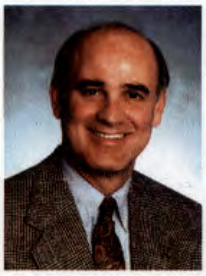

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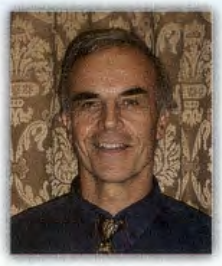

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Chemical Building Blocks

Focus on the BIG Idea

How do scientists investigate the natural world?

Chapter 1

Focus on the BIG Idea

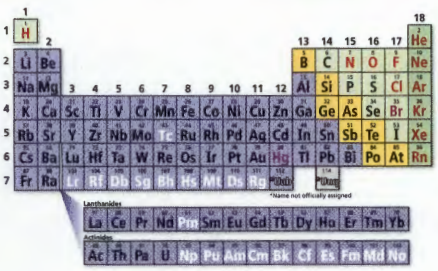
What is chemistry?

Chapter 2

Chapter 3

Focus on the **BIG Idea**

How do solids, liquids, and gases differ in the motion of their particles?



Chapter 4

Focus on the **BIG Idea**

How is the periodic table organized?

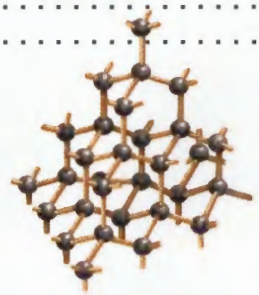
Unit 2

Chemical Interactions

Focus on the BIG Idea

How do compounds form?

Chapter 5



Focus on the BIG Idea

What happens during a chemical reaction?

Chapter 6

Chapter 7

Chapter 8

Focus on the **BIG Idea**

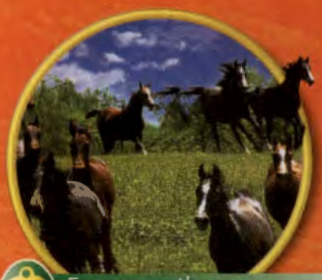
What are some characteristics of acids of bases?

Focus on the **BIG Idea**

Why does carbon have a central role in the chemistry of living organisms?

Unit 3

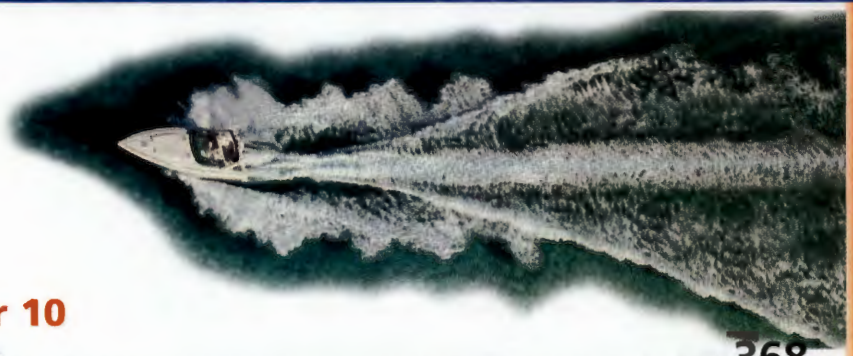
Motion, Forces, and Energy



Focus on the **BIG Idea**

How can you describe an object's motion?

Chapter 9



Focus on the **BIG Idea**

What causes an object's velocity to change?

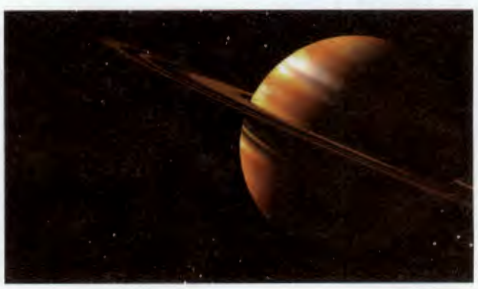
Focus on the **BIG Idea**

How can you predict if an object will sink or float in a fluid?

Astronomy

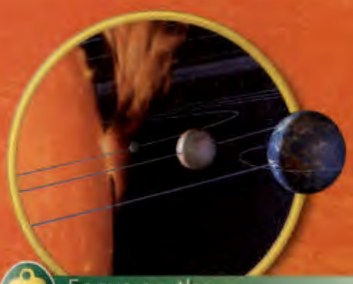
Focus on the BIG Idea

What events are caused by the motion of Earth and the moon?



Focus on the BIG Idea

How do scientists learn more about the solar system?



Focus on the **BIG Idea**

What types of objects are found in the solar system?

Focus on the **BIG Idea**

What is the structure and composition of the universe?

Activities

Lab zone Standards Warm-Up

Exploration and inquiry before reading

Lab zone Try This **Activity** Reinforcement of key concepts

Lab zone Skills **Activity** Practice of specific science inquiry skills

Lab zone At-Home Activity

Quick, engaging activities for home and family

Math

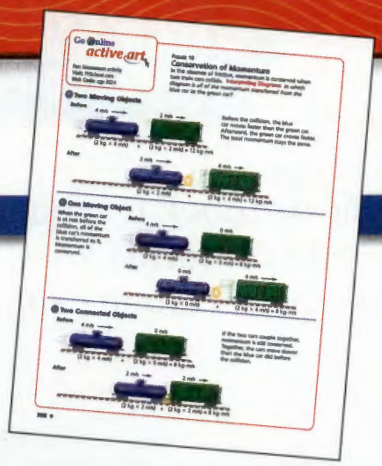
Point-of-use math practice

Sample Problems

Math Skills

Math Practice

active art Illustrations come alive online



Video Field Trip
Discovery Channel School

Enhance understanding through dynamic video.

Preview Get motivated with this introduction to the chapter content.

Field Trip Explore a real-world story related to the chapter content.

Assessment Review content and take an assessment.

Go Online
Web Links

Get connected to exciting Web resources in every lesson.

SCILINKS NSTA Find Web links on topics relating to every section.

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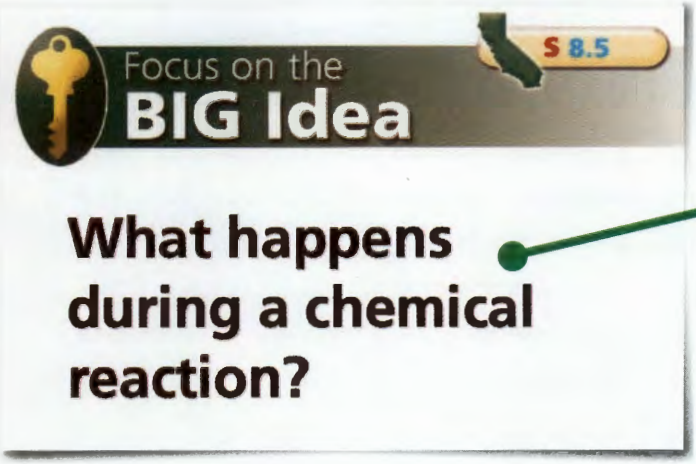
Videos Explore content and learn important lab skills.

Audio Support Hear key terms spoken and defined.

