

California

Focus on **Life**
Science

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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 area when harmful vapors may be involved. Avoid inhaling 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.

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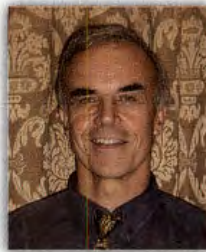
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Looking at Cells

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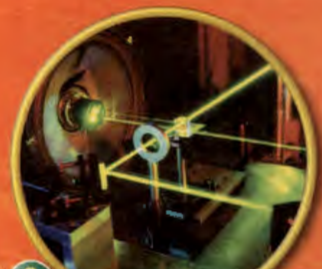
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Focus on the
BIG Idea

How do scientists make progress in understanding the natural world?







Focus on the
BIG Idea

How does light allow you to see?







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Focus on the
BIG Idea

What is the
structure of
a cell?



Focus on the
BIG Idea


How do cells
obtain the
energy they
need to carry
out all their
functions?

Genetics and Evolution

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Focus on the
BIG Idea

How are traits passed from parents to offspring?




Focus on the
BIG Idea


How are traits inherited in people?

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Focus on the
BIG Idea

What factors
have caused the
evolution and
diversity of
organisms?



Focus on the
BIG Idea

How does
evidence from
rocks help
scientists
understand
Earth's history?

Structure and Function in Living Systems

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Focus on the **BIG Idea**

How do structure and function vary among organisms in different domains and kingdoms?





Focus on the **BIG Idea**

How does the structure of a plant allow it to grow and reproduce?



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Focus on the
BIG Idea

What major functions do animals' bodies perform?



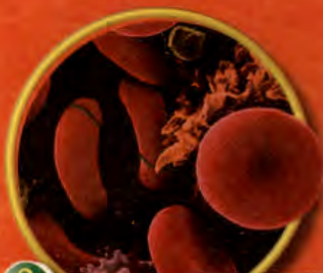
Focus on the
BIG Idea

How does the structure of vertebrates help them to function?



Focus on the
BIG Idea

How do the physical principles of forces and machines relate to the functions of your muscles and skeleton?



Focus on the
BIG Idea

What are the major functions of the circulatory and respiratory systems?

Structure and Function in the Human Body



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Focus on the
BIG Idea

How do organs
and other
structures
enable the
nervous system
to function?



Focus on the
BIG Idea

How do the
endocrine and
reproductive
systems work
together to
contribute to
reproduction?

Activities

Lab
zone

Standards Warm-Up

Exploration and inquiry before reading

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Lab
zone

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Lab
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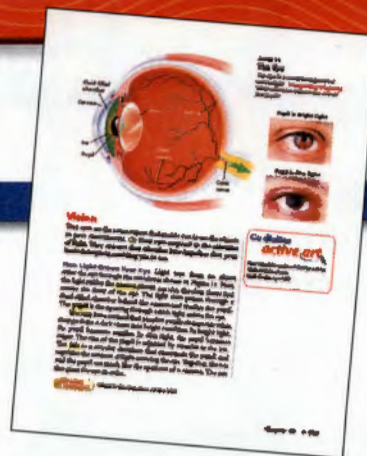
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Video Field Trip
 Discovery Channel School

VIDEO

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 Find Web links on topics relating to every section.

Active Art Interact with selected visuals from every chapter online.

Planet Diary Explore news and natural phenomena through weekly reports.

Science News Keep up to date with the latest science discoveries.

Interactive Textbook

Experience the complete textbook online and on CD-ROM.

Activities Practice skills and learn content.

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.

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



Focus on the
BIG Idea

S 8.5

How do cells obtain the energy they need to carry out all their functions?

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.

CALIFORNIA

Standards Focus

S 7.1.d Students know that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis.

- How does the sun supply living things with the energy they need?
- What happens during the process of photosynthesis?

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 7.1.d

Content Area

S for Science
E-LA for English-Language Arts
Math for Mathematics

The next several pages will introduce you to the California Science Content Standards for Grade 7. Seven sets of standards cover the material you will be learning this year. Each standard set contains several specific standards that tell what you need to know. For Grade 7, these standards focus mainly on life science. Some of the standards also help you learn about relationships between life science and other branches of science.

