

Teacher Annotated Edition

Science Notebook

Glencoe Science

Biology

Consultant

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Glencoe

New York, New York Columbus, Ohio Chicago, Illinois Peoria, Illinois Woodland Hills, California

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To the Teacher

Dear Science Teacher,

As you begin a new school year, one of the biggest challenges you will probably encounter is getting students to read their textbooks. Informational text can overwhelm students, leaving them less likely to read and more likely to become apathetic about learning. I believe that this Science Notebook will help students use their textbooks more effectively as they learn about Biology.

Note-Taking and Student Success

There is considerable research evidence that addresses how students understand difficult concepts and content in school. Glencoe/McGraw-Hill has developed the *Science Notebook* for science students based upon that research. Evidence indicates that students need to know how to take notes, use graphic organizers, learn vocabulary, and develop their thinking skills by writing, in order to achieve academic success.

The ability to take and organize notes predicts how well students will do in school. Peverly, Brobst, Graham, and Shaw (2003) showed that when students use background knowledge and take notes, they are likely to perform well on tests. Pauk (1974) observed that note-taking was a critical skill for college success. Notes serve as an external storage function (meaning on the paper) that builds comprehension and content understanding (Ganske, 1981). This *Science Notebook* is a tool that students can use to achieve this goal. I would like to share some of the features of this *Science Notebook* with you before you begin teaching.

The Cornell Note-Taking System

First, you will notice that the pages in the *Science Notebook* are arranged in two columns, which will help students organize their thinking. This two-column design is based on the **Cornell Note-Taking System**, developed at Cornell Uni-

versity. Faber, Morris, and Lieberman (2000) found that the Cornell Note-Taking System improves comprehension and increases test scores.

The column on the left side of the page highlights the main ideas and vocabulary of the lesson. This column will help students find information and locate the references in their textbooks quickly. Students can also use this column to sketch drawings that help them visually remember the lesson's information. In the column on the right side of the page, students will write detailed notes about the main ideas and vocabulary. The notes they take in this column will help them focus on the important information in the lesson. As students become more comfortable using the Cornell Note-Taking System, they will see that it is an important tool that helps them organize information.

The Importance of Graphic Organizers

Second, there are many graphic organizers in this *Science Notebook*. Graphic organizers allow students to see the lesson's important information in a visual format. In addition, graphic organizers help students summarize information and remember the content. I hope that you will encourage students to use the graphic organizers because they will help them understand what they are reading.

Research-Based Vocabulary Development

Third, you will notice that vocabulary is introduced and practiced throughout the *Science Notebook*. When students know the meaning of the words used to discuss information, they are able to understand that information better. Also, students are more likely to be successful in school when they have vocabulary knowledge. When researchers study successful students, they find that as students acquire vocabulary knowledge, their ability to learn improves (Martino and Hoffman, 2002). The *Science Notebook* focuses on learning words that are very specific to understanding the content of the textbook. The *Science Notebook* also highlights general academic words that students need to know so that they can understand any textbook. These vocabulary words are based on the Academic Word List (AWL) developed by Averil Coxhead. The AWL includes the most common 570 words found in academic texts, excluding the 2,000 general English words such as *the*, *in*, and *that*. Research indicates that students who master the words on Coxhead's list score significantly higher on standardized tests.

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Writing Prompts and Note-Taking

Finally, there are a number of writing exercises included in this *Science Notebook*. Writing is a useful tool that helps students understand the information that is being presented. Writing helps them to assess what they have learned. You will see that many of the writing exercises require students to practice the skills of good readers. Good readers *make connections* between their lives and the text and *predict* what will happen next in the reading. They *question* the information and the author of the text, *clarify* information and ideas, and *visualize* what the text is saying. Good readers also *summarize* the information that is presented and *make inferences* or *draw conclusions* about the facts and ideas.

I wish you well as you begin another school year. This *Science Notebook* is designed to help students understand the information in your Biology class. The guide will be a valuable tool that will also provide students with skills that they can use throughout their lives.

I hope you have a successful school year.

Sincerely,
Douglas Fisher

Note-Taking Tips

Your notes are a reminder of what you learned in class. Taking good notes can help you succeed in science. The following tips will help you take better classroom notes.

- Before class, ask what your teacher will be discussing in class. Review mentally what you already know about the concept.
- Be an active listener. Focus on what your teacher is saying. Listen for important concepts. Pay attention to words, examples, and/or diagrams your teacher emphasizes.
- Write your notes as clear and concise as possible. The following symbols and abbreviations may be helpful in your note-taking.

Word or Phrase	Symbol or Abbreviation	Word or Phrase	Symbol or Abbreviation
for example	e.g.	and	+
such as	i.e.	approximately	≈
with	w/	therefore	∴
without	w/o	versus	vs

- Use a symbol such as a star (★) or an asterisk (*) to emphasize important concepts. Place a question mark (?) next to anything that you do not understand.
- Ask questions and participate in class discussion.
- Draw and label pictures or diagrams to help clarify a concept.
- When working out an example, write what you are doing to solve the problem next to each step. Be sure to use your own words.
- Review your notes as soon as possible after class. During this time, organize and summarize new concepts and clarify misunderstandings.

Note-Taking Don'ts

- **Don't** write every word. Concentrate on the main ideas and concepts.
- **Don't** use someone else's notes because they may not make sense.
- **Don't** doodle. It distracts you from listening actively.
- **Don't** lose focus or you will become lost in your note-taking.

The Study of Life

Before You Read

Use the “What I Know” column to list the things you know about biology. Then list the questions you have about biology in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Animals, plants, and even bacteria and viruses are considered living things. But what do we mean when we say that an organism is a living thing? In the space below, describe two characteristics that are common to all living things.

Accept all reasonable responses.

The Study of Life

Section 1.1 Introduction to Biology

Main Idea

Details

Skim Section 1 of the chapter. Write three questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

environment

Use your book or dictionary to define environment.

living and nonliving things that surround an organism and with which the organism interacts

New Vocabulary

adaptation

biology

development

growth

homeostasis

organism

organization

reproduction

response

species

stimulus

Use your book or dictionary to help you write the correct vocabulary term in each blank.

Biology is the science of life. A(n) **organism** is anything that has all the characteristics of life. All living things are arranged in an orderly way. In other words, living things have **organization**. Most living things begin as one cell. The addition of mass is called **growth**. Over an organism's life, natural changes, called **development**, take place. The production of offspring, or **reproduction**, must occur to enable the group of breeding organisms, or **species**, to continue to exist. A living thing also has the ability to react to a(n) **stimulus** from its internal or external environment. The reaction is called a **response**. An organism must be able to maintain its internal conditions. If anything upsets its normal state, processes to restore **homeostasis** begin. Any inherited characteristic, or **adaptation**, developed in a species over time can enhance the species' ability to survive and produce offspring in its environment.

Section 1.1 Introduction to Biology (continued)

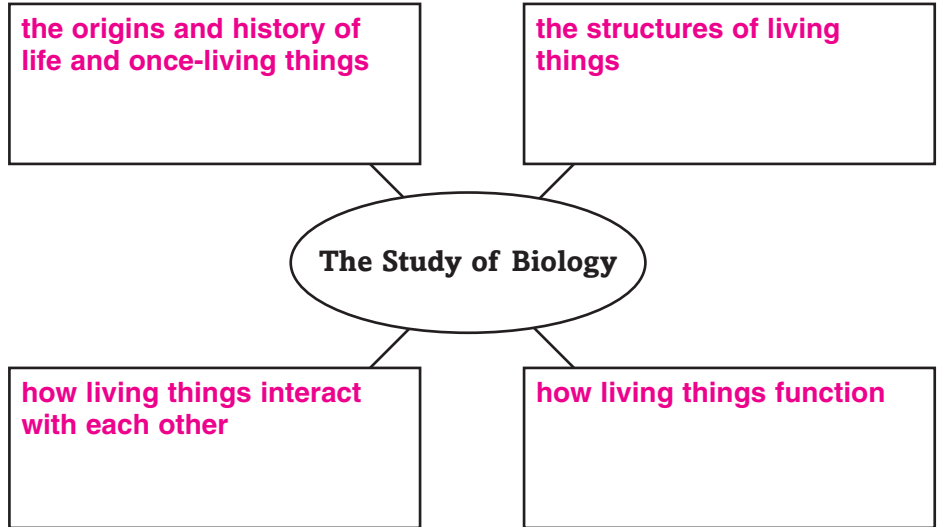
Main Idea

The Science of Life

I found this information on page _____.
SE, p. 4
RE, p. 1

Details

Identify four kinds of information you will learn about living things when you study biology.



What Do Biologists Do?

I found this information on page _____.
SE, pp. 5–6
RE, p. 1

Model one specific question that a biologist might seek to answer for each of the following areas of study. **Accept all reasonable responses.**

Area of Study	Question
Diversity of life	How do chimpanzees in the wild gather food?
Diseases	Why does the flu virus change every year?
New technologies	Can a computer-controlled brace enable paralysis victims to walk?
Agriculture	Can crop rotation increase the output of wheat in Nigeria?
Environment	Can environmental education in the Amazon slow the loss of rain forest?

Analyze the specific type of work in biology that you might like to do, and explain why. **Accept all reasonable responses.**

Type of work: Observe the behavior of birds in the wild

Reason: I am fascinated by the beauty of birds and the ability of these fragile-looking creatures to fly.

Section 1.1 Introduction to Biology (continued)

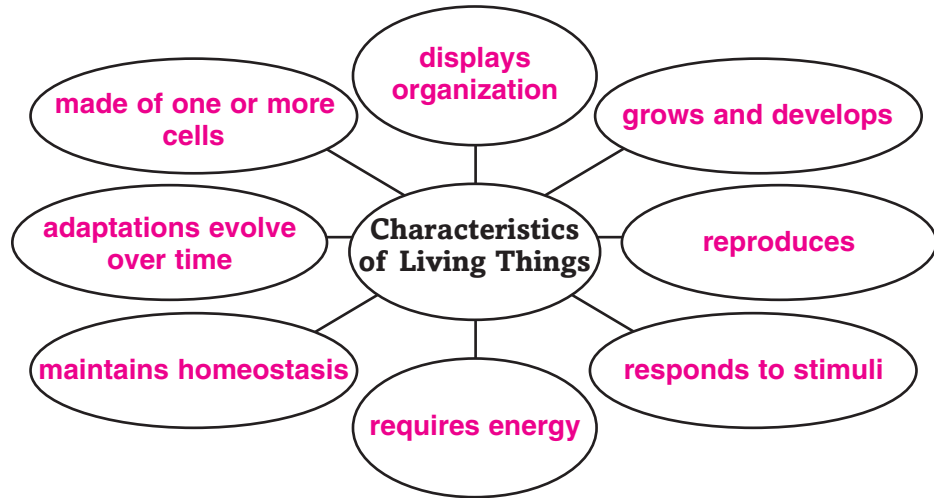
Main Idea _____ **Details** _____

The Characteristics of Life

I found this information on page _____.

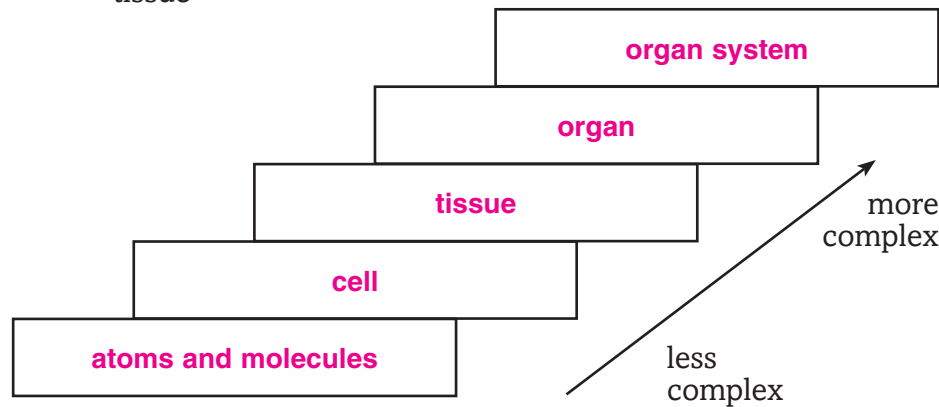
SE, pp. 6–10
RE, pp. 2–3

Identify the eight characteristics that something must have to be alive.



Sequence the levels of organization listed below in the correct order from least complex to most complex.

- organ
- atoms and molecules
- cell
- organ system
- tissue



CONNECT

A friend argues that a car is alive because its parts form organized systems and it requires energy (gasoline and battery power). How would you respond to your friend?

Accept all reasonable responses. Students should recognize that, to be alive, something must possess all the characteristics of a living thing, not just a few.

The Study of Life

Section 1.2 The Nature of Science

Main Idea

Details

Scan the titles, boldfaced words, pictures, figures, and captions in Section 2. Write two facts you discovered about the nature of science as you scanned the section.

1. **Accept all reasonable responses.**

2.

Review Vocabulary

investigation

Use your book or dictionary to define investigation.

careful search or examination to uncover facts

New Vocabulary

ethics

Use your book or dictionary to define each term.

set of moral principles or values

forensics

field that applies to science fields such as archaeology and botany, as well as to matters of legal interest

metric system

units of measurement with divisions that are powers of ten

peer review

process by which scientists in the same field or who conducted similar research evaluate an experiment's procedures and results

science

body of knowledge based on the study of nature and its physical setting

SI

International System of Units, which are the unit standards of the metric system

theory

explanation of a natural phenomenon supported by many observations and experiments over time

Academic Vocabulary

unbiased

Define unbiased to show its scientific meaning.

to be objective, impartial, or fair

Section 1.2 The Nature of Science (continued)

Main Idea

Details

What is science?

I found this information on page _____.

SE, pp. 11–14
RE, pp. 4–6

Classify each statement as a characteristic of a science, a pseudoscience, or both.

- makes unbiased observations
- often driven by cultural or commercial goals
- makes claims about the natural world
- physics
- astrology
- involves constant reevaluation of what is known
- research designed to justify existing knowledge
- discards observations that are not consistent with beliefs
- bases claims on a large amount of data
- uses peer review

Science	Both	Pseudoscience
<ul style="list-style-type: none"> • makes unbiased observations • physics • involves constant reevaluation of what is known • bases claims on a large amount of data • uses peer review 	<ul style="list-style-type: none"> • makes claims about the natural world 	<ul style="list-style-type: none"> • often driven by cultural or commercial goals • astrology • research designed to justify existing knowledge • discards observations that are not consistent with beliefs

Analyze what is required for a proposed explanation to become accepted as a theory.

The proposed explanation must be supported by enough evidence from many observations and experiments over a period of time.

Identify what each SI unit listed below is used to measure.

gram: mass meter: length
second: time liter: volume

Section 1.2 The Nature of Science (continued)

Main Idea

Science in Everyday Life

I found this information on page _____.

SE, p. 15
RE, p. 6

Details

Identify an environmental issue, and explain why you think it is an important topic for scientific study. **Accept all reasonable responses.**

Issue: global warming

Importance: Research of the causes is needed to guide policy for stopping it. If not stopped, global warming could cause catastrophic climate change that could threaten life on Earth.

Analyze an ethical issue. Choose one issue involving ethics mentioned in the text. Write a statement summarizing each side of the issue, both for and against. **Accept all reasonable responses.**

Issue: euthanasia

For: People who are suffering and have no chance of recovery should be allowed to die to relieve their suffering.

Against: Life is valuable. No one has the right to decide that someone should die.

Explain why it is important for you to become science literate.

Accept all reasonable responses. Science literacy is needed to evaluate the vast amount of information available in the media, to participate in discussions of important issues, and to support policies that reflect your views.

SUMMARIZE

Identify clues you would look for to judge whether a claim is based on science or pseudoscience.

Accept all reasonable responses. Check the credibility of the source of the claim. Find out whether extensive supporting research has been conducted. Look for supporting evidence from other reliable sources. Analyze the motives behind the claim; if the claim promotes commercial goals, be suspicious.

The Study of Life

Section 1.3 Methods of Science

Main Idea

Details

Skim Section 3 of the chapter. Write two questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

theory

Use your book or dictionary to define theory.

an explanation of a natural phenomenon supported by many observations and experiments over time

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

data	information gained from observations
experimental group	group in an experiment that is exposed to the factor being tested
observation	direct method of gathering information in an orderly way
control group	group in an experiment that is not exposed to the factor being tested and is used for comparison
scientific method	organized series of events in scientific inquiry
dependent variable	factor in an experiment that results from or depends on changes to the independent variable
safety symbol	logo that alerts you about a specific danger during lab activities
constant	factor that remains fixed during an experiment while the independent and dependent variables change
independent variable	tested factor in an experiment that might affect the outcome
hypothesis	testable explanation of a situation
experiment	investigation done in a controlled setting that tests a hypothesis
inference	logical conclusion based on gathered information
serendipity	occurrence of accidental or unexpected, but fortunate, results

Section 1.3 Methods of Science (continued)

Main Idea

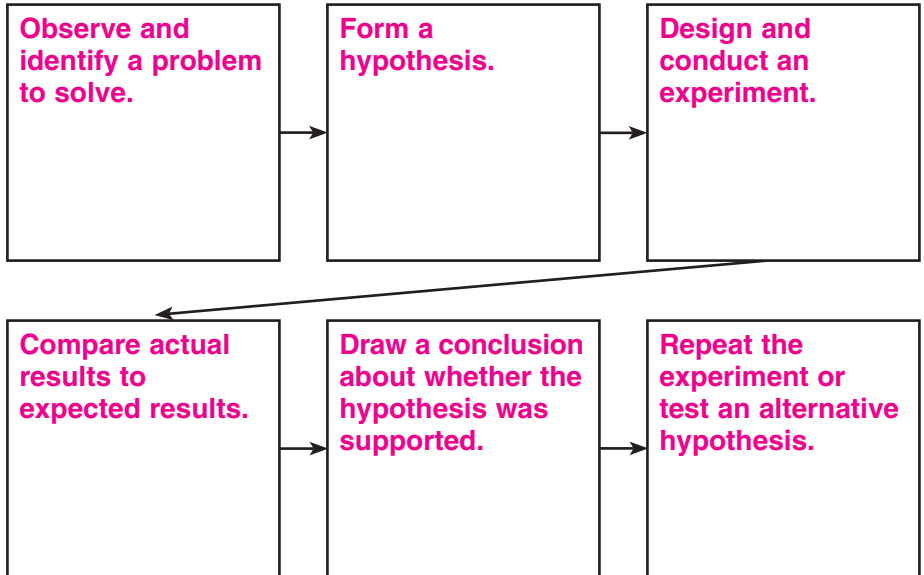
Details

Ask a Question

I found this information on page _____.

SE, p. 16
RE, p. 7

Sequence *the basic steps in scientific methods by completing the flowchart.*



Form a Hypothesis

I found this information on page _____.

SE, p. 18
RE, p. 8

Analyze *the relationship between a hypothesis and a theory.*

Accept all reasonable responses. A theory is a hypothesis that is supported by enough evidence from many investigations to be considered valid by the scientific community.

Collect the Data

I found this information on page _____.

SE, pp. 18–19
RE, pp. 8–9

Identify *the parts of the experiment described in the table below.*

Experiment: A biologist gives a new kind of food to a group of dogs and compares the weight gain of these dogs over time to a group of similar dogs that do not receive the new food.
Experimental group: the dogs that receive the new food
Control group: the dogs that do not receive the new food
Independent variable: the new kind of food
Dependent variable: weight gain

Section 1.3 Methods of Science (continued)

Main Idea

Analyze the Data

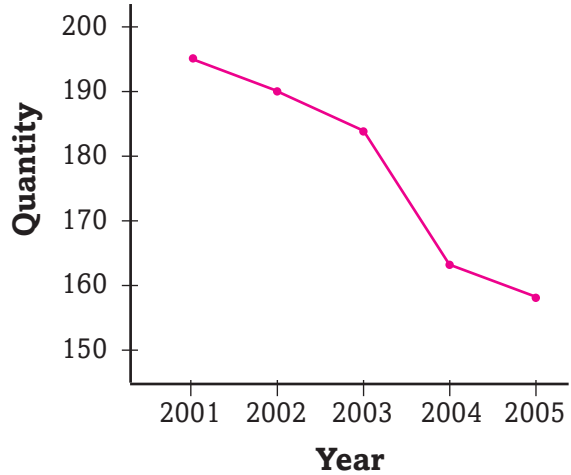
I found this information on page _____.

SE, p. 20
RE, pp. 9–10

Details

Model a line graph from the data in the table below. Plot the points, and draw a line connecting the points.

Grizzly Bears in Park X	
Year	Quantity
2001	195
2002	190
2003	184
2004	164
2005	158



Report Conclusions

I found this information on page _____.

SE, p. 20
RE, p. 10

Summarize what the above graph shows about grizzly bears in Park X.

Accept all reasonable responses. The number of bears declined each year, with an especially steep drop between 2003 and 2004.

Analyze why it is important for biologists to report their results in scientific journals.

Accept all reasonable responses. The results will be available for review by the public and for use by other scientists.

State what you will do when you see a safety symbol in a lab activity.

Accept all reasonable responses. I will refer to the safety symbols chart at the front of the book before beginning the activity and will take appropriate safety precautions.

Student Scientific Inquiry

I found this information on page _____.

SE, p. 21
RE, p. 10

CONNECT

Analyze an experiment in which one group of plants receives extra fertilizer and another group receives extra water. Is the experiment controlled or uncontrolled? Support your answer.

Uncontrolled; there are two test factors (independent variables) that change. Both groups are exposed to a test factor, so there is no control group for comparison.

Principles of Ecology

Before You Read

Use the “What I Know” column to list the things you know about ecology. Then list the questions you have about ecology in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Organisms such as birds get what they need to survive from their environment. Hypothesize why is it important for birds to be able to fly long distances.

Some birds have adaptations that enable them to fly long distances. By flying a long range or distance, the bird is more likely to find the food on which it survives.

Principles of Ecology

Section 2.1 Organisms and Their Relationships

Main Idea

Details

Skim Section 1 of the chapter. Write two questions that come to mind from the headings and illustration captions.

Accept all reasonable responses.

New Vocabulary

Use the vocabulary words in the left margin to complete the graphic organizer below. List the biological levels from largest to smallest.

- abiotic factor*
- biological community*
- biome*
- biosphere*
- biotic factor*
- commensalism*
- ecology*
- ecosystem*
- habitat*
- mutualism*
- niche*
- parasitism*
- population*
- predation*
- symbiosis*

Levels of Organization
biosphere
biome
ecosystem
biological community
population

Compare the terms in the tables by defining them side by side.

habitat area where the organism lives out its life	niche the role or position that an organism has in its environment; how it meets its needs for food, shelter, and reproduction
abiotic factor nonliving part of an organism's environment, such as soil, wind, moisture, light, temperature, and available nutrients	biotic factor living organisms that inhabit an environment

symbiosis permanent, close association between two or more organisms of different species		
commensalism one species benefits and the other species is neither harmed nor does it benefit	mutualism both species benefit	parasitism one species benefits and one is harmed
predation the act of one organism consuming another for food		

Section 2.1 Organisms and Their Relationship (continued)

Main Idea

Details

Ecology

I found this information on page _____.

SE, pp. 32–33
RE, p. 11

Create a journal entry. Imagine that you are an ecologist. Choose one plant or animal in nature and write three relationships of that organism in its environment.

Journal Entry

Date _____

Organism _____

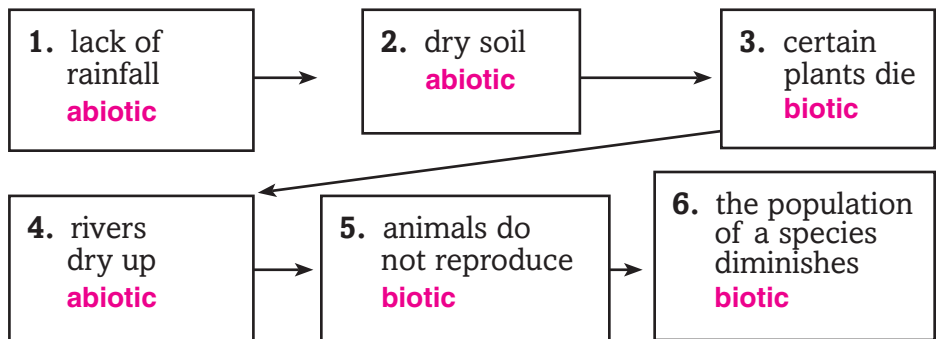
1. **Encourage students to demonstrate thoughtfulness and list the organism’s relationship with food sources, with predators and prey, and with nonliving parts of the environment.**
2. _____
3. _____

The Biosphere

I found this information on page _____.

SE, pp. 34–35
RE, p. 12

Sequence the abiotic and biotic factors. Write abiotic or biotic in each square.



Levels of Organization

I found this information on page _____.

SE, p. 36
RE, p. 13

Identify each level of organization that is described.

- population a group of organisms of all the same species
- communities interacting populations
- organism an individual living thing made of cells
- ecosystem all the different populations in a community
- biome a large group of organisms that share the same climate and have similar types of communities

Section 2.1 Organisms and Their Relationships (continued)

Main Idea

Ecosystem Interactions

I found this information on page _____.

SE, p. 38
RE, p. 14

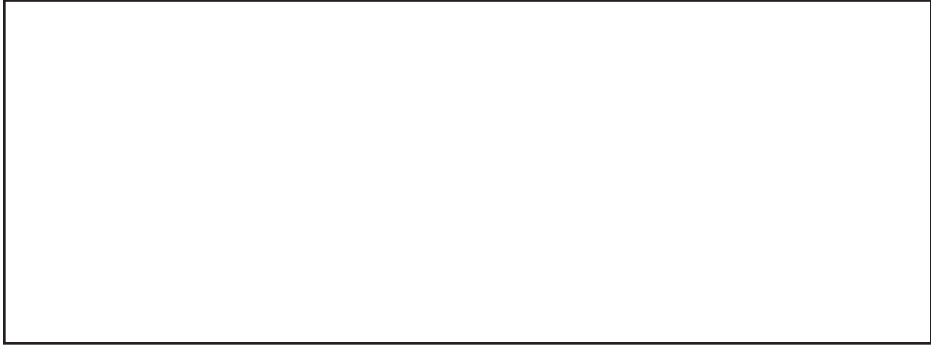
Community Interactions

I found this information on page _____.

SE, pp. 38–40
RE, pp. 14–15

Details

Model a community with several organisms. Show two organisms occupying the same niche. Below your sketch, explain why those two organisms cannot usually occupy the same niche for long.



Two organisms cannot occupy the same niche for long because they compete for the same resources. Eventually, one species will out-compete the other.

Rephrase mutualism, commensalism, and parasitism in your own words. Provide an example of each term.

1. **mutualism:** Certain types of bacteria in our intestines help digest our food.
2. **commensalism:** Lichen grows on tree branches.
3. **parasitism:** A lamprey eel feeds on the blood of another fish.

SUMMARIZE

Bacteria live inside our bodies. Analyze helpful, neutral, and harmful things that bacteria do while living in our bodies. Incorporate the terms *parasitism*, *mutualism*, *habitat*, and *niche* in your discussion.

Accept all reasonable responses. While helpful bacteria use our body as their habitat, they occupy the niche and keep harmful bacteria out. The helpful bacteria can benefit us by keeping invaders at bay or by eating harmful substances, which is a mutualistic relationship. Harmful bacteria can act as parasites by eating food we need, causing infections, or harming our bodily structures.

Principles of Ecology

Section 2.2 Flow of Energy in an Ecosystem

Main Idea

Details

Scan Section 2 of the chapter. Make a list of the ways in which organisms obtain energy.

Accept all reasonable responses, such as using light energy, eating food, and breaking down dead organisms.

Review Vocabulary

Use your book or dictionary to define energy. Then name the ultimate source of energy for Earth.

energy

the ability to cause change; the Sun

New Vocabulary

Use your book or dictionary to fill in vocabulary terms in this paragraph about food chains.

- autotroph
- biomass
- carnivore
- decomposer
- detritivore
- food chain
- food web
- herbivore
- heterotroph
- omnivore
- trophic level

In a **food chain**, matter and energy move from **autotrophs** to **heterotrophs** to **decomposers**. A food chain is made of many steps; each organism in the food chain represents a step called a **trophic level**. An **herbivore** is a heterotroph that eats only plants, whereas a **carnivore** preys on other heterotrophs. An **omnivore** eats both plants and animals. Nutrients are returned to the soil, air, and water by **detritivores**. A model that shows all the possible feeding relationships at each trophic level is called a **food web**. If you were a scientist and you wanted to determine the weight of living matter at a certain trophic level, you would measure the **biomass**.

Academic Vocabulary

Define foundation to show its scientific meaning.

foundation

a basis on which something stands or is supported

Section 2.2 Flow of Energy in an Ecosystem (continued)

Main Idea

Energy in an Ecosystem

I found this information on page _____.

SE, pp. 41–42
RE, pp. 16–17

Details

Summarize *three ways that organisms get energy, by completing the table.*

Type of Organism	Autotrophs	Heterotrophs	Decomposers
Other name(s) for this type	producers	consumers, herbivores, carnivores, scavengers, omnivores	no other name
Food comes from	soil and the Sun	1. eating plants 2. eating animals 3. eating plants and animals	dead organisms
Chemical reactions that occur	Light energy and carbon dioxide are stored in energy-rich compounds.	The organisms that are eaten are turned into energy and molecules for the consumer's body.	
Examples	algae, plants	bears, lions, deer	fungi, bacteria

Design your own three-step example of the flow of energy. **Accept all reasonable responses.**



Classify each of the following organisms as an autotroph or a heterotroph. Put an **A** in front of those that are autotrophs and an **H** in front of those that are heterotrophs.

- | | | |
|-----------------------------------|---------------------------------------|-----------------------------------|
| <u> H </u> 1. Alligator | <u> A </u> 5. Moss | <u> A </u> 9. Dandelion |
| <u> H </u> 2. Squirrel | <u> H </u> 6. Siberian tiger | <u> H </u> 10. Rabbit |
| <u> A </u> 3. Maple tree | <u> A </u> 7. Daffodil | <u> A </u> 11. Tomato |
| <u> H </u> 4. Whale | <u> H </u> 8. Rhinoceros | <u> H </u> 12. Cockroach |

Section 2.2 Flow of Energy in an Ecosystem (continued)

Main Idea

Models of Energy Flow

I found this information on page _____.

SE, pp. 42–44
RE, pp. 17–18

Details

Contrast a food chain *with* a food web.

Food chains show how matter and energy move through an ecosystem. Food webs show all feeding relationships at each trophic level in a community.

State three things that an ecological pyramid shows that food webs and food chains do not show.

An ecological pyramid shows that energy decreases as you go up the trophic levels. There are more organisms in the lower trophic levels. An ecological pyramid also shows biomass consumption.

Create a food web and name the organisms you include. Indicate each organism's trophic level.

Accept all reasonable drawings. See SE page 43 for an example.

SUMMARIZE

Analyze the place in the food chain in which you participate. Use the vocabulary terms from this section that apply to you.

Most students will indicate that they are the top level in their food webs. Strict vegetarians might indicate that they are heterotrophs and herbivores. Others will report that they are heterotrophs and omnivores.

Principles of Ecology

Section 2.3 Cycling of Matter

Main Idea

Details

Scan the titles, boldfaced words, pictures, figures, and captions in Section 3. Write two facts you discovered about animals as you scanned the section.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

cycle

Use your book or dictionary to define cycle. Then give an example of a cycle.

a series of events that occur in a regular repeating pattern;
examples of cycles will vary

New Vocabulary

biogeochemical cycle

Use your book or dictionary to define each vocabulary term.

the exchange of matter through the biosphere, which involves living organisms, geological processes, and chemical processes

denitrification

a process in which some soil bacteria convert fixed nitrogen compounds back into nitrogen gas, which returns to the atmosphere

matter

anything that takes up space and has mass; provides the nutrients needed for organisms to function

nitrogen fixation

the process of capture and conversion of nitrogen into a form that is usable by plants

nutrient

a chemical substance that an organism must obtain from its environment to sustain life and to undergo life processes

Section 2.3 Cycling of Matter (continued)

Main Idea

Cycles in the Biosphere

I found this information on page _____.

SE, pp. 45–49
RE, pp. 19–22

Details

Create *minimodels* for each cycle of matter in nature. Use words or pictures to sketch a simple example for each type of cycle to show the movement of matter. **Accept all reasonable models.**

<p>A. The Water Cycle Models should show water falling from clouds as precipitation, moving through the earth and water table back into lakes and oceans, and evaporating again. Models may include tree transpiration.</p>	<p>B. The Carbon Cycle Models should show plants using carbon dioxide to make sugars, animals eating the sugars, respiration, and combustion putting carbon into the air. Models may also show the long-term carbon cycle in which organic matter is buried and converted to fossil fuels. Carbon dioxide is released when fossil fuels are burned.</p>
<p>C. The Nitrogen Cycle Models should show bacteria fixing nitrogen from the air into the soil, plants using it, animals eating plants and making the nitrogen into proteins. Animals make urine that goes into soil, die, and decay back into soil. They may show bacteria putting nitrogen from soil back into air.</p>	<p>D. The Phosphorus Cycle (short-term and long-term) Short-term models should show soil to plants to animals to decay and back to soil. Long-term models should show rocks dissolving into the water table and precipitating back onto the rocks.</p>

Section 2.3 Cycling of Matter (continued)

Main Idea _____ **Details** _____

Describe each of the cycles in nature. Identify where each cycle is found, how organisms use them, and what key words relate to them.

	Water	Carbon/ oxygen	Nitrogen	Phosphorus
Where found	underground, in the atmosphere, and on Earth's surface	in all living things, in the atmosphere	in the atmosphere; in plants	cell compounds; in Earth's crust
How used	basis of life for all living things	to life processes; make up molecules such as carbon dioxide and sugar	to produce proteins; in chemical fertilizers	make up bones and teeth
Key words in the cycle	evaporating, water vapor, precipitation, transpiration	photosynthesis, cellular respiration, fossil fuel, calcium carbonate	nitrogen fixation, nitrates, decomposers, ammonia, denitrification	decomposers, weathering, erosion, phosphates

SUMMARIZE

Analyze current farming practices that are designed to make the best use of energy flow in ecosystems and cycles of matter.

Accept all reasonable responses. Fertilizers replace nitrogen, phosphorus, and other minerals that are lost from the soil when vegetable matter is harvested and removed. Pesticides and herbicides try to stop insects from eating crops, and other plants from stealing the nutrients in the soil from the crop. Greenhouses are used to make the most of the Sun's energy.

Communities, Biomes, and Ecosystems

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Communities, Biomes, and Ecosystems	After You Read
	<ul style="list-style-type: none"> • Once an ecosystem is established, its plant and animal species remain the same. 	D
	<ul style="list-style-type: none"> • Over time, a forest can develop from bare rock. 	A
	<ul style="list-style-type: none"> • Mountains are not a biome because climate, plants, and animals change with elevation. 	A
	<ul style="list-style-type: none"> • Most of Earth’s freshwater is locked in ice. 	A

Science Journal

“Organisms in a community reflect the resources and climate of that community.” Give some examples to illustrate this statement.

Accept all reasonable responses.

Communities, Biomes, and Ecosystems

Section 3.1 Community Ecology

Main Idea

Details

Skim Section 1 of the chapter. List three facts you discovered about ecosystems.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

abiotic factor

Use your book or dictionary to define abiotic factor.

the nonliving part of an organism's environment

New Vocabulary

Use the new vocabulary terms to complete the following sentences

climax community

community

ecological succession

limiting factor

primary succession

secondary succession

tolerance

Your **community** includes the people, other animals, plants, bacteria, and fungi in your area. A **limiting factor** is any abiotic or biotic factor that restricts the numbers, reproduction, or distribution of organisms. The ability of any organism to survive when subjected to abiotic or biotic factors is its **tolerance**. Changing abiotic or biotic factors can trigger **ecological succession**—the replacement of one community with another. **Primary succession** occurs when a community becomes established in an area of exposed rock without topsoil. Eventually, a stable, mature **climax community** can develop from bare rock. If a disturbance, such as fire, removes the community but not the soil, an orderly and predictable change called **secondary succession** restores the community over time.

Section 3.1 Community Ecology (continued)

Main Idea

Communities

I found this information on page _____.

SE, pp. 60–61
RE, pp. 23–24

Details

Predict how an unusually prolonged drought might affect a biological community.

Accept all reasonable responses. Drought uncharacteristic of the ecosystem might cause some species of plants and animals to decline or become extinct in the area. Other organisms that feed on these plants and animals would also decline. Declining species would be replaced by species that are less sensitive to drought.

Create a tolerance graph similar to the *Tolerance of Steelhead Trout* figure in your book. Title your graph *Tolerance of Plant A*. Label the zones. Then label the limits of each zone according to the facts about Plant A listed below.

- can live at an elevation between 1,000 and 2,000 m
- can live at an elevation between 5,000 and 6,000 m
- cannot live above 6,000 m
- grows best between 2,000 and 5,000 m
- cannot live below 1,000 m

Accept all reasonable responses.

Infer other abiotic factors that might limit the survival of Plant A.

Accept all reasonable responses. Abiotic limiting factors might include temperature, amount of sunlight, and nutrients in the soil.

Section 3.1 Community Ecology (continued)

Main Idea

Ecological Succession

I found this information on page _____.
 SE, pp. 62–64
 RE, pp. 24–25

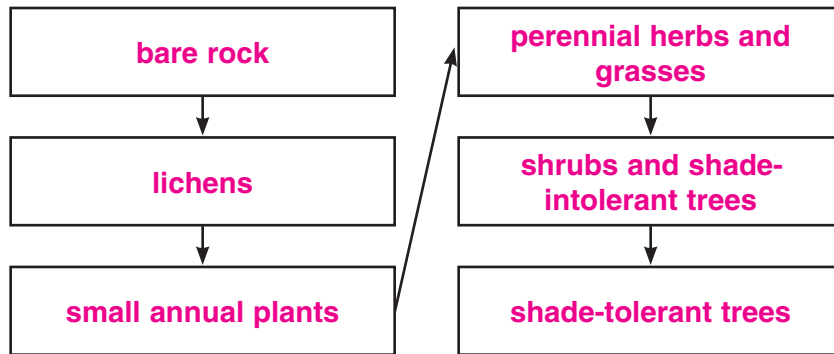
Details

Contrast *primary succession and secondary succession. Give an example of each.*

Accept all reasonable responses. Primary succession is the process of establishing a community in an area of exposed rock without topsoil. An example is a hardened lava flow. Secondary succession occurs after a community of organisms has been removed, but the soil remains. An example is a forest fire.

Sequence *the following steps in the primary succession of a forest by writing each step in the flowchart.*

- perennial herbs and grasses
- lichens
- shade-tolerant trees
- bare rock
- shrubs and shade-intolerant trees
- small annual plants



CONNECT

Suppose that a recent flood devastated a wildlife preserve in your area. Local leaders suggested organizing volunteers to plant trees in the damaged area. Evaluate your plan and support your reasoning.

Accept all reasonable responses. Students may take either position as long as they support their position. Some students might argue that natural succession takes many years, and replanting could hasten the process. Other students might argue that ecosystems will naturally restore the species that thrive in these conditions. Planting trees before their natural succession could upset the balance by preventing other vegetation common to this ecosystem from taking hold.

Communities, Biomes, and Ecosystems

Section 3.2 Terrestrial Biomes

Main Idea

Details

Skim Section 2 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define biome.

biome

a large group of ecosystems that share the same climate and have similar types of plant communities

New Vocabulary

Use your book or dictionary to define the following term.

latitude

distance of any point on the surface of Earth north or south from the equator

Compare the terms in the tables by defining them side by side.

weather

weather: **condition of the atmosphere at a specific place and time**

climate: **average weather conditions in an area, including temperature and precipitation**

climate

Describe the vegetation and growing conditions for each biome.

boreal forest

tundra: **treeless; cold temperatures; permafrost**

boreal forest: **dense evergreen forest; warmer than tundra; no permafrost**

temperate forest: **broad-leaved deciduous trees; well-defined seasons**

desert

grassland

woodlands: **woods and mixed shrubs; less annual rainfall than temperate forests**

grassland: **thick cover of grasses; fertile soil; underground stems and buds**

desert: **variety of sparse plants; dry**

temperate forest

tropical rain forest

tropical savanna

tropical seasonal forest

tropical savanna: **grasses and scattered trees; less precipitation than other tropical areas**

tropical seasonal forest: **deciduous and evergreen trees; seasonal rainfall**

tropical rain forest: **canopy of tall, broad-leaved trees with mosses and orchids; understory of shorter trees, shrubs, ferns, and creeping plants; warm and rainy year round**

tundra

woodland

Section 3.2 Terrestrial Biomes (continued)

Main Idea

Effects of Latitude and Climate

I found this information on page _____.

SE, pp. 65–66
RE, pp. 26–27

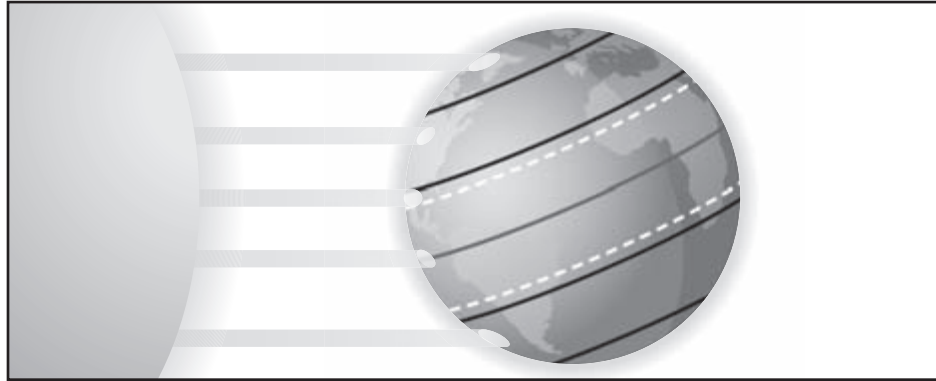
Major Land Biomes

I found this information on page _____.

SE, pp. 66–72
RE, pp. 27–29

Details

Model the latitude lines, poles, equator, Tropic of Cancer, Tropic of Capricorn, and the Sun below. Labels should resemble those in Fig. 3.5 on text page 65.



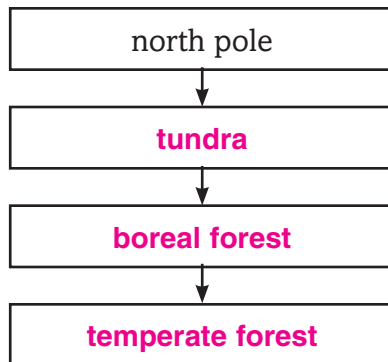
Analyze how latitude affects climate and why.

Accept all reasonable responses. Sunlight strikes different areas of Earth at different angles. Direct sunlight provides more warmth than less direct sunlight. As a result, areas in more direct sunlight tend to be warmer than areas in less direct sunlight.

Identify three factors other than latitude that affect climate.

(any three) elevation, continental landmasses, ocean currents, prevailing winds, holes in ozone layer, global warming

Sequence the boreal forest, temperate forest, and tundra in the diagram below.



Section 3.2 Terrestrial Biomes (continued)

Main Idea

Details

Classify the land biome described by each characteristic below.

Characteristic	Biome
most trees drop their leaves during the dry season	tropical seasonal forest
annual rate of evaporation exceeds rate of precipitation	desert
open areas of trees and mixed shrubs along the west coasts of North and South America	temperate woodland
most diverse of all biomes, with a canopy and understory of vegetation	tropical rain forest
grasses and scattered trees; receives less precipitation than other tropical areas	tropical savanna
thick cover of grasses with underground stems and buds that can survive fires	temperate grassland
dense evergreen forest; also called northern coniferous forest or taiga	boreal forest
composed of broad-leaved deciduous trees; has four well-defined seasons	temperate forest
treeless; has a layer of permanently frozen soil below the surface called permafrost	tundra

Other Terrestrial Areas

I found this information on page _____.

SE, pp. 72–73
RE, p. 29

Analyze why the two land areas below are not true biomes.

Mountains: Climate characteristics and plant and animal life vary depending on elevation.

Polar regions: They are ice masses and not true land areas because they lack exposed soil.

CONNECT

Compare and contrast a tundra to a desert. Include latitude, climate, and major biomes.

Accept all reasonable responses.

Communities, Biomes, and Ecosystems

Section 3.3 Aquatic Ecosystems

Main Idea

Details

Scan the titles, boldfaced words, figures, and captions in Section 3. Write three facts you discovered about aquatic ecosystems.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

salinity

Use your book or dictionary to define salinity.

a measure of the amount of salt in a body of water

New Vocabulary

Write the correct term in the left column for each definition below.

profundal zone	deepest areas of a large lake
intertidal zone	narrow band where the ocean meets land
aphotic zone	area of the open ocean that is too deep for sunlight to penetrate
photic zone	area of the open ocean to a depth of about 200 m that is shallow enough for sunlight to penetrate
abyssal zone	deepest region of the ocean
wetlands	areas of land such as marshes, swamps, and bogs that are saturated with water and that support aquatic plants
littoral zone	area of a lake or pond that is closest to shore
estuary	ecosystem that is formed where a freshwater river or stream merges with the ocean
limnetic zone	open water area of a lake or pond that is well lit and dominated by plankton
benthic zone	area of sand, silt, and dead organisms along the ocean floor
sediment	material that is deposited by water, wind, or glaciers
plankton	free-floating photosynthetic autotrophs that live in freshwater or marine ecosystems

Section 3.3 Aquatic Ecosystems (continued)

Main Idea

The Water on Earth

I found this information on page _____.

SE, p. 74
RE, p. 30

Freshwater Ecosystems

I found this information on page _____.

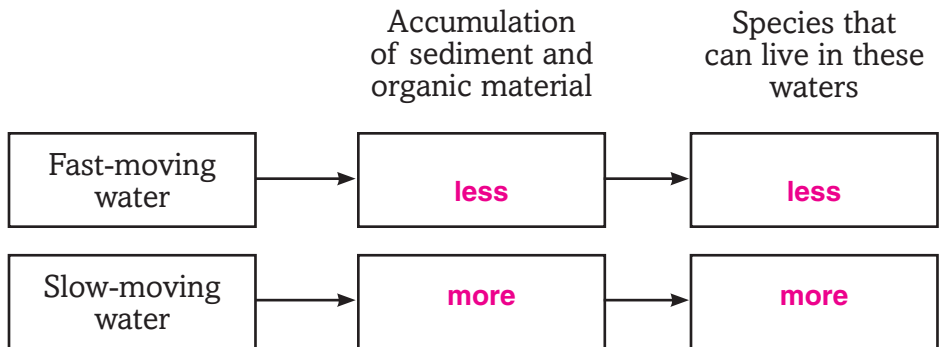
SE, pp. 74–77
RE, pp. 30–32

Details

Complete *this paragraph about the distribution of water on the Earth.*

By far, **salt water** is the most common type of water on Earth. Of the 2.5 percent of **freshwater** on Earth, most is locked in the ice of **glaciers**. Most freshwater species live in **lakes**, **ponds**, **rivers**, **streams**, and **wetlands** that make up only **0.3** percent of all freshwater. The remaining freshwater is found in **groundwater**.