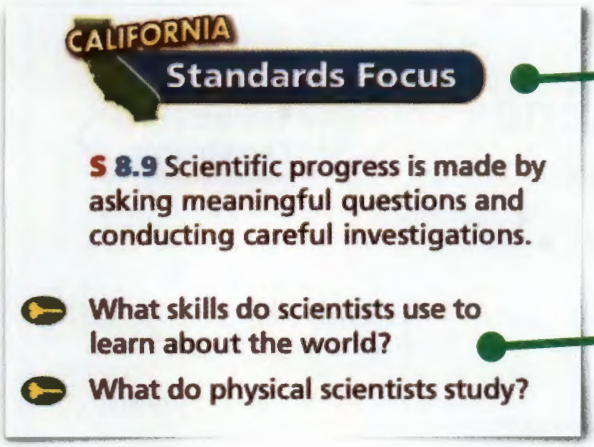
Self-Assessment Use instant feedback to help you track your progress.

CALIFORNIA Science Content Standards

This textbook is organized to support your understanding of the California Science Content Standards. Understanding this organization can help you master the standards.



Every chapter begins with a Focus on the Big Idea question that is linked to a California Science Standard. Focus on the Big Idea poses a question for you to think about as you study the chapter. You will discover the answer to the question as you read.



Each section begins with a Standards Focus. You will learn about these California Science Standards as you read the section.

The Standards Focus is broken down into two to four Key Concept questions. You will find the answers to these questions as you read the section.

Standards Key

Grade Level

Standard Set and Standard

S 8.2.a

Content Area

S for Science

E-LA for English-Language Arts

Math for Mathematics

The *Science Content Standards for California Public Schools* was adopted in 1998. The California Grade 8 strand is organized into nine general standard sets. The standard sets are Motion, Forces, Structure of Matter, Earth in the Solar System, Reactions, Chemistry of Living Systems, Periodic Table, Density and Buoyancy, and Investigation and Experimentation. Each standard set is divided into a series of specific topic standards. Use this section as a preview for your physical science course and as a review guide when you study for exams.

STANDARD SET 1

Motion

1. The velocity of an object is the rate of change of its position. As a basis for understanding this concept:

1. a. ***Students know*** **know position is defined in relation to some choice of a standard reference point and a set of reference directions.**

1. b. ***Students know*** **that average speed is the total distance traveled divided by the total time elapsed and that the speed of an object along the path traveled can vary.**

1. c. ***Students know*** **how to solve problems involving distance, time, and average speed.**

What It Means to You

Understanding position, distance, and speed is key to learning about motion. You describe the position and distance of an object relative to a reference point. For example, you could measure your bike to be 50 meters east of the flagpole. The flagpole is the reference point.

Speed describes how much distance an object travels in a given time period. If you pedal quickly on your bike, you will travel a greater distance in a certain time period than if you pedal slowly. You will learn how to use position, distance, and speed to describe the motion of objects.

Where You Will Learn It

This material is covered in Chapter 9.

STANDARD SET 1, continued

1. d. *Students know* the velocity of an object must be described by specifying both the direction and the speed of the object.
1. e. *Students know* changes in velocity may be due to changes in speed, direction, or both.
1. f. *Students know* how to interpret graphs of position versus time and graphs of speed versus time for motion in a single direction.

What It Means to You

To accurately describe the motion of an object, you must include speed and direction. For example, if you want to get to a baseball game on time, you'll need to know how fast you must travel and in what direction. Velocity describes both the speed and direction of an object. For example, a car might have a speed of 30 miles per hour but a velocity of 30 miles per hour north. You will learn how to describe the velocity of objects.

You can graph the position and speed of an object over time. You can then analyze these graphs to determine if an object is moving at a constant speed, or if it is speeding up or slowing down. You will learn how to graph an object's motion. You will also learn how to interpret motion graphs.

Where You Will Learn It

This material is covered in Chapter 9.

2. Unbalanced forces cause changes in velocity. As a basis for understanding this concept:

2. a. ***Students know*** **a force has both direction and magnitude.**

2. b. ***Students know*** **when an object is subject to two or more forces at once, the result is the cumulative effect of all the forces.**

2. c. ***Students know*** **when the forces on an object are balanced, the motion of the object does not change.**

2. d. ***Students know*** **how to identify separately the two or more forces that are acting on a single static object, including gravity, elastic forces due to tension or compression in matter, and friction.**

What It Means To You

A force is a push or a pull. You will learn about the force of gravity, elastic forces, and friction. Usually there are at least two forces acting on an object at any given time. You will learn how to find the net force acting on an object.

If the net force on an object is zero, the forces acting on the object are balanced. The object's motion will not change. The forces on a parked car are balanced. The car's motion will not change until an unbalanced force acts on it. You will learn how to use net force to make predictions about an object's motion.

Where You Will Learn It

This material is covered in Chapter 10.

STANDARD SET 2, continued

2. e. *Students know* that when the forces on an object are unbalanced, the object will change its velocity (that is, it will speed up, slow down, or change direction).
2. f. *Students know* the greater the mass of an object, the more force is needed to achieve the same rate of change in motion.
2. g. *Students know* the role of gravity in forming and maintaining the shapes of planets, stars, and the solar system.

What It Means To You

Unbalanced forces cause an object's motion to change. When an object's motion changes, the object either speeds up or slows down. For example, when you release a ball, it accelerates to the ground. You will learn how to use net force and mass to calculate the acceleration of an object. You will also learn the effect of increasing force and increasing mass on the acceleration of an object.

Gravity causes objects to fall to Earth. It is also the force responsible for the formation of the solar system, stars, and galaxies. The moon revolves around Earth because of gravity. You will learn about gravity's role in the universe.

Where You Will Learn It

This material is covered in Chapters 10, 11, 12, and 14.

STANDARD SET 3

Structure of Matter

3. Each of the more than 100 elements of matter has distinct properties and a distinct atomic structure. All forms of matter are composed of one or more of the elements. As a basis for understanding this concept:

- 3. a. *Students know* the structure of the atom and know it is composed of protons, neutrons, and electrons.
- 3. b. *Students know* that compounds are formed by combining two or more different elements and that compounds have properties that are different from their constituent elements.
- 3. c. *Students know* atoms and molecules form solids by building up repeating patterns, such as the crystal structure of NaCl or long-chain polymers.
- 3. d. *Students know* the states of matter (solid, liquid, gas) depend on molecular motion.
- 3. e. *Students know* that in solids the atoms are closely locked in position and can only vibrate; in liquids the atoms and molecules are more loosely connected and can collide with and move past one another; and in gases the atoms and molecules are free to move independently, colliding frequently.
- 3. f. *Students know* how to use the periodic table to identify elements in simple compounds.