STANDARD SET 1

Cell Biology

- 1. All living organisms are composed of cells, from just one to many trillions, whose details usually are visible only through a microscope. As a basis for understanding this concept:**
 - 1. a. Students know cells function similarly in all living organisms.*
 - 1. b. Students know the characteristics that distinguish plant cells from animal cells, including chloroplasts and cell walls.*
 - 1. c. Students know the nucleus is the repository for genetic information in plant and animal cells.*

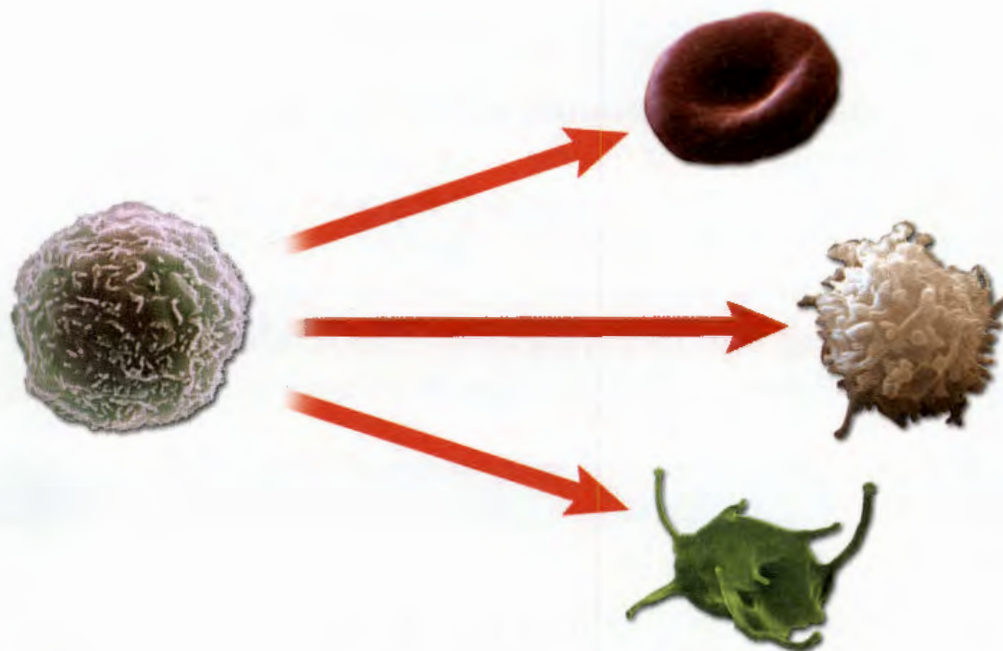
What It Means to You

You will learn that all organisms are made up of cells. These cells have many functions and structures in common, but there are differences between cells from different organisms. You will learn about the important differences between plant and animal cells. You will also learn that cells have a nucleus that holds the cell's genetic information and controls the cell's functions.

Where You Will Learn It

Chapters 3 and 9



**STANDARD SET 1, continued**

1. d. *Students know that mitochondria liberate energy for the work that cells do and that chloroplasts capture sunlight energy for photosynthesis.*
1. e. *Students know cells divide to increase their numbers through a process of mitosis, which results in two daughter cells with identical sets of chromosomes.*
1. f. *Students know that as multicellular organisms develop, their cells differentiate.*

What It Means to You

You will learn how cells get the energy they need to perform their functions. Some cells, such as those in plants, have chloroplasts that capture energy from sunlight and use it to produce food that the cell can use. You will learn that both plant and animal cells have mitochondria that release energy from food. Cells use this energy to carry out many functions. You will also learn how cells divide to produce new cells. In multicellular organisms, cells may develop specialized structures that allow them to perform different functions.