Analyze *how the speed of water flow affects life in a river by writing more or less in the appropriate boxes in the figure.*



Compare *the zones of lakes and ponds by completing the table below.*

Zone	Location	Example Species
limnetic	well-lit open water area	plankton, many species of fishes
profundal	deepest areas of a large lake	limited due to cold and reduced light and oxygen
littoral	closest to shore	algae, rooted and floating plants, snails, insects, clams, crustaceans, fishes, amphibians

Section 3.3 Aquatic Ecosystems (continued)

Main Idea

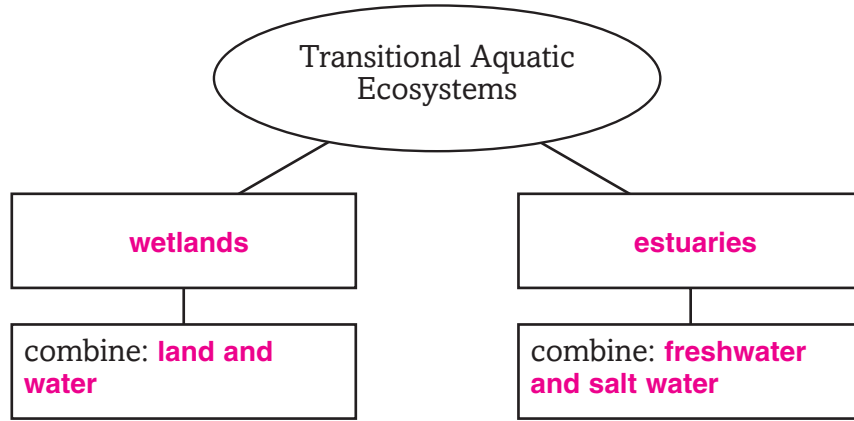
Transitional Aquatic Ecosystems

I found this information on page _____.

SE, p. 78
RE, p. 32

Details

Compare transitional aquatic ecosystems. Identify two types in the organizer below and describe the environments each type combines.

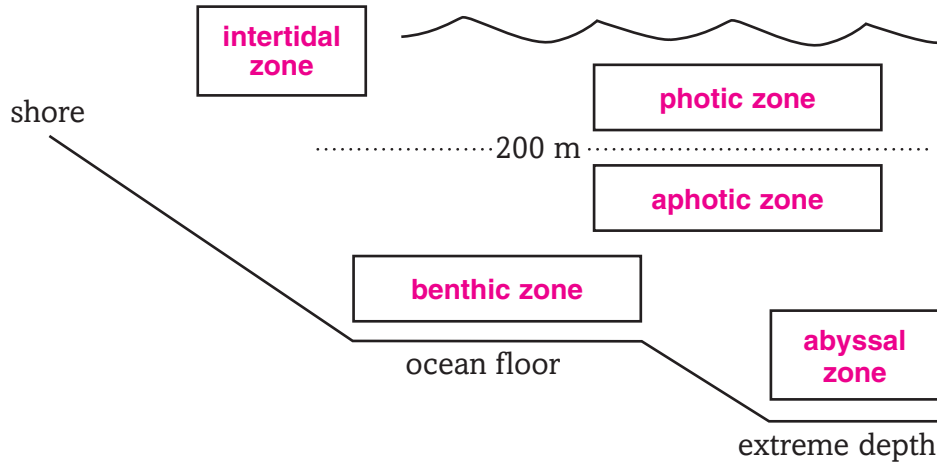


Marine Ecosystems

I found this information on page _____.

SE, pp. 79–81
RE, pp. 33–34

Identify the marine ecosystems. Write the name of the zone in each box in the figure below.



SUMMARIZE

Analyze several adaptations that would help organisms survive in the intertidal zone.

Accept all reasonable responses. Plants and animals would have to be able to withstand the currents of tides and waves. They would benefit from adaptations that enable them to cling to rocks or sand, such as suction cups, claws, or glue-like secretions. Organisms exposed at low tide would also have to be able to survive out of water for a period of time. The ability to burrow into the sand or breathe air would help organisms survive out of water.

Population Ecology

Before You Read

Use the “What I Know” column to list the things you know about population biology. Then list the questions you have about population biology in the “What I Want to Find Out” column.

Accept all reasonable responses.

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

White-tailed deer have become so numerous in some areas of the United States that they are a nuisance. Why do you think these deer populations have grown so large?

Accept all reasonable responses. Human land development has removed many deer predators and competitors that would have limited the deer populations naturally. The deer have been able to adapt to the changes in their environments, while many predator and competitor species could not.

Population Ecology

Section 4.1 Population Dynamics

Main Idea

Details

Skim Section 1 of the chapter. Write three questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define population.

population

the members of a single species that share the same geographic location at the same time

New Vocabulary

Compare the terms in the tables by defining them side by side.

carrying capacity

population density the number of organisms per unit area

dispersion pattern of spacing of a population within an area

density-dependent factor

density-independent factor any factor in the environment that does not depend on the number of members in a population per unit area

density-independent factor any factor in the environment that depends on the number of members in a population per unit area

density-independent factor

dispersion

emigration

population growth rate speed at which a population grows

immigration

emigration the number of individuals moving away from a population

immigration the number of individuals moving into a population

population density

population growth rate

carrying capacity the maximum number of individuals in a species that an environment can support for the long term

Academic Vocabulary

Define fluctuate to show its scientific meaning.

fluctuate

to change from high to low levels or from one thing to another in an unpredictable way

Section 4.1 Population Dynamics (continued)

Main Idea

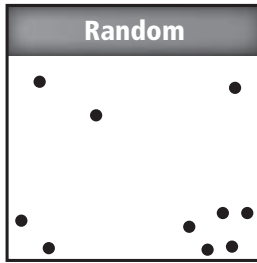
Population Characteristics

I found this information on page _____.

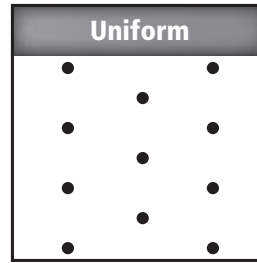
SE, pp. 92–94
RE, pp. 35–36

Details

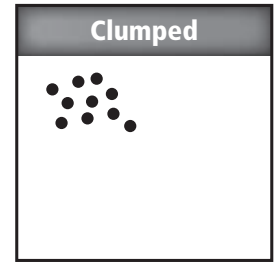
Identify each pattern of dispersion represented below.



Random



Uniform



Clumped

Analyze why populations are limited in their spatial distribution.

Accept all reasonable responses. A species cannot expand into a new area if it cannot adapt to the biotic and abiotic factors there.

Classify each limiting factor below as either density-independent or density-dependent by placing an X in the appropriate column.

Factor	Density-Independent	Density-Dependent
Lava flow	X	
Number of predators		X
Spread of disease		X
Especially cold winter	X	
Toxic chemical spill into a stream	X	
Another species competing for the same resources		X
Diverting a river for irrigation	X	
Fungus that attacks elm trees		X

Analyze how the expansion of housing developments in southern California might limit coyote populations in the area.

Accept all reasonable responses. The developments reduce the land available for coyote habitat. They might also reduce the habitat for the coyotes' prey animals, which would decrease the coyotes' food supply. Less space and less food would limit the coyote populations.

Section 4.1 Population Dynamics (continued)

Main Idea

Population-limiting factors

I found this information on page _____.
 SE, pp. 94–99
 RE, pp. 36–39

Details

Identify four main factors in a population's growth rate.

Factors in Population's Growth Rate	
• birthrate or natality	• emigration
• death rate or mortality	• immigration

Compare the general shapes of the curves of population growth graphs. Draw the appropriate graph. Label the lag phase, exponential growth phase, and carrying capacity. Below each graph, describe what the graph shows. Accept all reasonable responses.

Exponential Population Growth

Graph should resemble the J-shape of the figure at the top of text page 97. The lag phase and exponential growth phase should be labeled.

This graph shows how a population would grow if there were no limits placed on it by the environment. The population would grow slowly at first, and later would grow exponentially.

Logistic Population Growth

Graph should resemble the S-shape of the figure at the bottom of text page 97. The lag phase, exponential growth phase, and carrying capacity should be labeled.

This graph shows typical population growth. After exponential growth, limiting factors slow the growth until the population stops growing at its carrying capacity.

SUMMARIZE

Analyze whether humans are *r*-strategists or *k*-strategists.

Explain why. Support your reasoning.

Humans are *k*-strategists. Humans produce few offspring compared to other species. Human parents invest energy, resources, and time in caring for their offspring, increasing the chances that the young will survive to reproductive age. Humans also fit the profile of a *k*-strategist as a larger organism with a long life span.

Population Ecology

Section 4.2 Human Population

Main Idea

Details

Skim Section 2 of the chapter. Make a list of the ways in which human populations change.

Accept all reasonable responses.

Review Vocabulary

Use your book or dictionary to define carrying capacity.

carrying capacity

the maximum number of individuals in a species that an environment can support for the long term

New Vocabulary

Use your book or dictionary to define each term.

age structure

in a population, the number of males and females in each of three age groups: pre-reproductive stage, reproductive stage, and post-reproductive stage

demographic transition

a change in a population from high birth and death rates to low birth and death rates

demography

the study of human population size, density, distribution, movement, and birth and death rates

zero population growth (ZPG)

situation in a population in which birthrate equals death rate

Section 4.2 Human Population (continued)

Main Idea

Human Population Growth

I found this information on page _____.

SE, pp. 100–101
RE, p. 40

Details

Summarize two examples of events that could produce each of the following effects. **Accept all reasonable responses.**

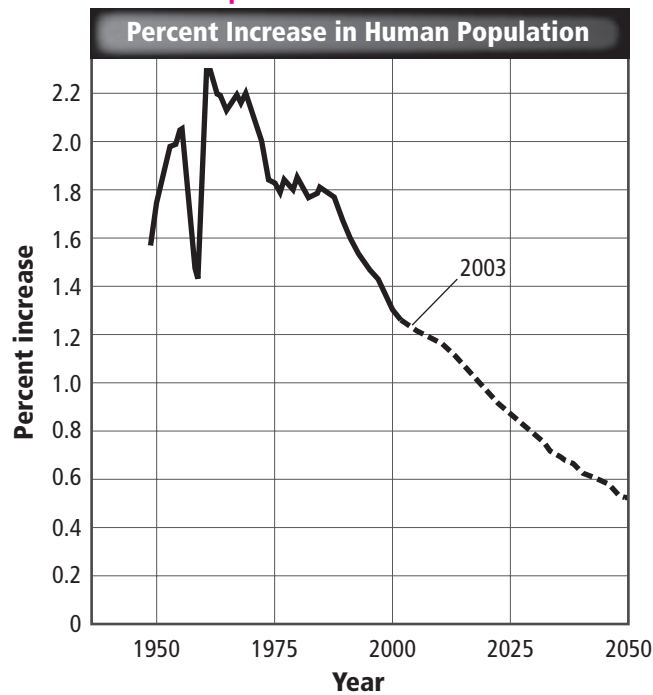
Effect: decline in world population growth

Events that could produce this effect: worldwide epidemic;
world war

Effect: increase in world population growth

Events that could produce this effect: new medicine reduces death rate;
new farming method yields more food per acre

Examine the graph below. Then complete the table that follows. **Accept all reasonable responses.**



Approximate Growth Rate			
1950	1975	2000	2025 (estimated)
1.7	1.8	1.3	0.9

What are the main reasons for the expected trend in human population between now and 2050?

diseases such as AIDS and voluntary population control

Section 4.2 Human Population (continued)

Main Idea

Trends in Human Population Growth

I found this information on page _____.

SE, pp. 102–105
RE, pp. 41–42

Details

Calculate the population growth rate for each fictitious country listed in the table below.

Country	Births per 1000	Deaths per 1000	Growth rate (percent)
X	25	9	1.6
Y	14	4	1
Z	12	15	-0.3

Compare trends in industrialized nations and developing countries in terms of the following factors.

Population growth rate: The population is growing at a faster rate in developing than in developed countries.

Resource use by individuals: Individuals in industrialized nations use far more resources than individuals in developing countries.

Identify three factors that could keep the human population from reaching its carrying capacity.

- family planning
- improvements in technology
- limiting the amount of resources each person uses

SUMMARIZE

Imagine that medical science discovered a cure for all cancers. Analyze how this medical achievement might affect life on Earth.

Accept all reasonable responses. The cure would probably decrease the death rate, resulting in rapid human population growth at first. Then other limiting factors would slow the exponential growth. Overcrowding would increase the spread of other diseases and of parasites. The food supply could not support the increased population, leading to starvation. Competition for resources between humans and other species might decimate animal and plant populations.

Tie It Together

FURTHER INQUIRY

Create a demographic profile for an imaginary country by describing its population characteristics below. List the sources of your data.

Accept all reasonable responses.

Name of country: _____

Geographic location: _____

Is it classified as a developing country or as an industrialized nation? _____

Population size: _____

Population density: _____

Description of the population's spatial distribution across the country's land area:

Birthrate: _____

Death rate: _____

Current population growth rate: _____

Expected population growth rate in the next 10 to 20 years: _____

General age structure: _____

Major factors promoting population growth: _____

Major factors limiting population growth: _____

Data sources used: _____

Biodiversity and Conservation

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Biodiversity and Conservation	After You Read
	• Biodiversity is the variety of ecosystems in the biosphere.	D
	• Genetic diversity tends to decrease over time in small pieces of habitat.	A
	• Nonnative species can damage an ecosystem.	A
	• The first national park was established in the United States in 1972.	D

Science Journal

For many years the bald eagle was close to extinction but now lives and reproduces in the wild. Hypothesize how scientists used their knowledge of diversity to save the bald eagle.

Accept all reasonable responses. Scientists studied the effects of the chemical DDT on the eagle; they understood its nesting habits; they cleaned up its feeding sites.

Biodiversity and Conservation

Section 5.1 Biodiversity

Main Idea

Details

Skim Section 1 of the chapter. Read the headings and the illustration captions. Write two questions that come to mind.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

gene

Use your book or dictionary to define gene.

functional unit that controls the expression of inherited traits

New Vocabulary

biodiversity

Use your book or dictionary to define each term.

the variety of species in a particular area

ecosystem diversity

the variety of ecosystems present in the biosphere

extinction

the complete disappearance of a species when its last member dies

genetic diversity

the variety of genes present in a population

species diversity

the variety of different species in a biological community

Academic Vocabulary

diverse

Define diverse to show its scientific meaning.

made of different qualities

Section 5.1 Biodiversity (continued)

Main Idea

What is Biodiversity?

I found this information on page _____.

SE, pp. 116–118
RE, pp. 43–44

Details

Compare and contrast *the species biodiversity of different areas.*
Accept all reasonable responses.

	Rain Forest	Corn Field	Vegetable Garden	Tundra
Plants	hundreds of species of plants	one type of plant	carrots, broccoli, corn, tomatoes, weeds, sunflowers	wild grasses, flowers
Animals	hundreds of species of birds, thousands of species of insects	hundreds of insects, several birds or animals	insects, moles, toads	polar bears, seals, birds

Describe *observable differences among the types of biodiversity using a forest ecosystem.* **Accept all reasonable responses.**

Type of Biodiversity	Example
Genetic diversity	differences in the coat color of rabbits that live in the forest
Species diversity	the number of tree species growing in the forest
Ecosystem diversity	the forest ecosystem is one of many types of ecosystems in the biosphere

Analyze *how genetic diversity in a population of fishes in a stream can help the fishes resist disease.*

Accept all reasonable responses. The variety present in a population of fishes with high genetic diversity increases the chance that some of the fishes will be able to resist disease, survive, and reproduce.

A population with a low level of diversity is less likely to survive and reproduce in the face of disease.

Section 5.1 Biodiversity (continued)

Main Idea

The Importance of Biodiversity

I found this information on page _____.

SE, pp. 118–121
RE, pp. 44–45

Details

Summarize why species should be preserved as a possible source of useful genes.

	Agriculture	Medicine
Organisms that might have value include	wild relatives of crop plants.	unknown plants and other organisms in remote regions.
These organisms someday might be useful as	a source of genes to give disease resistance to crop plants.	a source of new medicines to treat human diseases.

Identify resources and services that a healthy biosphere provides to people. **Accept all reasonable responses.**

Resources	Services
1. clean water	1. protection from floods
2. clean air	2. decomposition of wastes
3. fertile soil	3. protection from droughts
4. food	4. climate regulation

Organize how humans are dependent on plants and animals by describing two ways that you use products of each. **Accept all reasonable responses.**

Products of Animals	Products of Plants
eating meat	breathing oxygen
wearing wool clothing	eating a salad, wearing cotton

SUMMARIZE

Explain how the health of the biosphere impacts the health of people.

Accept all reasonable responses. A healthy biosphere has a high level of biodiversity.

Biodiversity can lead to the possibility of new medicines to treat human diseases. A healthy biosphere is able to provide clean water and clean air that people need. Healthy ecosystems can protect people from extreme weather, floods, and droughts.

Biodiversity and Conservation

Section 5.2 Threats to Biodiversity

Main Idea

Details

Scan the titles, boldfaced words, figures, and captions in Section 2. List three threats you discovered to biodiversity.

1. **Accept all reasonable responses.**

2.

3.

Review Vocabulary

Use your book or dictionary to define food web.

food web

the interconnected food chains and pathways in which matter and energy flow through a group of organisms

New Vocabulary

Use your book or dictionary to define the following terms.

biological magnification

the increased concentration of toxic substances in organisms at a high trophic level in the food chain

edge effect

different environmental conditions along an ecosystem's boundaries

eutrophication

water pollution that occurs when substances rich in nitrogen and phosphorous flow into waterways

habitat fragmentation

the separation of an ecosystem into small pieces of land

introduced species

nonnative species that are transported to a new habitat

overexploitation

excessive use of a species, often leading to extinction

Section 5.2 Threats to Biodiversity (continued)

Main Idea

Details

Extinction Rates

I found this information on page _____.

SE, pp. 122–123
RE, pp. 46–47

Factors That Threaten Biodiversity

I found this information on page _____.

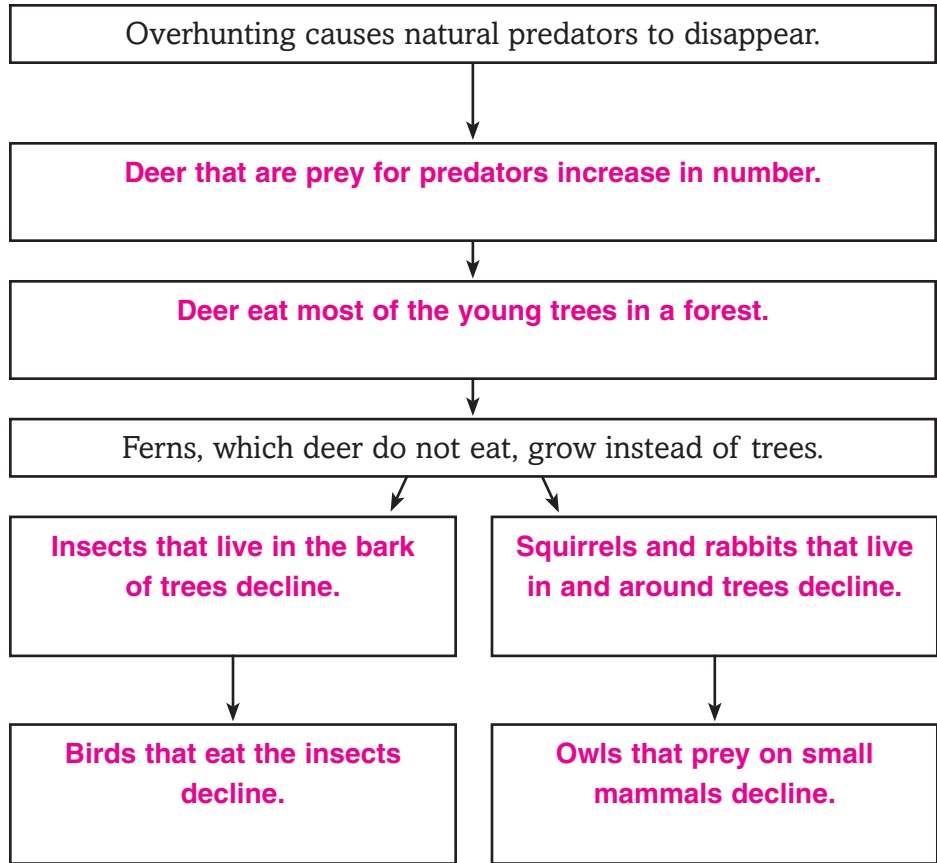
SE, pp. 123–128
RE, pp. 47–50

Summarize *extinction rates by completing the sentences below.*

_____ **Background extinction** _____ is slow and gradual. It is caused as _____ **ecosystems** _____ change by natural processes. A _____ **mass extinction** _____ is an event in which extinctions increase dramatically. Some scientists believe we are in a period of _____ **mass extinction** _____ today.

Sequence *the series of events describing how a habitat can be disrupted. The first one has been done for you.*

- Owls that prey on small mammals decline.
- Deer eat most of the young trees in a forest.
- Squirrels and rabbits that live in and around trees decline.
- Deer that are prey for predators increase in number.
- Birds that eat the insects decline.
- Overhunting causes natural predators to disappear.
- Insects that live in the bark of trees decline.



Section 5.2 Threats to Biodiversity (continued)

Main Idea

Details

Explain *why carnivores are subject to biological magnification of substances like DDT and PCBs.*

DDT and PCBs are pollutants that accumulate in bodily tissues.

These substances enter the food chain in low amounts. As one

animal eats another, they accumulate in bodily tissues. Because

carnivores eat animals that have the substances in their tissues,

they accumulate high levels of DDT and PCBs in their own tissues.

Describe *the effects of each change in habitat on species of animals.*

Accept all reasonable responses.

Edge effects	The organisms that live at the edge of a habitat are different from those that live in the middle of a habitat, due to different conditions.
Introduced species	Introduced species often destroy native species as they feed on them or disturb their habitat.
Pollution	Pollution in the air, water, and land can destroy soil and vegetation and make animals get sick and/or die.
Habitat fragmentation	The separation of habitats into small plots of land increases edge effects and causes loss of genetic diversity.
Habitat loss	Species might become extinct when habitat is destroyed.

CONNECT

Imagine a habitat near you. Hypothesize what would happen to the ecosystem if one species died out. Support your reasoning with information from this section.

Accept all reasonable responses. Students should describe several species of plants and

animals and understand that as one species dies out, other species will be affected.

Biodiversity and Conservation

Section 5.3 Conserving Biodiversity

Main Idea

Details

Read the main idea of Section 3 of the chapter and look at the figures and captions in the section. Predict two ways that people are preserving biodiversity.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define natural resources.

natural resources

organisms and materials found in the biosphere

New Vocabulary

Use your book or dictionary to define the following terms.

biological augmentation

the practice of adding essential materials to restore a degraded ecosystem

bioremediation

a method of using living things, such as bacteria, plants, or fungi, to remove toxins from a polluted area

endemic

native to one specific geographic area

nonrenewable resource

a natural resource that is present in limited amounts or requires a long period of time to be replaced

renewable resource

a natural resource that is replaced by natural processes faster than it is consumed

sustainable use

philosophy that lets people use natural resources in a way that will benefit them and maintain the ecosystem

Section 5.3 Conserving Biodiversity (continued)

Main Idea

Natural Resources

I found this information on page _____.

SE, pp. 129–130
RE, pp. 51–52

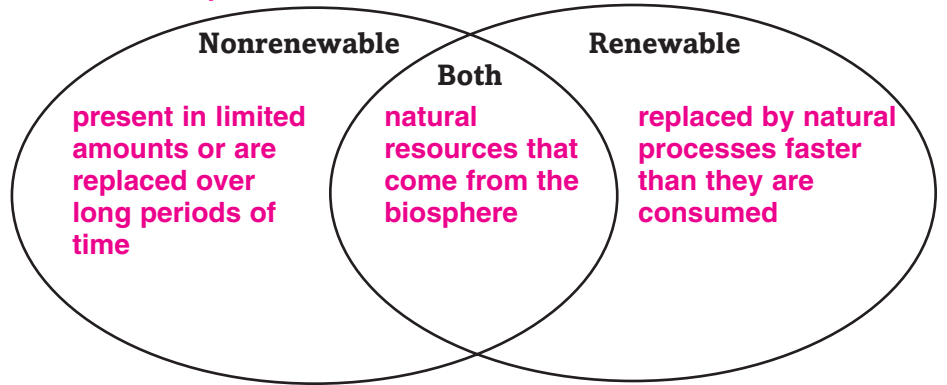
Protecting Biodiversity

I found this information on page _____.

SE, pp. 131–133
RE, pp. 52–53

Details

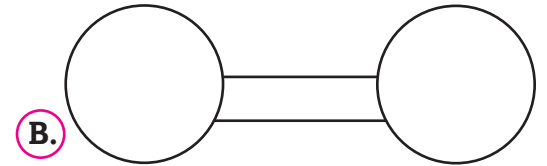
Compare and contrast *renewable and nonrenewable resources* by writing characteristics of each in the Venn diagram. **Accept all reasonable responses.**



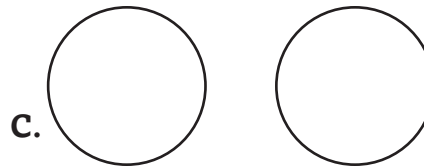
Choose the diagram that best represents a habitat corridor. *Explain your choice.*



A.



B.



C.

Accept all reasonable explanations. Students should note that the habitats must be completely separate, but have a connection between them.

Summarize the purpose of a habitat corridor. Provide an example to support your response.

Habitat corridors allow organisms to safely move among habitat fragments. **Accept any reasonable example.**

Section 5.3 Conserving Biodiversity (continued)

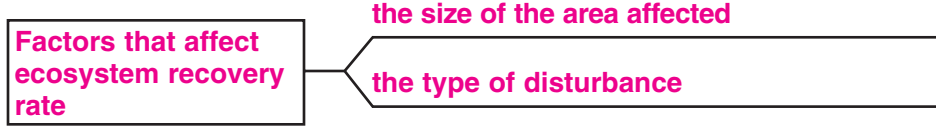
Main Idea

Restoring Ecosystems

I found this information on page _____. SE, pp. 134–135 RE, pp. 53–54

Details

Organize the factors that impact how long it takes for an ecosystem to recover after a disaster.



Explain the methods ecologists use to restore ecosystems.

Method: bioremediation

How it works: living things used to remove toxins from a polluted area

Example: plants used to remove heavy metals from soil

Method: biological augmentation

How it works: natural predators are added to a degraded ecosystem

Example: ladybugs added to control aphid populations

Rephrase a law or treaty designed to protect biodiversity.

Who or what: Endangered Species Act

When: 1973

How: gives legal protection to species that are in danger of becoming extinct

SUMMARIZE

Analyze how sustainable use could preserve biodiversity in hot spots.

Hot spots are locations around the world with large numbers of species in danger of extinction. Hot spots comprise only 1.5 percent of Earth’s land but have a high amount of biodiversity. Sustainable use would let people use the resources of these areas in a way that preserves biodiversity and long-term health of the ecosystems.

Chemistry in Biology

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Chemistry in Biology	After You Read
	• Atoms are the smallest particles in matter.	D
	• Chemical reactions occur constantly inside your body.	A
	• About 70 percent of your body is water.	A
	• Almost all molecules in living things contain the element carbon.	A

Science Journal

Consider the characteristics of a living and a nonliving thing. Describe a few ways that the two are alike and a few ways that the two are different.

Accept all reasonable responses.

Chemistry in Biology

Section 6.1 Atoms, Elements, and Compounds

Main Idea

Details

Scan the headings and boldfaced words in Section 1 of the chapter. Predict two things that you think might be discussed.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

substance

Use your book or dictionary to define substance.

form of matter that has a uniform and unchanging composition

New Vocabulary

atom

electron

neutron

nucleus

proton

atom	building block of matter	
nucleus	center of an atom that contains protons and neutrons	neutron particles with no charge that are located in the nucleus
proton	positively charged particles that are located in the nucleus	electron negatively charged particles that are located outside the nucleus

compound

covalent bond

element

ion

ionic bond

isotope

molecule

van der Waals force

Complete the paragraph below using the terms listed to the left.

A substance that cannot be broken down into other substances is a(n) **element**. Carbon-14 is a(n) **isotope**. It has a different number of neutrons than other carbon atoms. A(n) **compound** forms when two or more elements combine. The chemical bond that holds the elements together is a(n) **covalent bond** when electrons are shared. A substance with this kind of bond is called a(n) **molecule**. An atom that has lost or gained one or more electrons becomes a(n) **ion**, which carries an electric charge. Two of these oppositely charged atoms can form an electrical attraction called a(n) **ionic bond**. An attraction between oppositely charged regions of molecules is called a(n) **van der Waals force**.

Section 6.1 Atoms, Elements, and Compounds (continued)

Main Idea

Details

Atoms

I found this information on page _____.

SE, p. 148
RE, p. 55

Model an oxygen atom and label the parts. Note the type of electric charge for each part. Then complete the sentence that follows.

Models should resemble the oxygen atom in the book. Accept all reasonable variations. Students should show a negative charge on the electrons, positive charge on the protons, and no charge on the neutrons.

The overall charge of the oxygen atom is zero, because the atom has an equal number of positively charged protons and negatively charged electrons, and neutrons have no charge.

Elements

I found this information on page _____.

SE, pp. 149–150
RE, p. 56

Compare and contrast the characteristics of carbon-14 by completing the following sentences.

Structurally, carbon-14 differs from other carbon atoms because it has a different number of neutrons than other carbon atoms.

Carbon-14 is radioactive because its nucleus decays and breaks apart.

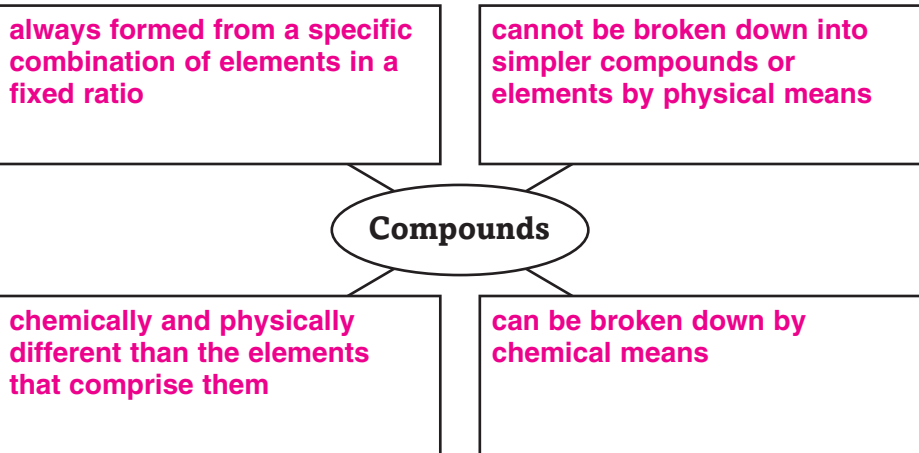
Knowing the half-life of carbon-14 enables scientists to calculate the age of an object.

Compounds

I found this information on page _____.

SE, p. 151
RE, p. 56

Identify four unique characteristics of compounds.



Section 6.1 Atoms, Elements, and Compounds (continued)

Main Idea

Chemical Bonds

I found this information on page _____.

SE, pp. 152–154

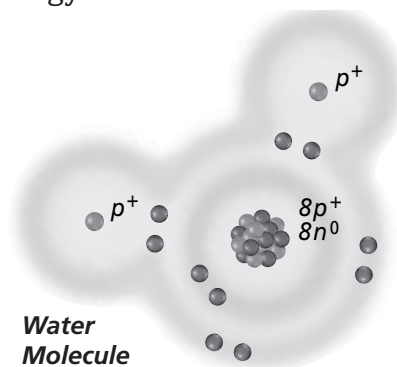
RE, pp. 57–58

Details

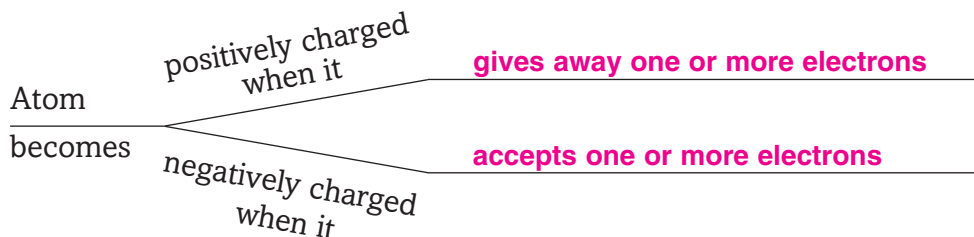
Label the following parts of the water molecule illustrated below.

- hydrogen atom(s)
- oxygen atom(s)
- covalent bonds
- first energy level
- second energy level

The covalent bonds occur where the electron pairs are shared. The first energy level is closest to the nucleus in the H and O atoms. The second level is the outer level on the O atom.



Compare positively and negatively charged ions.



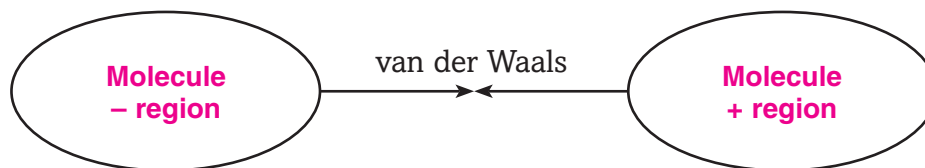
van der Waals Forces

I found this information on page _____.

SE, p. 155

RE, p. 58

Identify the type of substances held together by van der Waals forces. Include indicators of electric charges.



CONNECT

A chemical compound in your toothpaste helps protect your teeth from decay. The formula for this compound is $\text{Na}_2\text{PO}_3\text{F}$. Use the periodic table in your book to identify each element in this compound.

sodium, phosphorus, oxygen, fluorine

Chemistry in Biology

Section 6.2 Chemical Reactions

Main Idea

Details

Skim Section 2 of the chapter. Write two facts that you discovered as you read the headings and illustration captions.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

process

Use your book or dictionary to define *process*.

series of steps or actions that produces an end product

New Vocabulary

activation energy

Use your book or dictionary to define each term.

minimum amount of energy needed for reactants to form products in a chemical reaction

active site

location where a substrate binds on an enzyme

catalyst

substance that lowers the activation energy needed to start a chemical reaction

chemical reaction

process by which atoms or groups of atoms in substances are reorganized into different substances

enzyme

protein that speeds up a chemical reaction in a biological process

product

substance formed during a chemical reaction

reactant

starting substance in a chemical reaction

substrate

reactant that binds to an enzyme

Academic Vocabulary

coefficient

Define *coefficient* to show its scientific meaning.

number in front of a reactant or a product in a chemical equation

Section 6.2 Chemical Reactions (continued)

Main Idea

Reactants and Products

I found this information on page _____.
 SE, pp. 156–157
 RE, pp. 59–60

Details

Label the sides of the following equation as either products or reactants.



Calculate the number of atoms of each element in the chemical equation above. Record the information in the table below.

Element Symbol	Element Name	Number of Atoms (reactant side)	Number of Atoms (product side)
C	carbon	1	1
H	hydrogen	4	4
O	oxygen	4	4

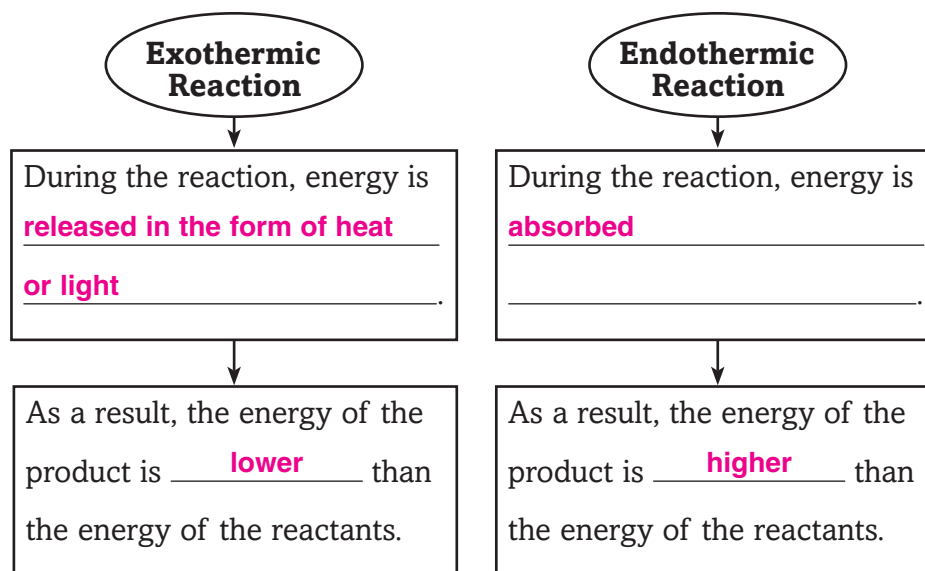
Analyze the formula to check to see if it is balanced. Support your reasons.

Each element has the same number of atoms on both sides of the equation. No mass has been lost or gained.

Energy of Reactions

I found this information on page _____.
 SE, pp. 157–158
 RE, pp. 60–61

Compare what happens to energy in exothermic and endothermic reactions by completing the diagram below.



Section 6.2 Chemical Reactions (continued)

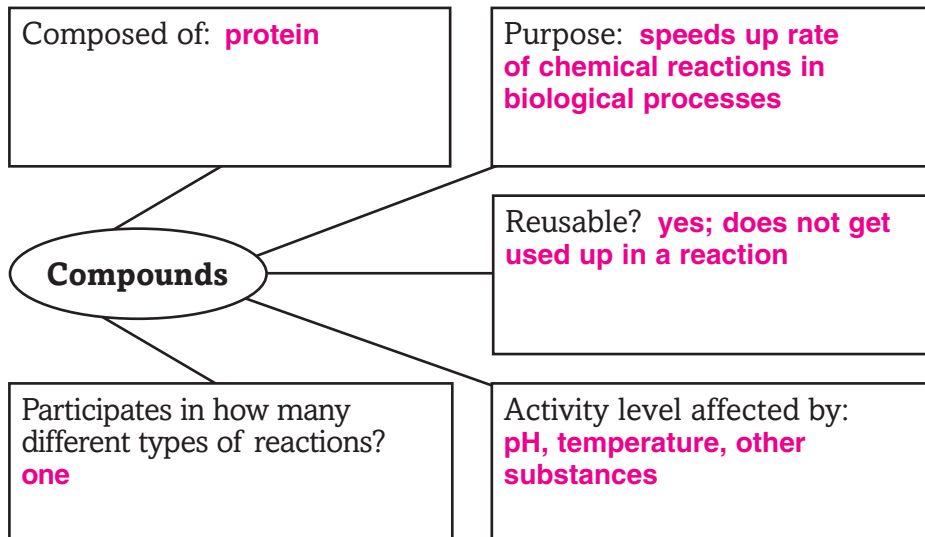
Main Idea

Enzymes

I found this information on page _____.
SE, pp. 159–160
RE, p. 61

Details

Summarize key characteristics of an enzyme by completing the organizer below.



Analyze how an enzyme works by completing the following paragraph.

For a substrate to bind with a particular enzyme, the _____ **size** _____ and _____ **shape** _____ of the substrate must match that of the enzyme's _____ **active site** _____. In the enzyme-substrate complex, chemical bonds in the _____ **reactants** _____ are broken and _____ **new bonds** _____ form. The results of the interaction between an enzyme and its _____ **substrates** _____ are products, which are released by the _____ **enzyme** _____.

SUMMARIZE

Analyze the role of catalysts in chemical reactions.

Accept all reasonable responses. Catalysts begin chemical reactions by lowering the activation energy needed to start the reaction. Some catalysts speed up reactions thousands of times.

Without them, scientists would not have been able to synthesize new elements, conduct nuclear reactions, and so on.

Chemistry in Biology

Section 6.3 Water and Solutions

Main Idea

Details

Scan Section 3 of the chapter. Identify two facts you discovered about water.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

physical property

Use your book or dictionary to define physical property.

characteristic of matter that can be observed or measured without changing the composition of the substance

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- _____ **base**
- _____ **acid**
- _____ **solvent**
- _____ **buffer**
- _____ **pH**
- _____ **solute**
- _____ **hydrogen bond**
- _____ **polar molecule**
- _____ **solution**
- _____ **mixture**

substance that releases hydroxide ions when dissolved in water

substance that releases hydrogen ions when dissolved in water

substance in which another substance is dissolved

mixture that can react with an acid or a base to keep the pH within a particular range

measure of concentration of hydrogen ions in a solution

substance that is dissolved in a solvent

weak interaction involving a hydrogen atom and a fluorine, oxygen, or nitrogen atom

molecule that has oppositely charged regions

mixture that has a uniform composition throughout

combination of two or more substances in which each substance retains its individual characteristics and properties

Academic Vocabulary

suspend

Define suspend to show its scientific meaning.

to keep from falling or sinking

Section 6.3 Water and Solutions (continued)

Main Idea

Water's Polarity

I found this information on page _____.

SE, p. 161
RE, pp. 62–63

Details

Analyze polarity by writing attract or repel to complete the diagram.



Analyze reasons for water's polarity and the effect of polarity.

Polarity of Water	
<p>Reasons for polarity: Electrons are more strongly attracted to the oxygen nucleus than to the hydrogen nuclei, resulting in an unequal distribution of electrons. This, along with the molecule's bent shape, creates oppositely charged regions.</p>	<p>Effects of polarity: Because oppositely charged regions attract, water molecules tend to form electrostatic bonds with other polar molecules and can readily form solutions.</p>

Identify the properties of water that allow it to help an organism maintain homeostasis.

Property	Description
Universal solvent	Water can separate the ions in many compounds.
Adhesive	Water will form hydrogen bonds with other surfaces. Capillary action is one result.
Polar	Water has a slight positive charge on one side of the molecule and a slight negative charge on the other side.
Cohesive	Water molecules are attracted to each other.

Section 6.3 Water and Solutions (continued)

Main Idea

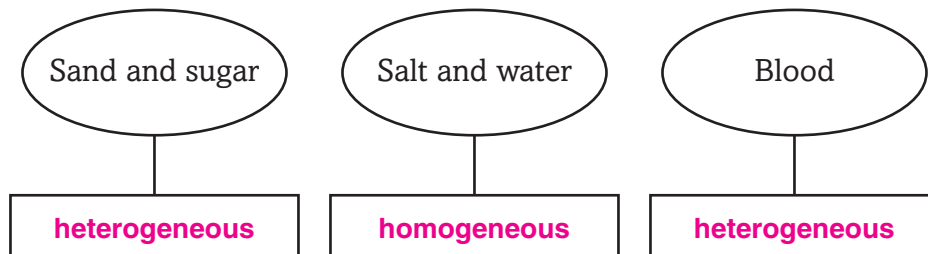
Mixtures with Water

I found this information on page _____.

SE, pp. 163–165
RE, pp. 63–64

Details

Identify each of the following mixtures as either homogeneous or heterogeneous.

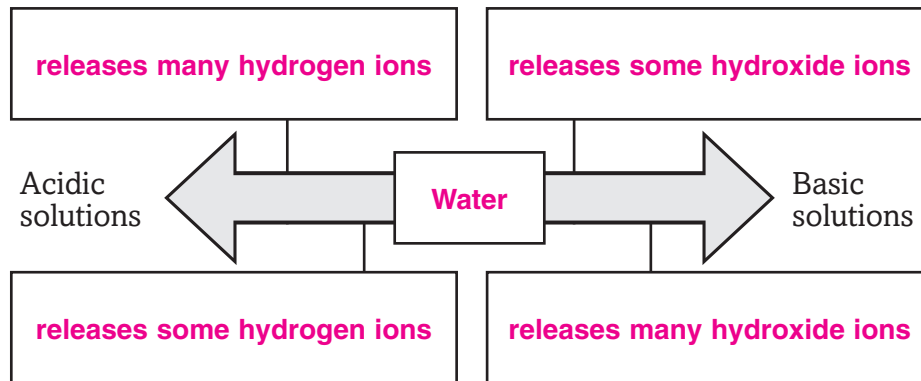


For any homogeneous mixture above, identify the solvent and the solute.

Solvent: water Solute: salt

Construct a model of acidic solutions and basic solutions by placing each of the items below in the correct sequence on the scale.

- releases some hydrogen ions
- releases many hydrogen ions
- water
- releases some hydroxide ions
- releases many hydroxide ions



SUMMARIZE

Analyze how water is important to life.

Accept all reasonable responses. Organisms are composed mostly of water. Humans can survive only a few days without water. Water has the ability to form many solutions in the body, enabling life functions. Water is a good insulator for the body. Water's ability to form hydrogen bonds enables functions such as capillary action in plants.

Chemistry in Biology

Section 6.4 The Building Blocks of Life

Main Idea

Details

Skim Section 4 of the chapter. Write two facts that you learned from reading the headings and illustration captions.

1. **Accept all reasonable responses.**

2.

Review Vocabulary

Use your book or dictionary to define organic compound.

organic compound

carbon-based substance that is the basis of living matter

New Vocabulary

Use your book or dictionary to define each term.

amino acid

component of protein that is a compound made of carbon, nitrogen, oxygen, hydrogen, and sometimes sulfur

carbohydrate

compound composed of carbon, hydrogen, and oxygen in a ratio of one oxygen and two hydrogen atoms for each carbon atom

lipid

molecule made mostly of carbon and hydrogen that makes up the fats, oils, and waxes

macromolecule

large molecule that is formed by joining smaller organic molecules

nucleic acid

complex macromolecule that stores and transmits genetic information

nucleotide

repeating subunit of a nucleic acid

polymer

molecule made from repeating units of identical or nearly identical compounds called monomers that are linked together by a series of covalent bonds

protein

compound made of small carbon compounds called amino acids

Section 6.4 The Building Blocks of Life (continued)

Main Idea

Organic Chemistry

I found this information on page _____.

SE, p. 166

RE, p. 65

Macromolecules

I found this information on page _____.

SE, pp. 167–171

RE, pp. 66–68

Details

Contrast *an organic compound to an inorganic compound.*

Any compound that contains carbon is organic. An inorganic

compound is not carbon-based.

Model *a carbon atom, and label its parts. Then use a label to point out and briefly explain why carbon can form a variety of organic compounds.*

Models should resemble the carbon atom in the text, but with labels added for the nucleus, electrons, and first and second energy levels.	It contains four electrons instead of the full eight, enabling covalent bonds to form chains of molecules.
---	--

Compare *the composition and functions of the four major groups of biological macromolecules by completing the table below.*

Group	Composition	Functions
Proteins	amino acids made of carbon, nitrogen, oxygen, hydrogen, and sometimes sulfur	transport substances; speed reactions; provide structural support; provide hormones
Nucleic acids	nucleotides made of carbon, nitrogen, oxygen, phosphorus, and hydrogen	store and communicate genetic information
Carbohydrates	carbon, hydrogen, and oxygen in ratio of one oxygen and two hydrogen for each carbon	store energy; provide structural support
Lipids	mostly carbon and hydrogen	store energy; provide steroids; waterproof coatings

Section 6.4 The Building Blocks of Life (continued)

Main Idea

I found this information on page _____.

SE, pp. 167–171

RE, pp. 66–68

Details

Evaluate the number of molecules of each element in the carbohydrate described by the formula below.



Carbon: 6 Hydrogen: 12 Oxygen: 6

Ratio of carbon, hydrogen, and oxygen: 1:2:1

Type of carbohydrate: monosaccharide/simple sugar

Model the two general shapes of proteins named below.

Student drawings should look similar to a folded sheet of paper.

Pleat

Student drawings should have a spiral appearance.

Helix

Describe nucleic acids by filling in the following chart.

Units that Make Up Nucleotides		
phosphate	nitrogenous base	ribose sugar

Function of DNA: **stores all the instructions for organisms to grow, reproduce, and adapt**

Function of RNA: **uses the information stored in DNA to make proteins**

CONNECT

Identify two examples of foods that contain high amounts of each of the following macromolecules: carbohydrates, lipids, and proteins. If you need help, read food labels.

Accept all reasonable responses. Carbohydrates are found in pasta, potatoes, and fruit. Lipids are found in animal fat and vegetable oil. Proteins are found in meat and beans.

Tie It Together

FURTHER INQUIRY

You have read about chemical reactions. Now create a simple science review manual explaining how chemical reactions allow living things to grow and develop. Your review manual should be easy to read and contain basic information and specific examples. Include diagrams to illustrate the ideas. Use the space below to create an outline for your review manual.

Accept all reasonable responses.

Cellular Structure and Function

Before You Read

Use the “What I Know” column to list the things you know about cells. Then list the questions you have about cells in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Imagine that you are small enough to fit inside a cell. Describe what you think you might observe while you are there.

Accept all reasonable responses.