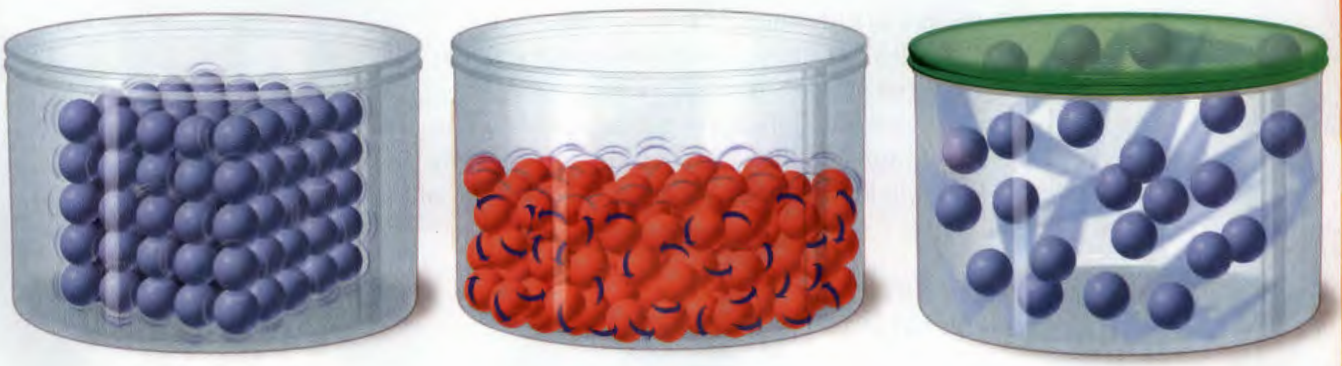
What It Means to You

All matter is made up of atoms. An atom consists of a positively charged nucleus surrounded by negatively charged electrons. There are more than 100 different types of atoms. Their unique atomic structures define elements. The periodic table organizes elements according to their atomic structures. You will learn about atomic structure and the periodic table.

Through the process of bonding, elements combine to form compounds. For example, hydrogen and oxygen bond together to form water. You will learn how elements bond in solids, liquids, and gases.

Where You Will Learn It

This material is covered in Chapters 2, 3, 4, and 5.



STANDARD SET 4

Earth in the Solar System (Earth Sciences)

4. The structure and composition of the universe can be learned from studying stars and galaxies and their evolution. As a basis for understanding this concept:

- **4. a.** ***Students know*** **galaxies are clusters of billions of stars and may have different shapes.**
- **4. b.** ***Students know*** **that the Sun is one of many stars in the Milky Way galaxy and that stars may differ in size, temperature, and color.**
- **4. c.** ***Students know*** **how to use astronomical units and light-years as measures of distances between the Sun, stars, and Earth.**
- **4. d.** ***Students know*** **that stars are the source of light for all bright objects in outer space and that the Moon and planets shine by reflected sunlight, not by their own light.**
- **4. e.** ***Students know*** **the appearance, general composition, relative position and size, and motion of objects in the solar system, including planets, planetary satellites, comets, and asteroids.**

What It Means to You

When you look up at the sky at night, you see many points of light. Some of these points are stars, while others are galaxies. Galaxies consist of clusters of stars. The sun is one of the many stars in the Milky Way galaxy. You will learn how to recognize different types of stars and galaxies.

The sun is the source of all light in the solar system. The planets and the planetary satellites are visible because they reflect sunlight. You will learn about the sun, the planets, and planetary satellites.

Where You Will Learn It

This material is covered in Chapters 12, 13, 14, and 15.

STANDARD SET 5

Reactions

5. Chemical reactions are processes in which atoms are rearranged into different combinations of molecules. As a basis for understanding this concept:

5. a. *Students know* reactant atoms and molecules interact to form products with different chemical properties.
5. b. *Students know* the idea of atoms explains the conservation of matter: In chemical reactions the number of atoms stays the same no matter how they are arranged, so their total mass stays the same.
5. c. *Students know* chemical reactions usually liberate heat or absorb heat.
5. d. *Students know* physical processes include freezing and boiling, in which a material changes form with no chemical reaction.
5. e. *Students know* how to determine whether a solution is acidic, basic, or neutral.

What It Means to You

Have you ever observed what happens when you drop an effervescent tablet in water? The tablet starts to disappear just as bubbles rise to the surface. This is an example of a chemical reaction. The water and the tablet are interacting to form products with different chemical properties. You will learn about chemical reactions.

Conservation of matter states that, in a chemical reaction, the mass of reactants equals the mass of products. You will apply this principle when you balance chemical equations and perform chemical reactions in the laboratory.

Where You Will Learn It

This material is covered in Chapters 2, 3, 6, and 7.

STANDARD SET 6

Chemistry of Living Systems (Life Sciences)

6. Principles of chemistry underlie the functioning of biological systems. As a basis for understanding this concept:

6. a. ***Students know*** **that carbon, because of its ability to combine in many ways with itself and other elements, has a central role in the chemistry of living organisms.**

6. b. ***Students know*** **that living organisms are made of molecules consisting largely of carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur.**

6. c. ***Students know*** **that living organisms have many different kinds of molecules, including small ones, such as water and salt, and very large ones, such as carbohydrates, fats, proteins, and DNA.**

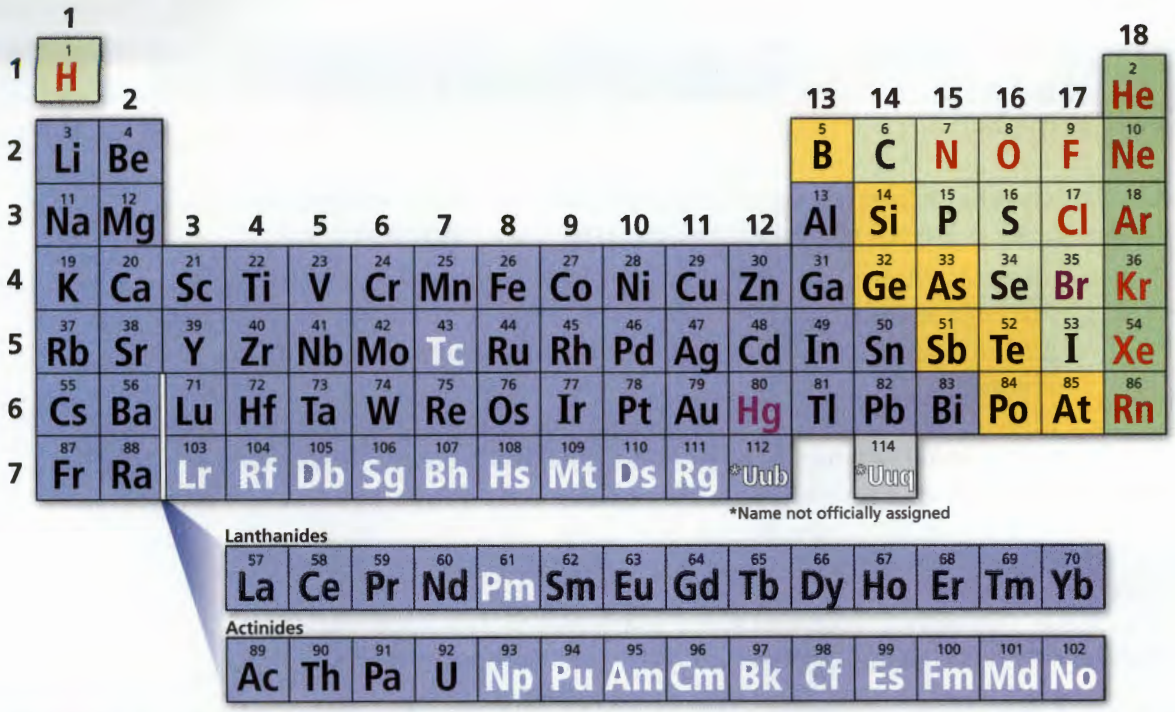
What It Means to You

Six elements combine to form most of the mass in living systems. These elements are carbon, hydrogen, nitrogen, oxygen, phosphorus, and sulfur. These elements combine to form large molecules such as DNA and carbohydrates and simpler compounds such as salt and water. You will learn about these molecules and compounds.