Where You Will Learn It

Chapters 4, 10, and 16

STANDARD SET 2

Genetics

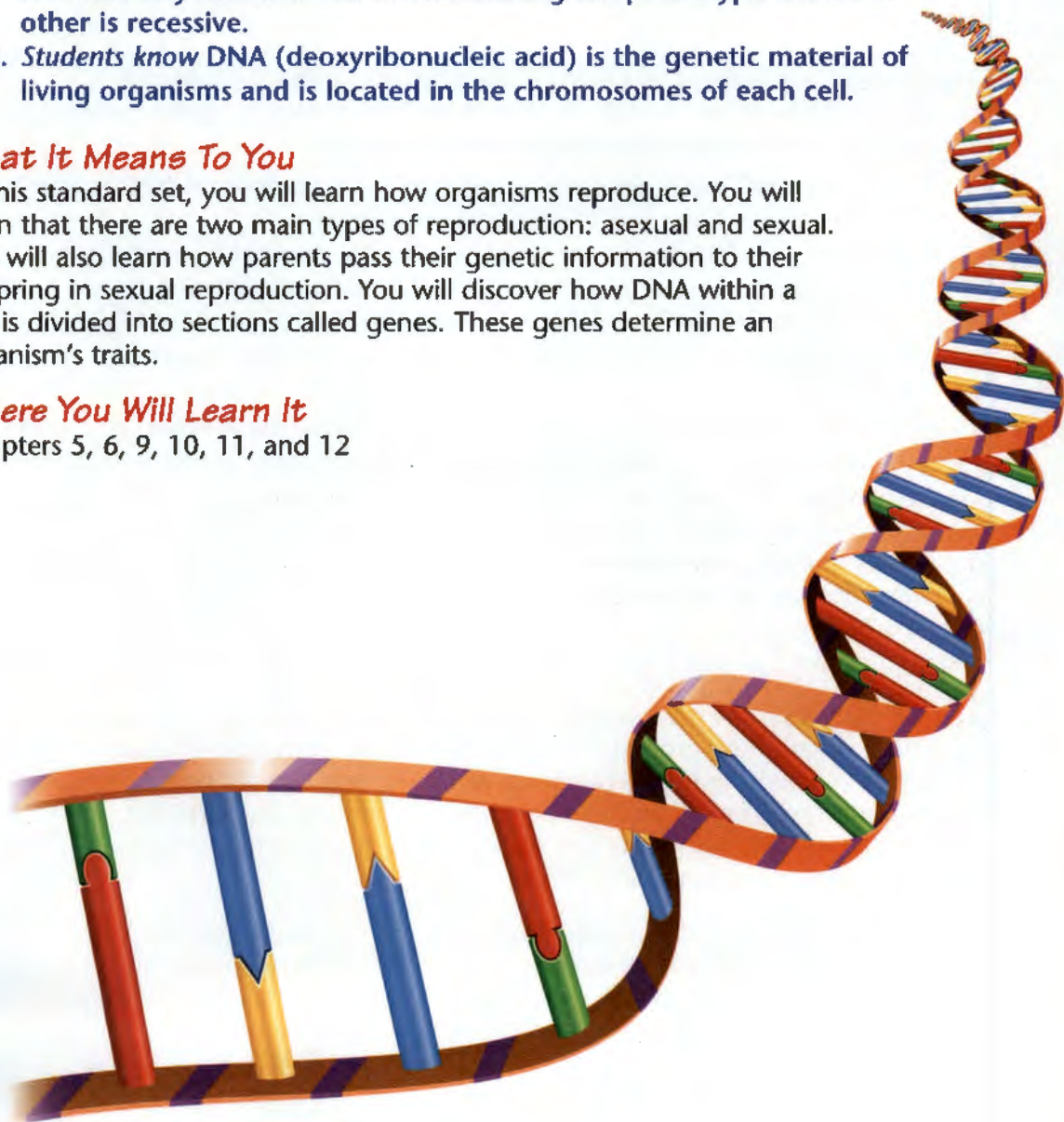
- 2. A typical cell of any organism contains genetic instructions that specify its traits. Those traits may be modified by environmental influences. As a basis for understanding this concept:**
2. a. *Students know* the differences between the life cycles and reproduction methods of sexual and asexual organisms.
 2. b. *Students know* sexual reproduction produces offspring that inherit half their genes from each parent.
 2. c. *Students know* an inherited trait can be determined by one or more genes.
 2. d. *Students know* plant and animal cells contain many thousands of different genes and typically have two copies of every gene. The two copies (or alleles) of the gene may or may not be identical, and one may be dominant in determining the phenotype while the other is recessive.
 2. e. *Students know* DNA (deoxyribonucleic acid) is the genetic material of living organisms and is located in the chromosomes of each cell.

What It Means To You

In this standard set, you will learn how organisms reproduce. You will learn that there are two main types of reproduction: asexual and sexual. You will also learn how parents pass their genetic information to their offspring in sexual reproduction. You will discover how DNA within a cell is divided into sections called genes. These genes determine an organism's traits.

Where You Will Learn It

Chapters 5, 6, 9, 10, 11, and 12





STANDARD SET 3

Evolution

- 3. Biological evolution accounts for the diversity of species developed through gradual processes over many generations. As a basis for understanding this concept:**
3. a. *Students know* both genetic variation and environmental factors are causes of evolution and diversity of organisms.
 3. b. *Students know* the reasoning used by Charles Darwin in reaching his conclusion that natural selection is the mechanism of evolution.
 3. c. *Students know* how independent lines of evidence from geology, fossils, and comparative anatomy provide the bases for the theory of evolution.
 3. d. *Students know* how to construct a simple branching diagram to classify living groups of organisms by shared derived characteristics and how to expand the diagram to include fossil organisms.
 3. e. *Students know* that extinction of a species occurs when the environment changes and the adaptive characteristics of a species are insufficient for its survival.

What It Means to You

You will learn that the great diversity of organisms on Earth has developed over time through the process of evolution. You will learn how Charles Darwin developed the theory of natural selection, and how evidence from fossils, Earth's rock layers, and comparisons of organisms supports this theory. You will also learn how genetic variations and environmental changes interact in natural selection.