Cellular Structure and Function

Section 7.1 Cell Discovery and Theory

Main Idea

Details

Skim Section 1 of the chapter. Write three questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

organization

Use your book or dictionary to define organization.

orderly structure of cells in an organism

New Vocabulary

Use your book or dictionary to define each term.

cell

basic unit of all living things

cell theory

theory that all organisms are made of one or more cells, which are the basic units of life, and that all cells come from other cells

eukaryotic cell

cell with specialized structures, which include the nucleus and other organelles

nucleus

cell organelle that controls the cell's activities and contains DNA

organelle

membrane-bound structure with special functions within eukaryotic cells

plasma membrane

boundary that helps control what enters and leaves a cell

prokaryotic cell

simple cell without specialized structures

Section 7.1 Cell Discovery and Theory (continued)

Main Idea

Details

History of the Cell Theory

I found this information on page _____.
 SE, pp. 182–183
 RE, pp. 69–70

Identify the three main ideas of the cell theory. Then write a short sentence for each one describing each idea. **Accept all reasonable responses.**

All living things are made of one or more cells. Sample response: I have seen that an onion is made of cells, and I know an onion was alive because it was a plant.

Cells are the basic units of structure and function in living things. Sample response: I know our muscles are made of muscle cells. I have seen that plants are made of plant cells.

All cells come from other cells. Sample response: We learned that living things only come from other living things. You cannot make a cell in a laboratory.

Microscope Technology

I found this information on page _____.
 SE, pp. 183–185
 RE, pp. 70–71

Summarize information about electron microscopes using five or six bullet points. **Accept all reasonable responses.** Important points are listed below.

- Microscopes improved in the 1930s–1940s.
- Microscopes allowed scientists to magnify objects up to 500,000 times.
- They use a beam of electrons instead of a beam of light.
- Scanning (SEM) can show a cell’s 3-D shape.
- Transmission (TEM) can help see inside a cell.
- Scanning tunneling electron microscope (STM) can show 3-D images of atoms.

Section 7.1 Cell Discovery and Theory (continued)

Main Idea

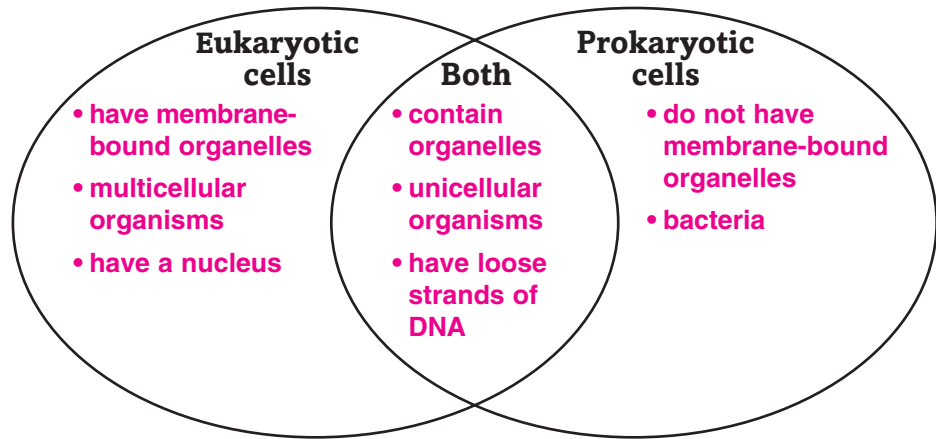
Details

Basic Cell Types

I found this information on page _____.
 SE, pp. 185–186
 RE, p. 71

Compare and contrast *eukaryotic and prokaryotic cells* by putting the phrases in the Venn diagram.

- bacteria
- contain organelles
- have loose strands of DNA
- have a nucleus
- have membrane-bound organelles
- multicellular organisms
- unicellular organisms
- do not have membrane-bound organelles



Model a eukaryotic cell. Label the parts of the cell.

Accept all reasonable models. Students should include and label the plasma membrane, nucleus, and one or more organelles.

SUMMARIZE

Analyze how more sophisticated microscopes have allowed scientists to advance their knowledge of cells.

Accept all reasonable responses. Increased magnification has enabled scientists to study cells in greater detail. Today's microscopes allow cell structures to be identified and studied.

Cellular Structure and Function

Section 7.2 The Plasma Membrane

Main Idea

Details

Scan the illustrations and captions in Section 2 of the chapter. List two facts you discovered about the plasma membrane.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define ion.

ion

atom or group of atoms with a positive or negative electrical charge

New Vocabulary

Use your book or dictionary to define each term.

fluid mosaic model

structural model of the plasma membrane where phospholipids and proteins float within the surface of the membrane

phospholipid bilayer

large molecule with a glycerol backbone, two fatty acid chains, and a phosphate group

selective permeability

process in which a membrane allows some molecules to pass through while keeping others out

transport protein

protein that moves needed substances or waste materials through the plasma membrane into or out of the cell

Section 7.2 The Plasma Membrane (continued)

Main Idea

Function of the Plasma Membrane

I found this information on page _____.

SE, p. 187
RE, p. 72

Structure of the Plasma Membrane

I found this information on page _____.

SE, pp. 188–190
RE, pp. 73–74

Details

Analyze what would happen if the cell membrane were not selectively permeable. Support your response.

Accept all reasonable analyses. Sample response: The cell might be destroyed because wastes could not leave and inappropriate molecules might enter the cell.

Identify five ways that the membrane can deal with materials.

- keeping molecules out
 - allowing molecules in at any time
 - allowing molecules in only at certain times
 - allowing molecules in only in limited amounts
 - expelling wastes from inside the cell
- membrane deals with materials by

Model a phospholipid, and label its parts. Describe how the phospholipid functions to make up the fluid membrane.

Accept all reasonable responses. The phosphate group forms the polar head of the molecule. It points outward to interact with the watery environment outside the cell. The nonpolar fatty acid tails point inward toward each other (since two layers make up each membrane) away from the water outside the cell. A barrier is created that is water-soluble on the outside but water-insoluble on the inside.

Diagrams should resemble those on SE p. 188.

Section 7.2 The Plasma Membrane (continued)

Main Idea

I found this information on page _____.

SE, pp. 188–190

RE, pp. 73–74

Details

Model the plasma membrane. Label each part, and describe the function of that part in detail.

Diagrams should clearly show and explain phospholipids, proteins, and cholesterol.

phospholipids: polar phosphate heads allow membrane to interact with surface water; nonpolar tails are on inside of membrane and make it difficult for water-soluble particles to move through the membrane

transport proteins: regulate what is allowed to enter and exit the cell through the membrane

cholesterol: keeps phospholipids fluid, prevents them from sticking together

receptors: transmit signals to the inside of cells

Discuss how the terms fluid and mosaic describe the plasma membrane.

Fluid: It is fluid because the phospholipids, proteins, and cholesterol float in the membrane.

Mosaic: It is a mosaic because it has many parts. The proteins create patterns on the membrane's surface.

SUMMARIZE

Analyze the role of the plasma membrane in maintaining homeostasis in the cell.

Accept all reasonable responses. As a selectively permeable barrier between the inside of the cell and the outside environment, the plasma membrane controls the amount of substances entering and leaving the cell and the timing of substance flow.

Cellular Structure and Function

Section 7.3 Structures and Organelles

Main Idea

Details

Skim Section 3 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

enzyme

Use your book or dictionary to define enzyme.

protein that speeds up the rate of a chemical reaction

New Vocabulary

cell wall

centriole

chloroplast

cilium

cytoplasm

cytoskeleton

endoplasmic reticulum

flagellum

Golgi apparatus

lysosome

mitochondrion

nucleolus

ribosome

vacuole

Write each term in the table under the heading that best describes it.

Cell Structure (5)	Related to Genetic Material (2)	Food, Storage, and Waste (5)	Energy (2)
cell wall	nucleolus	cytoplasm	chloroplast
cilium	ribosome	endoplasmic reticulum	mitochondrion
cytoskeleton		Golgi apparatus	
flagellum		lysosome	
centriole		vacuole	

Compare and contrast each pair of terms by defining them and noting their differences.

Chloroplast	Mitochondrion
plant organelle that captures light and converts it to a chemical	in plants and animals, converts energy to a form cells can use
Vacuole	Centriole
storage compartment in a cell	organelle that functions during cell division
Cilium	Flagellum
short, hairlike projection that aids in locomotion	long, hairlike projection that aids in locomotion

Section 7.3 Structures and Organelles (continued)

Main Idea

Cytoplasm and Cytoskeleton

I found this information on page _____.

SE, pp. 191–192
RE, p. 75

Cell Structures

I found this information on page _____.

SE, pp. 193–199
RE, pp. 75–78

Details

Compare the cytoplasm and cytoskeleton by defining each in the boxes.

Cytoplasm	Cytoskeleton
semifluid material inside the organelles or plasma membrane in which cell processes take place directly	supporting network of long, thin protein fibers forming a framework for the cell and providing an anchor for organelles

Identify the part of the cell that corresponds to each function described.

nucleus	directs cell processes; contains the cell's DNA; stores information for cell growth, function, and reproduction
nuclear envelope	double membrane that surrounds the nucleus
ribosome	helps manufacture proteins
nucleolus	produces ribosomes inside the nucleus
endoplasmic reticulum	site of ribosome attachment; can be smooth or rough
Golgi apparatus	modifies, sorts, and packages proteins for transport outside the cell
vacuole	membrane-bound storage area within the cell
lysosome	vesicle that contains substances that digest excess or worn-out organelles
centriole	structure near the nucleus that functions during cell division
mitochondrion	converts fuel particles (sugars) into useable energy
chloroplast	captures light energy and converts it to chemical energy through photosynthesis
cell wall	gives support to plant cells
cilia and flagella	projections that allow the cell to move or to move substances along the surface of the cell

Section 7.3 Structures and Organelles (continued)

Main Idea

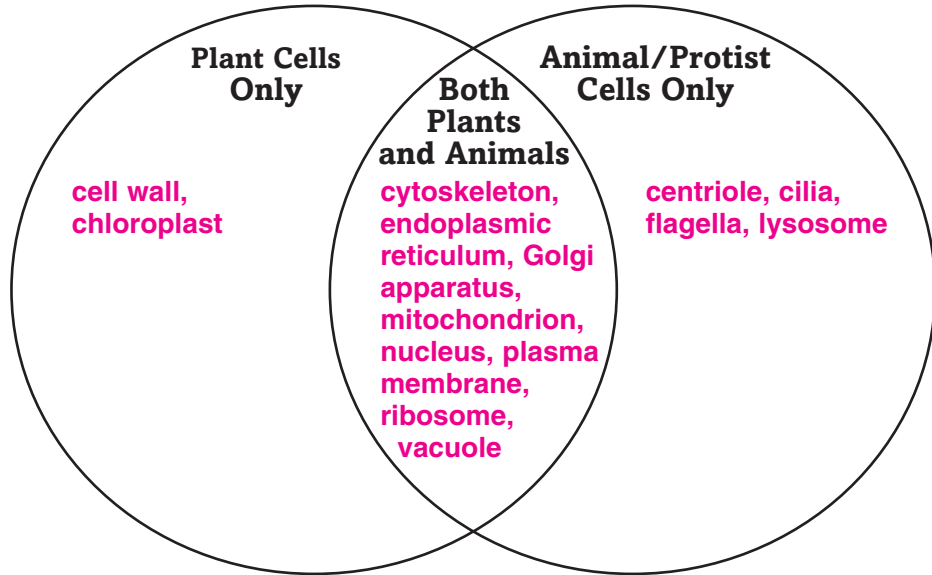
Comparing Cells

I found this information on page _____.

SE, p. 200
RE, p. 79

Details

Compare and contrast the cell parts found in the following categories.

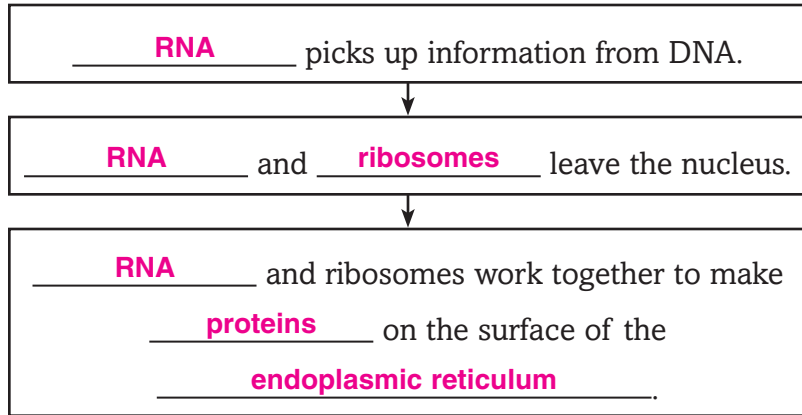


Organelles at Work

I found this information on page _____.

SE, p. 200
RE, p. 79

Sequence the steps that describe how proteins are made by completing the flowchart.



CONNECT

Create and describe a unique model for the structure and function of the cell.

Accept all reasonable responses. Responses should mention specific cell parts and their role in the metaphor.

Cellular Structure and Function

Section 7.4 Cellular Transport

Main Idea

Details

Skim Section 4 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define homeostasis.

homeostasis

regulation of the internal environment to maintain conditions

suitable for life

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

endocytosis

process by which the plasma membrane surrounds a substance outside the cell and moves it inside the cell

active transport

movement of substances from a region of lower concentration to a region of higher concentration

diffusion

net movement of particles from an area where there are many particles of the substance to an area where there are fewer

hypertonic solution

solution that has a higher concentration of solutes in the cell

isotonic solution

solution in which the inside of the cell and the solution it is in have the same concentration of water and solutes

exocytosis

process by which the plasma membrane surrounds a substance inside the cell and moves it outside the cell

osmosis

diffusion of water across a selectively permeable membrane

facilitated diffusion

form of transport that uses transport proteins to move other ions and small molecules across the plasma membrane

dynamic equilibrium

condition in which there is continuous movement but no overall change in concentration

hypotonic solution

solution that has a lower concentration of solutes in the cell

Section 7.4 Cellular Transport (continued)

Main Idea

Diffusion

I found this information on page _____.

SE, pp. 201–202
RE, pp. 80–81

**Osmosis:
Diffusion of
Water**

I found this information on page _____.

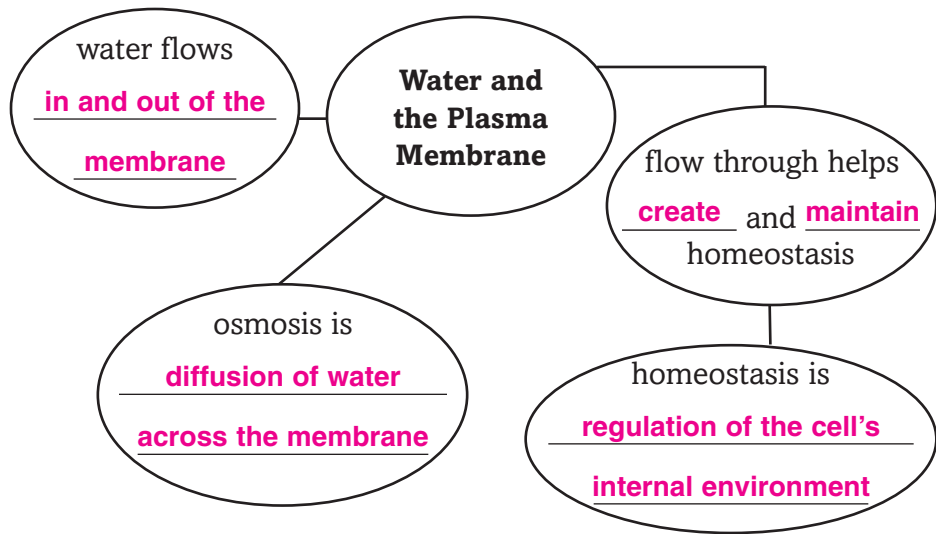
SE, pp. 203–205
RE, pp. 81–82

Details

Rephrase the process of diffusion in your own words, and give an example.

Accept all reasonable responses.

Summarize the relationship between water and the plasma membrane by completing the concept web below.



Model a cell in a hypertonic, hypotonic, and isotonic solution. Underneath each model, summarize the effect of each solution on the cell. Accept all reasonable responses.

Solutions		
Hypertonic	Hypotonic	Isotonic
Pressure inside the cell decreases in a hypertonic solution.	A cell swells when placed in a hypotonic solution.	Cell shows no effect when placed in an isotonic solution.

Section 7.4 Cellular Transport (continued)

Main Idea

Active Transport and Transport of Large Particles

I found this information on page _____.

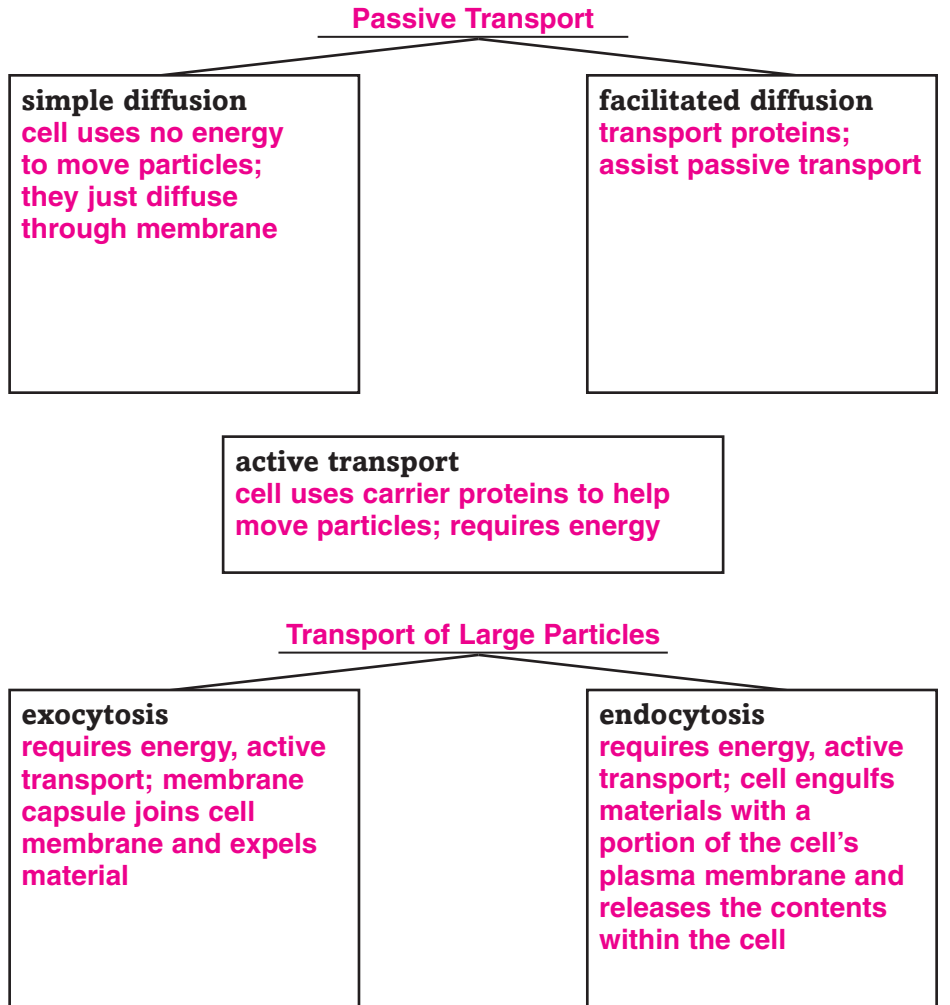
SE, pp. 205–207
RE, p. 82

For the analogy, encourage creative and original thought that synthesizes the concepts at hand.

Details

Classify and summarize the five ways particles move through the membrane. Make notes and sketches in the rectangle for each one.

Accept all reasonable responses.



CONNECT

Think of real-life movement between locations, and make analogies of the five different kinds of transport that occurs through the cell membrane. Explain how each type of transport works in your analogy.

Accept all reasonable responses. Simple diffusion is like walking through an entryway of streamers; facilitated diffusion is like taking an escalator; active transport is like entering through a subway gate using a ticket; endocytosis is like receiving shipping; and exocytosis is like taking out the garbage.

Tie It Together

SUMMARIZE

Make a concept web to show the main ideas and

important details in this chapter, and the relationships between the facts you learned.

Hint: You might find it easier to list the facts or topics you want to include first, then decide how to connect them in the web.

Accept all reasonable responses.

Cellular Energy

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Cellular Energy	After You Read
	<ul style="list-style-type: none"> • Energy can be transformed, but it cannot be created or destroyed. 	A
	<ul style="list-style-type: none"> • ATP is a molecule used by cells to store energy. 	A
	<ul style="list-style-type: none"> • Photosynthesis takes place inside the chloroplasts. 	A
	<ul style="list-style-type: none"> • Cellular respiration occurs in two stages: glycolysis and the Calvin cycle. 	D

Science Journal

How does energy get to cells? How do cells use energy? Write your own ideas.

Accept all reasonable responses.

Cellular Energy

Section 8.1 How Organisms Obtain Energy

Main Idea

Details

Scan Section 1 of the chapter and make a list of three general ways in which cells use energy.

1. **Accept all reasonable responses.**

2.

3.

Review Vocabulary

Use your book or dictionary to define metabolism.

metabolism

all the chemical reactions that occur within an organism

New Vocabulary

Use your book or dictionary to define each vocabulary term.

adenosine triphosphate

energy-storing molecule in cells, made of an adenosine molecule, a ribose sugar, and three phosphate groups

cellular respiration

catabolic pathway in which organic molecules are broken down to release energy

energy

the ability to do work

metabolism

all of the chemical reactions in a cell

photosynthesis

anabolic pathway in which light energy from the Sun is harvested as chemical energy for use by living things

thermodynamics

the study of how energy flows and is transformed in the universe

Section 8.1 How Organisms Obtain Energy (continued)

Main Idea

Transformation of Energy

I found this information on page _____.

SE, pp. 218–219

RE, pp. 83–84

Details

Organize at least seven of your body's cell processes that require energy. **Accept all reasonable responses.**

Energy in Cell Processes

Metabolism

I found this information on page _____.

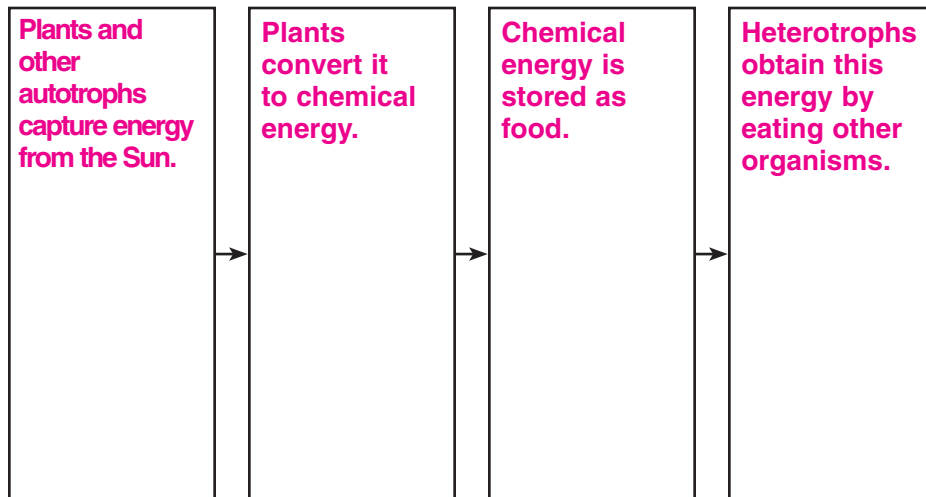
SE, p. 220

RE, pp. 84–85

Compare the laws about how energy flows. Give an example of each.

	First Law of Thermodynamics	Second Law of Thermodynamics
Defined	Energy is neither created nor destroyed, only transformed.	The amount of entropy in a system is always increasing.
Example	The body converts stored energy in food into chemical energy.	Some energy is changed to thermal energy as energy moves through food chain.

Sequence the flow of energy from the Sun to heterotrophs.

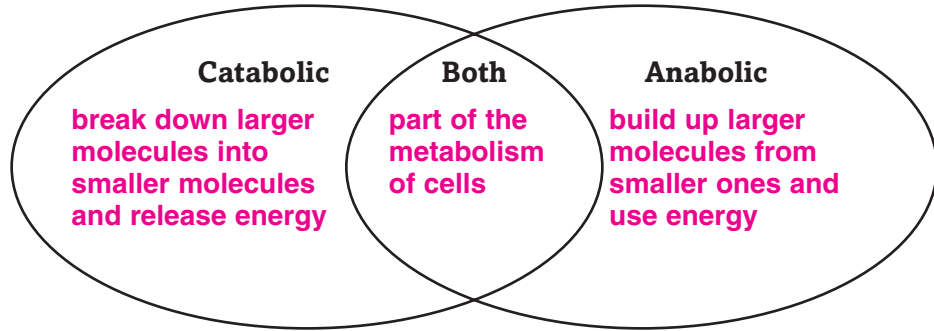


Section 8.1 How Organisms Obtain Energy (continued)

Main Idea

Details

Compare and contrast *catabolic and anabolic pathways by writing characteristics of each in the Venn diagram.*



ATP: The Unit of Cellular Energy

I found this information on page _____.

SE, p. 221
RE, p. 85

Summarize *ATP and ADP.*

ATP
Explain how your body uses ATP, and list the three parts of the molecule. **Adenosine triphosphate provides quick energy for cells when they need it. It is made of an adenosine molecule, a ribose sugar, and three phosphate groups.**

ADP
Explain how ADP is made from ATP. **Adenosine diphosphate is made when ATP loses a phosphate group.**

SUMMARIZE

Design a concept map to show the three most important ideas from this section.

Encourage students to choose concise but meaningful phrases for their maps.

Cellular Energy

Section 8.2 Photosynthesis

Main Idea

Details

Scan Section 2 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define carbohydrate.

carbohydrate

an organic compound containing carbon, hydrogen, and oxygen

New Vocabulary

Use your book or dictionary to define each vocabulary term.

Calvin cycle

series of reactions during the light-independent phase of photosynthesis in which energy is stored in simple sugars

granum

a stack of thylakoid membranes on the inside of chloroplasts

NADP+

final electron-carrying molecule in light-dependent reactions; combines with electrons to form the energy-storage molecule NADPH

pigments

molecules that absorb specific wavelengths of light

rubisco

an enzyme in the Calvin cycle that converts inorganic carbon molecules into organic molecules that can be used by the cell

stroma

the fluid-filled space outside the grana; location of the light-independent reactions of photosynthesis

thylakoid

flattened saclike membranes inside chloroplasts; location of the light-dependent reactions of photosynthesis

Academic Vocabulary

Define transport to show its scientific meaning.

transport

to carry something from one place to another

Section 8.2 Photosynthesis (continued)

Main Idea

Overview of Photosynthesis

I found this information on page _____.
SE, p. 222
RE, p. 86

Phase One: Light Reactions

I found this information on page _____.
SE, pp. 223–224
RE, pp. 87–88

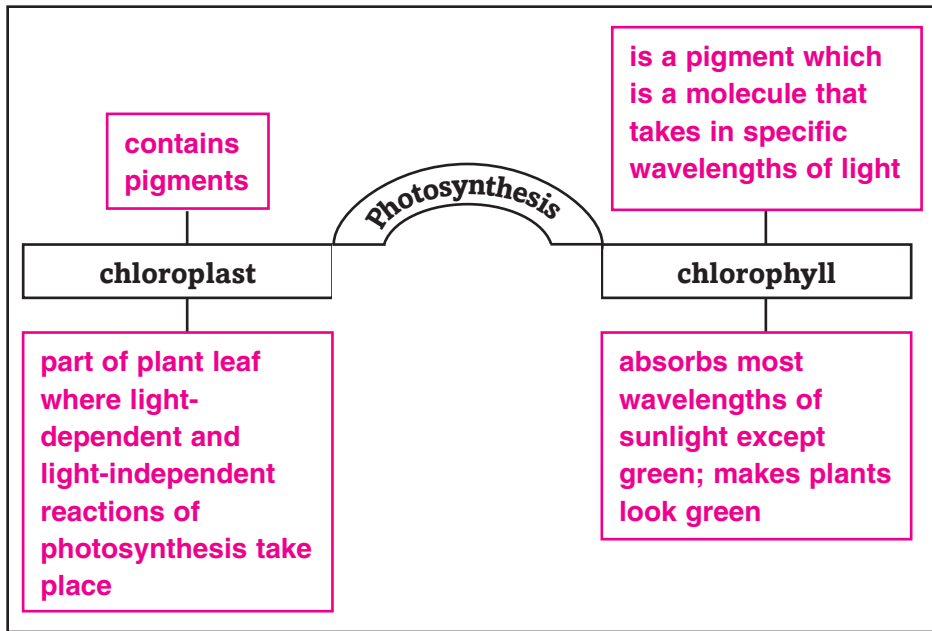
Details

Summarize the functions of the light-dependent and light-independent reactions by completing the sentences.

Plants and other green organisms trap light energy from the Sun. The light-dependent reactions change light energy into the molecules ATP and NADPH. The light-dependent reactions use ATP and NADPH to make glucose.

The light-independent reactions produce simple sugars, which are then made into complex carbohydrates, such as starch, which stores energy in plants.

Create a concept web to summarize what you know about chloroplasts and chlorophyll. **Accept all reasonable responses.**



Analyze how leaves change color in the fall.

Leaves break down chlorophyll, so other pigment colors become visible.

Section 8.2 Photosynthesis (continued)

Main Idea

**Phase Two:
The Calvin Cycle**

I found this information
on page _____.

SE, p. 226
RE, p. 89

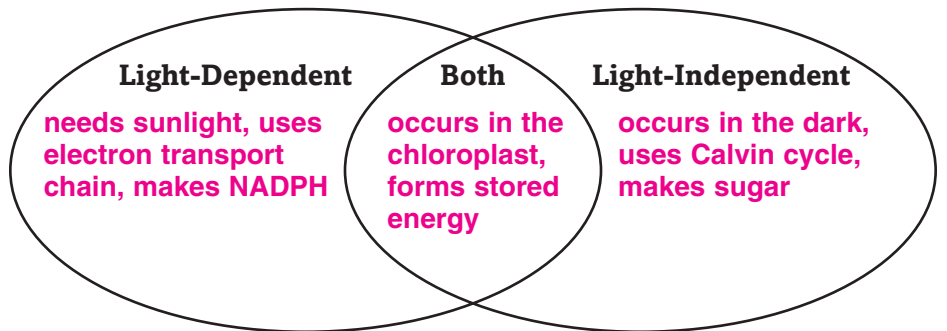
Details

Model *light-dependent reactions in a flow chart.*

Accept all reasonable responses.

Compare *light-dependent and light-independent reactions by putting each phrase into the correct part of the Venn diagram.*

- forms stored energy
- makes NADPH
- makes sugar
- needs sunlight
- occurs in the chloroplast
- occurs in the dark
- uses Calvin cycle
- uses electron transport chain



Alternative Pathways

I found this information
on page _____.

SE, p. 227
RE, p. 89

Compare *two alternative photosynthesis pathways. Identify plants that use each pathway.*

Pathway: C₄ pathway	Pathway: CAM pathway
Description: carbon dioxide fixed in 4-carbon instead of 3-carbon compounds	Description: carbon dioxide enters leaves only at night
Plants that use this pathway: sugar cane and corn	Plants that use this pathway: cacti, orchids, and pineapple

SUMMARIZE

Explain the results of light-dependent and light-independent reactions. **Accept all reasonable responses.**

Sunlight triggers light-dependent reactions, which produce ATP and NADPH molecules to produce sugars out of carbon dioxide and water.

Cellular Energy

Section 8.3 Cellular Respiration

Main Idea

Details

Scan the headings, illustrations, and captions in Section 3 of the chapter. Write three facts that you discover about cellular respiration.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

cyanobacterium

Use your book or dictionary to define cyanobacterium.

a type of eubacterium that is a photosynthetic autotroph

New Vocabulary

Read the definitions below and write the correct vocabulary term in the blank.

anaerobic process

metabolic process that does not require oxygen

glycolysis

in cellular respiration, a series of anaerobic chemical reactions in the cytoplasm that break down glucose into pyruvic acid; forms a net profit of two ATP molecules

aerobic

metabolic processes that require oxygen

Krebs cycle

in cellular respiration, a cycle of chemical reactions that break down glucose and produce ATP; energizes electron carriers that pass the energized electrons on to the electron transport chain

fermentation

a series of anaerobic reactions in the cytoplasm that regenerate NAD^+ for glycolysis and produce ATP; supplies energy for aerobic organisms when oxygen is low

aerobic respiration

in cellular respiration, the processes that take place in the mitochondrion and require oxygen; includes the Krebs cycle and electron transport

Section 8.3 Cellular Respiration (continued)

Main Idea

Overview of Cellular Respiration

I found this information on page _____.

SE, p. 228
RE, p. 90

Glycolysis, Krebs Cycle, and Electron Transport

I found this information on page _____.

SE, pp. 229–231
RE, pp. 90–91

Anaerobic Respiration

I found this information on page _____.

SE, pp. 231–232
RE, p. 92

Details

Rephrase *the function of cellular respiration in your own words. Write the equation that describes it.*

Function: harvest electrons from carbon compounds and use that energy to make QTP

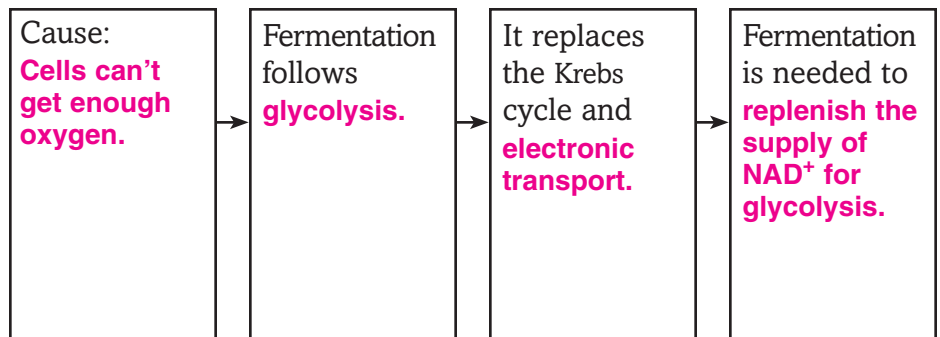
Equation:



Compare and summarize *the three stages of cellular respiration. Accept all reasonable responses.*

Glycolysis	Krebs Cycle	Electron Transport
a series of chemical reactions that break down glucose	a series of chemical reactions that break down pyruvate from glycolysis	ATP made from high-energy electrons and protons.
takes place in the cytoplasm of the cell	takes place in the mitochondria	takes place in mitochondrial membrane
produces two ATP molecules for every glucose molecule that is broken down	produces one ATP and two CO ₂	provides energy for ATP production final electron acceptor is electron oxygen

Sequence *events that lead to fermentation in aerobic organisms.*



Section 8.3 Cellular Respiration (continued)

Main Idea

Details

Photosynthesis and Cellular Respiration

I found this information on page _____.

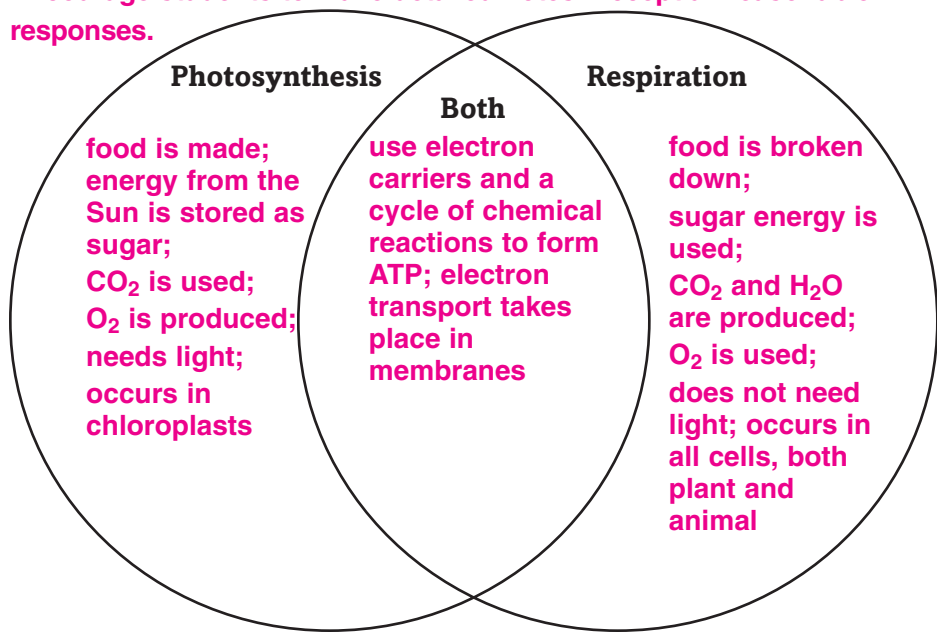
SE, p. 233
RE, p. 98

Summarize a process of fermentation that is useful to humans.

Alcoholic fermentation is a process used by some types of bacteria and yeast to make CO₂ and ethyl alcohol from pyruvic acid (which is made during glycolysis from glucose). This process is used to produce alcoholic beverages.

Compare photosynthesis and respiration in a Venn diagram.

Encourage students to make detailed notes. Accept all reasonable responses.



SUMMARIZE

Create a graphic organizer to compare aerobic and anaerobic processes. Accept all reasonable responses.

Cellular Reproduction

Before You Read

Use the "What I Know" column to list the things you know about how cells work. Then list the questions you have about how cells work in the "What I Want to Find Out" column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

New cells are created in your body every day. Write about the reasons your body might need new cells.

Accept all reasonable responses.

Cellular Reproduction

Section 9.1 Cellular Growth

Main Idea

Details

Scan the titles, boldfaced words, pictures, figures, and captions in Section 1. Write three facts you discovered about cellular growth as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

carbohydrate

Use your book or dictionary to define carbohydrate.

an organic compound containing carbon, hydrogen, and oxygen, usually in a 1:2:1 ratio

New Vocabulary

cell cycle

Use your book or dictionary to define each term.

the sequence of events by which cells grow and divide

chromatin

the relaxed form of DNA in the cell's nucleus

chromosome

structure in the nucleus that contains the genetic material

cytokinesis

the stage of the cell cycle in which the cytoplasm divides and a new cell is created

interphase

the stage of the cell cycle during which the cell grows, carries out normal functions, and copies its DNA

mitosis

the stage of the cell cycle during which the nucleus and nuclear material divide

Section 9.1 Cellular Growth (continued)

Main Idea

Cell Size Limitations

I found this information on page _____.
 SE, pp. 244–246
 RE, pp. 93–94

The Cell Cycle

I found this information on page _____.
 SE, pp. 246–247
 RE, pp. 94–95

Details

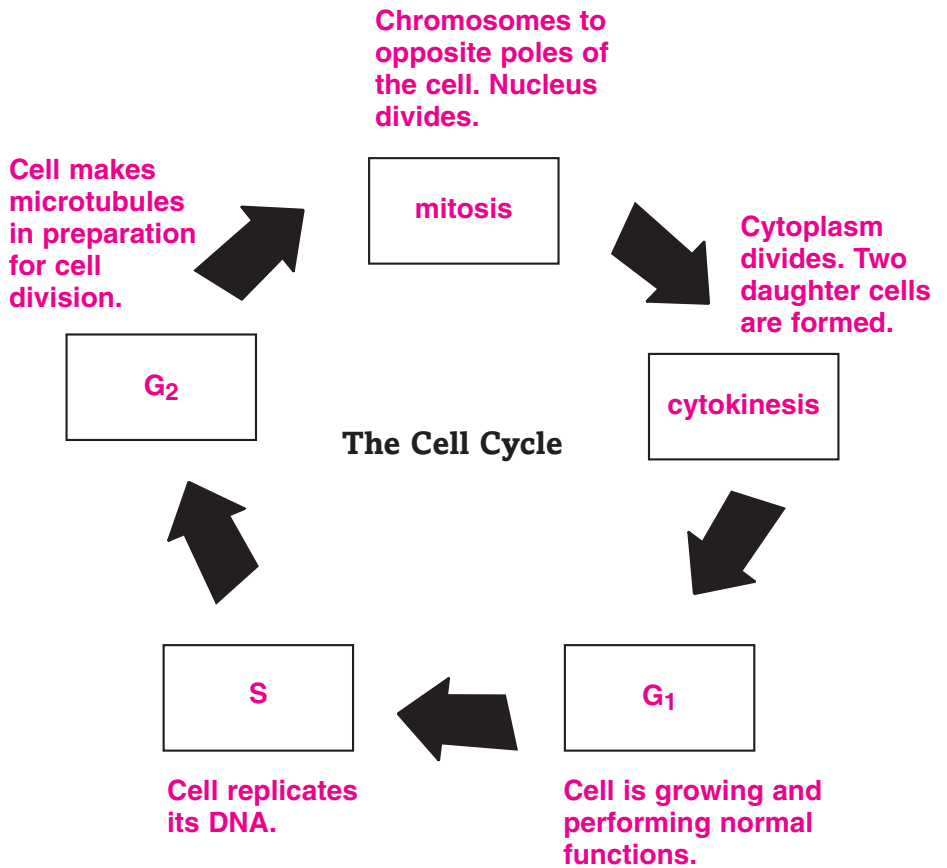
Analyze movement of nutrients and wastes as cell size increases. Accept all reasonable responses.

If a <u>cell</u> <u>gets too large</u> ,	transport of <u>nutrients and wastes</u> by <u>diffusion</u> slows down.	Therefore, cells <u>divide</u> before <u>they become too large</u> .
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Describe how surface area-to-volume ratio relates to cell size by completing the sentence.

As a cell grows larger, its volume increases more rapidly than its surface area, thus surface area-to-volume ratio decreases.

Complete the diagram of the cell cycle. Describe the main events in each stage.



Section 9.1 Cellular Growth (continued)

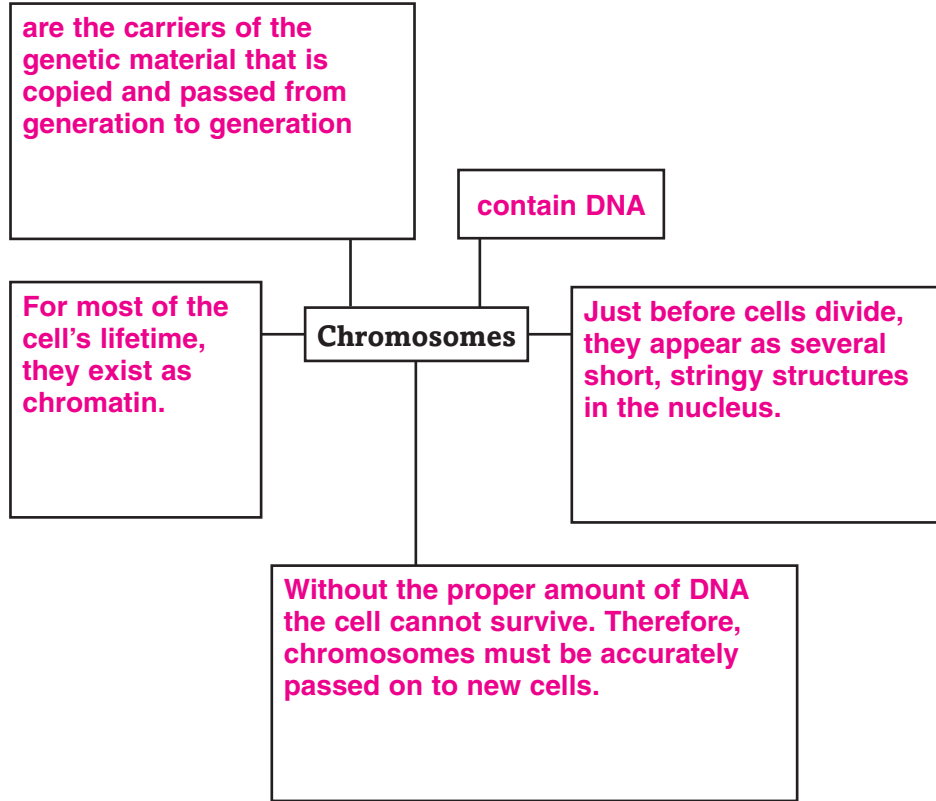
Main Idea

I found this information on page _____.

SE, pp. 246–247
RE, pp. 94–95

Details

Organize information about chromosomes in the concept web. Accept all reasonable responses.



Identify four events that occur in a cell during interphase.

1. cell grows
2. cell carries on metabolism
3. cell duplicates chromosomes
4. cell prepares for division

SUMMARIZE

Analyze the relationship between cell size and the stages of the cell cycle.

Cells must stay small to function properly. Cells use the cell cycle to stay small. Actively growing cells are in interphase. When a growing cell reaches its maximum size, it keeps itself small by entering mitosis and cytokinesis and dividing into two smaller daughter cells.

Cellular Reproduction

Section 9.2 Mitosis and Cytokinesis

Main Idea

Details

Scan Section 2 of the chapter. From the headings and illustrations list the four stages of mitosis.

- | | |
|---------------------|---------------------|
| 1. <u>prophase</u> | 3. <u>anaphase</u> |
| 2. <u>metaphase</u> | 4. <u>telophase</u> |

Review Vocabulary

Use your book or dictionary to define life cycle.

life cycle

the sequence growth and development stages that an organism goes through during its life

New Vocabulary

Use your book or dictionary to define the following terms.

anaphase

the third stage of mitosis, during which the centromeres separate and the chromatids are pulled apart

centromere

structure at the center of the chromosome to which the sister chromatids attach

metaphase

the second stage of mitosis, during which the sister chromatids line up along the equator of the cell

prophase

the first stage of mitosis, during which the chromatid condenses into chromosomes

sister chromatid

structures in a chromosome containing identical copies of the DNA

spindle apparatus

structure that helps move and organize the chromosomes during mitosis; made of spindle fibers, centrioles, and aster fibers

telophase

the final stage of mitosis, during which the chromosomes migrate to the poles of the cell and then decondense

Section 9.2 Mitosis and Cytokinesis (continued)

Main Idea

Mitosis

I found this information on page _____.
SE, p. 248
RE, p. 96

The Stages of Mitosis

I found this information on page _____.
SE, pp. 248–251
RE, pp. 96–98

Details

Identify two functions of mitosis in animals.

Function of mitosis in animals

- wound repair
- growth of organism to adult size

Model the stages of mitosis and the process of cytokinesis. Draw and label a cell in each stage, name each stage, and describe what is happening. **Accept all reasonable responses.**

Name of Phase	Sketch of Cell	Description
prophase		chromatin coils to form chromosomes
metaphase		chromosomes move to the center of the cell
anaphase		centromeres split and sister chromatids are pulled to the opposite sides of the cell
telophase		two new nuclei are formed and a double membrane begins to form between them
cytokinesis		cell's cytoplasm divides and separates into two new identical cells

Summarize the similarities and differences of any two phases of mitosis.

Accept all reasonable responses.

Section 9.2 Mitosis and Cytokinesis (continued)

Main Idea

I found this information on page _____.

SE, pp. 248–251
RE, pp. 96–98

Details

Summarize the function of each structure in mitosis.

centromeres: part of chromosome to which spindle apparatus attaches

microtubules: tube-like structures that shorten and pull the chromosomes to opposite poles of the cell

motor proteins: help microtubules pull chromosomes to poles of the cell

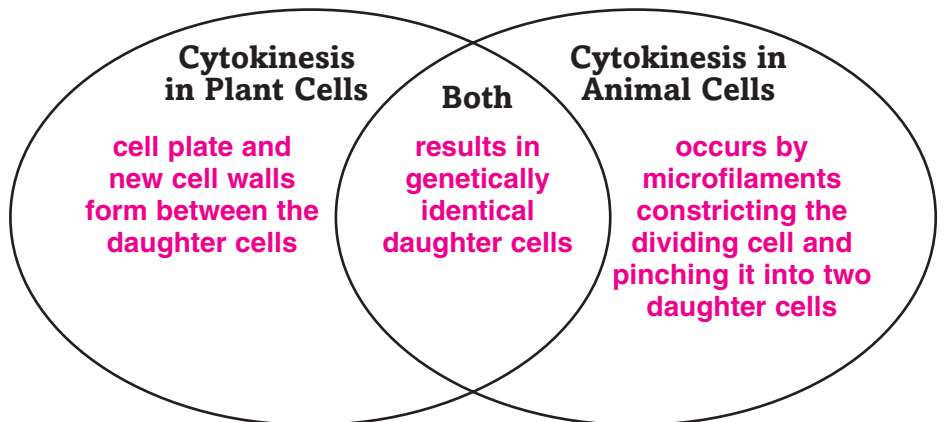
spindle apparatus: attaches to and moves the chromosomes

Cytokinesis

I found this information on page _____.