Carbon has a unique role in the functioning of biological systems because it can bond to itself and to many other elements. You will learn about the various carbon molecules and their roles. You will also construct models of carbon-based molecules.

Where You Will Learn It

This material is covered in Chapter 8.



STANDARD SET 7

Periodic Table

7. The organization of the periodic table is based on the properties of the elements and reflects the structure of atoms. As a basis for understanding this concept:

7. a. ***Students know*** **how to identify regions corresponding to metals, nonmetals, and inert gases.**

7. b. ***Students know*** **each element has a specific number of protons in the nucleus (the atomic number) and each isotope of the element has a different but specific number of neutrons in the nucleus.**

7. c. ***Students know*** **substances can be classified by their properties, including their melting temperature, density, hardness, and thermal and electrical conductivity.**

What It Means to You

The periodic table is an invaluable tool for chemists. It organizes the elements according to their atomic structures. For example, the atomic number of elements increases from left to right and down one row at a time. You will use the periodic table to find the atomic numbers of elements.

In the periodic table, metals are on the left, semimetals are in the middle, nonmetals are on the right, and inert gases are on the far right. You will use the periodic table to classify a substance as a metal, semimetal, nonmetal, or inert gas.

Where You Will Learn It

This material is covered in Chapters 4 and 5.

CALIFORNIA

STANDARD SET 8

Density and Buoyancy

8. All objects experience a buoyant force when immersed in a fluid. As a basis for understanding this concept:

8. a. ***Students know*** **density is mass per unit volume.**

8. b. ***Students know*** **how to calculate the density of substances (regular and irregular solids and liquids) from measurements of mass and volume.**

8. c. ***Students know*** **the buoyant force on an object in a fluid is an upward force equal to the weight of the fluid the object has displaced.**

8. d. ***Students know*** **how to predict whether an object will float or sink.**

What It Means to You

Suppose you have a steel ball and a foam ball of the same size. The steel ball has a greater density. It has more mass per unit of volume than the foam ball. The volume of the foam ball would have to be many times greater than that of the steel ball in order for the two balls to have the same mass.

You will learn how to calculate the densities of different objects. You will also learn how to use density to predict whether an object will sink or float in a fluid.

Where You Will Learn It

This material is covered in Chapters 1 and 11.

Investigation and Experimentation

9. Scientific progress is made by asking meaningful questions and conducting careful investigations. As a basis for understanding this concept and addressing the content in the other strands, students should develop their own questions and perform investigations. Students will:

- 9. a. Plan and conduct a scientific investigation to test a hypothesis.
- 9. b. Evaluate the accuracy and reproducibility of data.
- 9. c. Distinguish between variable and controlled parameters in a test.
- 9. d. Recognize the slope of the linear graph as the constant in the relationship $y = kx$ and apply this principle in interpreting graphs constructed from data.
- 9. e. Construct appropriate graphs from data and develop quantitative statements about the relationships between variables.
- 9. f. Apply simple mathematic relationships to determine a missing quantity in a mathematic expression, given the two remaining terms (including speed = distance/time, density = mass/volume, force = pressure x area, volume = area x height).
- 9. g. Distinguish between linear and nonlinear relationships on a graph of data.

What It Means to You

In this program, you will do activities that demonstrate the concepts in the text. You will design and build a vehicle that moves without the use of electricity, gravity, or a person pushing or pulling on it. You will conduct tests to compare how various antacids neutralize acid.

This program contains various types of activities. The *Standards Warm-Ups* introduce the concepts in a section. The *Skills Activities*, *Try This*, and *At-Home Activities* reinforce key concepts from the sections. The Labs reinforce both inquiring skills and science concepts. All of the activities in the text will lead you through the process of discovering meaningful ideas about physical science.

Where You Will Learn It

This material is covered in the labs and activities in the Student Edition.

Your Keys to Success

Read for Meaning

This textbook has been developed to fully support your understanding of the science concepts in the California Science Standards. Each chapter contains built-in reading support.

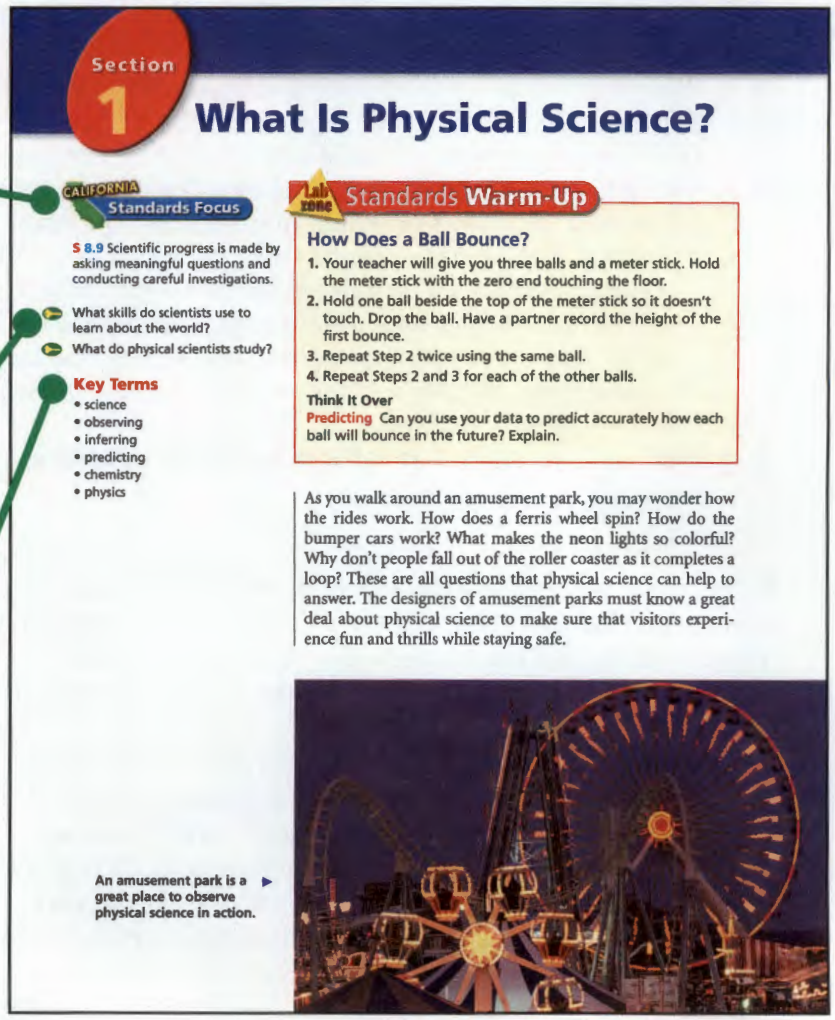
Before You Read

Use the Standards Focus to preview the California Science Standards that are covered, the key concepts, and key terms in the section.

Standards Focus The California Science Standards that you will learn are listed at the beginning of each section.

Key Concepts Each science standard is broken down into smaller ideas called Key Concepts.