You will practice creating diagrams that show the relationship among living organisms and fossils. You will also learn that when a species of organisms cannot adapt to a change in the environment, the species may die out, or become extinct.

Where You Will Learn It

Chapters 7, 11, and 12

STANDARD SET 4

Earth and Life History

4. Evidence from rocks allows us to understand the evolution of life on Earth. As a basis for understanding this concept:

4. a. *Students know* Earth processes today are similar to those that occurred in the past and slow geologic processes have large cumulative effects over long periods of time.
4. b. *Students know* the history of life on Earth has been disrupted by major catastrophic events, such as major volcanic eruptions or the impacts of asteroids.
4. c. *Students know* that the rock cycle includes the formation of new sediment and rocks and that rocks are often found in layers, with the oldest generally on the bottom.

What It Means to You

You will learn how scientists use evidence found in layers of rock to study the evolution of life on Earth. You will learn how scientists study processes that occur on Earth today, such as the rock cycle, to understand what happened in earlier times. You will also learn how sudden events (such as volcanic eruptions and asteroid impacts) have changed the history of life on Earth.

Where You Will Learn It

Chapter 8



STANDARD SET 4, continued

- 4. d. *Students know* that evidence from geologic layers and radioactive dating indicates Earth is approximately 4.6 billion years old and that life on this planet has existed for more than 3 billion years.
- 4. e. *Students know* fossils provide evidence of how life and environmental conditions have changed.
- 4. f. *Students know* how movements of Earth's continental and oceanic plates through time, with associated changes in climate and geographic connections, have affected the past and present distribution of organisms.
- 4. g. *Students know* how to explain significant developments and extinctions of plant and animal life on the geologic time scale.

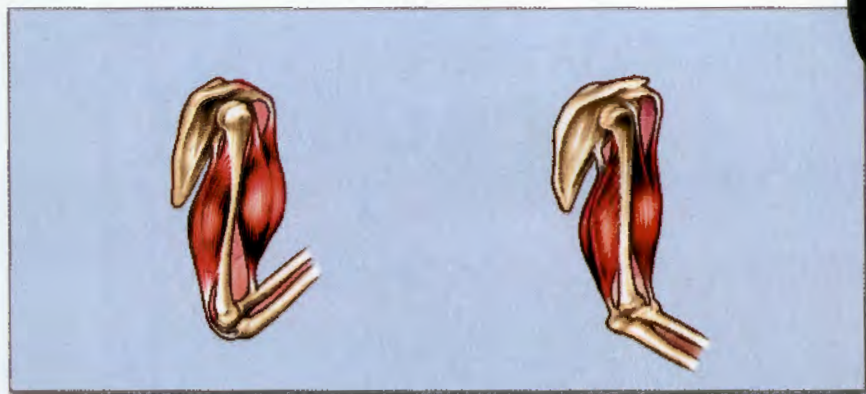
What It Means to You

You will learn how scientists have determined the age of Earth and of early life forms by using radioactive dating and by comparing materials found in different rock layers. Fossils found in rock layers show how Earth's organisms and environments have changed over time. You will also learn how the movement of Earth's plates has changed Earth's environments, and how those changes have affected life on Earth. You will learn about the geologic time scale and how scientists determine when important events occurred.

Where You Will Learn It

Chapters 7 and 8





STANDARD SET 5

Structure and Function in Living Systems

- 5. The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function. As a basis for understanding this concept:**
- Students know plants and animals have levels of organization for structure and function, including cells, tissues, organs, organ systems, and the whole organism.*
 - Students know organ systems function because of the contributions of the individual organs, tissues, and cells. The failure of any part can affect the entire system.*
 - Students know how bones and muscles work together to provide a structural framework for movement.*

What It Means to You

You will learn about the structures found in organisms. These structures are organized into cells, tissues, organs, organ systems, and whole organisms. You will learn how different body parts work together to ensure that the whole organism survives. For example, you will explore how bones and muscles work together to allow animals to move. You will learn about a variety of structures in both plants and animals and how each structure helps the organism to carry out its life functions.

Where You Will Learn It

Chapters 1, 9, 10, 11, 12, 13, 14, 15, and 16

**STANDARD SET 5, continued**

- 5. d. *Students know* how the reproductive organs of the human female and male generate eggs and sperm and how sexual activity may lead to fertilization and pregnancy.
- 5. e. *Students know* the function of the umbilicus and placenta during pregnancy.
- 5. f. *Students know* the structures and processes by which flowering plants generate pollen, ovules, seeds, and fruit.
- 5. g. *Students know* how to relate the structures of the eye and ear to their functions.