SE, p. 252
RE, p. 99

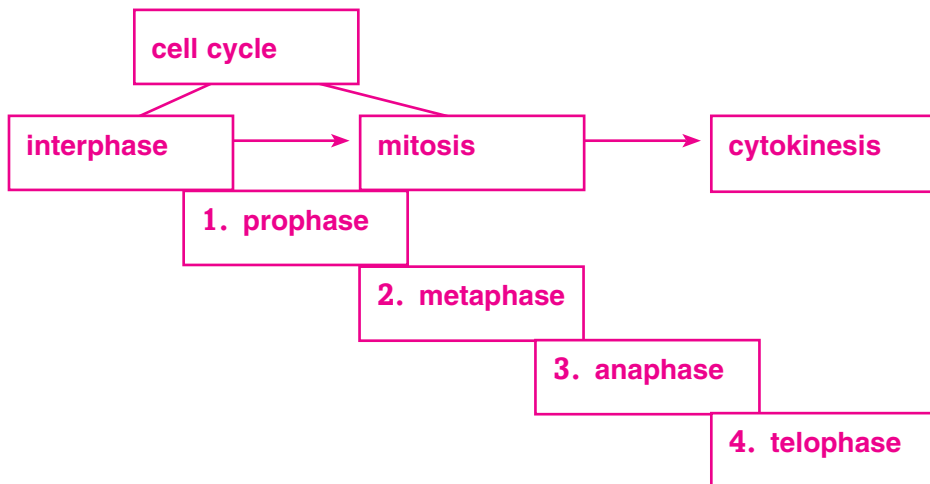
Compare and contrast cytokinesis in plant and animal cells.



SUMMARIZE

Create a concept map describing the stages of the cell cycle.

Accept all reasonable responses.



Cellular Reproduction

Section 9.3 Cell Cycle Regulation

Main Idea

Details

Scan the illustrations and read the captions in Section 3 of the chapter. Write three facts you discovered about stem cells.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

nucleotide

Use your book or dictionary to define nucleotide.

subunit that makes up RNA and DNA

New Vocabulary

apoptosis

Use your book or dictionary to define the following term.

process of programmed cell death

cancer

uncontrolled growth and division of cells; results from a failure of cell cycle regulation

carcinogen

substance known to cause cancer

cyclin

protein that binds to cyclin-dependent kinases to regulate the activities of the cell cycle

cyclin-dependent kinase

enzymes that are activated by cyclins and serve to regulate the activities of the cell cycle

stem cell

unspecialized cells that have the potential to develop into specialized cells

Section 9.3 Cell Cycle Regulation (continued)

Main Idea

Normal Cell Cycle

I found this information on page _____.

SE, pp. 253–254
RE, pp. 100–101

Abnormal Cell Cycle

I found this information on page _____.

SE, pp. 254–255
RE, pp. 101–102

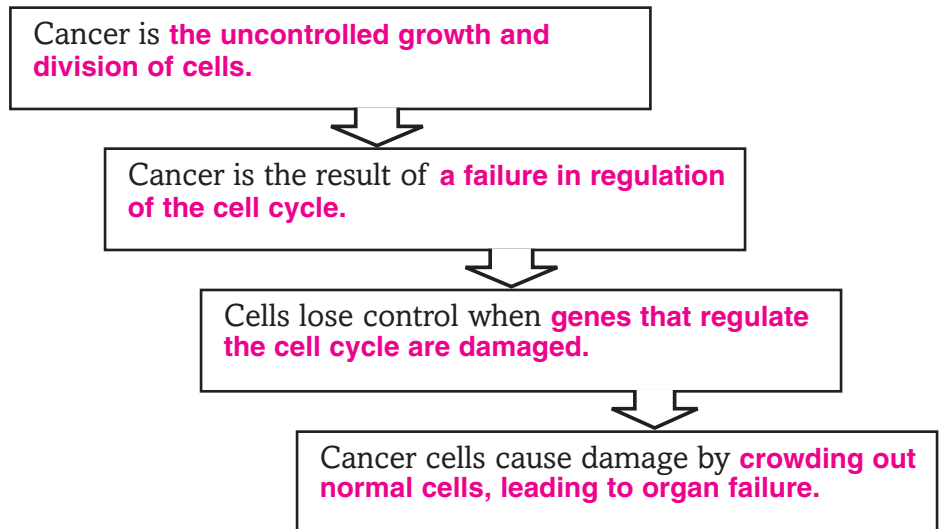
Details

Summarize how cells regulate the cell cycle. Choose from the list of words to complete the paragraph.

- checkpoints
- cyclin/CDK
- cyclins
- cyclin-dependent kinases
- cytokinesis
- G₁ stage
- G₂ stage
- mitosis
- S stage

Cells use cyclins and cyclin-dependent kinases to control the cell cycle. Different combinations of cyclin/CDK start the cell cycle at different checkpoints. The cell also uses cyclin/CDK to monitor the cycle for quality control. In G₁ stage, the cell checks the DNA for damage. If there is any damage, the cycle won't proceed to S stage. In mitosis, if the spindle apparatus is malfunctioning, the cycle won't proceed to cytokinesis.

Sequence the causes and effects of cancer by completing the flow chart below.



Identify four environmental factors that cause cancer.

1. cigarette smoke
2. asbestos
3. X rays
4. ultraviolet radiation

Section 9.3 Cell Cycle Regulation (continued)

Main Idea

Details

Apoptosis

I found this information on page _____.

SE, p. 256
RE, p. 102

Summarize information about apoptosis.

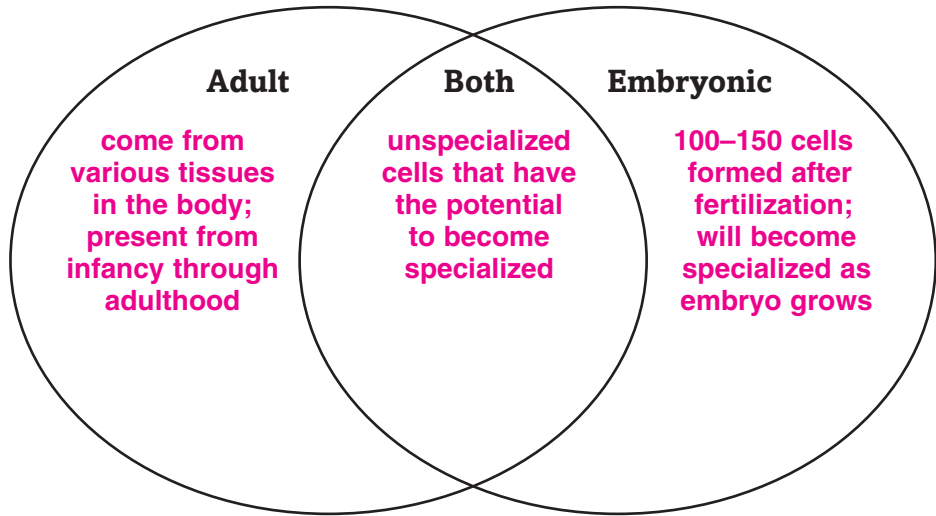
Apoptosis is a process of programmed cell death.	Organisms use apoptosis to destroy cells that are no longer needed.	Two processes that use apoptosis: 1. trees losing their leaves in autumn 2. development of hands and feet
--	---	---

Stem Cells

I found this information on page _____.

SE, pp. 256–257
RE, p. 102

Compare and contrast adult and embryonic stem cells by writing characteristics in the Venn diagram.



CONNECT

A classmate thinks that cancer and apoptosis are both harmful to organisms. Do you agree or disagree? Explain your reasoning.

Accept all reasonable responses. Only cancer is harmful to an organism. Apoptosis is a normal process in which cells that are not needed by an organism die in a controlled process.

Sexual Reproduction and Genetics

Before You Read

Use the “What I Know” column to list the things you know about genetics. Then list the questions you have about genetics in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Genetics explains why you have inherited certain characteristics from your parents. Write about some characteristics that you have inherited from your own parents, or similarities in other families, animals, or plants that you think might have been inherited.

Accept all reasonable responses.

Sexual Reproduction and Genetics

Section 10.1 Meiosis

Main Idea

Details

Skim the headings and illustration captions in Section 1 of the chapter. Write three facts you discovered about meiosis as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

chromosome

Use your book or dictionary to define chromosome.

a cellular structure that contains DNA

New Vocabulary

diploid

gamete

gene

haploid

homologous chromosomes

meiosis

fertilization

crossing over

Use the terms in the left margin to complete the paragraph below.

A segment of DNA on a chromosome that controls the production of a protein is called a **gene**. A **diploid** cell contains two copies of each chromosome. A sex cell, or **gamete**, is **haploid**, meaning it contains one copy of each chromosome. **Homologous chromosomes** are pairs of chromosomes, one from each parent.

Describe three processes that occur during sexual reproduction.

Accept all reasonable responses.

	Meiosis	Fertilization	Crossing Over
What happens?	cell division reduces chromosome number	two haploid sex cells, one from each parent combine	segments of homologous chromosomes break and change places
What is the product?	four haploid cells	a diploid fertilized egg	new combinations of genetic material on chromosomes

Section 10.1 Meiosis (continued)

Main Idea

Chromosomes and Chromosome Numbers

I found this information on page _____.

SE, pp. 270–271
RE, pp. 103–104

Meiosis I, Meiosis II, and The Importance of Meiosis

I found this information on page _____.

SE, pp. 271–276
RE, pp. 105–108

Details

Identify three characteristics that are the same in each member of a pair of homologous chromosomes. Name one thing that is different.

Same	Different
1. length 2. centromere position 3. position of genes	1. exact version of each gene

Compare and contrast the phases of Meiosis I and Meiosis II. Sketch each phase. Accept all reasonable responses. Sketches should be similar to those in the text.

Meiosis I	Prophase I	Metaphase I	Anaphase I	Telophase I
Description	chromosomes condense and pair up, spindle forms	spindle fiber attaches to centromere, pulls chromosomes to center of cell	chromosomes move apart from each other toward poles of cell	each pole contains one member of a pair of homologous chromosomes, cell divides
Sketch				
Meiosis II	Prophase II	Metaphase II	Anaphase II	Telophase II
Description	chromosomes condense and spindle forms	haploid number of chromosomes line up at center of cell	sister chromatids are pulled apart	nuclear membrane and nucleus reforms, cell divides into 4 haploid cells
Sketch				

Analyze the chart above to determine the phase of meiosis when crossing over can occur. Mark a star on the correct phase. Students should place a star by Prophase I.

Section 10.1 Meiosis (continued)

Main Idea

**Sexual
Reproduction
v. Asexual
Reproduction**

I found this information
on page _____.

SE, p. 276
RE, p. 108

Details

Compare *meiosis and mitosis by filling in the chart below.*

	Mitosis	Meiosis
Number of DNA replications	1	1
Number of cell divisions	1	2
Number of daughter cells	2	4
Chromosome number of daughter cells	2n	n

Organize *information on how meiosis produces genetic variation.*

Meiosis produces **random arrangement of chromosomes at equator**
crossing over

Compare *sexual reproduction and asexual reproduction by completing the paragraph with the terms below.*

- sexual reproduction
- asexual reproduction
- protists
- mammals
- animals
- plants
- genes
- genetic diversity

In **asexual reproduction**, an organism inherits its genetic material from a single parent. The new organism has the same **genes** as its parent. In **sexual reproduction**, an organism inherits genetic material from two different parents. Sexual reproduction increases **genetic diversity**, whereas asexual reproduction does not. **Protists**, simple **animals**, and most **plants** can reproduce sexually or asexually. **Mammals** only reproduce sexually.

SUMMARIZE

Explain how meiosis and fertilization produce genetic variation during sexual reproduction.

Crossing over and random sorting of chromosomes during meiosis increase genetic variation.

Fertilization increases genetic variation further by combining genetic material from two different individuals.

Sexual Reproduction and Genetics

Section 10.2 Mendelian Genetics

Main Idea

Details

Skim Section 1 of the chapter, and then write two questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

segregation

Use your book or dictionary to define segregation.

the separation of alleles that occurs during meiosis

New Vocabulary

allele

genetics

hybrid

law of independent assortment

law of segregation

Use terms in the left margin to complete the paragraph below.

Genetics is the branch of biology that studies how traits are inherited. **Hybrid** offspring result from parents that have different forms of **alleles** for certain traits. Mendel's **law of segregation** states that every individual has two alleles of each gene and when gametes are produced, each gamete receives one of these alleles. Mendel's **law of independent assortment** states that genes for different traits are inherited independently of each other.

Compare and contrast each pair of terms by defining them and/or noting their differences. **Accept all reasonable responses.**

dominant

genotype

heterozygous

homozygous

phenotype

recessive

dominant trait	recessive trait
an observed trait that masks the recessive form of a trait	trait that can be observed if the dominant trait is not present
genotype	phenotype
the allele combination an organism contains	the way an organism looks and behaves
homozygous	heterozygous
an organism's genotype when two alleles for a trait are the same	an organism's genotype when two alleles for a trait are different

Section 10.2 Mendelian Genetics (continued)

Main Idea

Details

How Genetics Began

I found this information on page _____.

SE, p. 277
RE, p. 109

The Inheritance of Traits

I found this information on page _____.

SE, pp. 277–280
RE, pp. 109–111

Describe *how a plant self-pollinates.*

A plant self-pollinates when its male and female gametes come from the same plant.

Infer *why Mendel used cross-pollination to study inheritance.*

Mendel cross-pollinated plants to create offspring that have traits of both plants.

Analyze *Mendel’s experiment with green-seed and yellow-seed pea plants by completing this summary paragraph.*

Mendel used only **true breeding** lines, which consistently produced the same trait in the offspring. He controlled variables by **studying one trait at a time**. When he crossed a green-seed plant with a yellow-seed plant, the F₁ offspring were **100** percent yellow and **0** percent green. He allowed the F₁ plants to **self-fertilize** to produce **F₂** plants. The F₂ plants were **75** percent yellow and **25** percent green. Mendel concluded that each trait has two forms, called **alleles**. Mendel called yellow seed color the **dominant** form and green seed color the **recessive** form of the trait.

Compare *genotypes and phenotypes for pea plants.*

Genotype	Homozygous or Heterozygous	Phenotype
YY	homozygous	yellow seeds
Yy	heterozygous	yellow seeds
yy	homozygous	green seeds

Section 10.2 Mendelian Genetics (continued)

Main Idea

I found this information on page _____.

SE, pp. 277–280
RE, pp. 109–111

Punnett Squares and Probability

I found this information on page _____.

SE, pp. 280–282
RE, p. 112

Details

Demonstrate the law of independent assortment by listing the 4 alleles that are produced when a pea plant with the genotype RrYy produces gametes.

1. YR 2. Yr 3. yr 4. yR

Complete the Punnett squares for height in the F₁ and F₂ generations. Tall plants (T) are dominant over short plants (t). Write the expected genotypes and the probability for each.

		F ₁				F ₂		
		T	T			T	t	
t	Tt	Tt	Tt 100%		TT	Tt	TT 25%	
t	Tt	Tt			Tt	tt	Tt 50%	tt 25%

Identify the genotypes within the Punnett square showing the dihybrid cross of seed color and seed texture. The first row has been done for you. Write the expected phenotypic ratio.

	YR	yR	Yr	yr
YR	YYRR	YyRR	YYRr	YyRr
yR	YyRR	yyRR	YyRr	yyRr
Yr	YYRr	YyRr	YYrr	Yyrr
yr	YyRr	yyRr	Yyrr	yyrr

Phenotypic ratio: 9 yellow round : 3 green round : 3 yellow wrinkled : 1 green wrinkled

SUMMARIZE

Discuss the effects of Mendel’s two laws (segregation and independent assortment). Give an example. **Accept all reasonable responses.**

The law of segregation states that every individual has two alleles of each gene and each gamete receives one of these alleles. The law of independent assortment states that genes for different traits are inherited independently. For example, when a pea plant with the genotype RrYy produces gametes, the alleles R and r will separate from each other and from the alleles Y and y.

Sexual Reproduction and Genetics

Section 10.3 Gene Linkage and Polyploidy

Main Idea

Details

Scan the headings, boldfaced words, pictures, figures, and captions in Section 3.

- Read all section titles.
- Read all boldfaced words.
- Look at all pictures and read the captions.
- Look at all figures.
- Read all captions.

Predict three things that you think will be discussed.

1. **Accept all reasonable responses.**

2. _____
3. _____

Review Vocabulary

protein

Use your book or dictionary to define protein.

the total nitrogenous material in plant and animal tissues

New Vocabulary

genetic recombination

Use your book or dictionary to define each term.

new combinations of genes that result from crossing over and independent assortment

polyploidy

the occurrence of one or more extra sets of all chromosomes in an organism

Section 10.3 Gene Linkage and Polyploidy (continued)

Main Idea

Genetic Recombination

I found this information on page _____.

SE, p. 283
RE, p. 113

Gene Linkage and Chromosome Maps

I found this information on page _____.

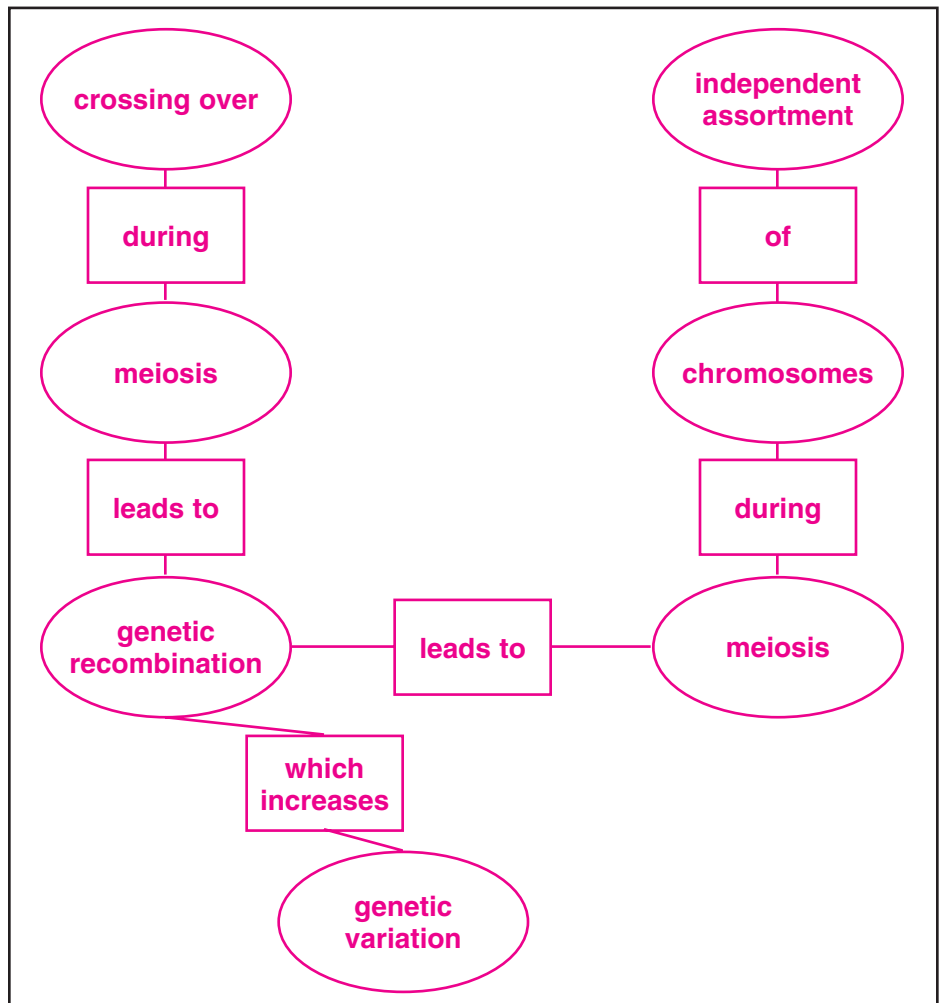
SE, pp. 283–285
RE, p. 114

Details

Calculate the number of chromosome combinations due to independent assortment by filling in the chart. Use the formula 2^n . The first one has been done for you.

Species	Chromosome Number (n)	Possible Combinations
Pea	7	$2^7 = 128$
Housefly	6	$2^6 = 64$
Cabbage	9	$2^9 = 512$
Fruit fly	4	$2^4 = 16$
Frog	13	$2^{13} = 8192$

Summarize at least five pieces of information about genetic recombination by creating a concept map below. **Accept all reasonable responses.**



Section 10.3 Gene Linkage and Polyploidy (continued)

Main Idea

I found this information on page _____.
SE, pp. 283–285
RE, p. 114

Details

Complete the paragraph about gene linkage.

- chromosomes
- crossing over
- farther
- individual genes
- inherited
- linked
- sequence

Genes close together on the same chromosome are linked.
 Linked genes are usually inherited together. Chromosomes, not individual genes, follow Mendel’s law of independent assortment. Linked genes might become separated, as a result of crossing over. Crossing over is more likely to happen if genes are farther apart on a chromosome.

Analyze whether the gene linkage is an exception to, or an example of, Mendel’s law of independent assortment. Use an example from your book.

Gene linkage is an exception because genes that are located close to each other on the same chromosome usually travel together.

Scientists studied the fruit fly to confirm this exception.

Polyploidy

I found this information on page _____.
SE, p. 285
RE, p. 114

Identify four species that show polyploidy.

1. earthworms
2. goldfish
3. wheat
4. sugar cane

SUMMARIZE

Compare and contrast gene linkage to polyploidy and how they do not follow all of Mendel’s laws of inheritance.

Gene Linkage	Polyploidy
<ul style="list-style-type: none"> • Genes close together on the chromosome do not sort independently. • Each trait is controlled by two alleles. 	<ul style="list-style-type: none"> • Polyploid organisms have more than two sets of chromosomes. • They have more than two alleles for each trait.

Complex Inheritance and Human Heredity

Before You Read

Use the “What I Know” column to list the things you know about human heredity and genetics. Then list the questions you have about these topics in the “What I Want to Find Out” column.

Accept all reasonable responses.

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Describe how you think a child’s DNA is different from his or her mother’s DNA and father’s DNA.

Accept all reasonable responses.

Complex Inheritance and Human Heredity

Section 11.1 Basic Patterns of Human Inheritance

Main Idea

Details

Skim and Scan Section 1 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about patterns of heredity and human genetics.

Write three facts you discovered about patterns of heredity and human genetics as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

genes

Use your book or dictionary to define genes.

segments of DNA that control the production of proteins

New Vocabulary

carrier

Use your book or dictionary to define each vocabulary term.

an individual heterozygous for a recessive genetic disorder

pedigree

a diagram of genetic inheritance used by geneticists to trace genetic traits

Explain why pedigrees are needed to identify the carriers of a recessive trait in a family.

Pedigrees are necessary to find carriers because the recessive traits are not readily apparent by looking at the phenotype.

Academic Vocabulary

decline

Define decline to show its scientific meaning.

to gradually waste away; a downward slope

Section 11.1 Basic Patterns of Human Inheritance (continued)

Main Idea

Recessive Genetic Disorders

I found this information on page _____.

SE, pp. 296–298
RE, pp. 115–116

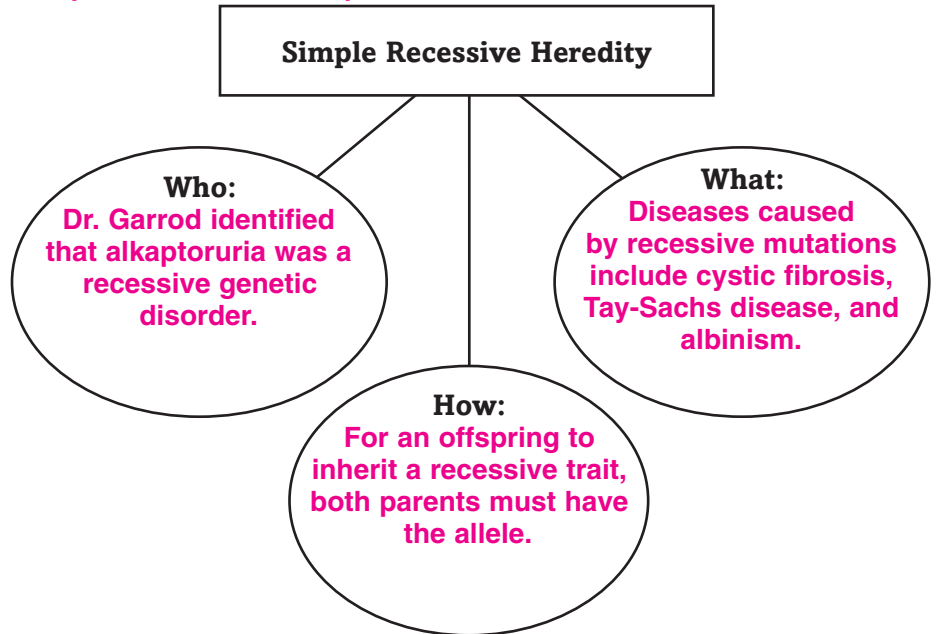
Dominant Genetic Disorders

I found this information on page _____.

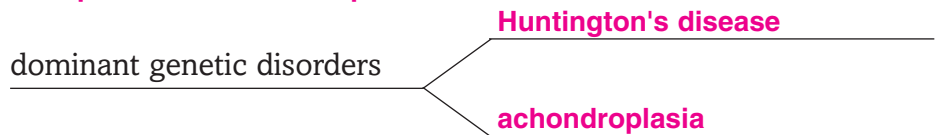
SE, p. 298
RE, pp. 116–117

Details

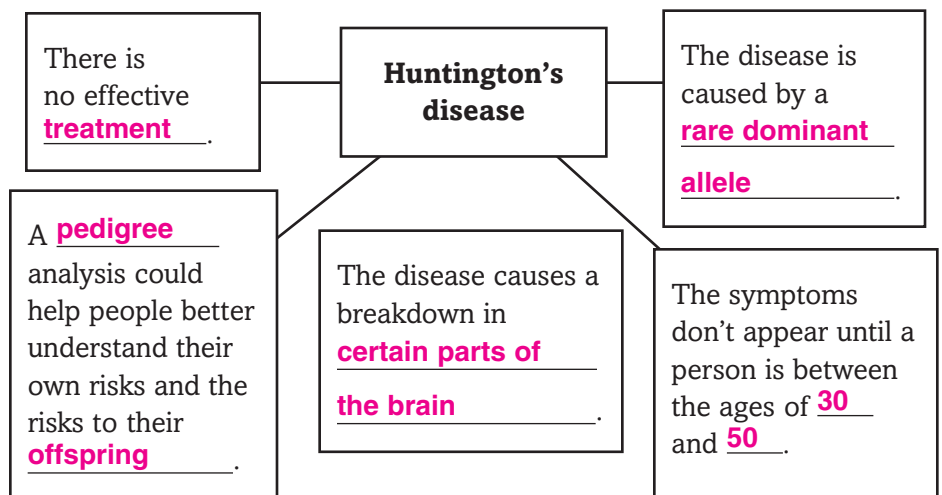
Write *three facts about recessive heredity in the concept map.*
Accept all reasonable responses.



Identify *two examples of dominant genetic disorders in humans.*
Accept all reasonable responses.



Summarize *the facts about Huntington's disease by completing the concept map below.*



Section 11.1 Basic Patterns of Human Inheritance (continued)

Main Idea

Details

Pedigrees

I found this information on page _____.

SE, p. 299
RE, p. 117

Summarize pedigree symbols by naming them and then drawing them in the right-hand column of the table. Sketches should resemble those in the book.

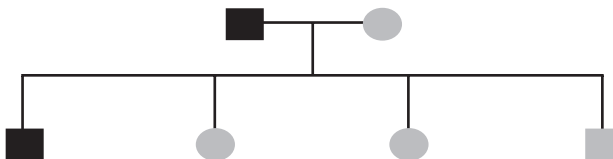
	Description of Symbol	Sketch of Symbol
male	square	
female	circle	
affected male	shaded square	
affected female	shaded circle	
known heterozygotes	half-shaded symbol	
parents and offspring siblings	line down, from parent circles or squares on second row	
parents	circle joined to square	

Analyzing Pedigrees

I found this information on page _____.

SE, pp. 299–301
RE, p. 118

Evaluate the inheritance of achondroplasia shown in the pedigree.



Parent with achondroplasia: the father

Number of children with achondroplasia: one

Genotype of the younger son: homozygous recessive

CONNECT

Create a pedigree diagram for an imaginary family. Pick a trait and designate it as dominant, then shade the boxes to show who has recessive genes, who has dominant genes, and who is likely heterozygous. **Accept all reasonable responses.**

Complex Inheritance and Human Heredity

Section 11.2 Complex Patterns of Inheritance

Main Idea

Details

Skim Section 2 of the chapter. Write two questions that come to mind from reading the headings and illustration captions.

1. _____

2. _____

New Vocabulary

Use your book or dictionary to define gamete.

gamete

a mature sex cell with a haploid number of chromosomes

New Vocabulary

Use your book or dictionary to define each term.

autosomes

any chromosomes that are not sex chromosomes

codominance

inheritance pattern where phenotypes of both homozygote parents are produced in heterozygous offspring; both alleles are expressed

epistasis

interaction of alleles with one allele masking the effects of the other

incomplete dominance

inheritance pattern where the phenotype of a heterozygote is intermediate between those of the two homozygotes; neither allele of the pair is dominant but combine and display a new trait

multiple alleles

presence of more than two alleles for a genetic trait

polygenic trait

inheritance pattern of a trait controlled by two or more genes; genes may be on the same or different chromosomes

sex chromosomes

the chromosomes that determine the sex of an individual and carry sex-linked characteristics

sex-linked traits

traits controlled by genes located on sex chromosomes

Section 11.2 Complex Patterns of Inheritance (continued)

Main Idea

Incomplete Dominance

I found this information on page _____.

SE, p. 302
RE, p. 119

Details

Analyze the ratios of offspring of the following snapdragon pairs. *Hint: To write the genotypes, designate the dominant red allele as R and the recessive white allele as r.*

Parent Flowers	Genotypes of Parent Flowers	Punnett Square	Ratio of Offspring									
red and white	$RR \times rr$	<table border="1"> <tr> <td></td> <td>R</td> <td>R</td> </tr> <tr> <td>r</td> <td>Rr</td> <td>Rr</td> </tr> <tr> <td>r</td> <td>Rr</td> <td>Rr</td> </tr> </table>		R	R	r	Rr	Rr	r	Rr	Rr	4 pink
	R	R										
r	Rr	Rr										
r	Rr	Rr										
pink and white	$Rr \times rr$	<table border="1"> <tr> <td></td> <td>R</td> <td>r</td> </tr> <tr> <td>r</td> <td>Rr</td> <td>rr</td> </tr> <tr> <td>r</td> <td>Rr</td> <td>rr</td> </tr> </table>		R	r	r	Rr	rr	r	Rr	rr	2 pink: 2 white
	R	r										
r	Rr	rr										
r	Rr	rr										
red and pink	$RR \times Rr$	<table border="1"> <tr> <td></td> <td>R</td> <td>R</td> </tr> <tr> <td>R</td> <td>RR</td> <td>RR</td> </tr> <tr> <td>r</td> <td>Rr</td> <td>Rr</td> </tr> </table>		R	R	R	RR	RR	r	Rr	Rr	2 red: 2 pink
	R	R										
R	RR	RR										
r	Rr	Rr										
pink and pink	$Rr \times Rr$	<table border="1"> <tr> <td></td> <td>R</td> <td>r</td> </tr> <tr> <td>R</td> <td>RR</td> <td>Rr</td> </tr> <tr> <td>r</td> <td>Rr</td> <td>rr</td> </tr> </table>		R	r	R	RR	Rr	r	Rr	rr	1 red: 2 pink: 1 white
	R	r										
R	RR	Rr										
r	Rr	rr										

Codominance

I found this information on page _____.

SE, pp. 302–303
RE, pp. 119–120

Predict the results if two people who are heterozygous for sickle-cell anemia but lead normal lives have a child.

The child might have no alleles for the disease, might be heterozygous, or might be homozygous for the disease.

Multiple Alleles

I found this information on page _____.

SE, p. 304
RE, pp. 120–121

Identify the blood group that results from each combination of genotypes. The first one has been done for you.

Possible Genotype Combinations	Phenotypes
A and A	A
A and B	AB
A and O	A
B and B	B
B and O	B
O and O	O

Section 11.2 Complex Patterns of Inheritance (continued)

Main Idea

Epistasis, Sex Determination, Dosage Compensation, Sex-Linked Traits, and Polygenic Traits

I found this information on page _____.

SE, pp. 305–309
RE, pp. 121–123

Environmental Influences

I found this information on page _____.

SE, p. 309
RE, p. 123

Twin Studies

I found this information on page _____.

SE, p. 310
RE, p. 123

Details

Analyze the role of each item in inheritance. Give an example of a trait governed by each process.

	Role in Inheritance	Example
Epistasis	interaction where one allele masks another	coat color in Labrador retrievers
Polygenic traits	traits that arise from the interaction of multiple genes	skin color
X-chromosome inactivation	X chromosome stops working in female to balance gene dosage	coat color in calico cats
X-linked traits	traits controlled by genes on the X chromosome	red-green color blindness

Identify environmental influences that can affect phenotype.

External factors	Behaviors
1. heat 2. sunlight	1. diet 2. exercise

Describe the use of twin studies in the study of genetics by completing the paragraph.

Scientists use twin studies to distinguish between genetic and environmental influences on a trait. If a high percentage of identical twins but not fraternal twins express a trait, there is a strong chance that the trait is genetic.

CONNECT

Think of some traits in people, plants, or animals. Describe one trait and tell whether you think the trait is a dominant/recessive, multiple allele, codominant, incompletely dominant, sex-linked, or polygenic trait. Explain your reasoning.

Accept all reasonable responses. Eye color; some people have blue eyes, some have green, and some have brown. I think this is a multiple allele situation because there are many possible colors, and some colors seem dominant over others.

Complex Inheritance and Human Heredity

Section 11.3 Chromosomes and Human Heredity

Main Idea

Details

Organize Information *Make a list of some physical characteristics that appear in your family members or friends. Try to determine how each trait is inherited by examining its inheritance pattern.*

Accept all reasonable responses.

Review Vocabulary

Use your book or dictionary to define mitosis.

mitosis

a process in the nucleus of a dividing cell; made of prophase, metaphase, anaphase, and telophase

New Vocabulary

Use your book or dictionary to define the following terms.

nondisjunction

cell division during which sister chromatids fail to separate properly

telomere

protective caps made of DNA and protein found at the end of chromosomes

karyotype

Define karyotype and describe its use. Then make a sketch of a human karyotype in the space below.

chart of homologous chromosome pairs arranged according to size; used to pinpoint unusual chromosome numbers in cells

Accept all reasonable responses.

Section 11.3 Chromosomes and Human Heredity (continued)

Main Idea

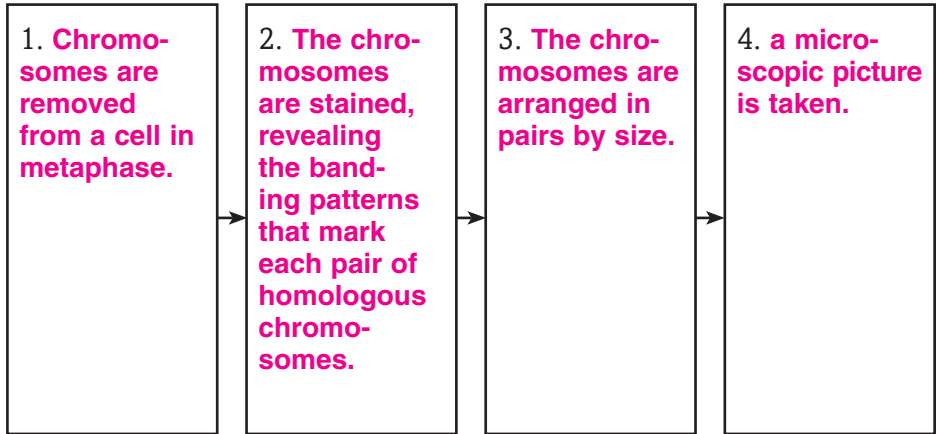
Details

Karyotype Studies

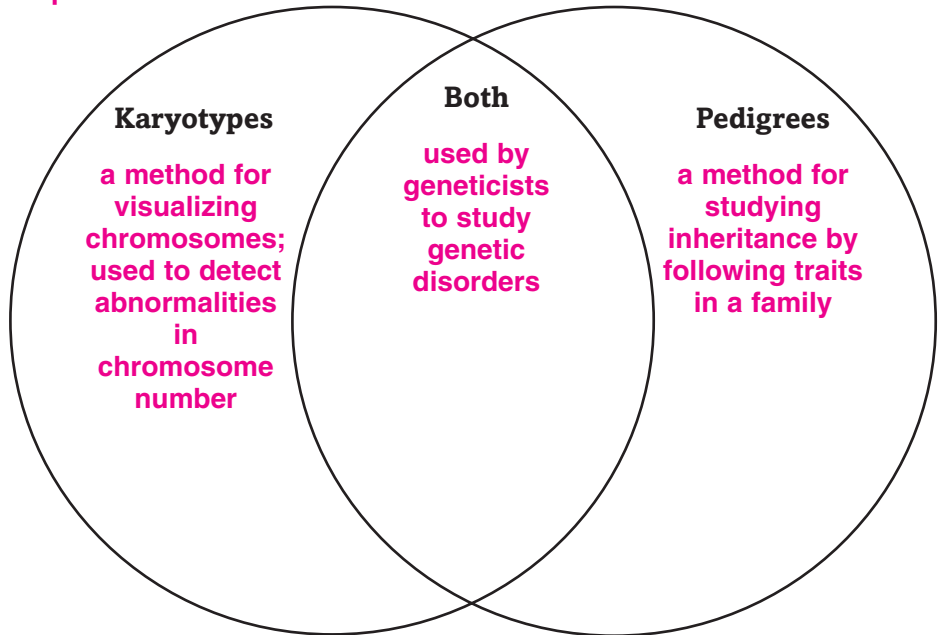
I found this information on page _____.

SE, p. 311
RE, p. 124

Sequence *how a scientist makes a karyotype.*



Compare and contrast karyotype studies and pedigrees by writing characteristics in the Venn diagram. **Accept all reasonable responses.**



Telomeres

I found this information on page _____.

SE, p. 311
RE, p. 125

Describe telomeres by completing the paragraph. **Accept all reasonable sketches.**

Telomeres are made of DNA and protein . They are located at the ends of chromosomes . Their function is to protect the chromosomes .

Section 11.3 Chromosomes and Human Heredity

Main Idea

Nondisjunction

I found this information on page _____.

SE, pp. 313–314
RE, pp. 125–126

Details

Model a picture showing the ways that nondisjunction during meiosis can produce a sex cell with an extra copy of a chromosome.

Sketches should be similar to parts of Figure 11.20 and should show nondisjunction during meiosis I and meiosis II.

Model a karyotype of a boy with Down's syndrome.

The karyotype should show 22 pairs of autosomes and XY sex chromosomes. There should be 3 copies of chromosome 21.

Fetal Testing

I found this information on page _____.

SE, pp. 314–315
RE, p. 126

Summarize the following facts about fetal testing.

- how an abnormal number of chromosomes is identified

A sample of cells is taken from an individual or fetus.

- four possible results of abnormal chromosome numbers

embryo death, Down syndrome, Turner's syndrome, and

Klinefelter's syndrome

SUMMARIZE

Analyze how nondisjunction during meiosis could lead to Klinefelter's syndrome.

A person with Klinefelter's syndrome has two X chromosomes and one Y chromosome.

Nondisjunction in meiosis I or meiosis II could produce an egg with two sex chromosomes

(either XX or XY). Klinefelter's syndrome would result when an XX egg is fertilized with a

sperm carrying a Y chromosome.

Molecular Genetics

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Molecular Genetics	After You Read
	• James Watson and Francis Crick discovered that DNA was the genetic material.	D
	• DNA replication is the same in prokaryotes and eukaryotes.	D
	• Information in a cell flows from DNA to RNA to protein.	A
	• A mutation is a permanent change in a cell's DNA.	A

Science Journal

Ponies on the Shetland Islands in Scotland have short stature, thick hair, strength, and hardiness so they can thrive in their harsh environment. How do you think the DNA of their population has changed over time?

Accept all reasonable responses.

Molecular Genetics

Section 12.1 DNA: The Genetic Material

Main Idea _____ **Details** _____

Scan Section 1 of the chapter. Identify the results of three DNA experiments.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

nucleic acid

Use your book or dictionary to define nucleic acid.

a biomolecule that stores cellular information in the form of a code

New Vocabulary

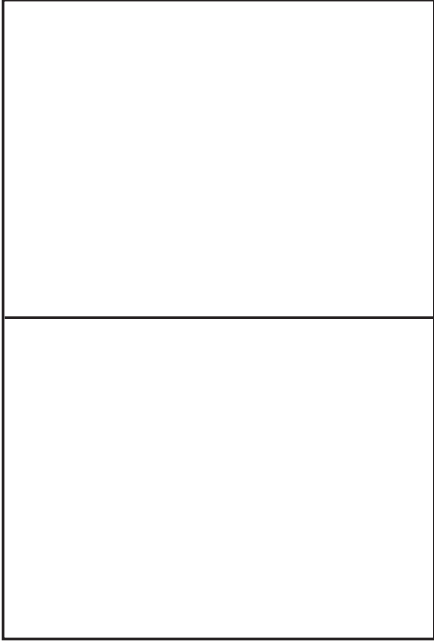
double helix

Use your book or dictionary to define each term. In the box to the right, make a sketch to help you remember each term.

shape of a DNA molecule
consisting of two strands of
nucleotides that are twisted into
a coil and held together by the
nitrogenous bases

nucleosome

a structure found in chromosomes
in which DNA is coiled around
histone proteins



Academic Vocabulary

transform

Define transform to show its scientific meaning.

to cause a change in type or kind

Section 12.1 DNA: The Genetic Material (continued)

Main Idea

Discovery of the Genetic Material

I found this information on page _____.

SE, pp. 326–328
RE, pp. 127–129

DNA Structure

I found this information on page _____.

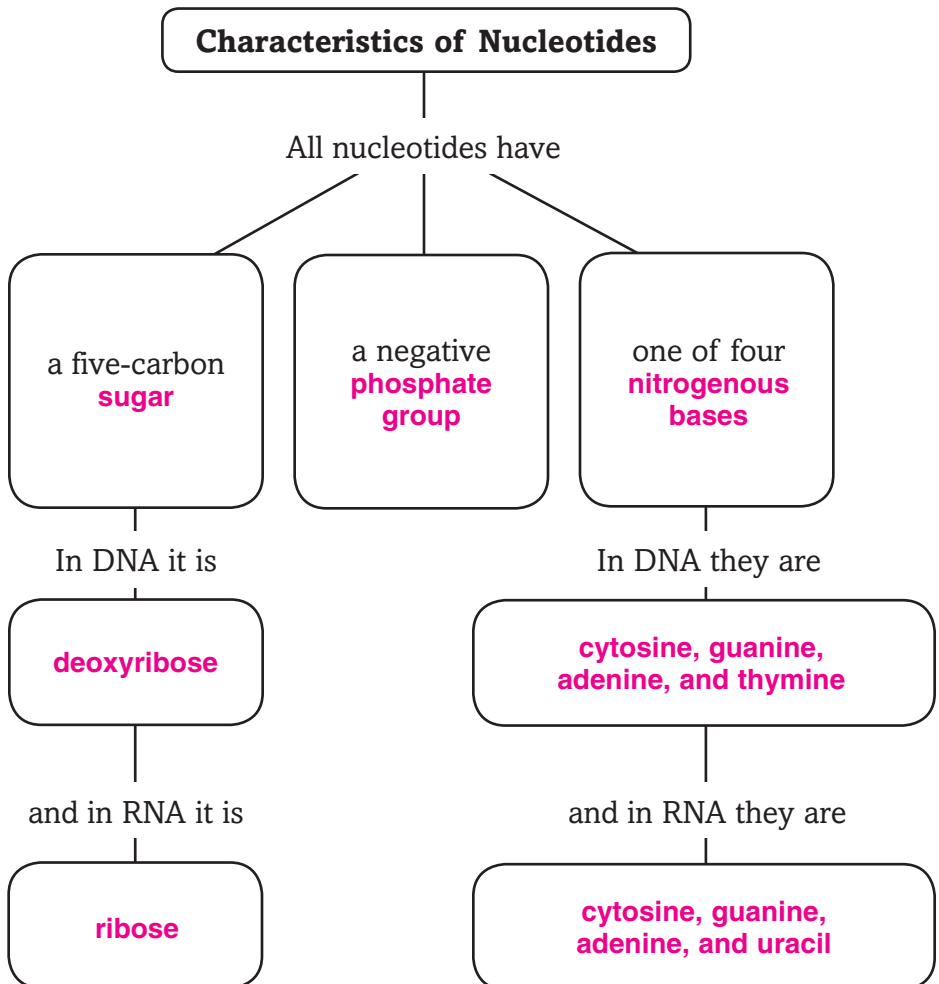
SE, pp. 329–331
RE, pp. 130–131

Details

Complete the table below about geneticists and their discoveries.

Scientist	Discovery	Year
Fredrick Griffith	discovered a transforming factor that could change rough bacteria into smooth bacteria	1928
Oswald Avery	identified DNA as the transforming factor	1931
Alfred Hershey and Martha Chase	proved that DNA was the genetic material in a virus	1952
James Watson and Francis Crick	discovered that the structure of DNA is a double helix	1953

Organize the characteristics of nucleotides by filling in the graphic organizer below.



Section 12.1 DNA: The Genetic Material (continued)

Main Idea

I found this information on page _____.

SE, pp. 329–331
RE, pp. 130–131

Details

Create a memory device to help you remember how the nitrogenous bases are always paired.

Accept all reasonable responses that pair adenine with thymine and cytosine with guanine. Sample response: Aunt Tillie and Cousin Gus

Analyze the DNA molecule by explaining how each word applies to the molecule. Use a sketch to back up your explanation in each case.

Word and What It Means	Sketch of Effect
complementary: Nitrogenous bases are paired on the inside of the molecule.	Accept all reasonable responses.
helix: A helix is something twisted into a coil.	
double (as in “double helix”): DNA is made of two strands that are twisted into a coil.	

Chromosome Structure

I found this information on page _____.

SE, p. 332
RE, p. 131

Synthesize and rephrase how a DNA strand that is 200 million bases long can fit inside a cell.

A long strand of DNA is coiled around a beadlike group of histone proteins to form a nucleosome. The nucleosomes group together in fibers, then supercoil into a chromosome.

SUMMARIZE

State how Watson and Crick’s DNA structure supported Chargaff’s rules.

Chargaff’s data showed that for any organism, the number of purine bases in DNA (A and G) always equals the number of pyrimidine bases (T and C). Watson and Crick’s structure showed that A pairs with T and G pairs with C, therefore A = T and G = C.

Molecular Genetics

Section 12.2 Replication of DNA

Main Idea

Details

Scan Section 2 of the chapter. Write three questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define template.

template

a molecule of DNA that is a pattern for synthesis or a new DNA molecule

New Vocabulary

Use your book or dictionary to define the following terms. Then look through the section to find a sentence with each term. Write the sentence. **Sentences will vary.**

DNA polymerase

enzyme that creates chemical bonds between nucleotides using a DNA strand as a template

Okazaki fragment

small segments of DNA made as DNA polymerase copies DNA 3' to 5' on the lagging strand

semiconservative replication

method of DNA replication in which strands separate, serve as templates, and produce DNA molecules each containing one original strand and one new strand

Section 12.2 Replication of DNA (continued)

Main Idea

Details

Semiconservative Replication

I found this information on page _____.