Key Terms Use the list of key terms to preview the vocabulary for each section.



Section 1

What Is Physical Science?

CALIFORNIA Standards Focus

S 8.9 Scientific progress is made by asking meaningful questions and conducting careful investigations.

- What skills do scientists use to learn about the world?
- What do physical scientists study?

Key Terms
- science
- observing
- inferring
- predicting
- chemistry
- physics

Lab zone Standards Warm-Up

How Does a Ball Bounce?

1. Your teacher will give you three balls and a meter stick. Hold the meter stick with the zero end touching the floor.
2. Hold one ball beside the top of the meter stick so it doesn't touch. Drop the ball. Have a partner record the height of the first bounce.
3. Repeat Step 2 twice using the same ball.
4. Repeat Steps 2 and 3 for each of the other balls.

Think It Over

Predicting Can you use your data to predict accurately how each ball will bounce in the future? Explain.

As you walk around an amusement park, you may wonder how the rides work. How does a ferris wheel spin? How do the bumper cars work? What makes the neon lights so colorful? Why don't people fall out of the roller coaster as it completes a loop? These are all questions that physical science can help to answer. The designers of amusement parks must know a great deal about physical science to make sure that visitors experience fun and thrills while staying safe.

An amusement park is a great place to observe physical science in action.

As You Read

Key Concepts in boldface sentences allow you to focus on the important ideas of the chapter.

Look for the green and yellow keys to find the key concepts in each section.

Skills Scientists Use

Science is the study of the natural world. Science includes all of the knowledge gained by exploring nature. To think and work like a scientist, you need to use the same skills that they do. **Scientists use the skills of observing, inferring, and predicting to learn more about the natural world.**

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For: More on scientific thinking
Visit: PHSchool.com
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Observing Scientists observe things. **Observing** means using one or more senses to gather information. Your senses include sight, hearing, touch, taste, and smell. Each day of your life, you observe things that help you decide what to eat, what to wear, and whether to stay inside or go out.

Scientists usually make observations in a careful, orderly way. They make both qualitative and quantitative observations. Qualitative observations are descriptions that don't involve numbers or measurements. Noticing that a ball is round, that milk smells sour, or that a car is moving is a qualitative observation. Quantitative observations are measurements. You make a quantitative observation when you measure your height or weight. In science, observations may also be called evidence, or data.

Inferring When you explain your observations, you are **inferring,** or making an inference. Inferences are based on reasoning from what you already know. You make inferences all the time without thinking about it. For example, your teacher gives lots of surprise quizzes. So if your teacher walks into the room carrying a stack of paper, you may infer that the pages contain a quiz. But inferences are not always correct. The papers could be announcements to be taken home.

Predicting Every day, people make statements about the future. **Predicting** means making a forecast of what
n past experience or
ientists predict the
and current infor-
st is based on data,
ss.
s based on?

FIGURE 1 Inferring
When you explain or interpret your observations, you are making an inference. Inferring *How do you think these young women obtained the stuffed bear? Explain your reasoning.*

Temperature

As you head out the door each morning, one of the first things you might notice is the temperature. Is it cold out this morning? How high will the temperature rise?

Units of Temperature Scientists commonly use the Celsius temperature scale. On the **Celsius Scale,** water freezes at 0°C and boils at 100°C. There are exactly 100 degrees between the freezing point and boiling point of water. Normal human body temperature is about 37°C.

In addition to the Celsius scale, scientists also use another temperature scale, called the **Kelvin scale.** Units on the Kelvin scale are the same size as those on the Celsius scale. **The kelvin (K) is the SI unit of temperature.**

The temperature 0 K on the Kelvin scale is called **absolute zero.** Nothing can get colder than this temperature. Absolute zero is equal to –273°C on the Celsius scale.

Measuring Temperature You can measure temperature using a thermometer. Most thermometers consist of a sealed tube that contains a liquid. The liquid expands or contracts as the temperature changes.

FIGURE 16
Measuring Temperature
Scientists use the Celsius and Kelvin scales to measure temperature.

Section 3 Assessment

S 8.8.a, 8.8.b, E-LA: Reading 8.2.0, Math: 7NS1.2

Target Reading Skill Preview Text Structure
Complete the graphic organizer for this section. What question did you ask about Weight and Mass? What was your answer?

Reviewing Key Concepts

1. a. Identifying What is the standard measurement system used by scientists around the world?
   b. Predicting Suppose that two scientists use different measurement systems in their work. What problems might arise if they shared their data?
2. a. Listing What are the SI units of length, mass, volume, density, time, and temperature?
   b. Estimating Estimate the length of a baseball bat and mass of a baseball in SI units. How can you check how close your estimates are?
   c. Describing Outline a step-by-step method for determining the density of a baseball.

Math Practice

Two solid cubes have the same mass. They each have a mass of 50 g.

3. Calculating Density Cube A has a volume of 2 cm × 2 cm × 2 cm. What is its density?
4. Calculating Density Cube B has a volume of 4 cm × 4 cm × 4 cm. What is its density?

After You Read

The Section Assessment tests your understanding of the Key Concepts. Each bank of Reviewing Key Concepts questions here focuses on one of the Key Concepts.

If you can't answer these items, go back and review the section.

Your Keys to Success

How to Read Science

Reading Skill

The target reading skills introduced on this page will help you read and understand information in this textbook. Each chapter introduces a reading skill. Developing these reading skills is key to becoming a successful reader in science and other subject areas.

Preview Text Structure By understanding how textbooks are organized, you can gain information from them more effectively. This textbook is organized with red headings and blue subheadings. Before you read, preview the headings. Ask yourself questions to guide you as you read. **(Chapter 1)**

Preview Visuals The visuals in your science textbook provide important information. Visuals are photographs, graphs, tables, diagrams, and illustrations. Before you read, take the time to preview the visuals in a section. Look closely at the title, labels, and captions. Then ask yourself questions about the visuals. **(Chapter 4)**

Sequence Many parts of a science textbook are organized by sequence. Sequence is the order in which a series of events occurs. Some sections may discuss events in a process that has a beginning and an end. Other sections may describe a continuous process that does not have an end. **(Chapters 11 and 12)**

Compare and Contrast Science texts often make comparisons. When you compare and contrast, you examine the similarities and differences between things. You can compare and contrast by using a table or a Venn diagram. **(Chapters 5 and 8)**

Analyze Cause and Effect A cause makes something happen. An effect is what happens. When you recognize that one event causes another, you are relating cause and effect. **(Chapter 13)**

Identify Main Ideas As you read, you can understand a section or paragraph more clearly by finding the main idea. The main idea is the most important idea. The details in a section or paragraph support the main idea. Headings and subheadings can often help you identify the main ideas. **(Chapters 2 and 9)**

Identify Supporting Evidence Science textbooks often describe the scientific evidence that supports a theory or hypothesis. Scientific evidence includes data and facts, information whose accuracy can be confirmed by experiments or observation. A hypothesis is a possible explanation for observations made by scientists or an answer to a scientific question. **(Chapter 15)**

Create Outlines You can create outlines to help you clarify the text. An outline shows the relationship between main ideas and supporting details. Use the text structure—headings, subheadings, key concepts, and key terms—to help you figure out information to include in your outline. **(Chapters 3, 7, and 14)**