What It Means to You

You will learn how humans reproduce, beginning with the production of egg and sperm cells. You will see how structures in the female reproductive system protect a developing fetus and transfer nutrients and other materials between the mother and the fetus. You will also learn how different plants reproduce. Finally, you will explore how the human eye and ear enable people to see and hear.

Where You Will Learn It

Chapters 10, 15, and 16

STANDARD SET 6

Physical Principles in Living Systems

6. Physical principles underlie biological structures and functions. As a basis for understanding this concept:

6. a. *Students know* visible light is a small band within a very broad electromagnetic spectrum.
6. b. *Students know* that for an object to be seen, light emitted by or scattered from it must be detected by the eye.
6. c. *Students know* light travels in straight lines if the medium it travels through does not change.
6. d. *Students know* how simple lenses are used in a magnifying glass, the eye, a camera, a telescope, and a microscope.
6. e. *Students know* that white light is a mixture of many wavelengths (colors) and that retinal cells react differently to different wavelengths.
6. f. *Students know* light can be reflected, refracted, transmitted, and absorbed by matter.
6. g. *Students know* the angle of reflection of a light beam is equal to the angle of incidence.

What It Means to You

This standard set includes some ways that concepts from physical science are important in life science. You will learn how light behaves and how your eye reacts to different kinds of light. You will explore tools, such as telescopes and microscopes, that allow people to observe objects that cannot be seen without these tools.

Where You Will Learn It

Chapters 1, 2, 3, and 15



**STANDARD SET 6, continued**

- 6. h. *Students know how to compare joints in the body (wrist, shoulder, thigh) with structures used in machines and simple devices (hinge, ball-and-socket, and sliding joints).*
- 6. i. *Students know how levers confer mechanical advantage and how the application of this principle applies to the musculoskeletal system.*
- 6. j. *Students know that contractions of the heart generate blood pressure and that heart valves prevent backflow of blood in the circulatory system.*

What It Means to You

You will learn how the bones, muscles, and joints in your body are similar to machines such as levers. By exploring how simple machines work, you will learn how your own muscles and bones function. You will also learn how your heart moves blood through your body.

Where You Will Learn It

Chapters 13 and 14

STANDARD SET 7

Investigation and Experimentation

- 7. 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 three strands, students should develop their own questions and perform investigations. Students will:**
7. a. Select and use appropriate tools and technology (including calculators, computers, balances, spring scales, microscopes, and binoculars) to perform tests, collect data, and display data.
 7. b. Use a variety of print and electronic resources (including the World Wide Web) to collect information and evidence as part of a research project.
 7. c. Communicate the logical connection among hypotheses, science concepts, tests conducted, data collected, and conclusions drawn from the scientific evidence.
 7. d. Construct scale models, maps, and appropriately labeled diagrams to communicate scientific knowledge (e.g., motion of Earth's plates and cell structure).
 7. e. Communicate the steps and results from an investigation in written reports and oral presentations.

What It Means to You

You will learn how scientists gather, interpret, and communicate information. You will perform your own experiments and investigations and learn to draw conclusions from the data you collect. For instance, you will explore what conditions allow the stomach to digest protein. You will learn to find accurate information in print and electronic resources, and to create models and diagrams to communicate the information you learn.

Where You Will Learn It

This material is covered in Chapters 1, 3, and 9, and in the labs and activities in all chapters.





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 2 The Study of Life

CALIFORNIA Standards Focus

S 7.5 The anatomy and physiology of plants and animals illustrate the complementary nature of structure and function.

S 7.6 Physical principles underlie biological structures and functions.

How are the branches of life science related?
What are some big ideas in life science?

Key Terms


- life science
- biology
- organism
- development
- structure
- function
- complementary

Lab zone Standards Warm-Up

How Is Structure Related to Function?

1. Study the photo of the bird and list its characteristics.
2. Next, study the photos of the three food items below.

Think It Over
Inferring Based on your observations, which of the food items do you think the bird feeds on? Explain your reasoning.



In a laboratory, detectives are solving a crime by comparing the genetic makeup of different suspects. On a beach, a scientist studies the nesting behavior of sea turtles. Deep in a tropical rain forest, another scientist discovers a new kind of beetle. In a hospital laboratory, doctors study a deadly form of bird flu. At a cancer research institute, a team of scientists develops new treatments for a rare form of cancer. What do all of these people have in common? All these people are working in the field of life science.