SE, pp. 333–335
RE, pp. 132–133

Describe *semiconservative DNA replication.*

Model	During replication, the parental strands	The new DNA molecule is composed of
Semiconservative replication	separate and serve as templates	one parental strand and one new strand

Sequence and model *each step in the replication of a DNA molecule. Write about what happens, and draw a DNA molecule going through each step. In the last box, describe and draw the products of replication. Accept all reasonable responses.*

A. The DNA unzips.	B. Nucleotides in the cell attach to the unzipped chains (A to T and C to G).
C. The molecule continues to unzip, and nucleotides continue to match and join.	D. Two new DNA molecules will be formed, each containing one parental and one new strand.

Analyze *how a DNA molecule acts like a template.*

Complementary bases match up to the bases on the original strand, so the two new molecules are identical to the parent molecule.

Section 12.2 Replication of DNA (continued)

Main Idea

I found this information on page _____.

SE, pp. 333–335
RE, pp. 132–133

Details

Complete the table below on the role of each protein in DNA replication. The first one has been done for you.

Protein	Stage of DNA Replication	Activity
DNA helicase	unwinding	unwinds and unzips the DNA
DNA ligase	joining	links DNA sections after RNA primer is removed
DNA polymerase	base pairing, joining	forms new strand by base pairing; removes RNA primer and fills in with DNA
RNA primase	unwinding	adds on RNA primer to each DNA strand
Single-stranded binding protein	unwinding, base pairing	keeps the strands separate during replication

Comparing DNA Replication in Eukaryotes and Prokaryotes

I found this information on page _____.

SE, p. 335
RE, p. 132

Contrast the differences between prokaryotic and eukaryotic DNA replication.

	Eukaryotes	Prokaryotes
Number of origins for DNA replication	many	one
Where replication takes place in the cell	nucleus	cytoplasm

SUMMARIZE

Analyze how the activity of DNA polymerase is consistent with Watson and Crick’s model of semiconservative replication.

Watson and Crick predicted that DNA replication is semiconservative, meaning the parental strand serves as template for the daughter strand. DNA polymerase is the enzyme that creates the daughter strand using the parental DNA as a template.

Molecular Genetics

Section 12.3 DNA, RNA, and Protein

Main Idea

Details

Scan the headings and boldfaced words for the section. Predict two things that you think might be discussed.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

synthesis

Use your book or dictionary to define synthesis.

the composition or combination of parts to form a whole

New Vocabulary

Write the correct term in the left column for each definition below.

transcription	process in which RNA is synthesized from DNA
codon	a group of three nitrogenous bases in DNA or mRNA that code for one amino acid
RNA	nucleic acid made of ribose, phosphate, and one of four nitrogenous bases—adenine, cytosine, guanine, or uracil
intron	intervening DNA sequences that are transcribed and then removed from the final mRNA
translation	process by which mRNA directs the synthesis of a protein
messenger RNA	long strands of RNA that are complementary to one strand of DNA
exon	protein coding sequences in DNA that are transcribed into mRNA and translated into protein
transfer RNA	small RNA molecules that transport amino acids to the ribosome
RNA polymerase	an enzyme that catalyzes the synthesis of mRNA using DNA as a template
ribosomal RNA	RNA molecules that make up part of the ribosome

Section 12.3 DNA, RNA, and Protein (continued)

Main Idea

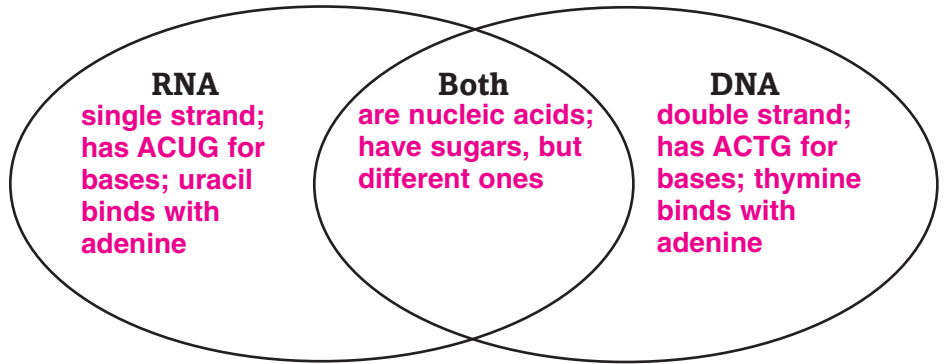
Central Dogma

I found this information on page _____.

SE, pp. 336–337
RE, pp. 134–135

Details

Compare and contrast RNA and DNA by writing at least five characteristics of their structure and composition in the Venn diagram. Accept all reasonable responses.



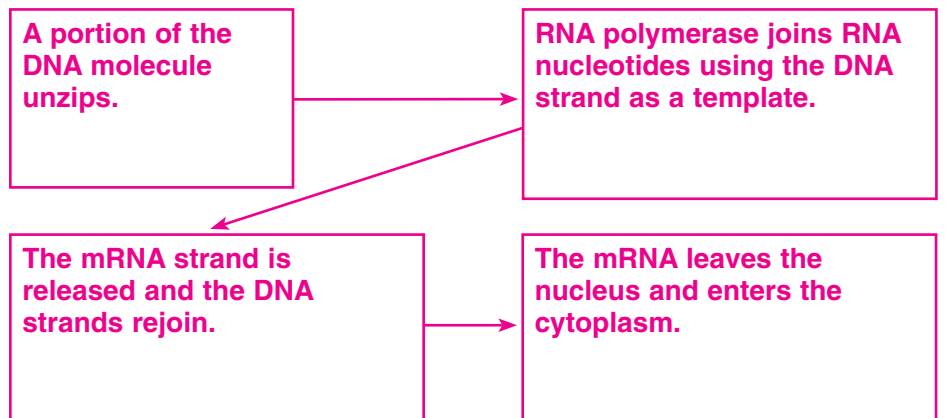
State the central dogma of biology.



Compare the function of each type of RNA molecule by completing the table.

Type of RNA	Function
mRNA	carry genetic information from the nucleus to the cytoplasm to direct protein synthesis
rRNA	form part of the ribosome
tRNA	carry amino acids to the ribosome

Sequence the steps in transcription of RNA.



Section 12.3 DNA, RNA, and Protein (continued)

Main Idea

**The Code,
One Gene—
One Enzyme**

I found this information
on page _____.

SE, pp. 338–341
RE, pp. 135–138

Details

Identify four examples of codons and state the instructions they encode.

1. (GCU) alanine _____
2. (AAA) lysine _____
3. (AUG) methionine, tells the ribosome that this is the start of the
amino acid chain _____
4. (UAA) stop, tells ribosome that this is the end of the amino acid chain _____

Model the movement of tRNA molecules showing the translation process.

Diagrams should show tRNA molecules moving to a ribosome while carrying amino acids. As each amino acid bonds, the tRNA moves away to bring another amino acid.

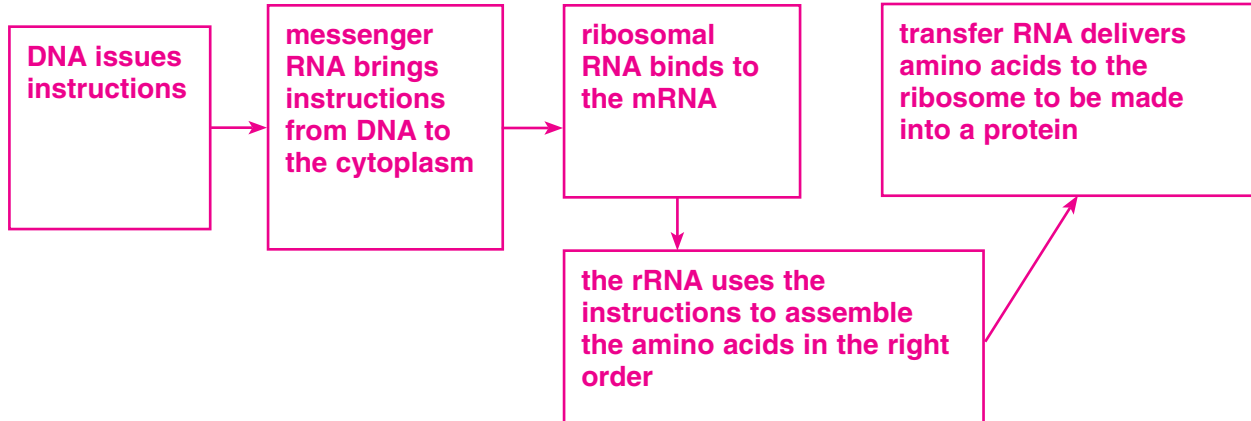
State the updated version of Beadle and Tatum’s hypothesis.

One gene _____ codes for one polypeptide _____.

SUMMARIZE

Create a flow chart to describe the formation of a protein.

Describe the activities of DNA and the three types of RNA. **Accept all reasonable responses.**



Molecular Genetics

Section 12.4 Gene Regulation and Mutation

Main Idea

Details

Scan the illustrations and tables in Section 3. Predict the effect of mutations on organisms.

Accept all reasonable responses.

Review Vocabulary

Use your book or dictionary to define prokaryote.

prokaryote

simple organism that lacks membrane-bound organelles and DNA organized in chromosomes

New Vocabulary

Use your book or dictionary to define the following terms.

gene regulation

the ability of an organism to control the expression of genes in response to the environment

mutagen

a substance, such as chemicals or radiation, that causes mutations

mutation

a permanent change in the DNA sequence

operon

a section of prokaryotic DNA that contains the genes for the proteins in a metabolic pathway

Academic Vocabulary

Define substitution and write a sentence to show its scientific meaning.

substitution

the act of replacing one thing with another

Section 12.4 Gene Regulation and Mutation (continued)

Main Idea

Prokaryote Gene Regulation

I found this information on page _____.
 SE, pp. 342–343
 RE, pp. 139–140

Details

Describe gene regulation in prokaryotes by using the terms below to complete the paragraph.

- *E. coli*
- environment
- genes
- metabolic pathway
- operator
- promoter
- proteins
- repressor
- RNA polymerase

An operon is a cluster of genes in *E. coli*. These genes make proteins that work together in one metabolic pathway. An operon is able to respond to changes in the environment. The operator is a segment of DNA that acts as a switch for transcription, turning the operon on or off. When the operon is on, [RNA polymerase] binds to the promoter and transcribes the DNA. When the operon is off, a repressor blocks transcription.

Compare and contrast the *trp* operon and the *lac* operon.

	<i>Trp</i> Operon	<i>Lac</i> Operon
Responds to the presence of	tryptophan	allolactose
Transcription is turned on when	no tryptophan is present	allolactose is present
The repressor is active when	tryptophan binds to it	no allolactose is bound to it
When the operon is turned on, the cell can	synthesize tryptophan	digest lactose

Eukaryote Gene Regulation

I found this information on page _____.
 SE, pp. 344–345
 RE, p. 141

Analyze the ways eukaryotes control gene expression.

Molecule	Effect on Gene Expression
Hox genes	determine the body plan of an organism by controlling gene expression during embryo development
Nucleosomes	control gene expression by inhibiting transcription of DNA in chromosomes
Small interfering RNA	inhibit gene expression by binding to a protein that degrades specific mRNA molecules in the cytoplasm
Transcription factors	regulate genes so that a gene is turned on at the right time and in the right amounts

Section 12.4 Gene Regulation and Mutation (continued)

Main Idea

Details

Mutations

I found this information on page _____.

SE, pp. 345–349
RE, pp. 141–142

Compare and contrast a point mutation and a frameshift mutation by defining each mutation and stating its consequence.

Point mutation happens when there is a change in a single base pair in the DNA.	consequence: One protein is changed.
Frameshift mutation occurs when a single nitrogenous base is added or deleted from the whole DNA sequence.	consequence: The whole sequence is changed. It is more harmful to an organism than a point mutation.

Analyze each type of DNA mutation and its result. Sketch what each change might look like. Accept all reasonable responses.

Mutation	Result	Sketch
Missense mutation	DNA codes for wrong amino acid	
Nonsense mutation	stop codon replaces amino acid codon	
Chromosome rearrangement	piece of chromosome is moved to different location	
Chromosome deletion	piece of chromosome is lost	

SUMMARIZE

Discuss why a mutagen can have longer-lasting effects in a sex cell than in a body cell.

Mutagens cause mutations, or changes in the DNA sequence. In a body cell, the mutation might kill the cell, or it might be passed to daughter cells in the body. A mutation in a sex cell can be passed on to the organism's offspring, and all subsequent generations will carry the mutation.

Tie It Together

SUMMARY

Create a concept web to tie together what you learned in this chapter about molecular genetics. Hint: You might find it easier to first list the facts or topics you want to include, then decide how to connect them in the web.

Accept all reasonable responses.

Genetics and Biotechnology

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write an **D** if you disagree with the statement.

Before You Read	Genetics and Biotechnology	After You Read
	<ul style="list-style-type: none"> • Hybridization is a type of selective breeding. 	A
	<ul style="list-style-type: none"> • Genetic engineering is the process of breeding animals for desired traits. 	D
	<ul style="list-style-type: none"> • Polymerase chain reaction is a way to make millions of copies of a fragment of DNA. 	A
	<ul style="list-style-type: none"> • Scientists have determined the sequence of all human DNA. 	A

Science Journal

Describe two examples of genetic technology that have affected your life or that you have read about in the news.

Accept all reasonable responses.

Genetics and Biotechnology

Section 13.1 Applied Genetics

Main Idea

Details

Scan Section 1 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all pictures and read the captions.

Write three facts you discovered about genetic technology.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

hybrid

Use your book or dictionary to define hybrid.

an organism whose parents have different forms of a trait

New Vocabulary

inbreeding

Use your book or dictionary to define each term. Then look through the section to find a sentence with each term and write the sentence. **Sentences will vary; important points are listed.**

mating between closely related individuals; ensures that offspring are homozygous for most traits, but also brings out harmful, recessive traits

selective breeding

the process of breeding plants and animals for desired traits

test cross

mating of an individual of unknown genotype with an individual of known genotype; can help determine the unknown genotype of the parent

Section 13.1 Applied Genetics (continued)

Main Idea

Selective Breeding

I found this information on page _____.

SE, pp. 360–361
RE, pp. 143–144

Details

Summarize *selective breeding by completing the prompts.*

Accept all reasonable responses.

Goal: increase the frequency of desired traits or alleles in a population

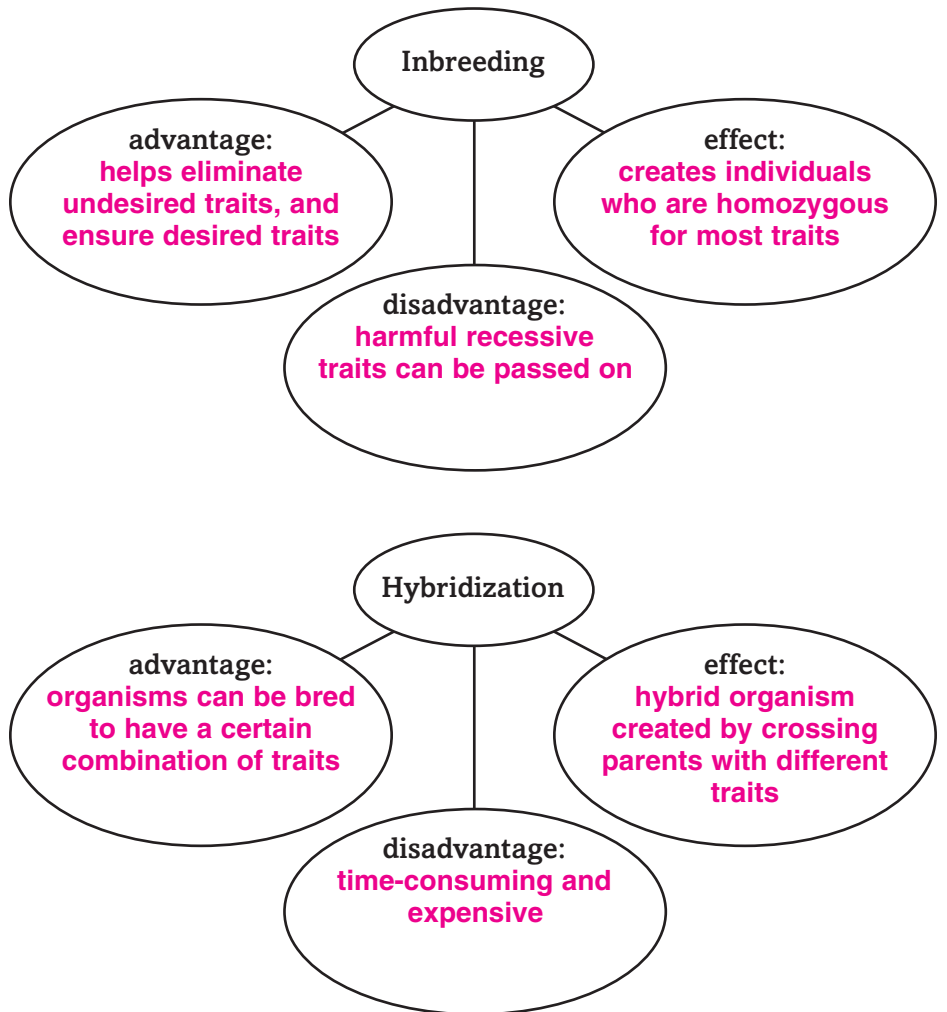
Example: breeds of dogs such as German shepherds and huskies

The offspring of parents that have different forms of a trait: hybrids.

Two different types of selective breeding:

hybridization and inbreeding

Analyze *inbreeding and hybridization by identifying the effect, an advantage, and a disadvantage of each.*



Section 13.1 Applied Genetics (continued)

Main Idea

Test Cross

I found this information on page _____.

SE, p. 362
RE, pp. 144–145

Details

Analyze the use of a test cross to determine the genotype of a yellow flower by completing the prompts. The first one has been done for you.

The genotype of the white flower: yy

Possible genotypes of the yellow flower: YY or Yy

	Possible Phenotypes	Possible Genotypes
offspring if the yellow flower is heterozygous	50% white 50% yellow	white: yy yellow: YY or Yy
offspring if the yellow flower is homozygous	100% yellow	YY or Yy

Create a Punnett Square that shows the result of each test cross.

Heterozygous:

	y	y
Y	Yy	Yy
y	yy	yy

Homozygous:

	y	y
Y	Yy	Yy
Y	Yy	Yy

Summarize how test crosses work by using the words genotype and phenotype to complete the sentence.

In a test cross, the phenotype of the offspring can reveal the genotype of the parents.

CONNECT

Selective breeding practices have been used since ancient times.

Provide specific examples where selective breeding has resulted in plants or animals that are familiar to us today.

Accept all reasonable responses. Clydesdale horses, Angus cattle, German shepherds,

Saint Bernards, huskies, corn, beans, flowers

Genetics and Biotechnology

Section 13.2 DNA Technology

Main Idea

Details

Scan Section 2 of the chapter. Write two questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.**

2.

Review Vocabulary

Use your book or dictionary to define DNA.

DNA

the genetic material of living things; the structure is a complementary double helix

New Vocabulary

Use your book or dictionary to define each term.

genetic engineering

method of manipulating DNA from one organism and inserting the DNA fragment into a host organism of the same or different species

genome

the total DNA present in the nucleus of each cell

restriction enzyme

bacterial enzyme that can cut foreign DNA at a specific nucleotide sequence

gel electrophoresis

a method of separating DNA fragments by size with the use of an electric current

recombinant DNA

DNA made by recombining fragments of DNA from different sources

plasmid

small, circular, double-stranded DNA found in bacterial cells and used as a vector

DNA ligase

an enzyme that is used to join DNA fragments; used by the cell for DNA repair and replication

transformation

a method for getting plasmid DNA into bacterial cells

cloning

the process of creating a genetically identical copy of an organism or gene

polymerase chain reaction

a technique for making millions of copies of a specific region of DNA

transgenic organism

organism that contains functional recombinant DNA from a different organism

Section 13.2 DNA Technology (continued)

Main Idea

Genetic Engineering

I found this information on page _____.

SE, p. 363
RE, p. 146

DNA Tools

I found this information on page _____.

SE, pp. 364–365
RE, pp. 146–147

Recombinant DNA Technology

I found this information on page _____.

SE, pp. 366–370
RE, pp. 148–150

Details

Identify one transgenic organism from this chapter. Describe how it was created. Then use your imagination to think of another possible transgenic organism that could be made and identify the original organisms that could be used to make it.

A glowing mosquito was created by putting GFP from a jellyfish into a mosquito. Accept all imagined transgenic organisms, for example, horses with wings (a horse and an eagle).

Complete the paragraph about DNA tools by using the words below.

- blunt ends
- Eco RI
- gel electrophoresis
- restriction enzymes
- sticky ends

Scientists use **restriction enzymes** to cut DNA at specific sequences, and **gel electrophoresis** to separate fragments based on size. Some **restriction enzymes** create DNA with single-stranded, **sticky ends**. **Eco RI** is an example of this type of enzyme. The resulting DNA fragments can be joined with other DNA fragments that have complementary **sticky ends**. Other **restriction enzymes** create **blunt ends**, which can be joined to another DNA fragment that has **blunt ends**.

Compare the DNA tools and techniques used in genetic engineering.

Genetic Engineering Application	Tool or Technique Used
Make millions of copies of a region of DNA	polymerase chain reaction
Determine the order of nucleotides	DNA sequencing
Chemically join together two fragments of DNA	DNA ligase
Carry recombinant DNA into bacteria	plasmid
Produce large amounts of recombinant DNA	DNA cloning

Section 13.2 DNA Technology (continued)

Main Idea

I found this information on page _____.
SE, p. 366–370
RE, pp. 148–150

Biotechnology

I found this information on page _____.
SE, p. 370–371
RE, p. 151

Details

Describe *the functions of the components of PCR.*

thermocycler: **cycles through hot and cool temperatures**

primers: **starting points for DNA synthesis**

nucleotides: **building blocks for new DNA strand**

DNA polymerase: **copies the DNA; can withstand high heat**

Organize *advances that have been made in transgenic organisms. Accept all reasonable responses.*

Area	Examples
transgenic animals	goats that have been engineered to secrete antithrombin III, which is used to prevent blood clotting during surgery
transgenic plants	herbicide- and insecticide-resistant soybeans, corn and cotton
transgenic bacteria	bacteria engineered to clean up oil spills or to protect crops from frost damage

SUMMARIZE

Summarize the uses of genetic technology. **Accept all reasonable responses.**

PCR is used to establish paternity, to identify victims and suspects in a crime, and to detect

infectious diseases. Genetic technology has been used to create transgenic organisms for

medicinal and agricultural uses.

Genetics and Biotechnology

Section 13.3 The Human Genome

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Look at all illustrations and read the captions.

Write three facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

New Vocabulary

Use your book or dictionary to define each term.

bioinformatics

the creation and maintenance of databases to handle large amounts of biological data

DNA microarray

tiny microscope slides or silicon chips dotted with DNA fragments

haplotype

regions of the human genome containing linked variations

pharmacogenomics

the study of the effect of genetics on the body's response to drugs

single nucleotide polymorphism

single nucleotide variations in human genomes; present in at least 1 percent of the human population

Academic Vocabulary

Define sequence to show its scientific meaning. Write a sentence using sequence.

sequence

a continuous series

Section 13.3 The Human Genome (continued)

Main Idea

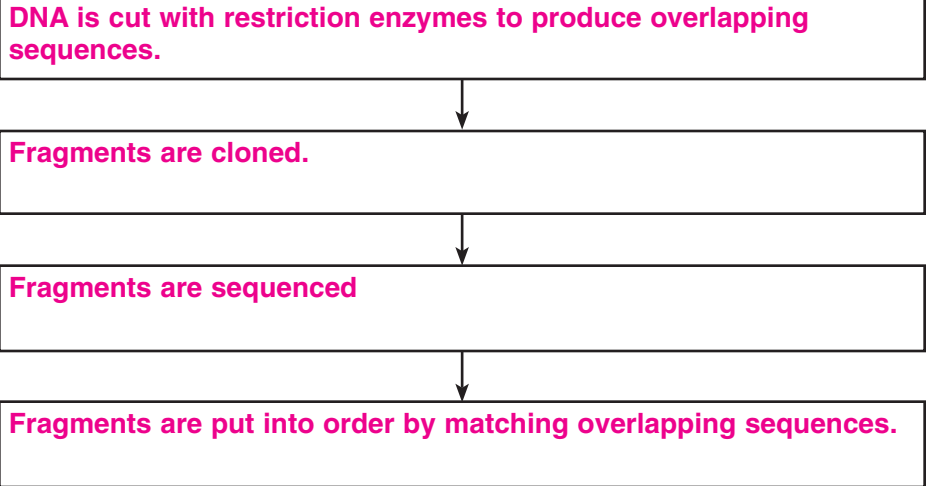
The Human Genome Project

I found this information on page _____.

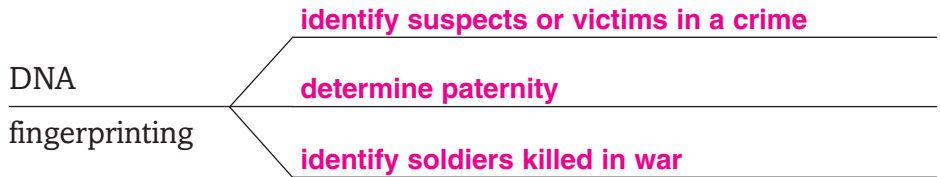
SE, pp. 372–374
RE, pp. 152–153

Details

Sequence *the steps in gene sequencing by writing the steps in order.*



Organize *three applications of DNA fingerprinting.*



Identifying Genes

I found this information on page _____.

SE, p. 374
RE, p. 153

Identify *different ways to find genes in DNA sequences. Name the organisms for which each method is used.*

Method for identifying genes	Organism
Scientists look for open reading frames, stretches of DNA that begin with a start codon, are followed by at least 100 codons, and end with a stop codon.	bacteria, yeast
Sophisticated computer algorithms are used to compare the DNA sequence under study to the genomes of other organisms.	humans, other complex organisms

Section 13.3 The Human Genome (continued)

Main Idea

**Bioinformatics,
DNA Microarrays,
The Genome
and Genetic
Disorders,
Genomics and
Proteomics**

*I found this information
on page _____.*

SE, pp. 375–379
RE, pp. 153–156

Details

Organize *the techniques that have arisen in the age of genomics. Give one benefit or application for each technique. The first one has been done for you.*

Description	Technique	Application or Benefit
inserting recombinant DNA into human cells to treat diseases	gene therapy	might someday be used to cure genetic diseases
slides or chips used to analyze complex changes in gene expression	DNA microarrays	large amount of information can be stored in a small space
an international effort to describe regions of linked variations in the human genome	HapMap	identify genes that cause disease in humans
the study of how to manage large amounts of biological information	bioinformatics	allows the study of gene evolution by comparing proteins from different organisms
the study of all of the DNA in the genome of an organism	genomics	powerful method for determining the function of human genes
the study and cataloging of an organism's proteins	proteomics	development of new drugs to treat diabetes, obesity, arteriosclerosis
the study of how to match a person's genetics to the drugs they are prescribed	pharmacogenomics	genetically-tailored drugs

SUMMARIZE

Discuss the applications of genetic technology that you think might affect your life in the future and the limitations you think there will be on DNA technology.

Accept all reasonable responses.

The History of Life

Before You Read

Use the “What I Know” column to list the things you know about the history of life. Then list the questions you have about the history of life in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Think about early life on Earth. Describe the physical conditions that needed to be present in order for life to begin to form.

Accept all reasonable responses.

The History of Life

Section 14.1 Fossil Evidence of Change

Main Idea

Details

Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

extinction

Use your book or dictionary to define extinction.

the death of all individuals of a species _____

New Vocabulary

Cambrian explosion

era

fossil

geologic time scale

half-life

K-T boundary

law of superposition

paleontologist

period

plate tectonics

radiometric dating

relative dating

Use the terms in the left column to complete the paragraph below.

Scientists measure Earth's geological and biological events using the **geologic time scale**, which is divided into **eras** and **periods**. The **Cambrian explosion** is the name of a period of rapid change during which the ancestors of most animal groups emerged. A layer of soot found between rock layers worldwide, known as the **K-T boundary**, might indicate that a large meteorite collided with Earth.

The theory of **plate tectonics** describes Earth's surface as large plates that move over Earth's thick, liquid interior. These plates are made up of various types of rocks. **Paleontologists** are scientists who study **fossils**. They determine the relative age of rocks using **relative dating**, which compares the sequence of rock layers. The **law of superposition** states that younger rock layers are deposited on top of older rock layers. Another method of determining the age of rocks is **radiometric dating**, which measures the decay of radioactive isotopes. The rate of decay can be measured using **half-lives**, the amount of time required for half of a radioactive isotope to decay.

Section 14.1 Fossil Evidence of Change (continued)

Main Idea

Earth's Early History

I found this information on page _____.

SE, pp. 392–393
RE, pp. 157–158

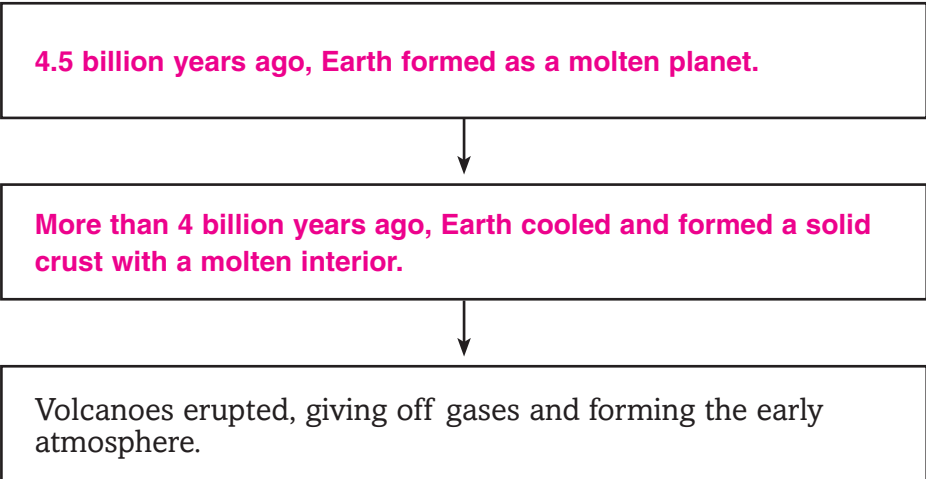
Clues in Rocks

I found this information on page _____.

SE, pp. 393–396
RE, pp. 158–160

Details

Sequence *the organizer below by listing the order of events that led to the formation of life in the oceans. The last step has been done for you.*



Identify *three types of materials in which fossils are found.*

1. **sedimentary rock** _____
2. **ice** _____
3. **amber** _____

Compare *relative and radiometric dating using the table below. Provide three facts for each type of dating.*

Accept all reasonable responses.

Relative Dating	Radiometric Dating
1. used with sedimentary rocks	1. measures rate of decay of radioactive isotopes
2. youngest rock on top of older rocks	2. gives accurate age of fossil
3. does not give exact age	3. cannot be used with of fossil sedimentary rocks; must date other rocks near sedimentary fossils

Section 14.1 Fossil Evidence of Change (continued)

Main Idea

Details

The Geologic Time Scale

I found this information on page _____.
 SE, pp. 396–400
 RE, pp. 160–163

Summarize *the four eras of the geologic time scale using the table below.*

Geologic Era	Major Biological Events	Organisms that Appeared	Other Facts
Precambrian	life began, eukaryotic cells evolved	unicellular life, eukaryotic cells, small marine animals	includes Earth's formation, almost 90% of Earth's entire history
Paleozoic	Cambrian explosion at beginning of Paleozoic, mass extinction at end	fish, amphibians, early land plants, reptiles	drastic changes in animal life occur
Mesozoic	mass extinction of dinosaurs, possibly caused by meteorite impact	dinosaurs, small mammals, flowering plants, birds	continents shift dramatically
Cenozoic	following extinction of dinosaurs, mammals diversify	large mammals, humans	most recent era

Rephrase *the current theory on the cause of the mass extinction at the end of the Mesozoic era. Accept all reasonable responses.*

Scientists propose that Earth was struck by a giant meteor, which caused a tremendous amount of dust to enter the atmosphere. This led to climate change. Species that could not adjust to the new climate disappeared.

SUMMARIZE

Discuss how paleontologists use relative and radiometric dating to support the geologic timescale.

Accept all reasonable responses. Paleontologists use relative dating to identify the age of rock layers. They use radiometric dating to accurately date fossils. Findings from both tools were helpful in structuring the geologic time scale and in determining the exact dates on the scale.

The History of Life

Section 14.2 The Origin of Life

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Look at all pictures and read the captions.
- Think about what you already know about the history of life.

Write three facts you discovered about the origin of life.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define amino acid. Use the term in a sentence to show its scientific meaning.

amino acid

building block of proteins

New Vocabulary

Use your book or dictionary to define each term.

endosymbiont theory

the idea that eukaryotic cells evolved from prokaryotes living symbiotically with other prokaryotes

spontaneous generation

mistaken idea that life arises from nonlife

theory of biogenesis

idea that living things arise from other living things

Academic Vocabulary

Define mechanism to show its scientific meaning.

mechanism

an instrument or process by which something is done or comes into being

Section 14.2 The Origin of Life (continued)

Main Idea

Details

**Origins:
Early Ideas**

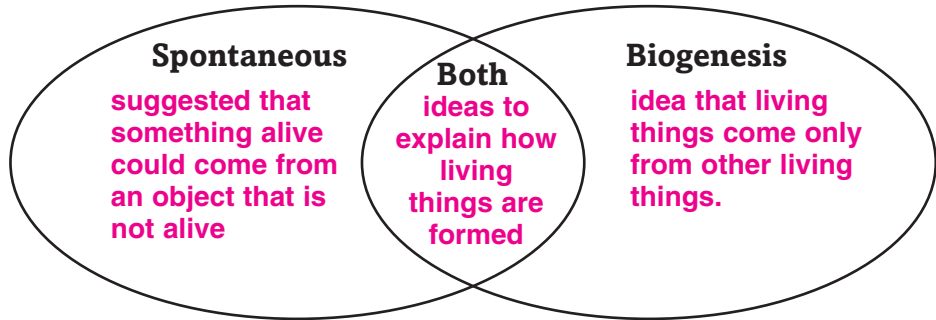
I found this information on page _____.
SE, pp. 401–402
RE, pp. 164–165

Create a cartoon that illustrates how Redi's experiment was used to disprove spontaneous generation.

Cartoons will vary but should include at least two different jars. One jar should be open with a piece of meat on the bottom, and a second jar should be covered with a piece of meat on the bottom. Students should show that there are flies and, later, maggots on the meat that is uncovered. The flies can be shown circling around the covered jar of meat but no maggots or flies should be shown inside the covered jar.

Compare spontaneous generation and biogenesis.

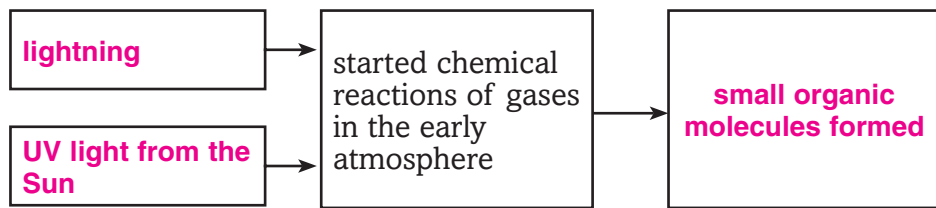
Accept all reasonable responses.



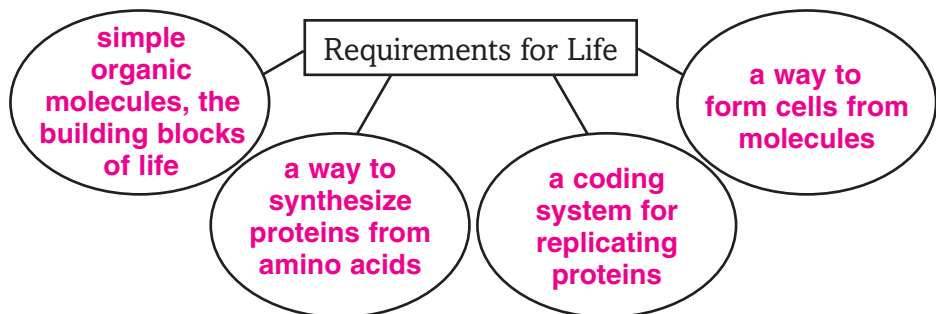
**Origins:
Modern Ideas**

I found this information on page _____.
SE, pp. 402–404
RE, pp. 165–167

Model Oparin's primordial soup hypothesis for the formation of simple organic molecules by filling in the graphic organizer below.



Identify four requirements for life using the concept map below.



Section 14.2 The Origin of Life (continued)

Main Idea

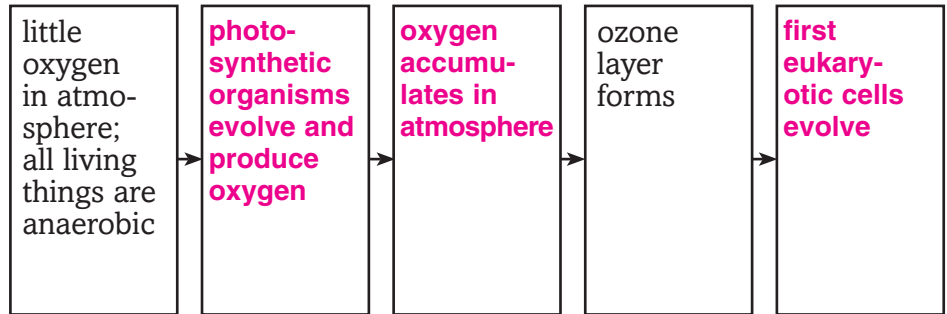
Details

Cellular Evolution

I found this information on page _____.

SE, pp. 405–407
RE, pp. 167–168

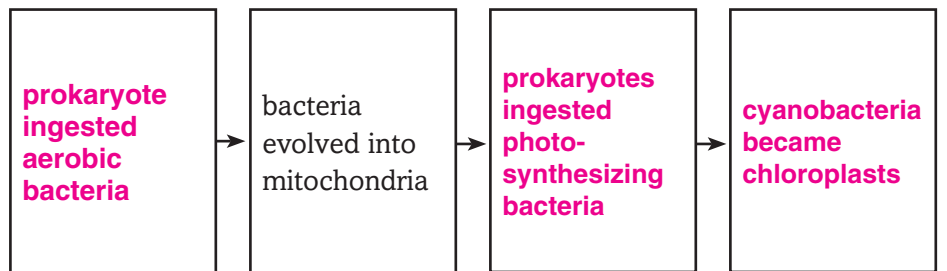
Sequence *how oxygen accumulated in the atmosphere and the effect it had on life by completing the flowchart below.*



Identify *three properties that mitochondria and chloroplasts share with prokaryotes.*

1. circular DNA
2. similar ribosomes
3. reproduce by fission

Analyze *the endosymbiont theory of the evolution of plant cells by completing the sequence chart.*



SUMMARIZE

Analyze how the four requirements for life were identified by scientists.

Accept all reasonable responses. Orapin’s hypothesis identified a way in which simple organic molecules may have formed. Clay is assumed by scientists to provide a framework for protein assembly. RNA might have been life’s first coding system. Researchers are still working to identify the pathways that led to cell formation.

Tie It Together

SUMMARIZE

Write an analogy to explain the difference between radiometric and relative dating. Develop a second analogy to explain the endosymbiont theory.

Accept all reasonable responses.

Analogy of dating methods used by paleontologists:

Analogy of endosymbiont theory:

Evolution

Before You Read

Use the “What I Know” column to list the things you know about evolution. Then list the questions you have about evolution in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Life has evolved slowly on Earth. Certain organisms evolved in response to changes in their environment. Describe an adaptation of an organism that you see around you. How has the organism become better suited to its environment as a result of this adaptation?

Accept all reasonable responses.

Evolution

Section 15.1 Darwin's Theory of Natural Selection

Main Idea

Details

Skim Section 1 of the chapter. Write three questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

selective breeding

Use your book or dictionary to define selective breeding.
process by which a breeder develops a plant or animal to have certain traits

New Vocabulary

artificial selection

Use your book or dictionary to define each term.
process of breeding organisms with specific traits to produce offspring with the same traits; selective breeding

evolution

change in a species over time

natural selection

occurs in nature when organisms with favorable variations survive, reproduce, and pass their variations to the next generation

Write a short paragraph that uses at least two of the terms above.

Accept all reasonable responses.

Section 15.1 Darwin's Theory of Natural Selection (continued)

Main Idea

Developing the Theory of Natural Selection

I found this information on page _____.

SE, pp. 418–421
RE, pp. 169–171

Details

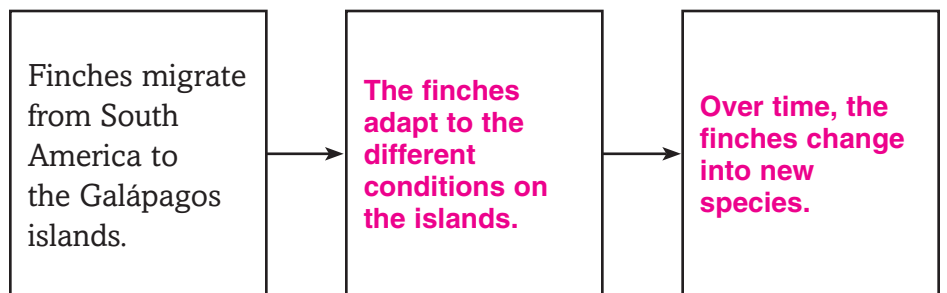
Summarize *three observations Darwin made in his research on the South American mainland.*

1. marine fossils present in Andes mountains
2. giant fossil versions of small, present-day animals
3. earthquakes can move rocks great distances

Identify *three organisms from the Galápagos Islands and their distinguishing characteristics.*

Organism	Variation
Mockingbirds	different mockingbirds present on each island
Tortoises	tortoises on each island have different shells
Finches	new species different from mainland species

Analyze *Darwin's hypothesis on the origin of Galápagos finches by filling in the flow chart. The first step has been done for you.*



Summarize *three observations that Darwin made in his research with pigeons.*

1. small variations in traits of individual pigeons
2. traits inherited by offspring
3. traits promoted in offspring by selection and breeding

Section 15.1 Darwin's Theory of Natural Selection (continued)

Main Idea

I found this information on page _____.

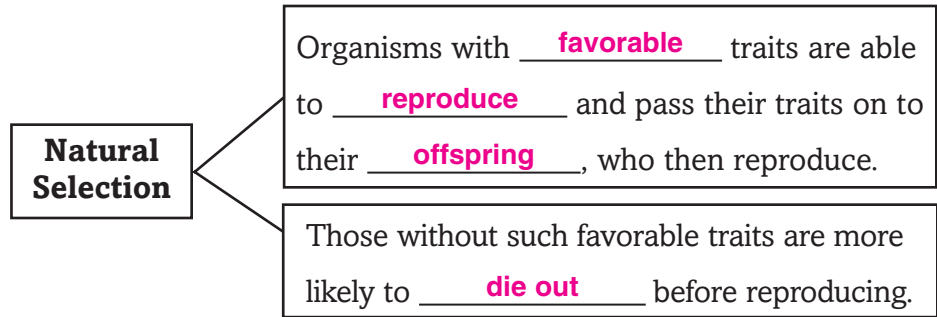
SE, pp. 418–421
RE, pp. 169–171

Details

Identify the four principles of natural selection.

1. **Organisms have more offspring than can survive.**
2. **Individuals in a population show variations.**
3. **These variations are inherited.**
4. **Variations that increase survival or reproductive success will be more common in the next generation.**

Summarize natural selection by completing the sentences below.

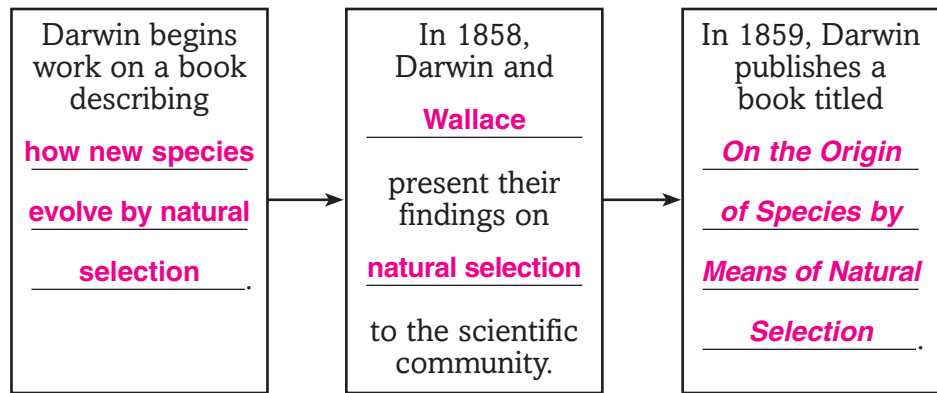


The Origin of Species

I found this information on page _____.

SE, p. 422
RE, p. 171

Sequence the events that led to the publication of Darwin's ideas.



SUMMARIZE

Discuss Darwin's different observations that led him to propose the theory of natural selection.

Accept all reasonable responses. Darwin observed that fossils he collected were distinct from present-day organisms. He observed patterns among similar species living on the Galápagos islands. He observed the process of selective breeding in pigeons.

Evolution

Section 15.2 Evidence of Evolution

Main Idea

Details

Scan Section 2 of the chapter. List the lines of evidence that support Darwin's theory of evolution by natural selection.

Accept all reasonable responses. Answers may include fossils, anatomy, embryology, biochemistry.

Review Vocabulary

Use your book or dictionary to define fossil.

fossil

remains of an organism or its activities

New Vocabulary

Use your book or dictionary to define the following terms.

analogous structures

structures with a similar function but different form and not arising from a common ancestor

ancestral trait

trait shared by species and common ancestors

biogeography

study of the distribution of plants and animals on Earth

camouflage

adaptation in which a species blends in with its environment

derived trait

newly evolved traits not found in common ancestors

embryo

early stage of development of a plant or animal

fitness

count of offspring born to an individual with a trait compared to an individual without that trait

homologous structures

anatomically similar structures with a common evolutionary origin

mimicry

adaptation in which one species resembles another species

vestigial structure

reduced form of a structure that is functional in other organisms

Section 15.2 Evidence of Evolution (continued)

Main Idea

Details

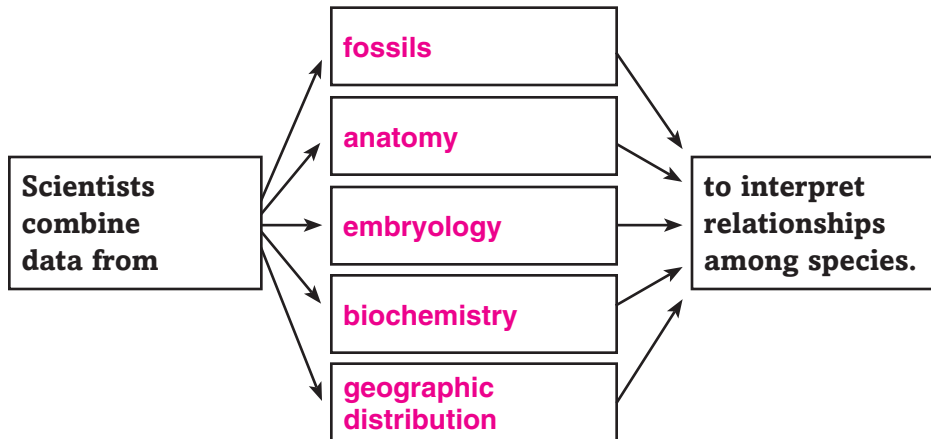
Support for Evolution

I found this information on page _____.
 SE, pp. 423–428
 RE, pp. 172–174

Summarize the role that anatomy plays in teaching us about evolution by completing the table below.