Take Notes Science chapters are packed with information. Taking good notes is one way to help you remember key ideas and to see the big picture. When you take notes, include key ideas, a few details, and summaries. **(Chapters 6 and 10)**

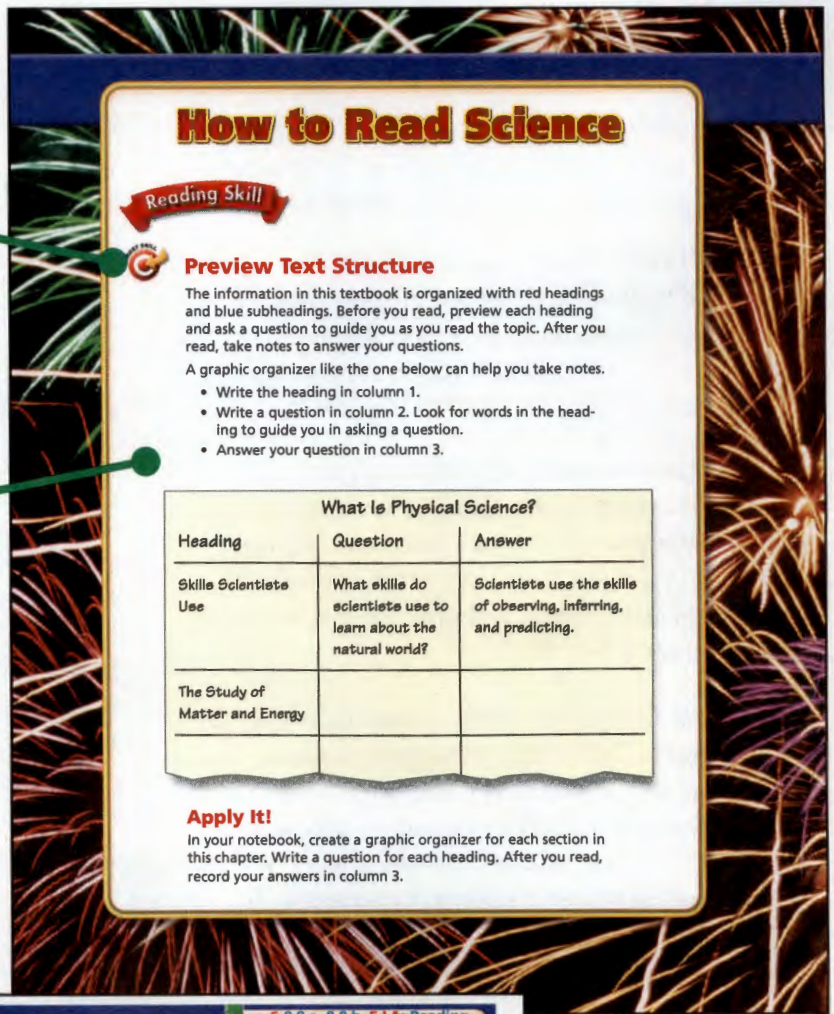
Target Reading Skills

Each chapter provides a target reading skill with clear instruction to help you read and understand the text. You will apply the skill as you read. Then you will record what you've learned in the section and chapter assessments.

Before You Read
Each chapter introduces a target reading skill and provides examples and practice exercises.

As You Read
As you read, you can use the target reading skill to help you increase your understanding.

After You Read
You can apply the target reading skill in the Section Assessments and in the Chapter Assessments.



How to Read Science

Reading Skill

Preview Text Structure

The information in this textbook is organized with red headings and blue subheadings. Before you read, preview each heading and ask a question to guide you as you read the topic. After you read, take notes to answer your questions.

A graphic organizer like the one below can help you take notes.

- Write the heading in column 1.
- Write a question in column 2. Look for words in the heading to guide you in asking a question.
- Answer your question in column 3.

What Is Physical Science?

Heading	Question	Answer
Skills Scientists Use	What skills do scientists use to learn about the natural world?	Scientists use the skills of observing, inferring, and predicting.
The Study of Matter and Energy		

Apply It!
In your notebook, create a graphic organizer for each section in this chapter. Write a question for each heading. After you read, record your answers in column 3.

Section 3 Assessment

S 8.8.a, 8.8.b, E-LA: Reading 8.2.0, Math: 7NS1.2

Target Reading Skill Preview Text Structure
Complete the graphic organizer for this section. What question did you ask about Weight and Mass? What was your answer?

Reviewing Key Concepts

1. a. **Identifying** What is the standard measurement system used by scientists around the world?
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2. a. **Listing** What are the SI units of length, mass, volume, density, time, and temperature?
   b. **Estimating** Estimate the length of a baseball bat and mass of a baseball in SI units. How can you check how close your estimates are?
   c. **Describing** Outline a step-by-step method for determining the density of a baseball.

Math Practice

Two solid cubes have the same mass. They each have a mass of 50 g.

3. **Calculating Density** Cube A has a volume of 2 cm × 2 cm × 2 cm. What is its density?
4. **Calculating Density** Cube B has a volume of 4 cm × 4 cm × 4 cm. What is its density?

Your Keys to Success

Build Science Vocabulary

Vocabulary Skill

Studying science involves learning a new vocabulary. Here are some vocabulary skills to help you learn the meaning of words you do not recognize.

Word Analysis

You can use your knowledge of word parts—prefixes, suffixes, and roots—to determine the meaning of unfamiliar words.

Prefixes A prefix is a word part that is added at the beginning of a root or base word to change its meaning. Knowing the meaning of prefixes will help you figure out new words. You will practice this skill in **Chapter 2.**

Suffixes A suffix is a letter or group of letters added to the end of a word to form a new word with a slightly different meaning. Adding a suffix to a word often changes its part of speech. You will practice this skill in **Chapters 3 and 15.**

Word Origins Many science words come to English from other languages, such as Greek and Latin. By learning the meaning of a few common Greek and Latin roots, you can determine the meaning of new science words. You will practice this skill in **Chapters 4, 10, 12, and 14.**

Use Clues to Determine Meaning

When you come across a word you don't recognize in science texts, you can use context clues to figure out what the word means. First look for clues in the word itself. Then look at the surrounding words, sentences, and paragraphs for clues. You will practice this skill in **Chapter 8.**

Identify Multiple Meanings

To understand science concepts, you must use terms precisely. Some familiar words may have different meanings in science. Watch for these multiple-meaning words as you read. You will practice this skill in **Chapters 6 and 11.**