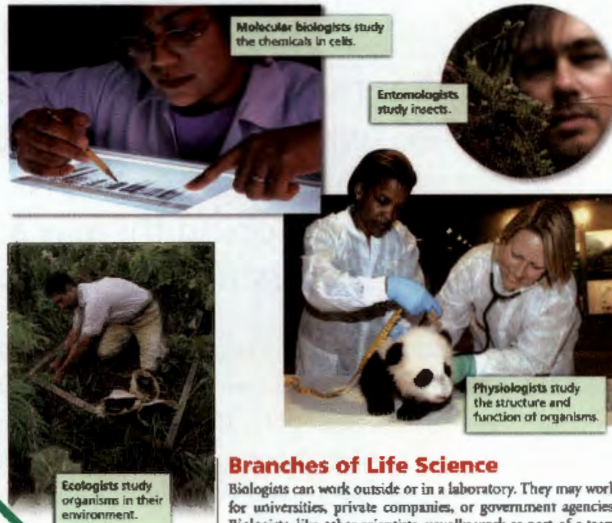
Life science is the study of living things. Another name for life science is biology. The word biology comes from two Greek words, *Bios* means "life" and *logos* means "reason" or "the study of." Thus **biology** is the study of life. Biologists are scientists who study living things.

Biologists study all kinds of living things. The general term for a living thing is an **organism**. An organism may be an animal, a plant, a fungus or a microbe.

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.



Molecular biologists study the chemicals in cells.

Entomologists study insects.

Ecologists study organisms in their environment.

Physiologists study the structure and function of organisms.

From Life Scientists at Work
You can find life scientists at work in such diverse places as forests, laboratories, zoos, and museums.

Branches of Life Science

Biologists can work outside or in a laboratory. They may work for universities, private companies, or government agencies. Biologists, like other scientists, usually work as part of a team studying a common topic.

Life science includes many different branches, or fields of study. Molecular biology, genetics, physiology, and ecology are just some fields of life science. Molecular biology is the study of the chemical building blocks of cells. Genetics is the study of how information about organisms is passed from parent to offspring. Physiology is the study of the structures and functions of organisms. Ecology is the study of how organisms interact with each other and with their surroundings. Other branches of life science include cell biology, plant biology, and microbiology. What do you think these fields involve?

Though life science can be divided into branches, the different fields of study often overlap. For example, understanding what controls plant development relies on concepts from molecular biology and plant biology. Progress in one field of life science often contributes to progress in another field.



For links on careers in life science
Visit: www.SciLinks.org
Web Code: cm-1012

The principles of physics also help explain life processes. Consider, for example, the relationship between the physics of light and the way that eyes function. To understand how eyes function, scientists must know what light is and how light travels. Scientists can compare the structure of an eye to that of a camera. Like a camera, an eye uses a lens to focus light and form an image. The principles that allow a camera to take a picture also allow an eye to see.

Compare the variety of eyes in Figure 9. Although each of the animals may see slightly differently, all of the eyes operate on similar physical principles.

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

Section 2 Assessment

5.7.5, 7.6 E-LA: Reading: 7.2.0

- Target Reading Skill Preview Text**
Structure When you took notes on Section 2, what question did you ask for the heading *Change Over Time*? What was your answer?

Reviewing Key Concepts

1. a. **Defining** What is life science?
b. **Describing** List three branches of life science and describe what is studied in each.
c. **Making Judgments** Your friend wants to be a plant biologist and says she or he needs to take courses in plant biology. Why might it be a good idea for your friend to study other branches of life science as well?
2. a. **Listing** What are four big ideas in life science?
b. **Comparing and Contrasting** What are some ways that a cat and a tree are similar? What are some ways they are different?

At-Home Activity

It's Complementary Explain to a family member what "complementary structure and function" means. Then look through books or magazines for photos of organisms that illustrate this concept. Find five examples to show your family member. Describe how a structure on each of the organisms is adapted to its function.

After You Read

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



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 titles, labels, and captions. Then ask yourself questions about the visuals. (Chapter 2)

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 10 and 14)

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 9 and 12)

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 16)

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 3, 6, and 15)

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 7)

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 4 and 8)

Take Notes Science chapters are packed with information. Taking good notes is one way to help you remember key ideas and see the big picture. When you take notes, include key ideas, a few details, and summaries. (Chapters 5, 11, and 13)

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. You can preview these headings to help you take notes about what you read. Organize your notes by dividing a sheet of paper into three columns.

- Write the heading in the first column.
- Write a question in the second column. Look for important words in the heading to guide you in asking a question.
- Answer your question in the third column.

The partially completed notes below are based on the first heading of Section 2 in this chapter.

Section 2: The Study of Life		
Heading	Question	Answer
Branches of Life Science	What are the branches of life science?	There are many branches of life science, but the branches overlap. Molecular biology—study of the building blocks of cells Genetics—how information is passed from parents to offspring Ecology—organisms and environment Physiology—functions of organisms

Apply It!