Structure	What is it?	Example
Homologous structure	structural features with common evolutionary origin	forelimbs of humans, cats, and bats are similar
Analogous structure	body parts that are similar in function but evolved from a different ancestor	birds and insects both have wings
Vestigial structure	body structure no longer serving a purpose	wings of kiwis
Embryo	earliest stage of growth and development of a plant or animal	embryos of fishes, birds, reptiles, and mammals have structures that suggest they had common ancestors

Identify ways scientists interpret relationships among species by completing the organizer below.



Section 15.2 Evidence of Evolution (continued)

Main Idea

Details

Adaptation

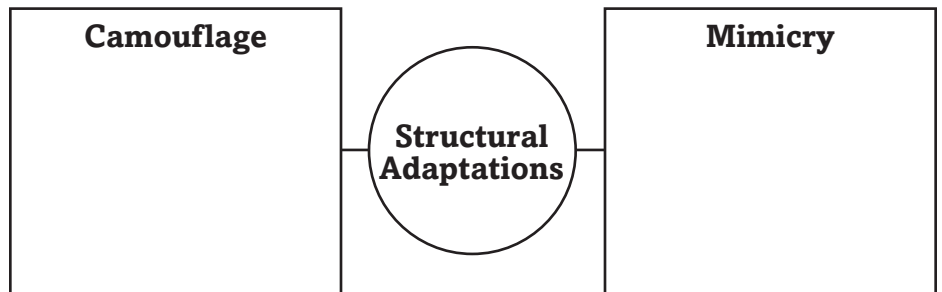
I found this information on page _____.

SE, pp. 428–430
RE, p. 175

Compare similarities and differences between adaptations and non-adaptations by writing yes or no in the table. Then give an example of an adaptation and a non-adaptation.

Characteristics	Adaptations	Non-Adaptations
inherited traits	yes	yes
increase survival or reproduction	yes	no
by-product arising from other evolutionary changes	no	yes
Example:	Accept all reasonable responses.	Accept all reasonable responses.

Apply Give examples of how animals use camouflage and mimicry in order to protect themselves. Use examples that are not given in your book. Accept all reasonable responses.



Analyze how antibiotics can lose their effectiveness over time.

The bacteria can undergo physiological adaptations to keep them from being killed by various antibiotics.

SUMMARIZE

Explain why fossils are important tools in understanding evolution.

Accept all reasonable responses. Fossils teach us about the structure of organisms from the past. Fossils show species that are intermediate between other species. Fossils clarify the evolutionary relationships between species.

Evolution

Section 15.3 Shaping Evolutionary Theory

Main Idea _____ **Details** _____

Scan Section 3 of the chapter. Write two facts that you discover.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define allele.

allele

alternate forms of a gene

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- Hardy-Weinberg Principle
- founder effect
- bottleneck
- prezygotic isolating mechanism
- genetic drift
- stabilizing selection
- postzygotic isolating mechanism
- directional selection
- disruptive selection
- sexual selection
- allopatric speciation
- sympatric speciation

- allele frequencies remain the same unless acted upon by a factor
- random evolution that occurs in a small, separate subpopulation
- process of a large population declining in number then rebounding to a large number again
- mechanism that operates before fertilization occurs
- change in the allele frequencies in a population by chance
- selection which removes organisms with extreme expressions of a trait
- mechanism that operates after fertilization occurs to ensure that resulting hybrid remains infertile
- selection which shifts a population toward an extreme trait
- selection which removes individuals with average traits
- change in a trait based on competition for mates
- speciation in the presence of a barrier
- speciation without any barriers

Section 15.3 Shaping Evolutionary Theory (continued)

Main Idea

Mechanisms of Evolution

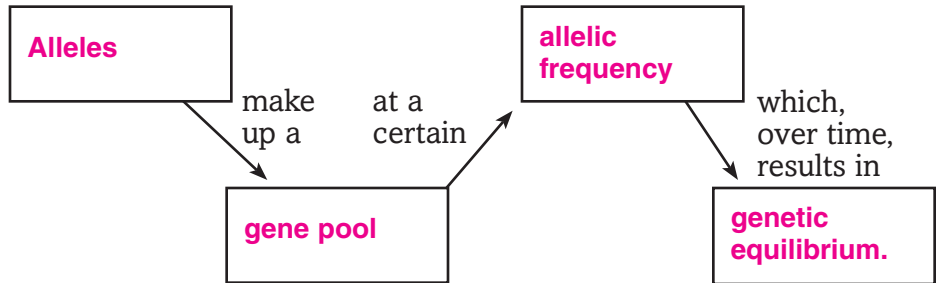
I found this information on page _____.
 SE, pp. 431–436
 RE, pp. 176–180

Reproductive Isolation

I found this information on page _____.
 SE, p. 437
 RE, pp. 180–181

Details

Sequence the steps associated with genetic equilibrium by completing the graphic organizer below.



Identify three ways that genetic equilibrium can be disrupted.

1. genetic mutation
2. genetic drift
3. gene flow

Contrast geographic isolation and reproductive isolation.

Geographic isolation is when a new species develops after members of a population are separated by a physical boundary. Reproductive isolation occurs when organisms that used to mate and produce fertile offspring no longer can do so.

Compare natural selection and sexual selection by completing the table.

	Species Changes Based on	Increases Fitness?
Natural selection	the environment	yes
Sexual selection	competition for a mate	not always

Section 15.3 Shaping Evolutionary Theory (continued)

Main Idea

Speciation

I found this information on page _____.

SE, p. 438
RE, p. 158

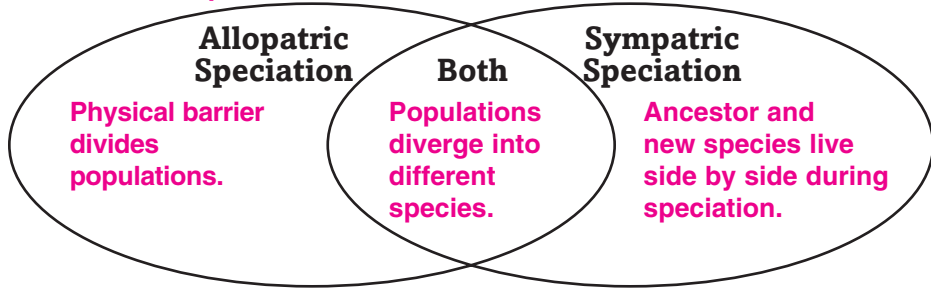
Speciation and Patterns of Evolution

I found this information on page _____.

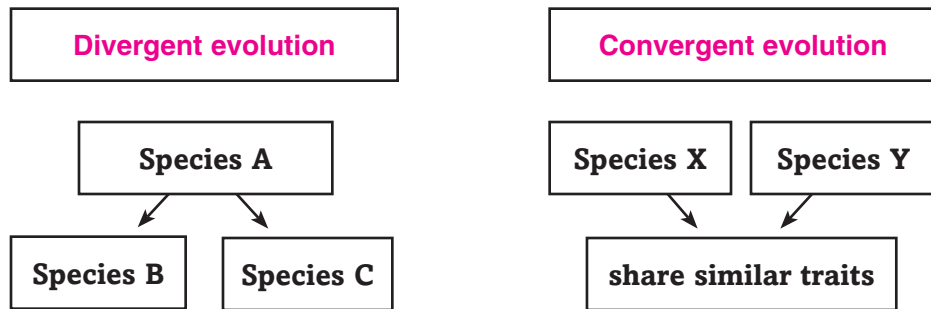
SE, pp. 439–441
RE, pp. 181–182

Details

Compare *allopatric speciation and sympatric speciation* by writing one fact in each segment of the Venn diagram below. **Accept all reasonable responses.**



Label each model as representing *divergent evolution* or *convergent evolution*.



Summarize the current thoughts about the rate of speciation by completing the table below.

Gradualism	Punctuated Equilibrium
species originate through a gradual change of adaptations	speciation occurs rapidly, in bursts, followed by periods of stability

SUMMARIZE

List three possible patterns of evolution and an example of each.

Accept all reasonable responses. adaptive radiation: more than 300 species of cichlid fishes

that once lived in Lake Victoria; coevolution: a species of moth and a comet orchid;

convergent evolution: mouse and marsupial mouse

Primate Evolution

Before You Read

Use the “What I Know” column to list the things you know about the way primates evolved. Then list the questions you have about primate evolution in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

The ability of an organism to adapt to its surroundings is needed for survival. Describe the adaptations you think were most important to the survival of primates in a variety of climates.

Accept all reasonable responses.

Primate Evolution

Section 16.1 Primates

Main Idea

Details

Scan the title and main idea of Section 1. List two things that might be discussed in this section.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define extinction.

extinction

the condition of no longer existing _____

New Vocabulary

Use your book or dictionary to define each term.

anthropoid

humanlike primate that appears to be more closely related to present-day humans than it is to present-day chimpanzees and bonobos _____

arboreal

tree-dwelling _____

binocular vision

overlapping fields of vision _____

diurnal

active during the day _____

hominin

humanlike primate _____

nocturnal

active at night _____

opposable first digit

either a toe or a thumb that is set apart from other digits and can be brought across the palm or foot so that it touches or nearly touches the other digits _____

prehensile tail

tail that functions like a fifth limb _____

Academic Vocabulary

Define diverge to show its scientific meaning.

diverge

to become different in character or form _____

Section 16.1 Primates (continued)

Main Idea

Characteristics of Primates

I found this information on page _____.
SE, pp. 452–454
RE, pp. 183–184

Details

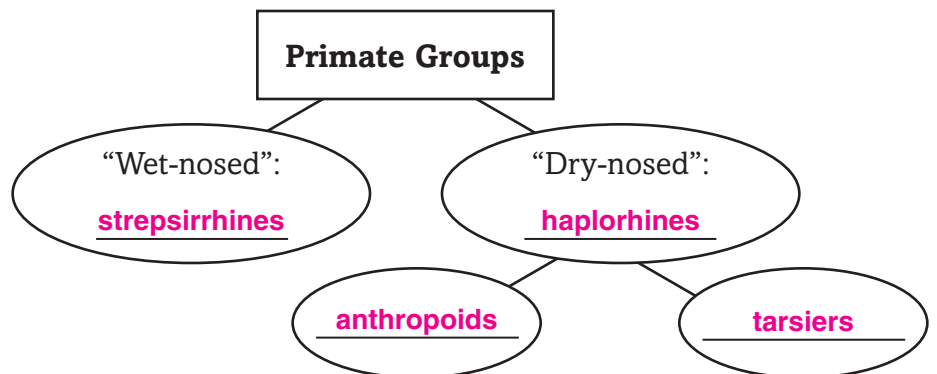
Identify the benefits of the following primate characteristics. Accept all reasonable responses.

Primate Characteristic	Benefits
Opposable first digit	can grasp objects with a powerful grip
Binocular vision	enables greater depth perception
Unspecialized teeth	suitable for diverse diets
Flexible shoulders and hips	enable easy movement through trees, walking on four limbs and some upright walking
Large, complex brain	enhanced memory and coordination; problem-solving abilities; well-developed social skills; complex communication
Low reproductive rate	extended dependency period allows time to learn complex social interaction

Primate Groups

I found this information on page _____.
SE, p. 455
RE, p. 184

Identify the primate groups in the diagram below.



Strepsirrhines

I found this information on page _____.
SE, pp. 455–456
RE, p. 185

Summarize a theory on why lemurs are found only on Madagascar and nearby islands.

Accept all reasonable responses. During the time lemurs evolved, Madagascar drifted away from the African mainland. Lemurs might have migrated there on rafts of leaves. There they evolved in reproductive isolation.

Section 16.1 Primates (continued)

Main Idea

Haplorhines

I found this information on page _____.

SE, pp. 456–458
RE, pp. 185–187

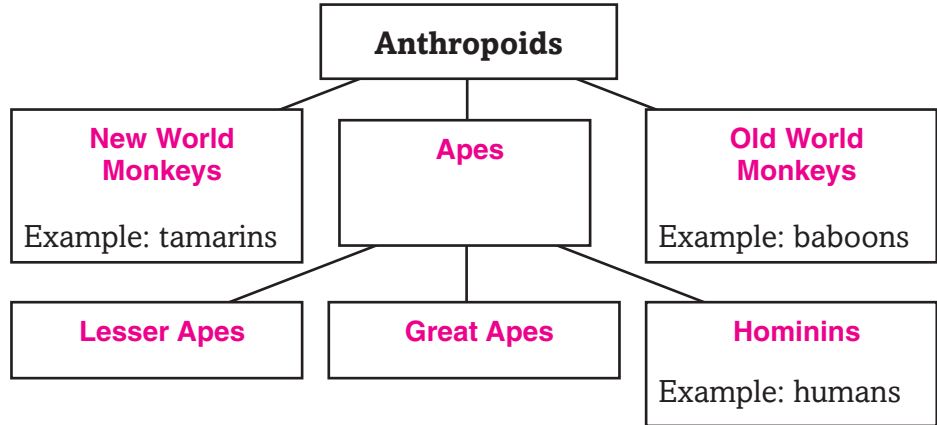
Primate Evolution

I found this information on page _____.

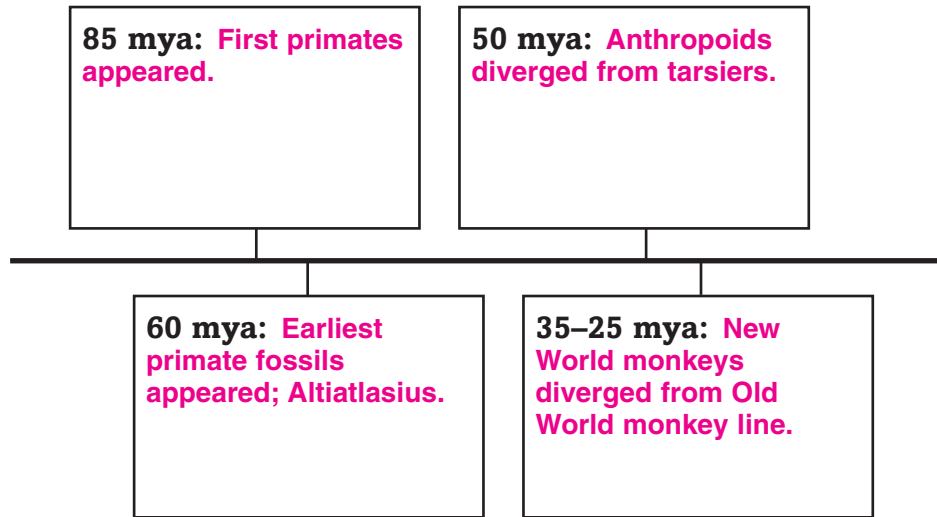
SE, pp. 458–460
RE, p. 188

Details

Classify the subgroups of anthropoids by completing the diagram.



Summarize primate evolution by completing the time line below.



SUMMARIZE

Analyze the theory that the rise of flowering trees had a great impact on primate evolution. Explain why.

Accept all reasonable responses. Flowering trees provided new food sources, such as flowers and fruits, as well as new living environments. To take advantage of these new niche opportunities, primates evolved adaptations for an arboreal life. Adaptations included prehensile tails, long limbs, brachiation, and opposable digits. These adaptations facilitated movement and food gathering in the trees.

Primate Evolution

Section 16.2 Hominoids to Hominins

Main Idea

Details

Scan the time line and other illustrations in Section 2 of the chapter. Write two questions that come to mind.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define savanna.

savanna

flat grassland of tropical or subtropical regions

New Vocabulary

Use your book or dictionary to define each term.

australopithecine

hominin group that lived in the east-central and southern part of Africa between 4.2 and 1 million years ago; first truly bipedal

hominin

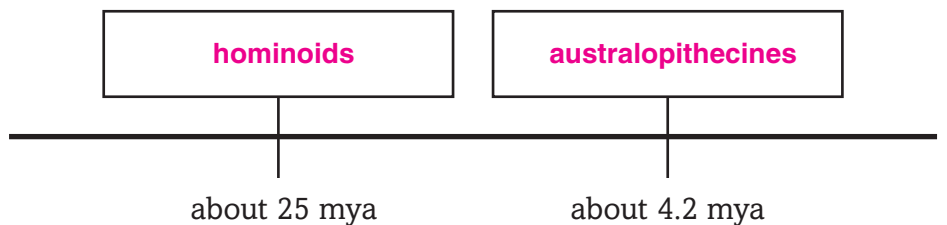
bipedal

ability to walk upright on two legs

hominoid

any nonmonkey anthropoid, including a human

Place the first australopithecines and first hominoids in the general time line below.



Section 16.2 Hominoids to Hominins (continued)

Main Idea

Hominoids

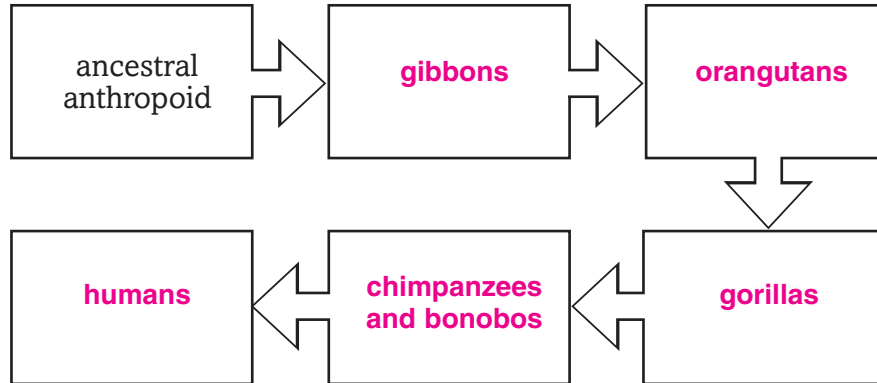
I found this information on page _____.

SE, pp. 461–462
RE, pp. 189–190

Details

Sequence *hominoid divergence by placing the primates listed below in the proper location on the flowchart.*

- gorillas
- gibbons
- chimpanzees and bonobos
- humans
- orangutans



Describe *why the Proconsul species was an important find for scientists. Accept all reasonable responses.*

Some of the oldest hominoid fossils are members of the genus

Proconsul. Some scientists believe that *Proconsul* is a human ancestor.

Hominins

I found this information on page _____.

SE, pp. 462–466
RE, pp. 190–192

Label *five adaptations for bipedalism on the skeleton.*

Labels should include descriptions such as the following: spine attaches at base of skull; S-shaped spine; arms shorter than legs; bowl-shaped pelvis; femur angled inward.



Section 16.2 Hominoids to Hominins (continued)

Main Idea

I found this information on page _____.
SE, pp. 462–466
RE, pp. 190–192

Details

Describe some potential advantages and disadvantages of bipedalism compared to quadrupedalism. **Accept all reasonable responses.**

Disadvantages of bipedalism: individuals easier for predators to see; slower running speed; greater strain on hips and back; might require more energy	Advantages of bipedalism: could travel longer distances to search for food; could spot food sources more easily; might reduce total area of body exposed to sunlight and increase area exposed to cooling winds; hands free to carry objects or for other purposes; could reach fruit on low branches
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Identify a key discovery by each of the following scientists. Then analyze how the discovery contributed to the debate about which adaptation evolved first: larger brain or bipedalism.

Raymond Dart	Donald Johanson	Mary Leakey
Discovery: Taung baby	Discovery: Lucy	Discovery: fossilized australopithecine footprints
Analysis: placement of the foramen magnum in the skull suggested that this small-brained australopithecine was bipedal	Analysis: helped resolve the debate; Lucy’s hip and knee joints showed that she was clearly bipedal	Analysis: supplied further evidence that australopithecines were bipedal

CONNECT

Analyze why scientists have difficulty classifying many hominin fossils.

Accept all reasonable responses. Hominins followed mosaic evolution—different body parts and behaviors evolved at different rates. As a result, early hominin fossils showed a patchwork of human and apelike traits. A variety of hominin species lived alongside human ancestors but were not direct human ancestors themselves.

Primate Evolution

Section 16.3 Human Ancestry

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables, figures, and graphs.
- Look at all pictures and read the captions.

Write two facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

mitochondrion

Use your book or dictionary to define mitochondrion.

organelle found in eukaryotic cells containing genetic material and responsible for cellular energy

New Vocabulary

Cro-Magnon

Use your book or dictionary to define each term.

first fully modern human group; expressed itself symbolically and artistically, developed sophisticated tools and weapons, was the first to fish, tailor clothing, and domesticate animals

Homo

genus that includes living and extinct humans

Neanderthal

distinct human species that evolved exclusively in Europe and Asia about 200,000 years ago, likely from *H. erectus* or a *Homo* intermediary; larger and more heavily muscled than modern humans

Section 16.3 Human Ancestry (continued)

Main Idea

The *Homo* Genus

I found this information on page _____.

SE, pp. 467–470
RE, pp. 193–195

Details

Identify the correct species from the list below for each of the following characteristics.

- *H. habilis* • *H. erectus* • *H. heidelbergensis*
- *H. ergaster* • *H. floresiensis* • *H. neanderthalensis*

Characteristic	<i>Homo</i> Species
Evidence suggests they cared for their sick and buried their dead	<i>H. neanderthalensis</i>
More versatile than predecessors; adapted successfully to a variety of environments	<i>H. erectus</i>
First undisputed member of the <i>Homo</i> genus	<i>H. habilis</i>
Nicknamed “The Hobbit” because of its small size	<i>H. floresiensis</i>
Larger and more heavily muscled than modern humans	<i>H. neanderthalensis</i>
Believed to have had the first human nose (nostrils facing downward)	<i>H. ergaster</i>
Classification for various transitional fossils that display a mosaic of <i>H. ergaster</i> and <i>H. sapiens</i> traits	<i>H. heidelbergensis</i>
Name means “handy man” because of association with primitive stone tools	<i>H. habilis</i>
Probably evolved from <i>H. erectus</i> or a <i>Homo</i> intermediary	<i>H. neanderthalensis</i>
First African <i>Homo</i> species to migrate in large numbers to Asia and Europe	<i>H. ergaster</i>
Serves as evidence that <i>H. erectus</i> or some other ancient hominin species remained on Earth until 12,000 years ago	<i>H. floresiensis</i>

Identify a *Homo* species that scientists hypothesize to be a human ancestor, based on features shared with modern humans.

Homo ergaster

Identify a *Homo* species that scientists believe was not a human ancestor, based on DNA tests on fossil bones.

Homo neanderthalensis

Section 16.3 Human Ancestry (continued)

Main Idea

Emergence of Modern Humans

I found this information on page _____.
 SE, pp. 471–473
 RE, pp. 195–196

Details

Rephrase two hypotheses proposed to explain the global dominance of modern humans.

<p>Multiregional evolution model: Modern humans evolved from several dispersed populations of early Homo species at the same time in different areas of the world. Modern races of humans arose in isolated populations by convergent evolution.</p>
<p>“Out of Africa” hypothesis: Modern humans evolved only once, in Africa, and then migrated to all parts of the world, eventually displacing other hominins.</p>

Summarize a scientific study that supported the “Out of Africa” hypothesis by completing the paragraph.

- Africans have the most variation in mitochondrial DNA
- mitochondrial DNA changes very little over time
- mitochondrial DNA is inherited only from the mother
- the population with the most variation had the longest existence

Because mitochondrial DNA changes very little over time, scientists reasoned that the population with the most variation had the longest existence. In studying the DNA of contemporary humans, scientists found that Africans have the most variation in mitochondrial DNA. Because mitochondrial DNA is inherited only from the mother, scientists concluded that *H. sapiens* emerged in Africa from a hypothetical “Mitochondrial Eve.”

SUMMARIZE

Contrast *Homo sapiens* to all other *Homo* species. **Accept all reasonable responses.**
H. sapiens are more gracile with thinner skeletons, rounder skulls, smaller faces, and more prominent chins than all other *Homo* species. Their brains are larger than all except Neanderthals. They have developed complex language and culture.

Organizing Life's Diversity

Before You Read

Use the "What I Know" column to list the things you know about life's diversity. Then list the questions you have about diversity in the "What I Want to Find Out" column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Consider several living organisms that you see around you. Describe some characteristics that biologists might use when trying to classify, or organize, them into similar species.

Accept all reasonable responses.

Organizing Life's Diversity

Section 17.1 The History of Classification

Main Idea

Details

Scan Section 1 of the chapter. Write three questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define morphology.

morphology

the structure and form of an organism or one of its parts

New Vocabulary

Classify each term at the left as being part of Linnaeus' two-word naming system or a taxonomic group.

binominal nomenclature
class
division
domain
family
genus
kingdom
order
phylum

Linnaeus' System	Taxonomic Group
<p>binominal nomenclature</p> <p>genus</p>	<p>class</p> <p>division</p> <p>family</p> <p>kingdom</p> <p>order</p> <p>phylum</p> <p>domain</p>

Use your book to define each term.

classification

grouping of objects or information based on a set of criteria

taxon

a named group of organisms

taxonomy

a discipline of biology primarily concerned with identifying, naming, and classifying species based on natural relationships

Section 17.1 The History of Classification (continued)

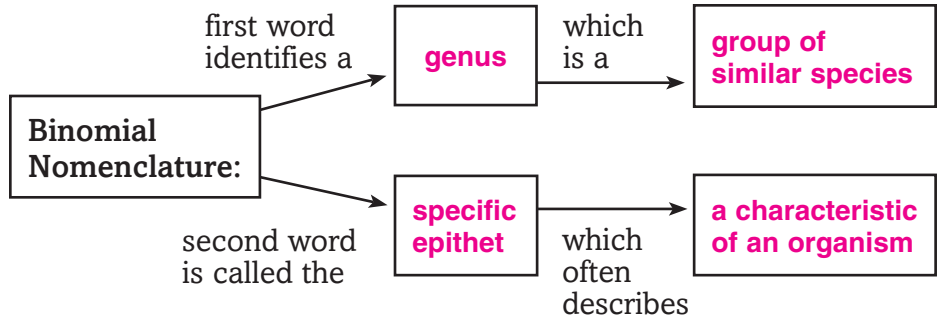
Main Idea

Early Systems of Classification

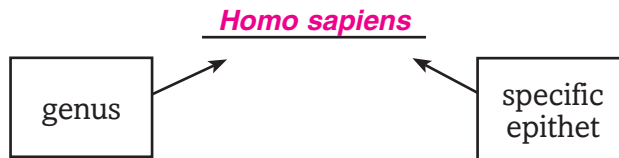
I found this information on page _____.
 SE, pp. 484–486
 RE, pp. 197–200

Details

Identify the parts of Linnaeus' two-word naming system by completing the graphic organizer below.



Distinguish the genus and specific name, or epithet, for the species name of modern humans.



1. Compare data in the table below to determine which two animals are most closely related. Support your reasoning.

coyote and wolf; their classifications are identical down to the species level

Classification of Selected Mammals				
Kingdom	Animalia	Animalia	Animalia	Animalia
Phylum	Chordata	Chordata	Chordata	Chordata
Class	Mammalia	Mammalia	Mammalia	Mammalia
Order	Cetacea	Carnivora	Carnivora	Carnivora
Family	Mysticeti	Felidae	Canidae	Canidae
Genus	<i>Balenopora</i>	<i>Felis</i>	<i>Canis</i>	<i>Canis</i>
Species	<i>B. physalis</i>	<i>F. catus</i>	<i>C. latrans</i>	<i>C. lupus</i>
Common name	Blue whale	Domestic cat	Coyote	Wolf

2. Analyze at which level the blue whale diverges from the other animals on the table.

at the order level

Taxonomic Categories

I found this information on page _____.
 SE, pp. 487–488
 RE, pp. 200–201

Section 17.1 The History of Classification (continued)

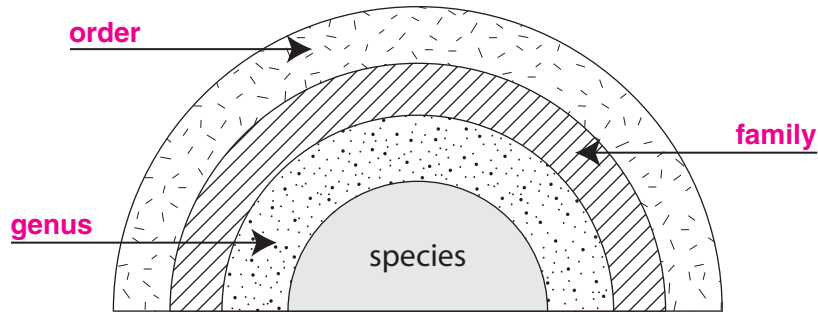
Main Idea

I found this information on page _____.

SE, pp. 487–488
RE, pp. 200–201

Details

Organize the following taxa from most specific to least specific: family, genus, order, species. The first one has been done for you.



Analyze the figure of the taxonomic groups in your book. Then identify the domain, kingdom, phylum, and class for humans.

Domain: Eukarya

Kingdom: Animalia

Phylum: Chordata

Class: Mammalia

Systematics Applications

I found this information on page _____.

SE, p. 489
RE, p. 201

Summarize how a dichotomous key works.

A dichotomous key is based on a series of choices between alternate characteristics. At each choice in the key, you identify a characteristic, such as color of stem—red or green. If the answer is red, you follow the key to the next choice. At the end, you will know the scientific name of the organism.

SUMMARIZE

Explain why a name such as *catfish* is not a good scientific name. Analyze why scientific names are better.

Accept all reasonable responses. Common names may describe a characteristic of an organism but be misleading. Catfish are not related to cats. Scientific names provide a specific way of classifying organisms that all biologists understand.

Organizing Life's Diversity

Section 17.2 Modern Classification

Main Idea

Details

Scan the illustrations in Section 2 of the chapter and read the captions. Select one illustration and state why you think it will be important.

Illustration: **Accept all reasonable responses.**

Why it will be important: _____

Review Vocabulary

Use your book or dictionary to define evolution.

evolution

the historical development of a regulated group of organisms

New Vocabulary

Use your book or dictionary to define each term.

characters

inherited features that vary among species; can be morphological or biochemical

cladistics

a method of analysis that reconstructs phylogenies

cladogram

a branching diagram that represents the proposed phylogeny or evolution of a species or group

molecular clock

a model that uses comparisons of DNA sequences to estimate how long species have been evolving independently

phylogeny

the evolutionary history of a species

Academic Vocabulary

Define corresponding to show its scientific meaning.

corresponding

being similar or equivalent in character, quantity, origin, structure, or function

Section 17.2 Modern Classification (continued)

Main Idea

Determining Species

I found this information on page _____.

SE, pp. 490–491
RE, pp. 202–204

Details

Compare the four concepts that biologists have used or are using to classify organisms.

Concept	Basis of Classification	Limitations
Typological species concept	physical characteristics	does not account for variations in species or the fact that species change over time
Biological species concept	group of organisms that can interbreed and produce fertile offspring in a natural setting	does not account for extinct species or species that reproduce asexually
Evolutionary species concept	groups that evolve independently from their ancestral population	unknown evolutionary histories for some species
Phylogenetic species concept	clusters of organisms that are distinct from other clusters and share a pattern of ancestry	unknown evolutionary histories for some species

Section 17.2 Modern Classification (continued)

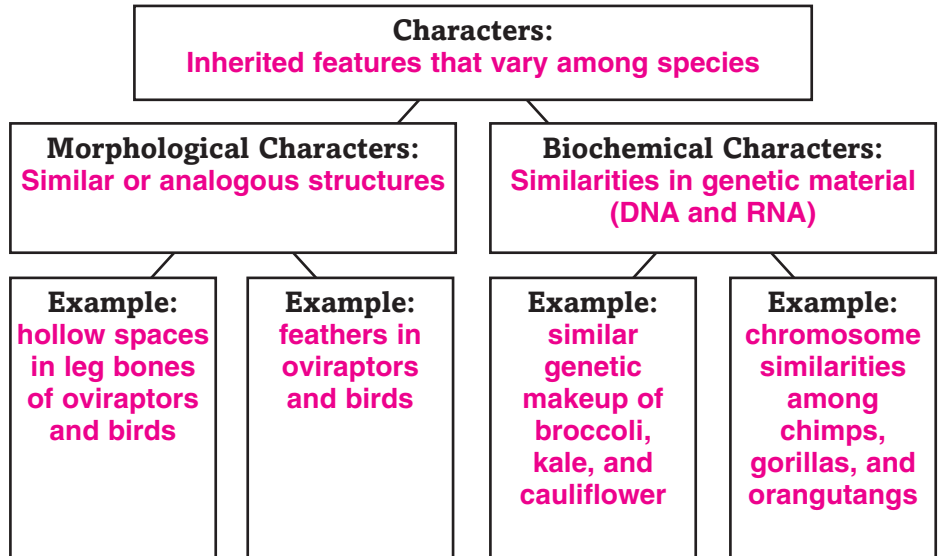
Main Idea

Characters

I found this information on page _____.
 SE, pp. 492–495
 RE, pp. 204–205

Details

Identify and give examples of the two types of characters in the concept map.



Phylogenetic Reconstruction

I found this information on page _____.
 SE, pp. 495–498
 RE, pp. 206–207

Describe cladograms by completing the paragraph.

A cladogram is a branching diagram that represents the proposed phylogeny or evolution of a species or group. The groups used in cladograms are called clades. To develop a cladogram, derived characters are identified. Then the ancestry of various species is identified based on the presence or absence of the derived characters in the species. In making a cladogram, taxonomists assume that groups that share more derived characters have a more recent common ancestor.

SUMMARIZE

Describe a process scientists use to construct a cladogram that includes a new species of vascular plant that was recently discovered in the rainforest.

Accept all reasonable responses. Scientists would identify derived characters and ancestral characters. They would place the new species close to other species that share the most derived characters.

Organizing Life's Diversity

Section 17.3 Domains and Kingdoms

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about groups of organisms.

Write three facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

eukaryote

Use your book or dictionary to define eukaryote.

an organism composed of one or more cells containing a nucleus and membrane-bound organelles

New Vocabulary

Archaea

Use your book or dictionary to define each term.

a kingdom of prokaryotes whose cell walls do not contain peptidoglycan; sometimes called extremophiles

eubacteria

a kingdom of prokaryotes whose cell walls contain peptidoglycan

fungus

eukaryotic organisms that can be unicellular or multicellular and absorbs nutrients from organic materials in its environment; have cell walls that contain chitin

protists

eukaryotic organisms that can be unicellular, colonial, or multicellular; subclassified as algae, protozoans, and fungus-like

Section 17.3 Domains and Kingdoms (continued)

Main Idea

Details

Grouping Species

I found this information on page _____.

SE, p. 499
RE, p. 208

Domain Bacteria

I found this information on page _____.

SE, pp. 499–500
RE, pp. 208–209

Domain Archaea

I found this information on page _____.

SE, p. 500
RE, p. 209

Domain Eukarya

I found this information on page _____.

SE, pp. 501–503
RE, pp. 209–212

Rephrase why the members formerly in the Kingdom Monera were separated into the two new domains Bacteria and Archaea.

Biochemical studies showed that there were two different types of bacteria, so they were divided into two domains.

Model the cell walls of eubacteria. Label the features of eubacteria.

Accept all reasonable drawings.

Analyze why archaeobacteria are sometimes called extremophiles.

Archaeobacteria are called extremophiles because they live in some of the most extreme environments on Earth, including boiling hot springs, salty lakes, thermal vents, and mud.

Organize the kingdoms in the Domain Eukarya and describe their cell structure. List each kingdom's sources of energy and other important characteristics.

Kingdom	Cell Structure	Energy Sources	Other Characteristics
Eubacteria	strong cell walls	heterotrophs, autotrophs, and chemo-synthetic	live in most habitats
Archaeobacteria	have cell walls that are different from eubacteria	autotrophs, chemo-synthetic, and photosynthetic	live in extreme environments

Section 17.3 Domains and Kingdoms (continued)

Main Idea _____

Details _____

I found this information on page _____.

SE, pp. 501–503
RE, pp. 209–212

Kingdom	Cell Structure	Energy Sources	Other Characteristics
Protists	unicellular or multicellular	autotrophs, heterotrophs	simple organ systems
Fungi	unicellular or multicellular	heterotrophs	stationary
Plants	have cell walls	autotrophs	stationary
Animals	no cell walls	heterotrophs	most able to move

SUMMARIZE

Model a diagram of the relationship between domains and kingdoms. **Accept all reasonable responses.**

Bacteria and Viruses

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Bacteria and Viruses	After You Read
	<ul style="list-style-type: none"> • Bacteria can live in a thermal vent on the ocean floor, where temperatures top 80°C. 	A
	<ul style="list-style-type: none"> • If you have bacteria in your intestines, you will get sick. 	D
	<ul style="list-style-type: none"> • Some viruses remain inactive for years inside human cells. 	A
	<ul style="list-style-type: none"> • <i>Mad cow</i> disease is caused by a protein. 	A

Science Journal

Many viruses and bacteria can cause diseases in animals and plants. Write about a disease that you know of that is caused by a virus or a bacteria. Be sure to discuss how the disease is treated.

Accept all reasonable responses.

Bacteria and Viruses

Section 18.1 Bacteria

Main Idea _____ **Details** _____

Scan Section 1 of the chapter. Write two facts that you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____

2. _____

Review Vocabulary

prokaryotic cell

Use your book or dictionary to define prokaryotic cell.

cell that does not contain any membrane-bound organelles

New Vocabulary

bacteria

Use your book or dictionary to define each term.

unicellular prokaryotic microorganisms

binary fission

division of a cell into two genetically identical cells

capsule

layer of secreted polysaccharides around a prokaryotic cell wall

conjugation

method of reproduction in which two prokaryotes attach to each other and exchange genetic information

endospore

structure produced by some bacteria during harsh environmental conditions that contains genetic information and can germinate into a new bacterial cell when conditions improve

nucleoid

area of a prokaryotic cell that holds the chromosome

pilus

submicroscopic, hairlike structure made of protein that is found on the outer surface of some bacteria

Section 18.1 Bacteria (continued)

Main Idea _____

Details _____

Diversity of Prokaryotes

I found this information on page _____.
 SE, pp. 516–517
 RE, pp. 213–214

Summarize *three general environments where archaeobacteria live, and give one example of each environment.*

1. **hot, acidic: sulfur hot springs, thermal vents, volcanoes** _____
2. **high concentrations of salt: Great Salt Lake, Dead Sea** _____
3. **oxygen-free: swamps, bogs, volcanic vents** _____

Prokaryote Structure

I found this information on page _____.
 SE, p. 518
 RE, pp. 214–215

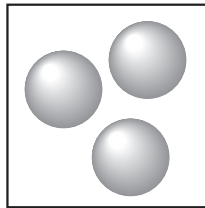
Model *a prokaryotic cell and label its structures.*

Drawings should include all labels shown in Figure 18.3. Accept all reasonable variations

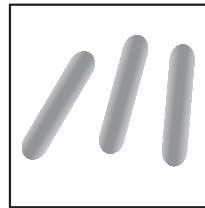
Identifying Prokaryotes

I found this information on page _____.
 SE, p. 519
 RE, p. 215

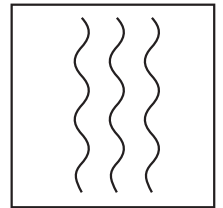
Identify *each bacterial shape below with its scientific name.*



Cocci



Bacilli



Spirilli/Spirochetes

Reproduction of Prokaryotes

I found this information on page _____.
 SE, p. 520
 RE, pp. 215–216

Compare *prokaryote reproduction by completing the table below.*

Reproduction Method	Binary Fission	Conjugation
Process	chromosome replicates, cell elongates, new plasma membrane and cell wall form and separate cell	two individuals use pili to attach to each other and exchange genetic material
Result	two genetically identical cells	new gene combination

Section 18.1 Bacteria (continued)

Main Idea _____ **Details** _____

Metabolism of Prokaryotes

I found this information on page _____.
 SE, pp. 520–521
 RE, pp. 216–217

Compare prokaryotes by describing how each group below obtains energy for cellular respiration.

- Saprotrophs: decompose dead organisms or organic waste
- Photoautotrophs: use light for photosynthesis
- Chemoautotrophs: use chemosynthesis to break down inorganic matter that contains nitrogen and sulfur

Survival of Bacteria

I found this information on page _____.
 SE, pp. 521–522
 RE, p. 217

Identify two bacterial survival mechanisms and describe the advantages of each mechanism.

Mechanism	Survival Advantages
Endospores	can survive extreme conditions that kill the bacteria; germinate when conditions improve
Mutations	produce new gene forms and combinations; increase chances that some can survive environmental changes and repopulate

Ecology of Bacteria

I found this information on page _____.
 SE, pp. 522–524
 RE, p. 218

List five ways that bacteria are helpful to humans.

- Bacteria are helpful
- decompose dead organisms and recycle nutrients
 - nitrogen fixation
 - normal flora protect against disease and produce vitamin K
 - used in producing foods and vitamin pills
 - used in producing antibiotics

SUMMARIZE

Assess whether bacteria are more harmful than helpful to humans. Defend your answer.

Accept all reasonable responses. Bacteria are more helpful than harmful. Life would be impossible without bacteria because they produce the oxygen that is necessary for life.

Bacteria and Viruses

Section 18.2 Viruses and Prions

Main Idea

Details

Scan the table and time line in Section 2 of the chapter. Write three facts you discovered about viruses from these elements.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define protein.

protein

large, complex polymer composed of carbon, hydrogen, oxygen, nitrogen, and sometimes sulfur

New Vocabulary

Use the new vocabulary terms in the left column to complete the following paragraph.

- capsid*
- lysogenic cycle*
- lytic cycle*
- prion*
- retrovirus*
- virus*

A **virus** is genetic material within a protein coat, but it has no organelles or other characteristics of life. The genetic material lies inside its **capsid**, or outer layer of protein. In the **lytic cycle**, viral genes instruct the host cell to make many copies of the viral RNA or DNA. Some viruses replicate in a **lysogenic cycle**, in which the viral DNA integrates into a host chromosome and lies dormant for some time. A **retrovirus**, such as the HIV virus, contains RNA instead of DNA. Mutation in the genes of a normal protein called a **prion** is responsible for diseases such as “mad cow.”

Academic Vocabulary

Define widespread to show its scientific meaning.

widespread

widely diffused or prevalent

Section 18.2 Viruses and Prions (continued)

Main Idea

Details

Viruses

I found this information on page _____.
 SE, pp. 525–527
 RE, pp. 219–220

Model of one type of virus. Label its parts.

Drawings should resemble one of the virus diagrams in Figure 18.1.

Viral Infection

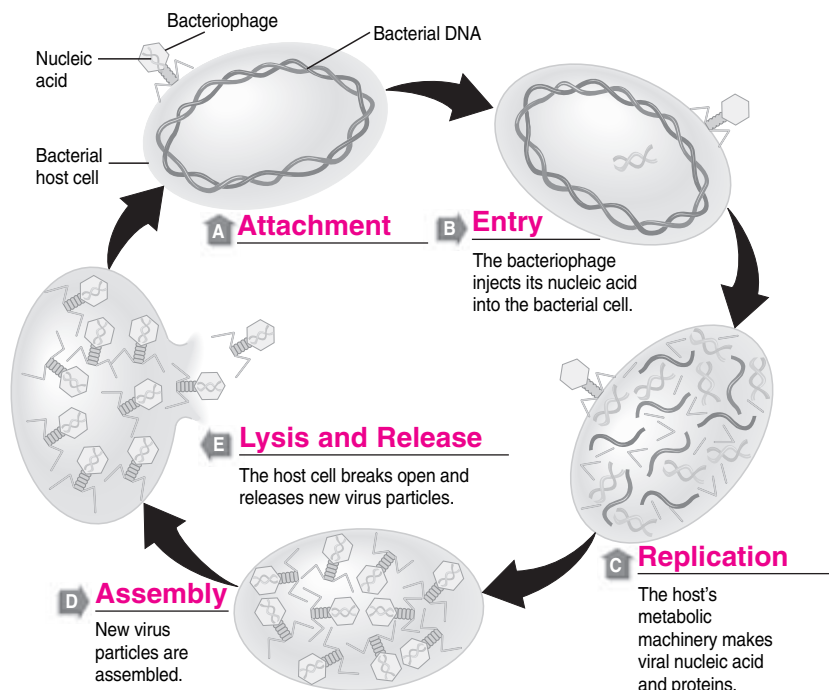
I found this information on page _____.
 SE, pp. 527–529
 RE, pp. 220–221

Synthesize why many viruses cannot pass from one species to another.

The virus attaches to the host cell using specific receptors on the plasma membrane of the host. Different types of organisms have receptors for different types of viruses, limiting transmission between species.

Label steps A, B, C, D, and E of a lytic cycle in the figure below. Use the following terms.

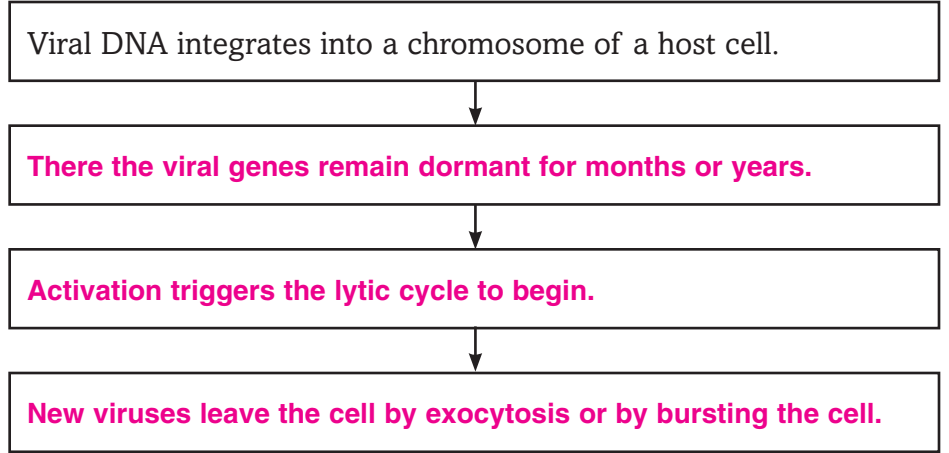
- Assembly
- Attachment
- Entry
- Lysis and Release
- Replication



Section 18.2 Viruses and Prions (continued)

Main Idea _____ **Details** _____

Sequence *the steps of a lysogenic cycle.*



Retroviruses

I found this information on page _____.
SE, p. 530
RE, pp. 221–222

Evaluate and discuss *the role of reverse transcriptase in the replication cycle of HIV.*

After HIV attaches to a cell and releases its RNA, the reverse transcriptase enzyme synthesizes DNA using the viral RNA as a template.

Prions

I found this information on page _____.
SE, p. 531
RE, p. 222

Summarize *information about prions by completing the table.*

What is a prion? a protein that normally exists in cells but can cause infection or disease	What causes a prion to become harmful? It mutates.
How might humans contract a prion-caused disease? by eating beef from an infected cow	What is the result of prion infection? Prions infect nerve cells in the brain, causing them to burst.

SUMMARIZE

Conclude whether viruses that replicate by the lytic cycle or the lysogenic cycle are more dangerous. Explain your reasoning. **Accept all reasonable responses.**

Tie It Together

SYNTHESIZE

Create a quiz to help you review key topics in this chapter. Write one question with its answer for each major topic listed below.

Accept all reasonable responses. Make sure all answers are correct.

<p>Topic: Diversity of Prokaryotes</p> <p>Question: _____</p> <p>Answer: _____</p>	<p>Topic: Metabolism of Prokaryotes</p> <p>Question: _____</p> <p>Answer: _____</p>
<p>Topic: Prokaryote Structure</p> <p>Question: _____</p> <p>Answer: _____</p>	<p>Topic: Ecology of Bacteria</p> <p>Question: _____</p> <p>Answer: _____</p>
<p>Topic: Identifying Prokaryotes</p> <p>Question: _____</p> <p>Answer: _____</p>	<p>Topic: Viruses</p> <p>Question: _____</p> <p>Answer: _____</p>
<p>Topic: Reproduction of Prokaryotes</p> <p>Question: _____</p> <p>Answer: _____</p>	<p>Topic: Retroviruses</p> <p>Question: _____</p> <p>Answer: _____</p>
<p>Topic: Survival of Bacteria</p> <p>Question: _____</p> <p>Answer: _____</p>	<p>Topic: Prions</p> <p>Question: _____</p> <p>Answer: _____</p>

Protists

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Protists	After You Read
	• Protists are not animals, plants, or fungi.	A
	• Some amoebas have a hard covering like a shell.	D
	• Protists cannot make their own food.	D
	• A type of downy mildew was responsible for widespread starvation in 19th century Ireland.	A

Science Journal

Protists are the base for most food chains in aquatic environments. Describe how protists might contribute to an important food source—fish and other seafood.