Identify Related Word Forms

You can increase your vocabulary by learning related forms of words or word families. If you know the meaning of a verb form, you may be able to figure out the related noun and adjective forms. You will practice this skill in **Chapter 7.**

atmos + sphaira = atmosphere

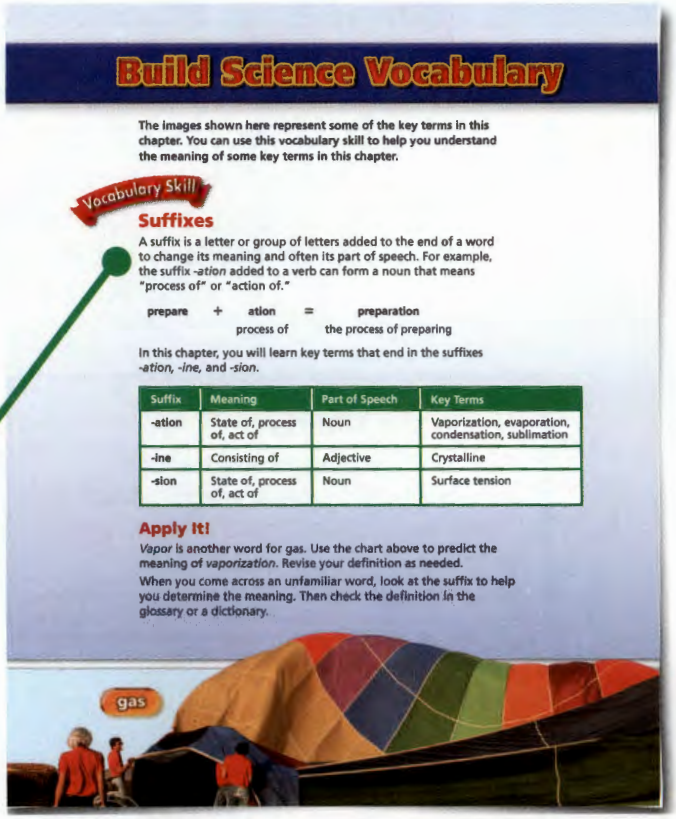
vapor gas + sphere = a layer of vapor or gases that surrounds Earth

Vocabulary Skills

One of the important steps in reading this science textbook is to be sure that you understand the Key Terms. Your book shows several strategies to help learn important vocabulary.

Before You Read

Each chapter introduces a Vocabulary Skill with examples and practice exercises. Key Terms come alive through visuals. The beginning of each section lists the Key Terms.



Build Science Vocabulary

The images shown here represent some of the key terms in this chapter. You can use this vocabulary skill to help you understand the meaning of some key terms in this chapter.

Vocabulary Skill

Suffixes

A suffix is a letter or group of letters added to the end of a word to change its meaning and often its part of speech. For example, the suffix *-ation* added to a verb can form a noun that means "process of" or "action of."

prepare + ation = preparation
process of the process of preparing

In this chapter, you will learn key terms that end in the suffixes *-ation*, *-ine*, and *-sion*.

Suffix	Meaning	Part of Speech	Key Terms
-ation	State of, process of, act of	Noun	Vaporization, evaporation, condensation, sublimation
-ine	Consisting of	Adjective	Crystalline
-sion	State of, process of, act of	Noun	Surface tension

Apply It!

Vapor is another word for gas. Use the chart above to predict the meaning of *vaporization*. Revise your definition as needed.

When you come across an unfamiliar word, look at the suffix to help you determine the meaning. Then check the definition in the glossary or a dictionary.

gas

Changes Between Solid and Gas

If you live where the winters are cold, you may have noticed that snow seems to disappear even when the temperature stays well below freezing. This change is the result of sublimation. **Sublimation** occurs when the surface particles of a solid gain enough energy that they [illegible]. **During sublimation, particles of a solid do not pass through the liquid state as they form a gas.** As a solid substance sublimates into a gas, the relative freedom of motion of its particles increases.

One example of sublimation occurs with dry ice. Dry ice is the common name for solid carbon dioxide. At ordinary atmospheric pressures, carbon dioxide cannot exist as a liquid. So instead of melting, solid carbon dioxide changes directly into a gas. As it changes state, the carbon dioxide absorbs thermal energy. If warmer materials are placed near dry ice, they will lose thermal energy and become colder. For this reason, dry ice can be used to keep things cold when a refrigerator is not available. When dry ice becomes a gas, it cools water vapor in the nearby air. The water vapor then condenses into a liquid, forming fog around the dry ice.

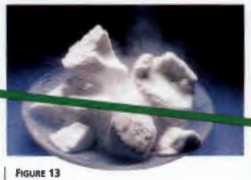


FIGURE 13
Dry Ice
When solid carbon dioxide, called "dry ice," sublimates, it changes directly into a gas. **Predicting** *If you allowed the dry ice to stand at room temperature for several hours, what would be left in the glass dish? Explain.*

Reading Checkpoint **What physical state is skipped during the sublimation of a substance?**

Section 2 Assessment

S 8.3.d, 8.5.d, E-LA: Reading 8.1.0, Writing 8.2.0

Vocabulary Skill **Suffixes** Complete the sentences using the correct word form (*vaporize*/*vaporization*). As a pot of water boils, the liquid will ___ and form a gas. Boiling and evaporation are two types of ___.

Reviewing Key Concepts

1. a. **Reviewing** What happens to the particles of a solid as it becomes a liquid?
   b. **Applying Concepts** How does the thermal energy of solid water change as it melts?
   c. **Making Judgments** You are stranded in a blizzard. You need water to drink, and you're trying to stay warm. Should you melt snow and then drink it, or just eat snow? Explain.
2. a. **Describing** What is vaporization?
   b. **Comparing and Contrasting** Name the two types of vaporization. Tell how they are similar and how they differ.
   c. **Relating Cause and Effect** Why does the evaporation of sweat cool your body on a warm day?
3. a. **Identifying** What process occurs as pieces of dry ice gradually get smaller?
   b. **Interpreting Photos** [illegible] in the air around the dry ice in Figure 13? Why does the fog form?

Writing in Science

Using Analogies Write a short essay in which you create an analogy to describe particle motion. Compare the movements and positions of people dancing with the motions of water molecules in liquid water and in water vapor.

Chapter 3 ♦ 101

As You Read

Each Key Term is highlighted in yellow, appears in boldfaced type, and is followed by a definition.

After You Read

You can practice the Vocabulary Skill in the Section Assessments. You can apply your understanding of the Key Terms in the Chapter Assessments.

Your Keys to Success

Build Science Vocabulary

High-Use Academic Words

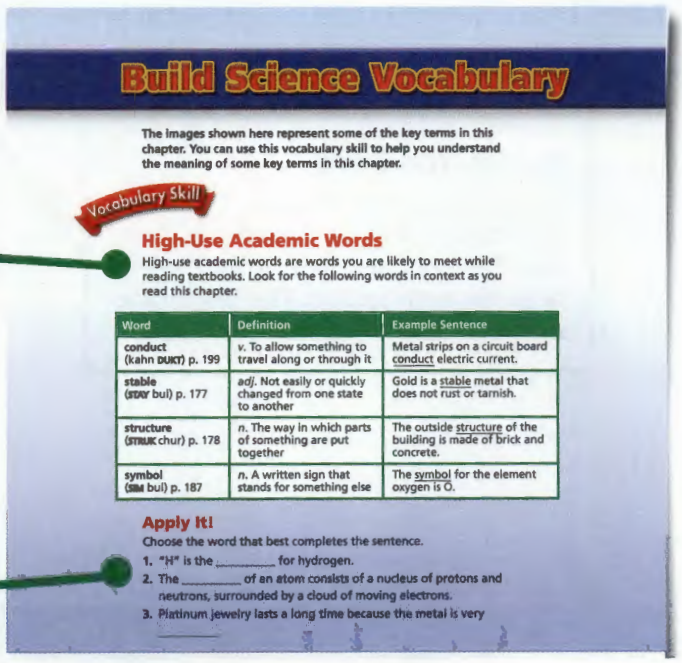
High-use academic words are words that are used frequently in classroom reading, writing, and discussions. They are different from Key Terms because they appear in many subject areas.