Review the notes above. Then answer the questions.

1. What are the key words in the heading in the first column?
2. What question has been asked about the heading?
3. The answer says that the branches of life science overlap. What does this mean?

When you read Section 2, take notes for all the headings. Also use this method to preview and take notes on Section 4.

Section 2 Assessment

S 7.5, 7.6 E-LA: Reading: 7.2.0

Target Reading Skill Preview Text Structure When you took notes on Section 2, what question did you ask for the heading *Change Over Time*? What was your answer?

Reviewing Key Concepts

1. **a. Defining** What is life science?
 - b. **Describing** List three branches of life science and describe what is studied in each.
 - c. **Making Judgments** Your friend wants to be a plant biologist and says she only needs to take courses in plant biology. Why might it be a good idea for your friend to study other branches of life science as well?
2. **a. Listing** What are four big ideas in life science?
 - b. **Comparing and Contrasting** What are some ways that a cat and a tree are similar? What are some ways they are different?

At-Home Activity

It's Complementary Explain to a family member what "complementary structure and function" means. Then look through books or magazines for photos of organisms that illustrate this concept. Find five examples to show your family member. Describe how a structure on each of the organisms is adapted to its function.



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 **Chapters 3 and 9**.

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 5 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 2, 4, 12, and 13**.

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 **Chapters 8 and 11**.

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 **Chapter 7**.

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 16**.

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 you 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

Prefixes

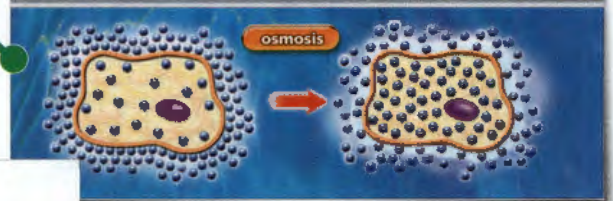
Words can sometimes be divided into parts. A root is the part of the word that carries the basic meaning. A prefix is a word part that is placed in front of the root to change the word's meaning. In the word *multicellular*, for example, *-cellular* is the root and *multi-* is the prefix. The prefix *multi-* means "many." *Multicellular* means "having many cells."

The prefixes below will help you understand some Key Terms.

Prefix	Meaning	Example Word
chlor-	green	chloroplast A cellular structure that captures energy from sunlight
cyto-	cell	cytoskeleton The framework inside a cell
multi-	many	multicellular Having many cells
uni-	one	unicellular Having one cell

Apply It!

1. A **chloroplast** is a structure in plant cells. What color do you think a chloroplast is?
2. What clue within the word **cytoskeleton** lets you know that the word has something to do with cells?



Unicellular and Multicellular

Organisms may be composed of only one cell or many trillions of cells. **Unicellular**, or single-celled, organisms include bacteria (bak-TEER-ee-uh), the most numerous organisms on Earth. **Multicellular** organisms are composed of many cells.

In multicellular organisms, cells are often organized into **tissues**, **organs**, and **organ systems**. A **tissue** is a group of similar cells that work together to perform a specific function. For example, your brain is mostly made up of nervous tissue, which consists of nerve cells. An **organ**, such as your brain, is made up of different kinds of tissues that work together. In addition to nervous tissue, your brain contains other kinds of tissue that support and protect it. Your brain is part of your nervous system, an organ system that directs body activities and processes. An **organ system** is a group of organs that work together to perform a major function.

Reading Check What is an organ?



Unicellular



Multicellular

Focus 4
Cellular Organization
This dog is multicellular. The bacteria that live naturally on its teeth are unicellular. Each green sphere is a bacterial cell.

Section 1 Assessment

5.1.1 E-LS: Reading 7.1.2, Writing 7.2.4

Vocabulary Skill **Prefixes** Complete the following sentences with Key Terms. Because bacteria each have only one cell, they are _____ organisms. Animals have many cells. Therefore, animals are _____ organisms.

Reviewing Key Concepts

1. a. **Defining** Define structure and function.
b. **Explaining** Explain this statement: Cells are the basic units of structure and function in organisms.
c. **Applying Concepts** In what important function are the cells in your eyes involved?
2. a. **Reviewing** What does a microscope enable people to do?
b. **Summarizing** Summarize Hooke's observations of cork under a microscope.
c. **Relating Cause and Effect** Why would Hooke's discovery have been impossible without a microscope?

3. a. **Listing** What does the cell theory state?
b. **Explaining** What did Virchow contribute to the cell theory?
c. **Applying Concepts** Use Virchow's ideas to explain why plants and fungi are not alive.
4. a. **Reviewing** How do multicellular organisms differ from unicellular organisms?
b. **Explaining** What is the relationship among cells, tissues, and organs?
c. **Inferring** Would a tissue or an organ have more kinds of specialized cells? Explain.