Accept all reasonable responses.

Protists

Section 19.1 Introduction to Protists

Main Idea

Details

Scan the table and pictures in Section 1 of the chapter. Read all captions. List three facts that you discovered about protists.

1. **Accept all reasonable responses.**

2. _____

3. _____

Review Vocabulary

heterotroph

Use your book or dictionary to define heterotroph. Then use the term in a sentence to show its scientific meaning.

organism that cannot make its own food and must get its energy and nutrients from other organisms

New Vocabulary

microsporidium

Use your book or dictionary to define each vocabulary term. Then use each term in a sentence.

microscopic protozoan that lives in the guts of termites and produces enzymes that digest wood

protozoan

unicellular, heterotrophic, animal-like protist

Section 19.1 Introduction to Protists (continued)

Main Idea

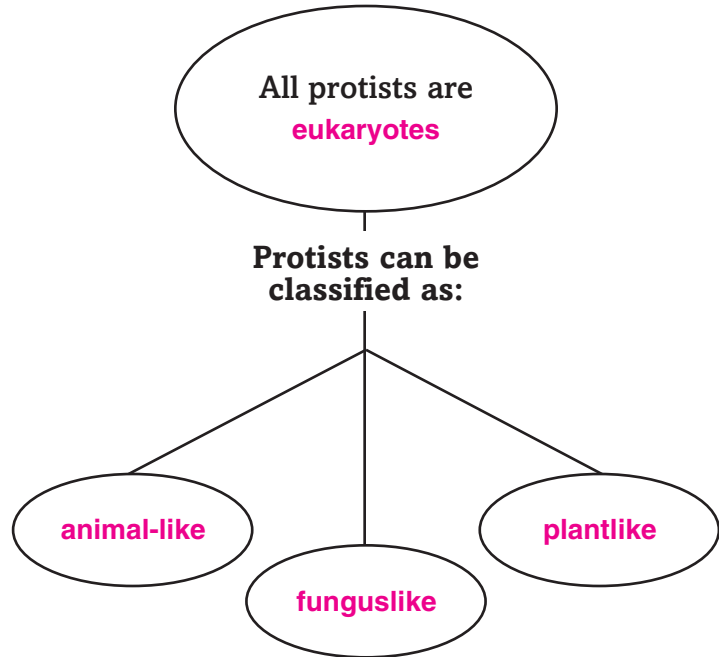
Protists

I found this information on page _____.

SE, pp. 542–544
RE, pp. 223–224

Details

Organize information about how protists are classified.



Analyze the characteristics that are used to classify protists.

Type of Protist	Characteristic	Example
Animal-like	heterotrophic	protozoans
Plantlike	photosynthetic	algae
Funguslike	absorb nutrients from other organisms	water mold

List two characteristics that distinguish funguslike protists from fungi.

distinguishing characteristics of funguslike protists

- centrioles
- composition of cell wall

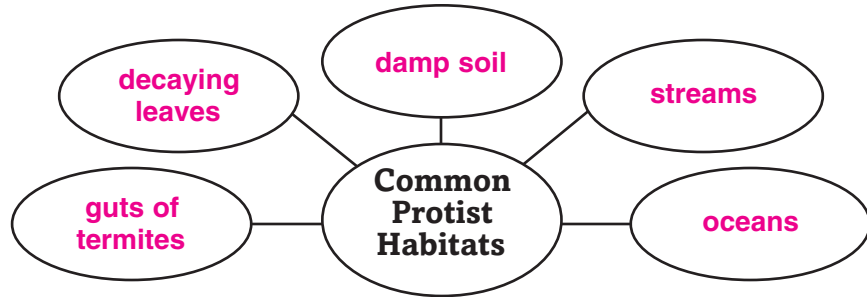
Section 19.1 Introduction to Protists (continued)

Main Idea

I found this information on page _____.
SE, pp. 542–544
RE, pp. 223–224

Details

Summarize the common habitats of protists by completing the graphic organizer. **Accept all reasonable responses.**



Identify two examples of mutualistic relationships between protists and other organisms.

1. **protozoans produce enzymes that help termites digest wood**
2. **green algae living in the hair of sloths provides camouflage**

Origin of Protists

I found this information on page _____.
SE, p. 545
RE, p. 224

Summarize information about the origin of protists by completing the following paragraph.

The theory of **endosymbiosis** suggests that **mitochondria** became part of protist cells early in the evolutionary process. Later in the evolutionary process, **chloroplasts** appeared in cells, and **algae** evolved as the only protists that could photosynthesize.

SUMMARIZE

Analyze why protists are difficult to classify and why the classification system is likely to change.

Accept all reasonable responses. Protists are difficult to classify because they have characteristics of animals, plants, and fungi, yet they have key differences as well. Classifying by method of obtaining nutrition is convenient, but it ignores an organism’s evolutionary history. As a result, the classification system will likely change as scientists learn more about the evolutionary history of protists.

Protists

Section 19.2 Protozoans—Animal-like Protists

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Look at all illustrations and read the captions.
- Think about what you already know about protists.

Write two facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

hypotonic

Use your book or dictionary to define hypotonic.

concentration of dissolved substances is lower in the solution outside the cell than the concentration inside the cell

New Vocabulary

contractile vacuole

Use your book or dictionary to define each vocabulary term.

structure that collects the excess water from the cytoplasm and expels it from the cell

pellicle

membrane that covers a paramecium

pseudopod

temporary extensions of cytoplasm, used for feeding and locomotion

test

hard, porous covering similar to a shell that surrounds the plasma membrane of some types of amoebas

trichocyst

elongated, cylindrical body that can discharge a spinelike structure

Section 19.2 Protozoans—Animal-like Protists (continued)

Main Idea

Ciliophora

I found this information on page _____.

SE, pp. 546–549
RE, pp. 225–227

Details

Model and label a paramecium and its parts in the space below. Label the following parts with a brief description of each part.

- anal pore
- cilia
- contractile vacuole
- ectoplasm
- gullet
- micronucleus
- macronucleus
- oral groove

Student drawings may resemble Figure 19.6 on SE, p. 548. Accept all reasonable responses.

Sarcodina

I found this information on page _____.

SE, p. 550
RE, pp. 227–228

Organize facts about amoebas in the table below. Accept all reasonable responses.

Phylum: Sarcodina	Excretion method: through outer membranes by diffusion
Habitats: salt water, freshwater streams, muddy bottoms of ponds, damp moss and leaves, inside animal host	Feeding method: extend pseudopodia to envelop small organism, form a food vacuole where enzymes break down food
Body structures: outer plasma membrane, inner ectoplasm membrane, cytoplasm, nucleus, food vacuoles, contractile vacuole	Reproduction method: asexually by cell division; some form cysts during harsh environmental conditions

Section 19.2 Protozoans—Animal-like Protists (continued)

Main Idea

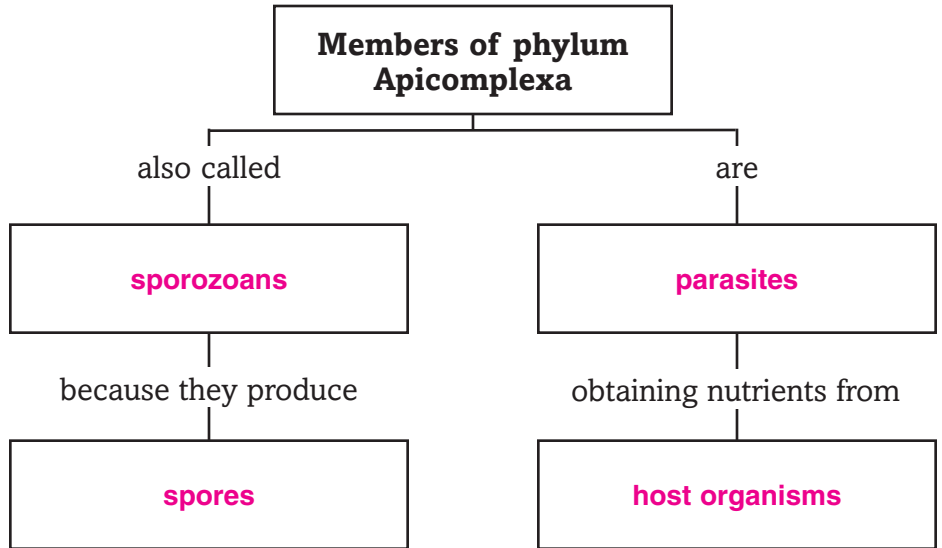
Apicomplexa

I found this information on page _____.

SE, p. 551
RE, p. 228

Details

Organize information about the members of the phylum Apicomplexa.

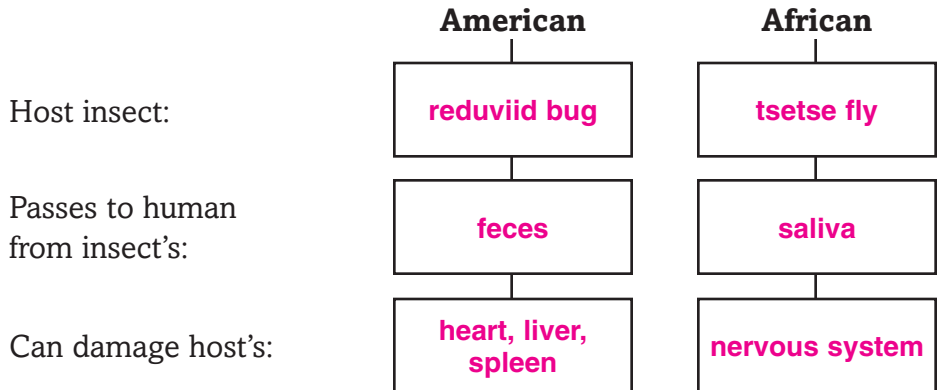


Zoomastigina

I found this information on page _____.

SE, p. 552
RE, p. 228

Compare American and African sleeping sickness.



SUMMARIZE

Compare the habitats and methods of movement among the three phyla of protozoans.

Accept all reasonable responses. Ciliates and sarcodines are found in aquatic environments.

Some sarcodines and all sporozoans are parasites that live inside animal hosts. Ciliates move using cilia; and sarcodines move using pseudopods. Sporozoans have no method of movement.

Protists

Section 19.3 Algae—Plantlike Protists

Main Idea

Details

Skim Section 3 of the chapter. Write three questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

chloroplasts

Use your book or dictionary to define chloroplasts.

chlorophyll-containing organelles found in the cells of green plants and some protists that capture light energy and convert it to chemical energy

New Vocabulary

alternation of generations

Use your book or dictionary to define each vocabulary term. Then write a sentence for each term to show its scientific meaning.

life cycle of algae that takes two generations—one that reproduces sexually and one that reproduces asexually—to complete a life cycle

bioluminescent

emit light

colony

group of cells that join together to form a close association

Academic Vocabulary

suspension

Define suspension, then write a sentence to show its scientific meaning.

mixture whose particles settle out over time and whose particles can be separated from the mixture by filtration

Section 19.3 Algae—Plantlike Protists (continued)

Main Idea

Characteristics of Algae

I found this information on page _____.
SE, p. 553
RE, p. 229

Details

Organize information about algae by completing the chart.

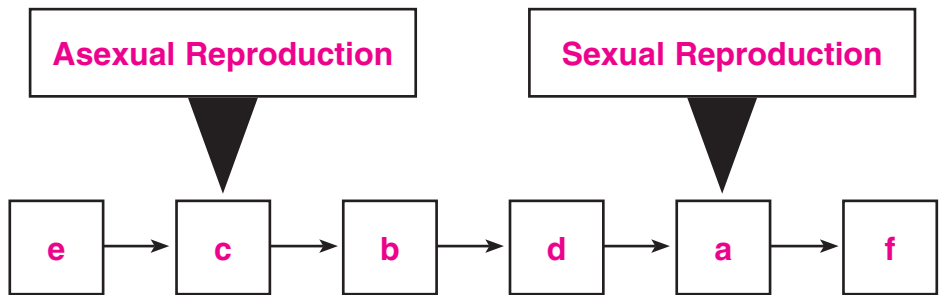
Algae	
Like plants: contain photosynthetic pigments that enable algae to produce food using energy from the Sun	Unlike plants: lack roots, leaves, and other structures typical of plants
Function of secondary pigments: allow algae to absorb light energy in deep water	Found in many colors because: secondary pigments reflect light at different wavelengths

Diversity of Algae

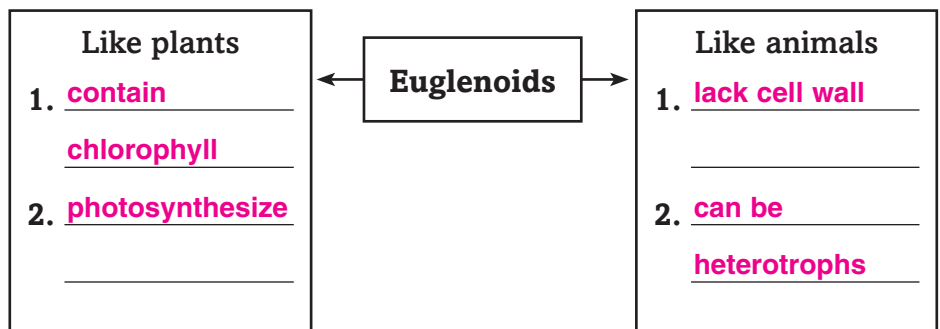
I found this information on page _____.
SE, pp. 554–559
RE, pp. 229–232

Sequence the asexual and sexual reproductive cycles of diatoms by writing the letter for each step in the correct box.

- a. fusion of gametes
- b. meiosis
- c. mitosis
- d. gametes released
- e. wall formation around cell
- f. zygote



Compare the ways that euglenoids are like plants and like animals.



Section 19.3 Algae—Plantlike Protists (continued)

Main Idea

Details

Uses for Algae

I found this information on page _____.

SE, pp. 554–559
RE, pp. 229–232

Summarize *the common uses for algae. Algae types may be used more than once.*

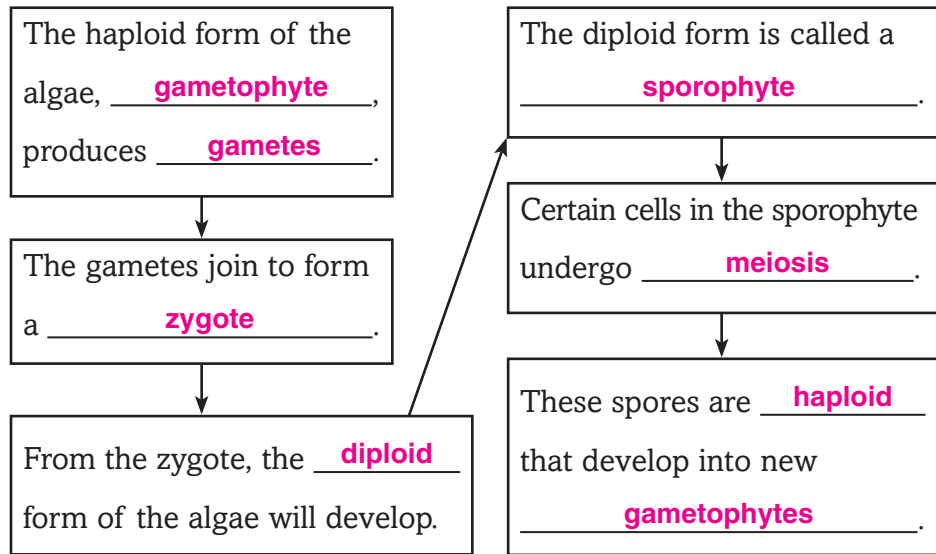
Common Uses	Type of Algae
Used for filtering water supplies	diatoms
Used to stabilize syrups	red and brown algae
Used in the preparation of scientific gels	red algae
Used as abrasives	diatoms
Used in salads	green algae
Used to thicken puddings and shampoos	red algae
Used to preserve canned meat and fish	red algae

Life Cycle of Algae

I found this information on page _____.

SE, p. 560
RE, p. 233

Summarize *the alternation of generations.*



SUMMARIZE

Use the terms *meiosis*, *fertilization*, *diploid*, and *haploid* in a sentence that demonstrates your understanding of alternation of generations in green algae.

Accept all reasonable responses. In meiosis haploid spores of green algae develop, and in fertilization they are combined to produce the diploid form.

Protists

Section 19.4 Funguslike Protists

Main Idea

Details

Scan Section 4 of the chapter. Write three facts that you discovered about cellular and acellular slime molds.

1. **Accept all reasonable responses.**

2.

3.

Review Vocabulary

cellulose

Use your book or dictionary to define cellulose.

glucose polymer that forms the cell walls of plants and some

funguslike protists

New Vocabulary

acrasin

Use your book or dictionary to define each vocabulary term.

chemical given off by a starving cellular slime mold, signaling slime

molds to congregate into a colony that functions like a single

organism and eventually reproduces asexually

plasmodium

mobile mass of cytoplasm that contains many diploid nuclei but

no separate cells

Academic Vocabulary

phase

Define phase to show its scientific meaning. Then use the word in a sentence.

particular state in a regular cycle of changes

Section 19.4 Funguslike Protists (continued)

Main Idea

Slime Molds

I found this information on page _____.

SE, pp. 561–563
RE, pp. 234–236

Details

Compare *slime molds to fungi by completing the table below.*

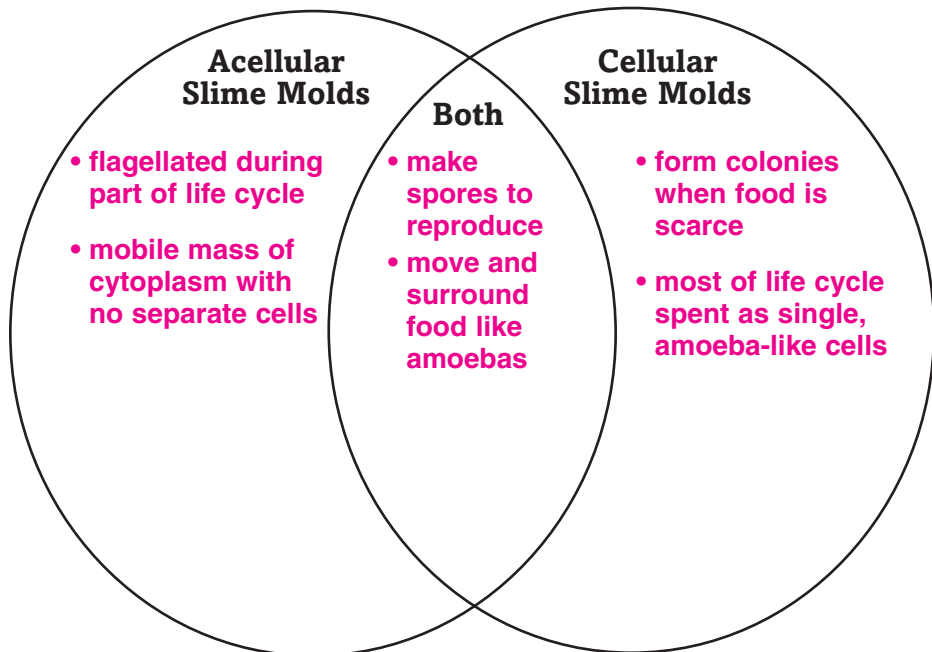
Similarities in Slime Molds and Fungi
Reproduce using: spores
Feed on: decaying organic matter
Absorb nutrients through: cell walls

Contrast *slime molds and fungi by completing the following sentence.*

The cell walls of fungi are composed of **chitin**, and cell walls in slime molds contain **cellulose or celluloselike compounds**.

Compare and contrast *acellular and cellular slime molds by using the following phrases to complete the Venn diagram.*

- move and surround food like amoebas
- flagellated during part of life cycle
- most of life cycle spent as single, amoeba-like cells
- form colonies when food is scarce
- mobile mass of cytoplasm with no separate cells
- make spores to reproduce



Section 19.4 Funguslike Protists (continued)

Main Idea

I found this information on page _____.

SE, pp. 561–563
RE, pp. 234–236

Details

Analyze *two ways in which the life cycles of acellular and cellular slime molds are similar and two ways in which they are different.*

Similarities in Life Cycle	Differences in Life Cycle
1. Both form masses during parts of their life cycles.	1. Cellular slime forms amoeba-like cells that feed and grow before they colonize.
2. Both make spores to reproduce.	2. Acellular slime produces flagellated cells before becoming amoeba-like.

Water Molds and Downy Mildew

I found this information on page _____.

SE, pp. 564–565
RE, p. 236

Organize *information about water molds and downy mildews by completing the table below.*

Water Molds and Downy Mildews	
Habitat	in water or damp places
Source of nutrition	from surrounding water or soil or from other organisms
Similarities to fungi	they envelop their food with a mass of threads; they break down the tissue and absorb nutrients through their cell walls
Differences from fungi	their cell walls are made of cellulose and celluloselike compounds and they produce flagellated reproductive cells

Tie It Together

SUMMARIZE

Malaria is a disease caused by sporozoans. It is spread by mosquitoes. Consider which would have a greater benefit—developing a drug that would cure malaria or developing an insecticide that would kill all mosquitoes. List the possible advantages and disadvantages of each approach. Then make a conclusion about which choice would be better.

Accept all reasonable responses.

Malaria Drug

Advantages

Disadvantages

Insecticide

Advantages

Disadvantages

Conclusions

Fungi

Before You Read

Use the “What I Know” column to list the things you know about fungi. Then list the questions you have about fungi in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Fungi can be both helpful and harmful to humans. On the lines below, write two things that you already know about fungi.

Accept all reasonable responses.

Fungi

Section 20.1 Introduction to Fungi

Main Idea

Details

Scan the figures and read the figure captions in Section 1 of the chapter. Write two facts that you discovered about fungi.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

saprobe

Use your book or dictionary to define saprobe.

organism that feeds on dead organisms or organic wastes

New Vocabulary

chitin

Use your book or dictionary to define each term.

strong, flexible polysaccharide found in the cell walls of all fungi and in the exoskeletons of insects and crustaceans

fruiting body

in fungi, the reproductive structure that grows above the ground

haustoria

in fungi, specialized hyphae that grow into a host's tissues and absorb their nutrients

hyphae

tubular filaments that are the basic structural units of multicellular fungi

mycelium

in fungi, netlike mass created by the hyphae as they grow at their tips and branch repeatedly

septa

cross-walls that divide the hyphae of a fungus into cells

sporangium

a sac or case in which spores are produced

spore

a reproductive haploid cell with a hard outer coat that develops into a new organism without the fusion of gametes

Section 20.1 Introduction to Fungi (continued)

Main Idea

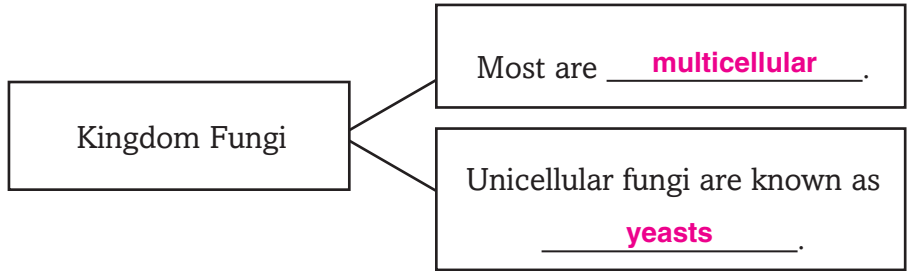
Characteristics of Fungi/Major Features of Fungi

I found this information on page _____.

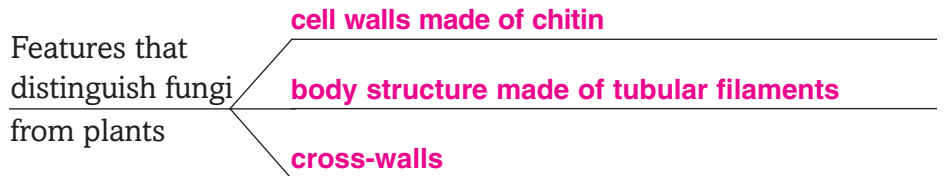
SE, pp. 576–578
RE, pp. 237–238

Details

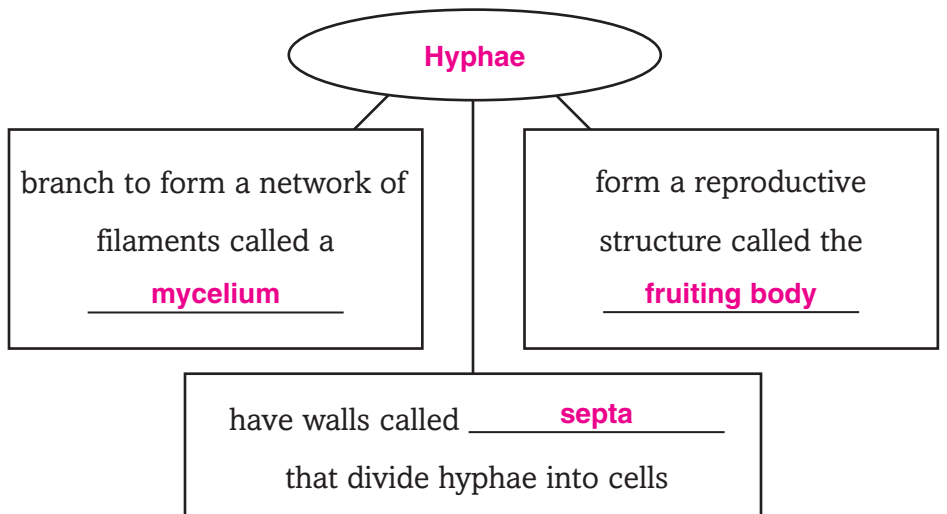
Describe *the kingdom Fungi.*



List *three features of fungi that distinguish them from plants.*



Organize *information about the structure of multicellular fungi by completing the graphic organizer.*



Nutrition in Fungi

I found this information on page _____.

SE, p. 578
RE, pp. 238–239

Describe *how fungi digest their food outside the body.*

Hyphae produce digestive enzymes that break down large organic molecules into smaller molecules. These small molecules are absorbed into the hyphae through their cell walls.

Section 20.1 Introduction to Fungi (continued)

Main Idea

Details

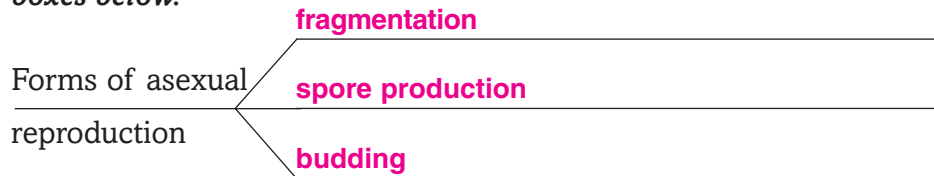
Classify types of fungi by writing how each obtains food.

Saprophytes	feed on dead organic material
Mutualists	have cooperative relationship with another organism
Parasites	absorb nutrients from host cells

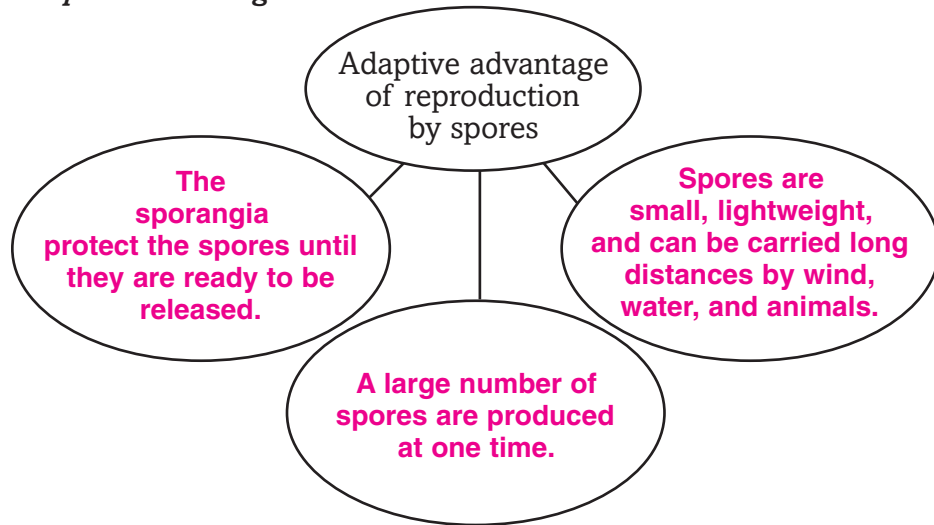
Reproduction in Fungi

I found this information on page _____.
 SE, pp. 580–581
 RE, p. 239

Distinguish the 3 forms of asexual reproduction in fungi in the boxes below.



Analyze three ways that reproduction by spores gives fungi an adaptive advantage.



SUMMARIZE

Discuss why hyphae are an adaptive advantage in fungi.

Accept all reasonable responses. Hyphae help fungi obtain sufficient nutrients by providing a large surface area for nutrients to be absorbed.

Fungi

Section 20.2 Diversity of Fungi

Main Idea

Details

Skim Section 2 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define flagellated.

flagellated

having long projections that propel organisms with a whiplike motion

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- _____ **stolons**
- _____ **rhizoids**
- _____ **gametangium**
- _____ **conidiophores**
- _____ **ascocarp**
- _____ **ascus**
- _____ **ascospores**
- _____ **basidiocarp**
- _____ **basidia**
- _____ **basidiospores**

- in molds, hyphae that spread across the surface of food
- in molds, hyphae that penetrate food and absorb nutrients
- a mold reproductive structure that contains a haploid nucleus
- in sac fungi, hyphae that produce spores on their tips for asexual reproduction
- in sac fungi, a reproductive structure where a zygote forms during sexual reproduction
- in sac fungi, a saclike structure where spores develop during sexual reproduction
- spores produced by the ascus in sac fungi
- fruiting body of club fungi
- club-shaped hyphae that produce spores in club fungi
- spores produced in basidia during sexual reproduction of club fungi

Section 20.2 Diversity of Fungi (continued)

Main Idea

Classification of Fungi

I found this information on page _____.
SE, p. 582
RE, p. 240

Details

Model *a phylogenetic tree for fungi and label the major phyla.*

Drawings should resemble Figure 20.8, with all major phyla labeled.

Chytrids

I found this information on page _____.
SE, p. 582
RE, p. 240

Summarize *the evidence supporting the initial classification of chytrids as protists and later reclassification as fungi.*

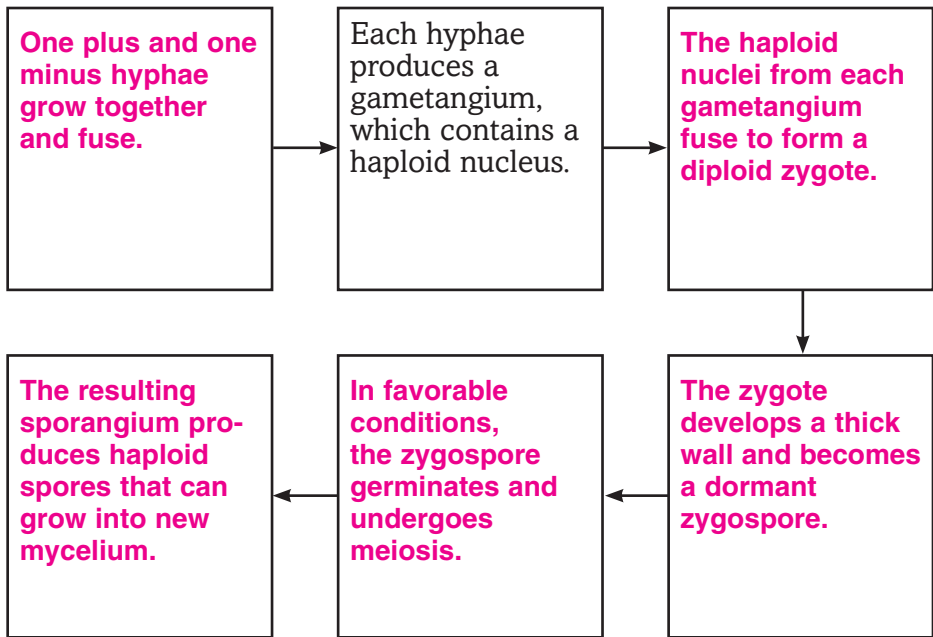
Chytrids are like protists.
flagellated spores

Chytrids are like fungi.
similar protein and DNA sequences, chitin-containing cell walls

Common Molds

I found this information on page _____.
SE, p. 583
RE, pp. 241–242

Sequence *how zygomycetes reproduce sexually, by completing the graphic organizer.*



Section 20.2 Diversity of Fungi (continued)

Main Idea

Sac Fungi

I found this information on page _____.

SE, pp. 584–585
RE, pp. 242–243

Club Fungi

I found this information on page _____.

SE, pp. 585–586
RE, p. 243

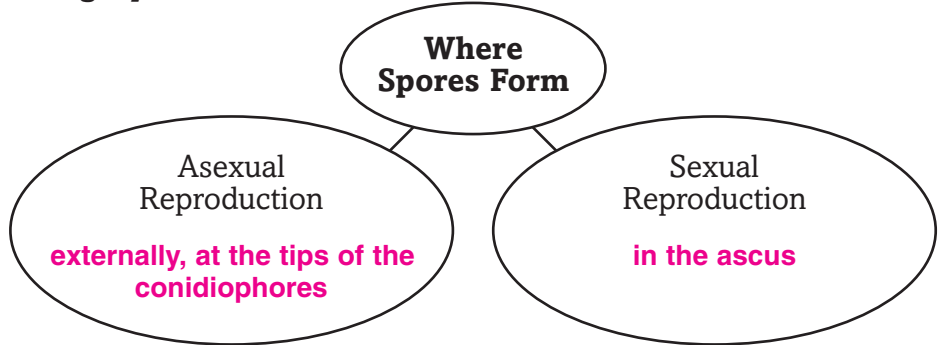
Other Fungi

I found this information on page _____.

SE, p. 586
RE, p. 243

Details

Organize information about where the spores of sac fungi form during reproduction.



Model a club fungi. Label the basidiocarp and the basidia.

Accept all reasonable responses.

Predict what might happen to the phylum Deuteromycota as scientists continue to study its species. Explain your reasoning.

Accept all reasonable responses. Students might predict that the phylum might eventually be discontinued. As scientists learn more about how the species in this group reproduce, they might be able to reclassify the species into other phyla.

SUMMARIZE

Explain the adaptive advantages of zygospores that help ensure the survival of the species.

Accept all reasonable responses. Zygospores have a thick wall that helps protect them. Their ability to remain dormant for months enables the next generation to germinate when growing conditions are favorable. Sexual reproduction through zygospores provides genetic diversity, helping zygomycetes survive in changing environments.

Fungi

Section 20.3 Ecology of Fungi

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables.
- Look at all pictures and read the captions.

Write two facts you discovered about the ecology of fungi.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

cyanobacterium

Use your book or dictionary to define cyanobacterium.

a bacterium that is a photosynthetic autotroph

New Vocabulary

bioindicator

Use your book or dictionary to define each term.

a living organism that is sensitive to changes in environmental conditions and is one of the first organisms to respond to changing conditions

lichen

a symbiotic relationship between a fungus and a photosynthetic partner

mycorrhiza

a symbiotic relationship between a specialized fungus and plant roots

Academic Vocabulary

cooperate

Define cooperate to show its scientific meaning.

to work or act together toward a common end or purpose

Section 20.3 Ecology of Fungi (continued)

Main Idea

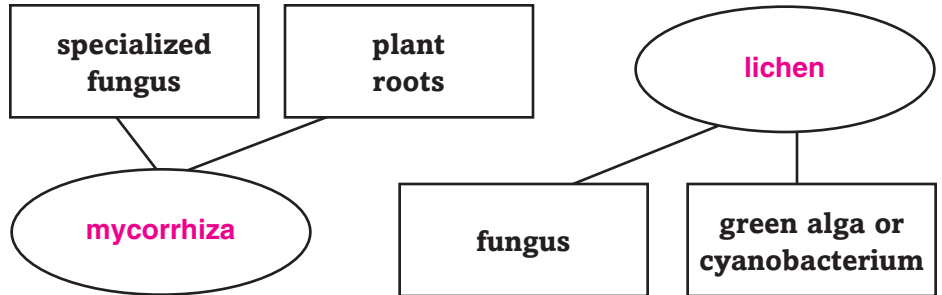
Fungi and Photosynthesizers

I found this information on page _____.

SE, pp. 587–589
RE, pp. 244–246

Details

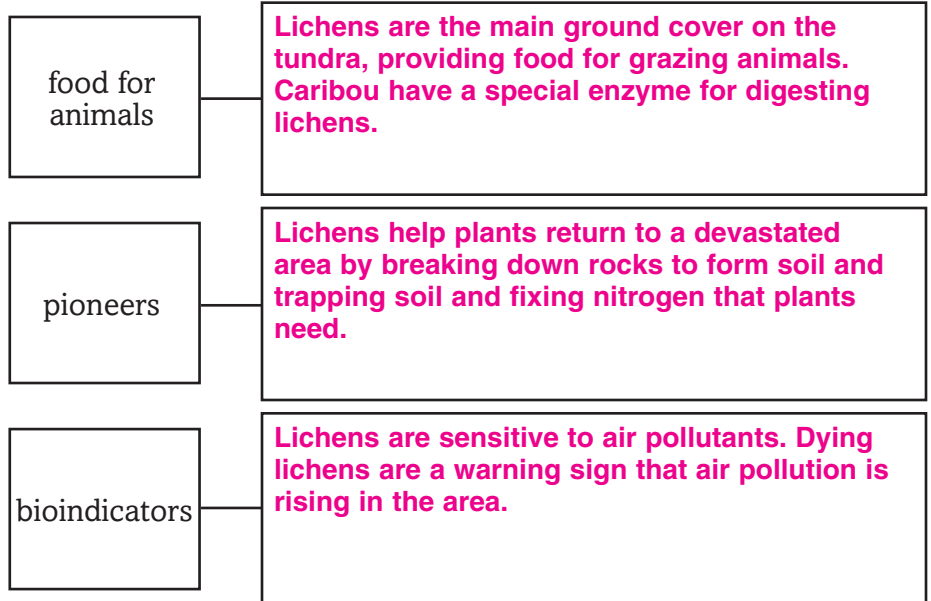
Identify the symbiotic relationships formed by the partners in the graphic organizer.



Complete the paragraph below to describe mycorrhizal relationships.

Infection by a fungal partner helps orchid seeds to germinate. The fungal partner of a *Eucalyptus* tree absorbs minerals for the tree. The tree can absorb more water because the hyphae of the fungus increase the surface area of the tree's roots. In return, the fungus receives carbohydrates and amino acids from the tree.

Analyze the benefits of lichens as . . .



Section 20.3 Ecology of Fungi (continued)

Main Idea

Fungi and Humans

I found this information on page _____.
SE, pp. 589–591
RE, p. 246

Details

Organize *the beneficial effects of fungi in the table below.*

Role of Fungi	Benefits to Humans
as decomposers	recycle nutrients; prevent dead organisms from littering the surface of Earth
in medicine	penicillin; treat high blood pressure, bleeding, migraine headaches; promote contractions during childbirth; help bodies of transplant patients avoid rejecting new organ
in foods	humans eat mushrooms and truffles; yeast used to make bread, beer, and wine; flavor cheeses and colas; used to make soy sauce
in bioremediation	used in environmental clean-up projects; decompose organic materials in pollutants, breaking them down into harmless substances

Describe *the harmful effects of fungi on each of the following.*

Plants	Humans
kill American elm and American chestnut trees; spread quickly from tree to tree; damage some crops	cause athlete's foot, ringworm, yeast infections, and oral thrush

SUMMARIZE

Compare and contrast mycorrhizae and lichens.

Accept all reasonable responses. Both involve symbiotic relationships between a fungus and another organism. A mycorrhizae is made up of a fungus and a plant, while a lichen is made up of a fungus and an algae or cyanobacteria.

Introduction to Plants

Before You Read

Use the “What I Know” column to list the things you know about plants. Then list the questions you have about plants in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Plants are found in many different environments. Describe some of the plants with which you are familiar. Identify the environment in which each lives.

Accept all reasonable responses.

Introduction to Plants

Section 21.1 Plant Evolution and Adaptations

Main Idea

Details

Scan Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

limiting factor

Use your book or dictionary to define limiting factor.

any abiotic or biotic factor that restricts the existence, numbers, reproduction, or distribution of organisms

New Vocabulary

Use your book or dictionary to define each term.

nonvascular plant

plants that do not have vascular tissues

seed

a plant organ of seed plants consisting of an embryo, a food supply, and a protective coat; protects the embryo from drying out

stomata

openings in the outer cell layers of leaves that enable the exchange of gases even with the presence of a waxy cuticle

vascular plant

plants that have vascular tissues; enables taller growth and survival on land

vascular tissue

tissues found in vascular plants composed of tubelike, elongated cells through which food, water, and other materials are transported throughout the plant; include xylem and phloem

Academic Vocabulary

dominant

Define dominant to show its scientific meaning.

most immediately noticeable

Section 21.1 Plant Evolution and Adaptations (continued)

Main Idea

Plant Evolution

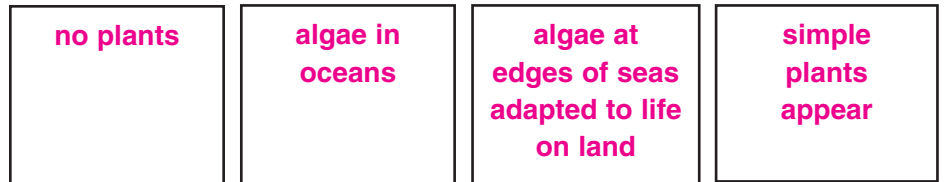
I found this information on page _____.

SE, p. 604
RE, pp. 247–248

Details

Sequence the evolution of plants by placing the following information in the correct boxes below.

- algae at edges of seas adapted to life on land
- no plants
- algae in oceans
- simple plants appear



Identify the 6 characteristics of the present-day members of the algae and plant groups.

- cell walls with cellulose
- chlorophyll in photosynthesis
- a cell plate during cell division
- similar genes for ribosomal DNA
- same types of enzymes in vesicle
- store food in the form of starch

Plant Adaptations to Land Environments

I found this information on page _____.

SE, pp. 605–607
RE, pp. 248–249

Organize the plant organs by completing the table below. The first row has been filled in for you.

	Location	Purpose	Plant organ?
cuticle	on stems and leaves	reduce water loss	no
leaf	grows from stem	photosynthesis, gas exchange	yes
root	bottom of stem	absorbs water and nutrients	yes
stem	middle of plant	provides support for growth	yes
seed	on plant	protects embryo from drying	yes

Section 21.1 Plant Evolution and Adaptations (continued)

Main Idea

Alternation of Generations

I found this information on page _____.
 SE, p. 607
 RE, pp. 249–250

Details

Compare the gametophyte generation and the sporophyte generation of plants. **Accept all reasonable responses.**

Gametophyte Generation	Sporophyte Generation
haploid	diploid
produces sperm and eggs	produced from the diploid zygote
sperm and eggs form a diploid zygote	multicellular
microscopic in size	produces spores
	usually dominant over the gametophyte generation

Plant Classification

I found this information on page _____.
 SE, p. 609
 RE, p. 250

Classify the following plant categories by writing an NV in front of nonvascular plants, an NS in front of seedless vascular plants, and a VS in front of vascular plants with seeds.

- | | |
|--------------------------|---------------------------|
| <u>VS</u> cycadophytes | <u>NV</u> anthocerophytes |
| <u>VS</u> anthophytes | <u>NV</u> bryophytes |
| <u>VS</u> coniferophytes | <u>VS</u> ginkgophytes |
| <u>NS</u> pterophytes | <u>VS</u> gnetophytes |
| <u>NV</u> hepaticophytes | <u>NS</u> lycophytes |

SUMMARIZE

Contrast how the sperm reaches the egg differently in seed plants than in non-seed plants.

Accept all reasonable responses. Seed plant's sperm can reach the egg without needing water.

In non-seed plants the sperm need a film of water in order to reach the egg, and require a wetter environment.

Introduction to Plants

Section 21.2 Nonvascular Plants

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about the diversity of plants.

Write three facts you discovered about the diversity of plants as you scanned the section.

1. **Accept all reasonable responses.** _____

2. _____

3. _____

Review Vocabulary

symbiosis

Use your book or dictionary to define symbiosis.

a relationship in which two organisms live together in a close association

New Vocabulary

thallose

Use your book or dictionary to define the following term.

a liverwort with a body resembling a fleshy, lobed structure

Section 21.2 Nonvascular Plants (continued)

Main Idea

Diversity of Nonvascular Plants

I found this information on page _____.

SE, pp. 610–612
RE, pp. 251–252

Details

Analyze *why nonvascular plants need to be near water.*

Nonvascular plants need water for life functions such as reproduction and photosynthesis. A steady supply of water is not available everywhere, so nonvascular plants need to be in moist habitats.

Model *and label an example of a sporophyte attached to a gametophyte.*

Sketches should resemble Figure 21.9 in the book, with sporophyte and gametophyte properly labeled.

Compare *characteristics of bryophytes, hepaticophytes, and anthocerophytes by completing the table below.*

Accept all reasonable responses.

	Description	Environment	Example
Bryophyta	small plants with leafy stems	variety of habitats	mosses, peat moss
Hepaticophyta	thallose body, shape of liverwort gametophyte looks like an animal's liver	grown on damp soil, tropical jungles, and places with dense fog	liverworts
Anthocerophyta	thallose body, shape of hornwort sporophyte looks like an animal's horn	moist environments	hornworts

Section 21.2 Nonvascular Plants (continued)

Main Idea

Details

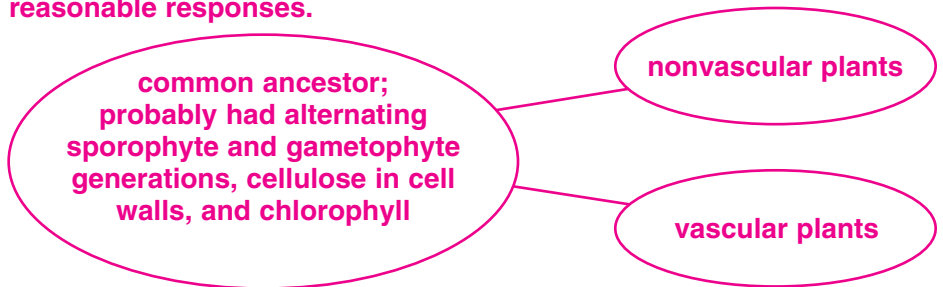
Organize the following terms with the correct definition below: *sporophyte, gametophyte, thallus, and rhizoid.*

Term	Definition
rhizoid	colorless, multicellular structures found in nonvascular plants; used to help anchor the plants to the soil
thallus	broad shape resembling a fleshy lobed leaf
sporophyte	diploid generation; grow attached to gametophytes
gametophyte	haploid generation; dominant generation

Conclude how anthocerophytes became known as hornworts.

The sporophyte of an anthocerophyte resembles the horn of an animal.

Create a graphic organizer that models the possible common ancestry of nonvascular and vascular plants. **Accept all reasonable responses.**



SUMMARIZE

Classify each group of nonvascular plants by naming one species of the group and one identifiable structure on that species. **Accept all reasonable responses.**

Bryophytes

Anthocerophytes

Hepaticophytes

Introduction to Plants

Section 21.3 Seedless Vascular Plants

Main Idea

Details

Predict the primary difference between the plants you read about in Section 2 of the chapter and the seedless vascular plants that you will read about in Section 3.

Accept all reasonable responses. Students should recognize that vascular tissue is the main difference between the two plant groups.