Learn the Words

Each unit contains a chapter that introduces high-use academic words. The introduction describes the words, provides examples, and includes practice exercises.

Practice Using the Words

You can practice using the high-use academic words in Apply It! and the section assessments.



Build Science Vocabulary

The images shown here represent some of the key terms in this chapter. You can use this vocabulary skill to help you understand the meaning of some key terms in this chapter.

Vocabulary Skill

High-Use Academic Words

High-use academic words are words you are likely to meet while reading textbooks. Look for the following words in context as you read this chapter.

Word	Definition	Example Sentence
conduct (kahn DUKT) p. 199	*v.* To allow something to travel along or through it	Metal strips on a circuit board conduct electric current.
stable (STAY bul) p. 177	*adj.* Not easily or quickly changed from one state to another	Gold is a stable metal that does not rust or tarnish.
structure (STRUK chur) p. 178	*n.* The way in which parts of something are put together	The outside structure of the building is made of brick and concrete.
symbol (SIM bul) p. 187	*n.* A written sign that stands for something else	The symbol for the element oxygen is O.

Apply It!

Choose the word that best completes the sentence.

1. "H" is the _____ for hydrogen.
2. The _____ of an atom consists of a nucleus of protons and neutrons, surrounded by a cloud of moving electrons.
3. Platinum jewelry lasts a long time because the metal is very _____.

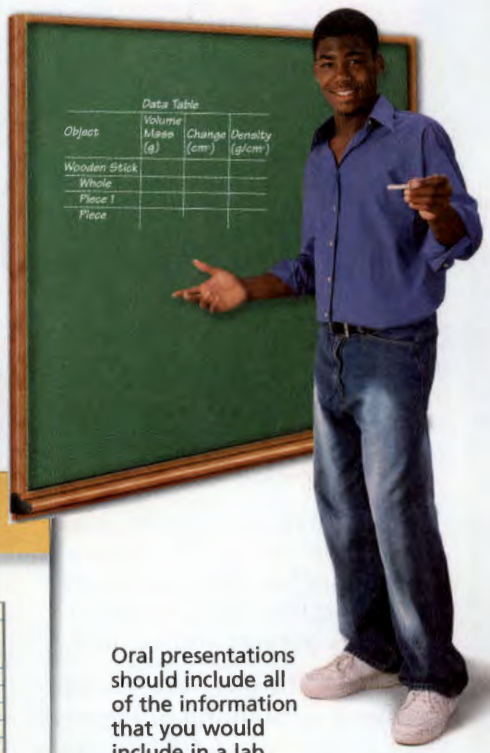
Focus on Physical Science High-Use Academic Words

Learning the meaning of these words will help you improve your reading comprehension in all subject areas.

accelerate	consist	distribute	locate	region
accurate	constant	ensure	maintain	release
alter	construct	estimate	method	reliable
area	consumer	evidence	minimize	require
assume	contact	expand	neutral	research
benefit	contract	expel	obvious	resource
category	contrast	explore	occurred	revolution
complex	define	factor	operate	series
concentrate	definite	flexible	potential	significant
concept	detect	formula	predict	similar
conclude	develop	individual	principle	source
conduct	displace	interact	recover	stable

Investigations

You can explore the concepts in this textbook through inquiry. Like a real scientist, you can develop your own scientific questions and perform labs and activities to find answers. Follow the steps below when doing a lab.



1 **Read the whole lab.**

5 **Record your data.**

Lab zone Skills Lab

Making Sense of Density

S 8.8.b, 8.9.b

Problem

Does the density of a material vary with volume?

Skills Focus

drawing conclusions, measuring, controlling variables

Materials

- balance
- water
- paper towels
- metric ruler
- graduated cylinder, 100-mL
- wooden stick, about 6 cm long
- ball of modeling clay, about 5 cm wide
- crayon with paper removed

Procedure

1. Use a balance to find the mass of the wooden stick. Record the mass in a data table like the one shown above right.
2. Add enough water to a graduated cylinder so that the stick can be completely submerged. Measure the initial volume of the water.
3. Place the stick in the graduated cylinder. Measure the new volume of the water.
4. The volume of the stick is the difference between the water levels in Steps 2 and 3. Calculate this volume and record it.
5. The density of the stick equals its mass divided by its volume. Calculate and record its density.
6. Thoroughly dry the stick with a paper towel. Then carefully break the stick into two pieces. Repeat Steps 1 through 5 with one piece. Then, repeat Steps 1 through 5 with the other piece.
7. Repeat Steps 1 through 6 using the clay rolled into a rope.
8. Repeat using the crayon.

Data Table

Object	Mass (g)	Volume Change (cm^3)	Density (g/cm^3)
Wooden stick			
Whole			
Piece 1			
Piece 2			
Modeling clay			
Whole			
Piece 1			
Piece 2			
Crayon			
Whole			
Piece 1			
Piece 2			

Analyze and Conclude

1. **Measuring** For each object you tested, compare the density of the whole object with the densities of the pieces of the object.
2. **Drawing Conclusions** Use your results to explain how density can be used to identify a material.
3. **Controlling Variables** Why did you dry the objects in Step 6?
4. **Communicating** Write a paragraph explaining how you would change the procedure to obtain more data. Tell how having more data would affect your answers to Questions 1 and 2 above.

Design an Experiment

Design an experiment you could use to determine the density of olive oil. With your teacher's permission, carry out your plan. Use the library or the Internet to find the actual density of olive oil. Compare your experimental value with the actual value, and explain why they may differ.

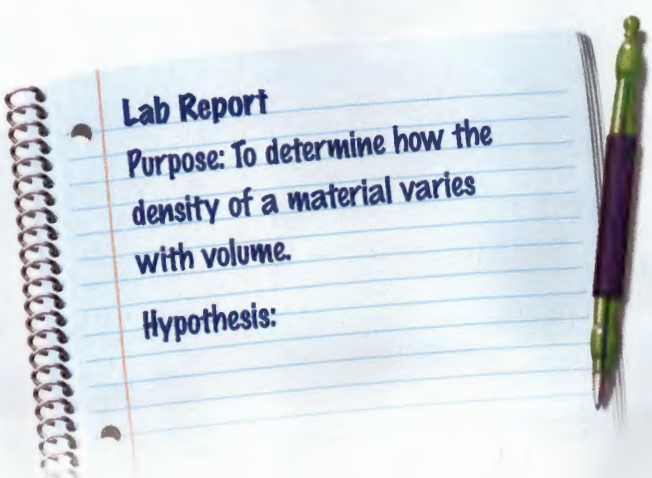
2 **Write a purpose.** What is the purpose of this activity?

3 **Write a hypothesis.** What is a possible explanation? Hypotheses lead to predictions that can be tested.

4 **Follow each step in the procedure.** Pay attention to safety icons.

6 **Analyze your results.** Answering the questions will help you draw conclusions.

Oral presentations should include all of the information that you would include in a lab report.



7 **Communicate your results in a written report or oral presentation.** Your report should include:

- a hypothesis
- a purpose
- the steps of the procedure
- a record of your results
- a conclusion

For more information on Science Inquiry, Scientific Investigations and Safety refer to the Skills Handbook and Appendix A.