Writing in Science

Writing an Award Speech Suppose you are a member of a scientific society that is giving an award to one of the early cell scientists. Choose the scientist, and write a speech that you might give at the award ceremony. Be sure to describe the scientist's accomplishments.

As You Read

Each key term is highlighted in yellow, appears in boldface 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 that are used frequently in classrooms. Look for the words below as you read this chapter.

Word	Definition	Example Sentence
concept (KAHM sept) pp. 14, 15	n. An idea or thought, especially a general idea or understanding	Each section in this textbook contains key concepts , which are the section's most important ideas.
process (PRAH ses) pp. 10, 15, 16	n. A series of actions or events; a particular way of doing things	Science is an ongoing process of discovery.
evidence (EV uh dums) p. 18	n. Facts, figures, or signs to show that something exists or is true	Scientists propose explanations based on evidence they gather.
research (REE surch) p. 21	n. Careful study of a subject to discover new facts or test new ideas	Research into the causes of cancer may lead to a cure.

Apply It!

Choose the word that best completes each sentence.

- Laboratory safety is an important _____ in this chapter.
- Jane Goodall conducted _____ on the behavior of chimpanzees.

Focus on Life Science High-Use Academic Words

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

adjust	contract	flexible	normal	section
adult	contrast	focus	obvious	sequence
affect	contribute	function	occur	series
alter	convert	identical	percent	source
analyze	cycle	indicate	predict	specific
approach	detect	interact	process	stable
area	determine	interpret	range	structure
attach	device	involve	region	survival
communicate	distinct	label	regulate	technique
complex	diverse	layer	require	theory
concept	enable	locate	research	transport
conduct	environment	maintain	resource	unique
consist	evidence	mature	respond	vary
constant	expose	method	reverse	visible

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.

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.

Lab zone Skills Lab

Changing Colors

S 7.8.a, 7.7.c

Problem
How do color filters affect the appearance of objects in white light?

Skills Focus
observing, inferring, predicting

Materials

- shoe box
- scissors
- flashlight
- removable tape
- red object (such as a ripe tomato)
- yellow object (such as a ripe lemon)
- blue object (such as blue construction paper)
- red, green, and blue cellophane, enough to cover the top of the shoe box

Procedure

1. Carefully cut a large rectangular hole in the lid of the shoe box.
2. Carefully cut a small, round hole in the center of one of the ends of the shoe box.
3. Tape the red cellophane under the lid of the shoe box, covering the hole in the lid.
4. Place the objects in the box and put the lid on.
5. In a darkened room, shine the flashlight into the shoe box through the side hole. Note the apparent color of each object in the box.
6. Repeat Steps 3–5 using the other colors of cellophane.

Analyze and Conclude

1. **Observing** What did you see when you looked through the red cellophane? Explain why each object appeared as it did.
2. **Observing** What did you see when you looked through the blue cellophane? Explain.
3. **Inferring** What colors of light does each piece of cellophane allow through?
4. **Predicting** Predict what you would see under each piece of cellophane if you put a white object in the box. Test your prediction.
5. **Predicting** What do you think would happen if you viewed a red object through yellow cellophane? Draw a diagram to support your prediction. Then test your prediction.
6. **Communicating** Summarize your conclusions by drawing diagrams to show how each color filter affects white light. Write captions to explain your diagrams.

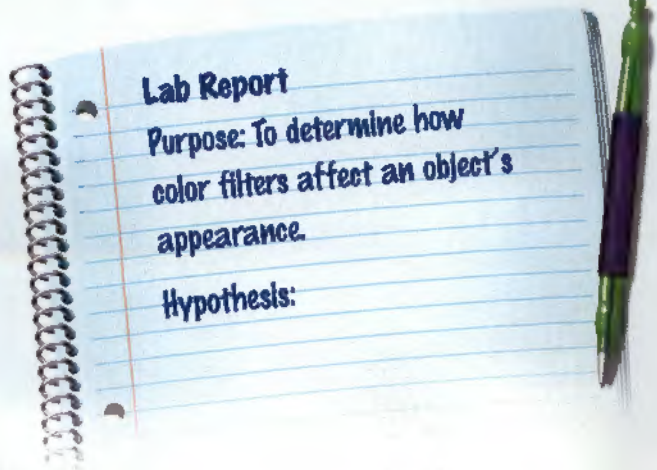
Design an Experiment

Do color filters work like pigments or like colors of light? Design an experiment to find out what happens if you shine a light through both a red and a green filter. Obtain your teacher's permission before carrying out your investigation.

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

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.