Review Vocabulary

spore

Use your book or dictionary to define *spore*.

a reproductive haploid cell with a hard outer coat that can develop into a new organism without the fusion of gametes

New Vocabulary

epiphyte

Use your book or dictionary to define each term.

a plant that lives anchored to an object or another plant

rhizome

thick, underground stem of a fern and other vascular plants; often functions as an organ for food storage

sorus

clusters of sporangia usually found on the surface of fern fronds

sporangium

a structure in ferns that forms spores; a cluster of sporangia form a sorus

strobilus

compact cluster of spore-bearing leaves produced by some non-seed vascular plants

Section 21.3 Seedless Vascular Plants (continued)

Main Idea

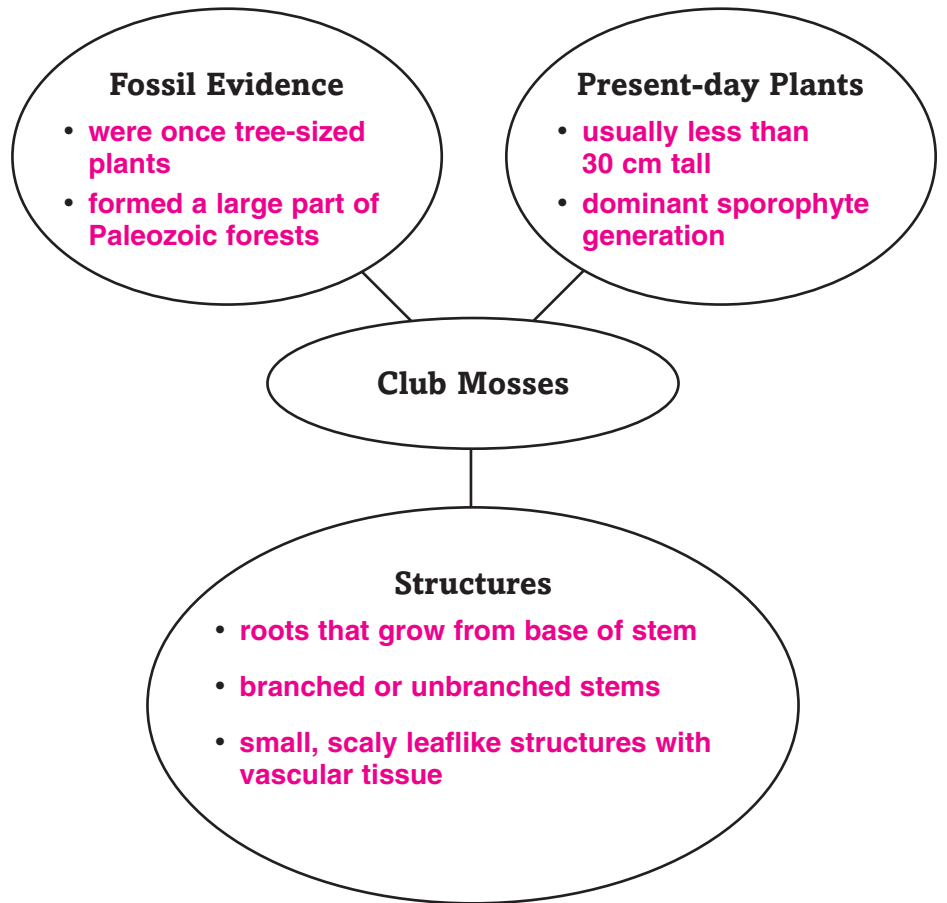
Diversity of Seedless Vascular Plants

I found this information on page _____.

SE, pp. 613–616
RE, pp. 253–254

Details

Compare *present-day club mosses with their ancestors and describe the structures found in present-day plants.*



Describe *the structures and common locations of ferns and horsetails.*

	Ferns	Horsetails
Structures	roots produced from sporophyte; rhizome used to store food; photosynthetic fronds; sporangium where spores form	ribbed, hollow stems with strobili at tips, scalelike leaves, roots
Locations	moist or dry environments	wet environments

Section 21.3 Seedless Vascular Plants (continued)

Main Idea _____ **Details** _____

Compare *the 2 divisions of non-seed vascular plants by completing the table below.*

Lycophyta	Pterophyta
club moss or spike moss; sporophyte generation is dominant; sporophyte has roots, stems, and leaflike structures; a single vein of vascular tissue runs through each leaflike structure	ferns and horsetails; become dormant when water is scarce; sporophyte generation has roots, stems, leaves, and rhizomes; the main stem is underground; first of vascular plants to have evolved leaves with veins of branching vascular tissue

Identify *each of the following plants or plant structures as lycophyte or pterophyte. Write L for lycophyte and P for pterophyte.*

- | | |
|---------------------------------|------------------------------|
| <u> L </u> club moss | <u> L and P </u> strobilus |
| <u> L </u> spike moss | <u> P </u> rhizome |
| <u> L </u> tropical tree fern | <u> P </u> frond |
| <u> P </u> sorus | <u> P </u> scouring rushes |
| <u> L </u> epiphyte | |

SUMMARIZE

Model the two main groups of non-seed vascular plants. Label the important features of each group and give an example of each one.

Accept all reasonable responses.

Introduction to Plants

Section 21.4 Vascular Seed Plants

Main Idea

Details

Scan the illustrations and read the captions. List two conclusions that you can draw about seeds and cones.

1. **Accept all reasonable responses.**

2.

Review Vocabulary

parasite

Use your book or dictionary to define parasite.

an organism that benefits at the expense of another organism

New Vocabulary

annual

Use your book or dictionary to define each term.

anthophyte that lives for one year or less

biennial

anthophyte that has a life span of two years

cone

reproductive structures of cycads and other gymnosperm plants;

may be male or female

cotyledon

structure of seed plant embryo that stores or absorbs food for the

developing embryo

perennial

able to live for several years and produce flowers and seed annually

Section 21.4 Vascular Seed Plants (continued)

Main Idea

Details

Diversity of Seed Plants

I found this information on page _____.
SE, pp. 617–621
RE, pp. 255–257

Summarize *the information about the divisions of seed plants by writing one or two sentences about division. Accept all reasonable responses.*

Division Cycadophyta: **Plants with cones evolved before plants with flowers. Cycads have soft stems consisting mostly of storage tissue. They live in the tropics or in subtropical zones.**

Division Gnetophyta: **Long-lived plants with unusual structural adaptations. Only one lives in the United States. *Welwitschia* takes moisture directly from fog, dew, or rain.**

Division Ginkgophyta: **One living species, *Ginkgo biloba*, has fern-shaped leaves with male and female structures on separate plants.**

Division Coniferophyta: **Cone-bearing plants with a wide range of sizes. Male and female cones grow on different branches. Leaves are adapted as waxy needles to survive cold, dry climates.**

Division Anthophyta: **Flowering plants, also known as angiosperms, widely distributed, anthophytes make up 75 percent of the plant kingdom. They are adapted to a wide variety of environments.**

Identify *the life span of each of the following types of plants and list one example of each.*

<p>Annual: one growing season; tomatoes</p>	<p>Biennial: two years; carrots</p>	<p>Perennial: several years; roses</p>
--	--	---

Section 21.4 Vascular Seed Plants (continued)

Main Idea

Details

Compare the characteristics of the different divisions of seed plants by completing the table below. The first one has been done for you.

	Reproduction	Environment	Examples
Cycadophyta	males produce pollen grains from cones, pollen produce motile sperm	tropics and subtropics	there are about 100 species today
Ginkgophyta	males produce pollen grains from cones, pollen produce motile sperm	male ginkgoes planted in cities—they tolerate smog and pollution	<i>Ginkgo biloba</i>
Gnetophyta	none given	found in deserts or mountains of Asia, Africa, North America, Central or South America	tropical climbing plants and shrub-like plants
Coniferophyta	reproductive structures produced in cones	found in many forest environments	pine, fir, spruce, juniper, cedar, redwood, yew, larch
Anthophyta	enclose seeds in a fruit	found in a variety of environments	fruit trees

CONNECT

Suppose you want to plant a vegetable garden. Research the soil conditions and overall climate in your area. Then describe a plant that should be successful, and explain your reasoning.

Accept all reasonable responses.

Tie It Together

FURTHER INQUIRY

You have read about the three types of plants: nonvascular plants, non-seed vascular plants, and seed plants. Now create a quick identification guide to common plants in your area. Your plant guide should be easy to read, yet contain basic information about the reproduction, environment, general structure, and significant characteristics of each plant. Include one plant from each type. Remember that a good plant guide has well-labeled diagrams. When you are finished, share your plant guide with your class.

Accept all reasonable responses.

Plant Structure and Function

Before You Read

Use the “What I Know” column to list the things you know about plant structure and function. Then list the questions you have about plant structure and function in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Describe some plants that you eat. Then describe some products that you use that come from plants.

Accept all reasonable responses.

Plant Structure and Function

Section 22.1 Plant Cells and Tissues

Main Idea

Details

Scan Section 1 of the chapter. Write two questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define adaptation.

adaptation

inherited characteristic that results from response to an environmental factor

New Vocabulary

Classify each vocabulary word in the list to the left as being a plant cell or a plant tissue. Then give a short description.

- collenchyma cell*
- companion cell*
- cork cambium*
- epidermis*
- ground tissue*
- guard cell*
- meristem*
- parenchyma cell*
- phloem*
- sclerenchyma cell*
- sieve-tube member*
- tracheid*
- vascular cambium*
- vessel element*
- xylem*

Cells (8 terms)	Tissues (7 terms)
<i>collenchyma</i> : long plant cell with unevenly thickened walls	<i>cork cambium</i> : lateral meristem that produces a tough protective covering for the surface of stems and roots
<i>companion cell</i> : cell with nucleus that helps transport sugars and other organic compounds through sieve tubes	<i>epidermis</i> : in plants, the outermost layer of flattened cells that covers and protects all parts of the plant
<i>guard cell</i> : controls the opening and closing of the stomata	<i>ground tissue</i> : plant tissue that is not meristemic, dermal, or vascular; has diverse functions, including photosynthesis, storage, and support
<i>parenchyma</i> : most abundant type of plant cell; spherical cell with thin, flexible cell walls and a large central vacuole; important for storage and food production	<i>meristem</i> : region of actively dividing cells
<i>sclerenchyma</i> : plant cell with rigid, thick walls; dies when mature, but still provides support	<i>phloem</i> : vascular plant tissue made of tubular cells joined end to end
<i>sieve-tube member</i> : tubular cell in phloem; lacks nucleus	<i>vascular cambium</i> : lateral meristem that produces new xylem and phloem cells in the stems and roots
<i>tracheid</i> : tubular cell in the xylem that has tapered ends; has small openings for transport of water and minerals	<i>xylem</i> : vascular plant tissue composed of tubular cells
<i>vessel element</i> : hollow, tubular cell in the xylem	

Section 22.1 Plant Cells and Tissues (continued)

Main Idea

Plant Cells

I found this information on page _____.

SE, pp. 632–633

RE, pp. 259–260

Details

Point out *three ways that plant cells differ from animal cells.*

Plant cells have a cell wall, a central vacuole, and can contain

chloroplasts.

Model *a plant cell. Label the cell wall, central vacuole, and chloroplast.*

Accept all reasonable responses. The cell wall, central vacuole, and chloroplast should be accurately labeled.

Compare *the three types of plant cells by completing the table below. Describe one characteristic and one function for each type of cell.*

	Parenchyma	Collenchyma	Sclerenchyma
Characteristic	sphere-shaped cells that have thin, flexible walls	long cells with unevenly thickened cell walls	thick and rigid cells that often die when they mature
Function	used for storage and food production	provide strength and support for surrounding tissue	provide support for plant

Plant Tissues

I found this information on page _____.

SE, pp. 634–638

RE, pp. 260–262

Summarize *the function of each of the following.*

epidermis: **covers and protects the body of a plant**

stomata: **control the exchange of gases**

guard cells: **control the opening and closing of stomata**

trichomes: **reduce the evaporation of water from the plant**

Section 22.1 Plant Cells and Tissues (continued)

Main Idea

I found this information on page _____.

SE, pp. 634–638
RE, pp. 260–262

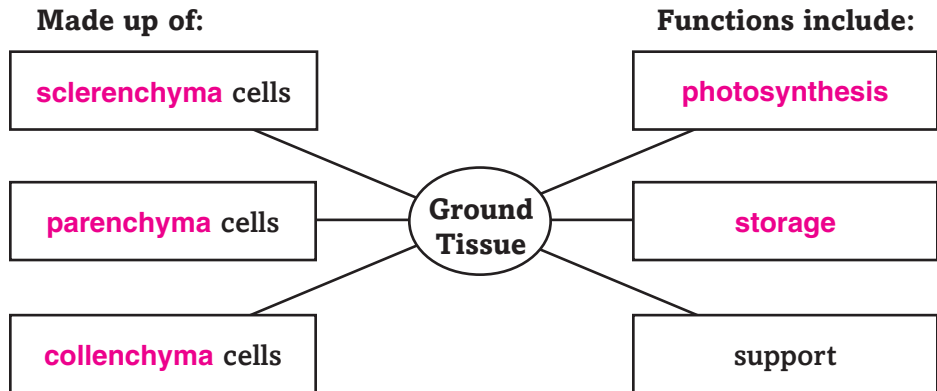
Details

Model a sketch of phloem tissue. Label the following parts.

- companion cell
- sieve plate
- sieve tube member

Sketches should resemble SE Figure 22.7, and the three parts should be accurately labeled.

Analyze ground tissue by completing the organizer below.



SUMMARIZE

Model a plant. Include captions that explain the three types of cells as well as the four types of tissues. **Accept all reasonable responses.**

Plant Structure and Function

Section 22.2 Roots, Stems, and Leaves

Main Idea

Details

Skim Section 2 of the chapter. For each structure below, list two functions. **Accept all reasonable responses.**

Roots: _____

Stems: _____

Leaves: _____

Review Vocabulary

Use your book or dictionary to define apical meristem.

apical meristem

tissue at the tips of roots and stems that produce cells

New Vocabulary

Write the correct term in the left column for each definition below.

pericycle

layer of cells just within the endodermis that gives rise to lateral roots

endodermis

single layer of cells that forms a waterproof seal around a root's vascular tissue

palisade mesophyll

column-shaped cells that contain many chloroplasts; most photosynthesis takes place here

transpiration

loss of water through stomata

root cap

tough, protective layer of parenchyma cells that covers the tip of a root

cortex

layer of ground tissue in the root that is involved in the transport of water

petiole

stalk that joins the leaf blade to the stem

spongy mesophyll

layer of irregularly shaped, loosely packed cells through which oxygen, carbon dioxide, and water vapor move

Section 22.2 Roots, Stems, and Leaves (continued)

Main Idea

Details

Roots

I found this information on page _____.

SE, pp. 639–641
RE, pp. 263–264

Compare the two main types of root systems. Describe taproots and fibrous roots, then make a sketch of each type.

Taproots	Fibrous Roots
Definition: single, thick structures with smaller branching roots	Definition: have many small branching roots that grow from a central point
Sketch: Accept all reasonable responses.	Sketch: Accept all reasonable responses.

Sequence the layers of cells of roots beginning with the outermost layer.

 3 endodermis 1 epidermis 4 pericycle 2 cortex

Stems

I found this information on page _____.

SE, pp. 642–643
RE, pp. 264–265

Distinguish among the three stems that store food.

A tuber is a swollen stem that has buds from which new plants grow.

A corm is a short thickened stem surrounded by leaf scales. Rhizomes also store food.

Summarize the information on stems in the blanks in the paragraph below.

Stems vary in their size and strength . The main function of a plant's stem is support of the leaves and reproductive structures. They also transport water and dissolved substances throughout the plant. The annual growth of bundles of xylem and phloem in the stem can lead to the formation of growth rings that reveal the age of the plant. Some stems, such as tubers , bulbs, and corms , store food .

Section 22.2 Roots, Stems, and Leaves (continued)

Main Idea

Leaves

I found this information on page _____.
SE, pp. 644–647
RE, pp. 265–266

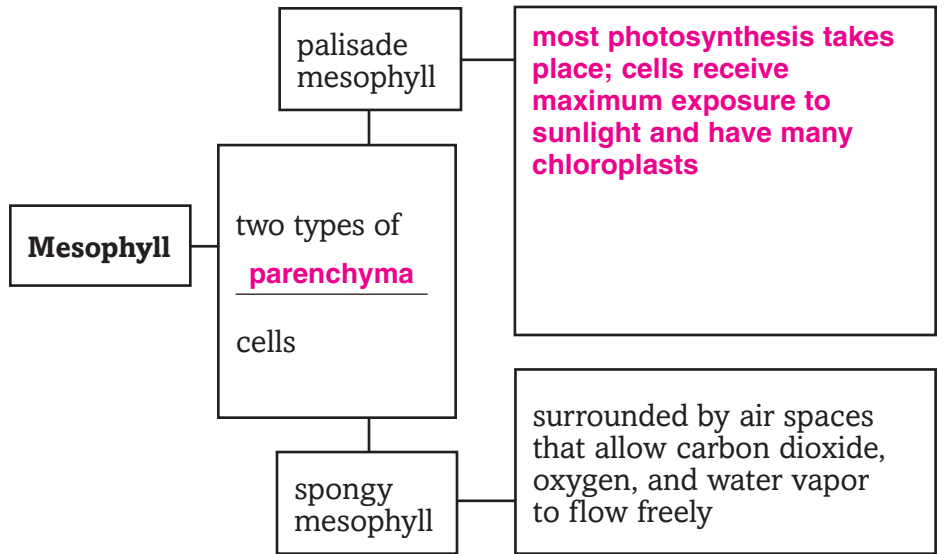
Details

Compare the shapes of leaves. Give a brief description of a simple and a compound leaf, and provide one example of each.

simple leaf: **blade that is not divided; maple leaf**

compound leaf: **blade that is divided into leaflets; walnut leaf**

Summarize the role of mesophyll by completing the organizer below.



Analyze two plants with leaves that have functions besides photosynthesis. Briefly describe these functions.

1. **Cacti spines help reduce water loss and provide protection from plant-eaters.**
2. **Carnivorous plants have leaves that can trap insects or small animals.**

SUMMARIZE

Use an analogy to explain how plant structures are adapted to their functions.

Accept all reasonable responses.

Plant Structure and Function

Section 22.3 Plant Hormones and Responses

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables.
- Look at all pictures and read the captions.

Write two facts you discovered about plant hormones.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

active transport

Use your book or dictionary to define active transport.

the movement of materials across the plasma membrane against a concentration gradient; requires energy

New Vocabulary

auxins

Use your book or dictionary to define each term.

group of plant hormones that promote cell elongation

cytokinins

group of hormones that stimulate mitosis and cell division

ethylene

plant hormone that promotes the ripening of fruit

gibberellins

group of plant hormones that cause plants to grow taller by stimulating cell elongation

nastic response

responsive movement of a plant not dependent on the direction of the stimulus

tropism

growth response of a plant to an external stimulus

Section 22.3 Plant Hormones and Responses (continued)

Main Idea

Plant Hormones

I found this information on page _____.
 SE, pp. 648–650
 RE, pp. 267–268

Details

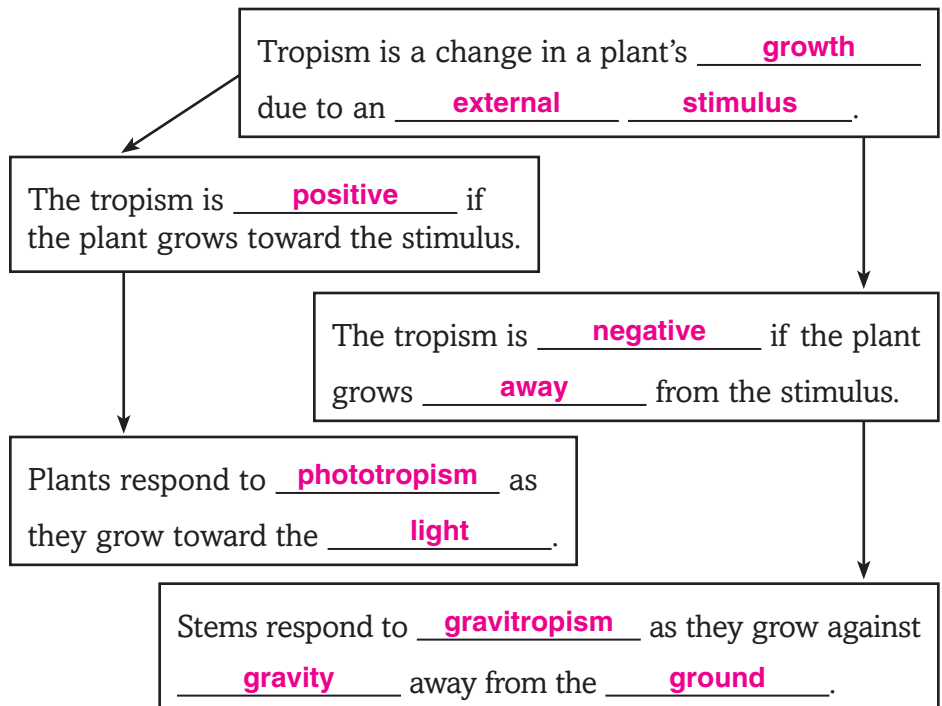
Compare four plant hormones by completing the table below.

Hormone	How This Hormone Regulates Growth	Characteristic of This Hormone	Another Benefit of This Hormone
Auxin	causes cells to lengthen or elongate	produced in apical meristems	delays fruit formation and keeps side branches from growing
Gibberellin	helps cells elongate	some dwarf plants do not produce these	increases the rate at which seeds begin to grow and buds develop
Cytokinin	stimulates the production of proteins needed for mitosis	effects are enhanced by other hormones	plant cells would never divide without it
Ethylene	causes cell walls to weaken and soften	is a gas made of carbon and hydrogen	speeds ripening of fruits

Plant Responses

I found this information on page _____.
 SE, pp. 650–651
 RE, p. 268

Summarize the two types of tropisms in the organizer below.



Section 22.3 Plant Hormones and Responses (continued)

Main Idea

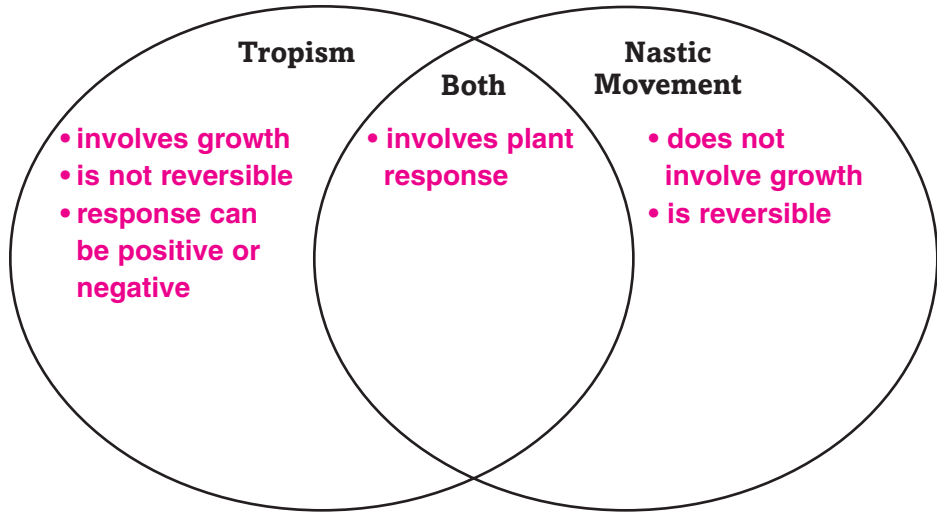
I found this information on page _____.

SE, pp. 650–651
RE, p. 268

Details

Compare *tropism* and *nastic movement*. Place each characteristic in the correct location in the Venn diagram below.

- does not involve growth
- involves growth
- involves plant response
- is reversible
- is not reversible
- response can be positive or negative



Classify each of the following as an example of *tropism* or *nastic movement*.

nastic movement Venus flytrap closes on an insect.

tropism Sweet pea tendrils climb a fence.

tropism Plant grows toward a lamp.

nastic movement Mimosa pudica leaflets become limp when touched.

tropism Plant roots grow into the soil.

CONNECT

Farmers often use hormones to improve their crop yield. Describe a hormone that a farmer might use and how the hormone can help increase crop output.

Accept all reasonable responses. Farmers use gibberellins to increase the formation of fruit.

Farmers might pick unripe fruit and use ethylene to ripen it later. Farmers can use auxins to control the ripening of their fruits.

Reproduction in Plants

Before You Read

Use the “What I Know” column to list the things you know about plant reproduction. Then list the questions you have about reproduction in plants in the “What I Want to Find Out” column.

Accept all reasonable responses.

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Explain how you think life on Earth would be affected if plants were to stop reproducing.

Accept all reasonable responses.

Reproduction in Plants

Section 23.1 Introduction to Plant Reproduction

Main Idea

Details

Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

flagellated

Use your book or dictionary to define flagellated.

having one or more flagella that propel a cell by whiplike motion

New Vocabulary

chemotaxis

Use your book or dictionary to define each term.

movement of moss sperm through a film of water to the archegonia in response to chemicals produced by archegonia

heterosporous

in conifers, the production of two types of spores that develop into male or female gametophytes

megaspore

female spore formed by some plants; develops into a female gametophyte

micropyle

opening in the ovule through which the pollen tube enters

microspore

male spore formed by some plants; develops into a male gametophyte

prothallus

tiny heart-shaped fern gametophyte that grows from spores; contains chloroplasts

protonema

in mosses, a small green filament of haploid cells that develops from a spore; develops into the gametophyte

vegetative reproduction

type of asexual reproduction in plants where a new plant is produced from existing plant organs or parts of organs

Section 23.1 Introduction to Plant Reproduction (continued)

Main Idea

Vegetative Reproduction

I found this information on page _____.
 SE, pp. 662–663
 RE, p. 269

Details

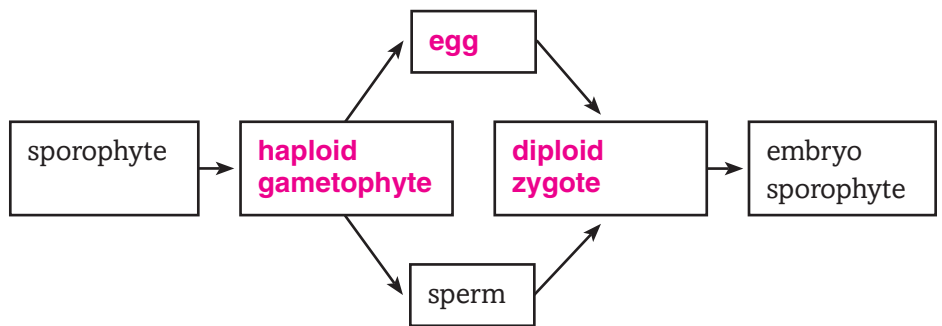
List three examples of vegetative reproduction.

1. Accept reasonable responses; the text refers to moss plants growing from fragments; liverworts reproducing from gemmae cups;
2. strawberries from stolons; potatoes from eyes; and various plants from tissue culture technique.
3. _____

Alternation of Generations

I found this information on page _____.
 SE, p. 663
 RE, p. 270

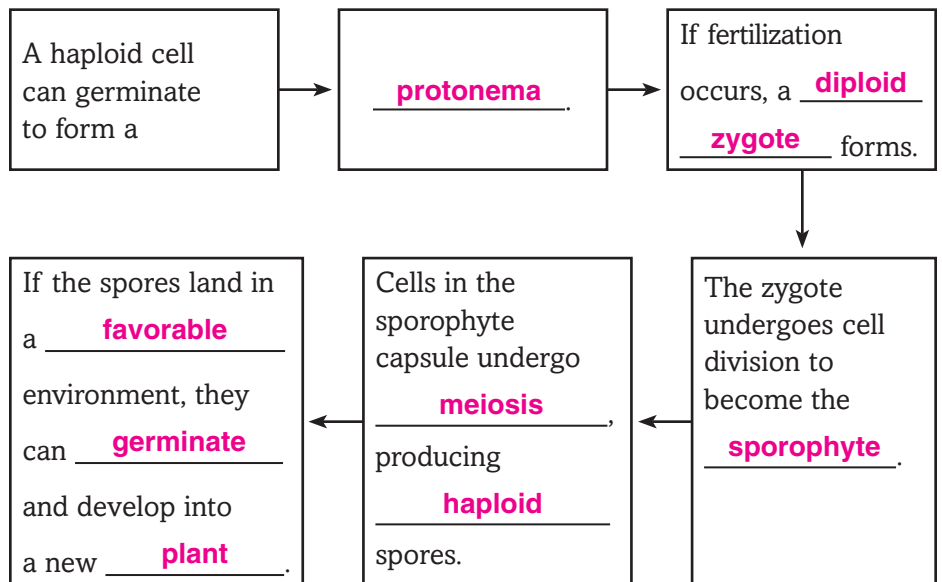
Summarize the alternation of generations in the flowchart below. Use the words eggs, diploid zygote, and haploid gametophyte.



Moss Reproduction and Life Cycle

I found this information on page _____.
 SE, p. 664
 RE, p. 271

Model the life cycle of mosses by completing the flowchart below.



Section 23.1 Introduction to Plant Reproduction (continued)

Main Idea

Fern Reproduction and Life Cycle

I found this information on page _____.

SE, p. 665
RE, p. 272

Conifer Reproduction and Life Cycle

I found this information on page _____.

SE, pp. 665–667
RE, p. 273

Details

Sequence the life cycle of ferns by numbering the following steps in the order that they occur. The first and last steps have been done for you.

- 1 A spore develops to form a prothallus.
- 8 If pieces of the rhizome break off, new fern plants can develop from the pieces by vegetative reproduction.
- 4 If fertilization occurs, the resulting diploid zygote develops into a sporophyte.
- 6 The prothallus dies and decomposes as the sporophyte matures.
- 7 The mature fern consists of rhizomes from which roots and fronds grow.
- 3 Sperm released by antheridia swim to eggs in archegonia.
- 5 As soon as the sporophyte produces green fronds, it can carry on photosynthesis and live on its own.
- 2 The prothallus produces archegonia and antheridia on its surface.
- 9 The cycle continues when sporangia develop on the fronds, and spores are released.

Compare female and male conifer cones in the table below. List two facts about each type of cone. **Accept all reasonable responses.**

Female Cones	Male Cones
larger than male cones; two ovules form on each scale; megaspores eventually become female gametophyte; depend on sporophyte for protection and nutrition	sporangia undergo meiosis to microspores; pollen grains transported on air currents

SUMMARIZE

Create a graphic organizer to compare the reproductive structure of mosses, ferns, and conifers. **Accept all reasonable responses.**

Reproduction in Plants

Section 23.2 Flowers

Main Idea

Details

Skim Section 2 of the chapter. Write two facts you discover about flower organs or adaptations.

1. **Accept all reasonable responses.**
2. _____

Review Vocabulary

Use your book or dictionary to define nocturnal.

nocturnal

active only at night

New Vocabulary

Use your book or dictionary to define the following term.

photoperiodism

flowering plant response to differences in the length of night and day

Classify each term as being a type of plant or a part of a plant. Write a brief definition of each term.

	Type of Flowering Plant (4 terms)	Part of Flowering Plant (4 terms)
<i>day-neutral plant</i>	day-neutral plant: plant that flowers over a range in the number of daylight hours	petal: leaflike flower organ, usually brightly colored structure at the top of a stem
<i>intermediate-day plant</i>	intermediate-day plant: plant that flowers as long as the number of hours of darkness is neither too great nor too few	pistil: female reproductive organ of a flower
<i>long-day plant</i>	long-day plant: plant that flowers when the number of daylight hours is longer than its critical period	sepal: leaflike, usually green structure that encircles the top of a flower stem below the petals and protects the bud
<i>petal</i>		
<i>pistil</i>		
<i>sepal</i>		
<i>short-day plant</i>	short-day plant: plant that flowers when the number of daylight hours is shorter than its critical period	stamen: male reproductive organ of a flower consisting of an anther and a filament
<i>stamen</i>		

Section 23.2 Flowers (continued)

Main Idea

Details

Flower Organs

I found this information on page _____.

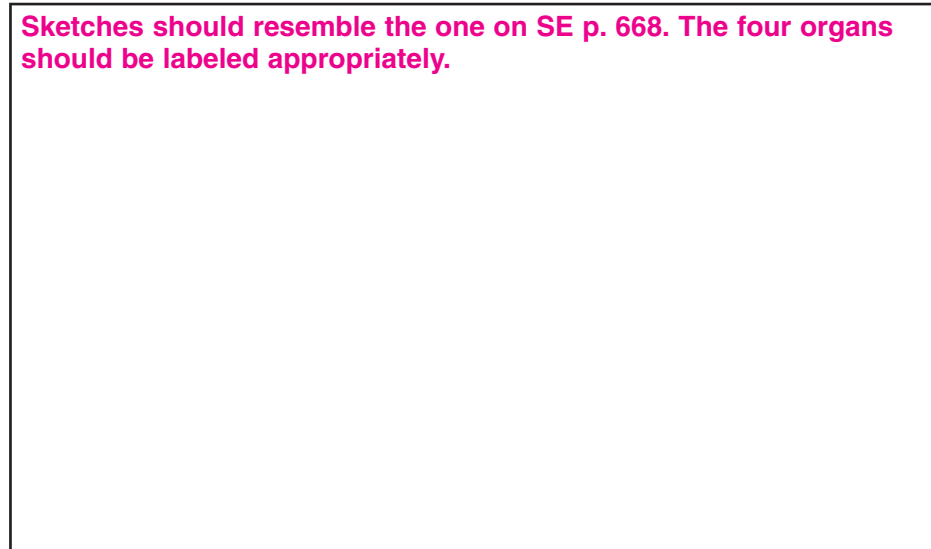
SE, pp. 668–669
RE, pp. 274–275

Compare the organs of a flower in the table below. Give the location and function for each organ.

Organ	Location	Function
Petal	top of stem	attracts pollinators; provides surface for insect pollinators to rest on
Stamen	inside flower; anther at top of filament	male reproductive organ
Sepal	outermost part of flower	protective covering for flower bud
Pistil	attached to stem inside flower	female reproductive organ

Model a complete flower and label the petals, sepals, stamen, and pistil.

Sketches should resemble the one on SE p. 668. The four organs should be labeled appropriately.



Section 23.2 Flowers (continued)

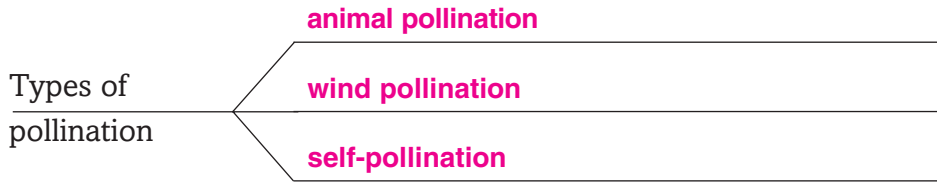
Main Idea

Details

Flower Adaptations

I found this information on page _____.
SE, pp. 669–673
RE, pp. 275–277

Identify the three types of pollination.



Compare the four types of plants based on their critical periods.

Plant Type	Flowering Season	Characteristic	Example
Short-day plant	winter, spring, or fall	flower when the number of hours of darkness is greater than the critical period	poinsettias, pansies, tulips, chrysanthemums
Long-day plant	summer	flower when the number of hours darkness is less than the critical period	lettuce, spinach, aster, coneflowers, potatoes
Day-neutral plant	any season	flower over a range in the number of hours of darkness	roses, corn, cotton, buckwheat, tomatoes
Intermediate-day plant	any season	will flower if the number of hours of darkness is neither too great or too few	sugarcane, some grasses

SUMMARIZE

Collect a flower from your home or neighborhood. On a separate sheet of paper, draw a diagram of the plant and label the major parts. List its critical period, flower adaptations, and methods of pollination. **Accept all reasonable responses.**

Reproduction in Plants

Section 23.3 Flowering Plants

Main Idea

Details

Scan the illustrations, and read the captions in Section 3 of the chapter. List two facts you learn about seeds.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

cytoskeleton

Use your book or dictionary to define cytoskeleton.

the long, thin protein fibers that form a cell's framework

New Vocabulary

dormancy

Use your book or dictionary to define each term.

period of inactivity in a mature seed prior to germination

endosperm

food storage tissue in an anthophyte seed that supports development of the growing embryo

germination

beginning of the development of an embryo into a new plant

hypocotyl

portion of the stem nearest the seed in a young plant

polar nuclei

two nuclei in the sac of a flowering plant that become the triploid

endosperm when joined with a sperm during double fertilization

radicle

embryonic root of an anthophyte embryo; the first part of the young

sporophyte to emerge during germination

seed coat

protective tissue around a seed, formed from outer layers of the ovule

Academic Vocabulary

compatible

Define compatible to show its scientific meaning.

capable of functioning together

Section 23.3 Flowering Plants (continued)

Main Idea

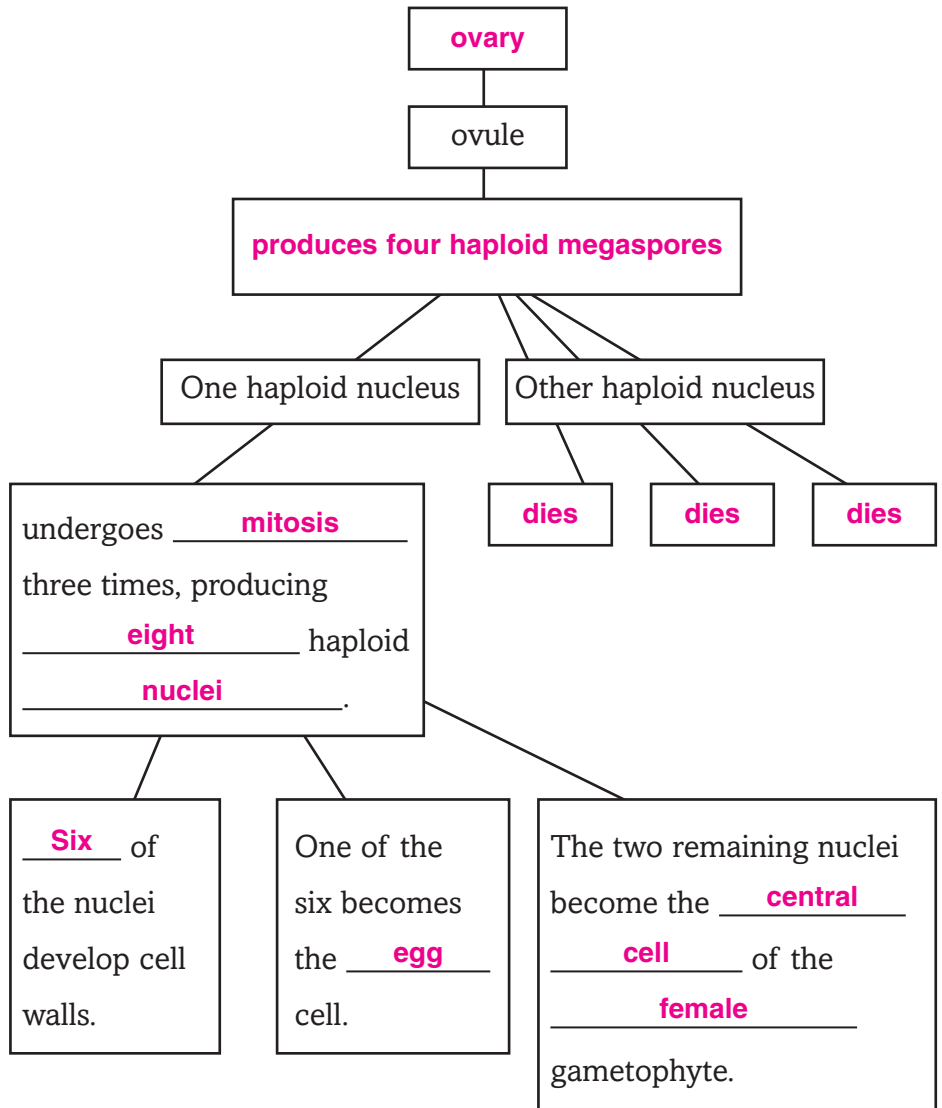
Details

Life Cycle

I found this information on page _____.

SE, pp. 674–676
RE, pp. 278–280

Summarize the development of the female gametophyte by completing the flowchart below.



Compare how the two haploid nuclei are involved in fertilization.

Tube Nucleus	Generative Nucleus
directs the growth of the pollen tube down through the pistil to the ovary	divides by mitosis, producing two sperm nuclei, which move down the pollen tube to the microphyle

Section 23.3 Flowering Plants (continued)

Main Idea

Details

Results of Reproduction

I found this information on page _____.
 SE, pp. 676–679
 RE, pp. 280–282

Compare the characteristics of seeds and fruits in the table below.

	Structure	Formation	Benefit to Plant
Seed	contains an embryo and a food supply covered by a protective coat	begins when fertilization occurs; zygote divides and develops into embryo plant; triploid central cell develops into endosperm; wall of ovule becomes seed coat	ensures future generation
Fruit	includes the ripened ovary of a flower	as seed forms, the ovary becomes the fruit	protection of seeds, dispersal of seeds, ensures future generation

Analyze the specific conditions that the following seeds need to germinate.

some conifer and wildflower seeds: must be exposed to fire

apple seeds: need a period of freezing temperatures

coconut seeds: have to soak in salt water

SUMMARIZE

Create a flowchart to describe the life cycle of flowering plants.

Accept all reasonable responses.

Introduction to Animals

Before You Read

Use the “What I Know” column to list the things you know about animals. Then list the questions you have about animals in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Describe at least three characteristics that distinguish animals from plants.

Accept all reasonable responses.

Introduction to Animals

Section 24.1 Animal Characteristics

Main Idea

Details

Scan the titles, boldfaced words, pictures, figures, and captions in Section 1 of the chapter. Write two facts you discovered about animals as you scanned the section.

1. **Accept all reasonable responses.**
2. _____

Review Vocabulary

Use your book or dictionary to define protist.

protist

diverse group of unicellular or multicellular eukaryotes that lack complex organ systems and live in moist environments

New Vocabulary

Compare the terms in the table by defining them side by side.

blastula
endoskeleton
exoskeleton
external fertilization
gastrula
hermaphrodite
internal fertilization
invertebrate
vertebrate
zygote

vertebrate animal with an endoskeleton and a backbone	invertebrate animal without a backbone
endoskeleton internal skeleton	exoskeleton hard or tough outer covering that provides a framework of support
internal fertilization sperm and egg combine inside the animal's body	external fertilization sperm and egg combine outside the animal's body
blastula fluid-filled ball of cells formed during early embryo development	gastrula two-cell-layer sac with an opening at one end, formed when blastula cells move inward during embryo development
hermaphrodite produces both eggs and sperm in the same body	
zygote fertilized egg cell	

List the cell layers from the most interior to the most exterior. Identify the tissues that develop from each layer.

ectoderm
endoderm
mesoderm

Layers of Cells in the Gastrula
ectoderm: nervous tissue and skin
endoderm: digestive organs and lining of the digestive tract
mesoderm: muscle tissue, circulatory system, excretory system, and, in some animals, respiratory system

Section 24.1 Animal Characteristics (continued)

Main Idea

General Animal Features and Feeding and Digestion

I found this information on page _____.

SE, p. 692
RE, p. 283

Support

I found this information on page _____.

SE, p. 693
RE, p. 283

Habitats

I found this information on page _____.

SE, p. 693
RE, p. 284

Animal Cell Structure and Movement

I found this information on page _____.

SE, p. 694
RE, p. 284

Details

Identify *the following facts about animals.*

earliest true animals from which all others likely evolved

choanoflagellates

features that mark the branching points of the evolutionary tree

adaptations in form

way that animals differ from plants in obtaining food

Plants make their own food from sunlight; animals get their food by eating organisms.

Classify *each animal below as having an endoskeleton or an exoskeleton.*

beetle **exoskeleton** shark **endoskeleton**

horse **endoskeleton** cicada **exoskeleton**

Analyze *each habitat below. Give an example of an adaptation that enables an animal to live in that habitat.*

Habitat	Adaptation
Polar region	Accept all reasonable responses.
Ocean	
Rain forest	

Summarize *the important differences between animals and plants.*

• Accept all reasonable responses.

•

•

•

Section 24.1 Animal Characteristics (continued)

Main Idea

Details

Reproduction

I found this information on page _____.

SE, pp. 695–697
RE, pp. 284–285

Sequence *the development of an animal from fertilization to birth by completing the following paragraph.*

During **sexual** reproduction, fertilization occurs when an **egg cell** is penetrated by a **sperm cell**, forming a **zygote**. After **mitosis** and cell division begin, the egg is called an embryo. The cells form a fluid-filled ball called a **blastula**. Some cells migrate inside, forming a cup-shaped structure called the **gastrula**, which has two cell layers. The layer on the outside is the **ectoderm** and will form the **nerve tissue and skin**. The inner layer is called the **endoderm**, which will form **the animals’s digestive tract lining and digestive organs**.

All animals retain the two embryonic cell layers throughout their lives, but others develop a third cell layer, the **mesoderm**, between the other layers. This layer forms **the muscles and other systems of the body**.

Identify *the tissue types into which each layer develops.*

Cell Layer	Forms These Tissues
Mesoderm	muscle, circulatory, excretory, sometimes respiratory
Ectoderm	skin, nerve
Endoderm	digestive tract lining and organs

SUMMARIZE

Next to each prefix, write a vocabulary word from this section that uses this prefix. Then write what you think the prefix means.

endo- **endoskeleton or endoderm; inside**

exo- **exoskeleton; outside**

meso- **mesoderm; middle**

Introduction to Animals

Section 24.2 Animal Body Plans

Main Idea

Details

Scan the figures and read the captions in Section 2 of the chapter. Write two facts that you discovered about animal body plans.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define phylogeny.

phylogeny

evolutionary history of a species based on comparative relationships of structures and comparisons of modern life-forms with fossils

New Vocabulary

Compare the terms within each table by writing their definitions.

acoelomate

anterior

bilateral symmetry

cephalization

coelom

deuterostome

dorsal

posterior

protostome

pseudocoelom

radial symmetry

symmetry

ventral

anterior head end of bilateral animals where sensory organs are often located	posterior tail end of bilaterally symmetrical animals	dorsal upper surface of bilaterally symmetrical animals	ventral lower surface of bilaterally symmetrical animals
--	--	--	---

cephalization **body plan that tends to concentrate nervous tissue and sensory organs at the anterior end of the animal**

symmetry **term describing the arrangement of an animal's body structures**

bilateral can be divided down the body's length into two similar right and left halves	radial can be divided along any plane, through a central axis, into roughly equal halves
---	---

protostome animal with a mouth that develops from the opening in the gastrula	deuterostome animal whose mouth develops from cells other than those at the opening of the gastrula
--	--

coelom fluid-filled body cavity completely surrounded by mesoderm	acoelomate an animal without a coelom	pseudocoelom fluid-filled body fluid-filled body with mesoderm
--	--	---

Section 24.2 Animal Body Plans (continued)

Main Idea

Details

Evolution of Animal Body Plans and Development of Tissues

I found this information on page _____.
SE, pp. 698–699
RE, pp. 286–287

Symmetry

I found this information on page _____.
SE, p. 700
RE, pp. 287–288

Model an evolutionary tree, and show what the trunk, branches, and branching points represent. **Accept all reasonable responses.**

Analyze the evolutionary sequence by completing the sentences.

The earliest animals had **asymmetrical** body plans, as do their modern descendants, such as **sponges**.



Later, sea stars, hydras, and other animals appeared with **radial symmetry**. They were able to detect and capture **prey** coming from any direction.



The last body plan to develop was **bilateral symmetry** with a head at the **anterior** end of the body and a tail at the **posterior** end of the body.

Model a bilaterally symmetrical being. Then create characters showing asymmetry and radial symmetry. Use your imagination. List the number of arms, legs, eyes, etc., that each character has. **Accept all reasonable responses.**

Bilateral Symmetry	Radial Symmetry	Asymmetry
body parts: 2 eyes, 2 legs, 2 arms, 1 nose in center	body parts:	body parts:

Section 24.2 Animal Body Plans (continued)

Main Idea

Body Cavities

I found this information on page _____.

SE, p. 701
RE, p. 288

Details

Model each type of body cavity labeled below. **Diagrams should resemble SE p. 701. Accept reasonable variations.**

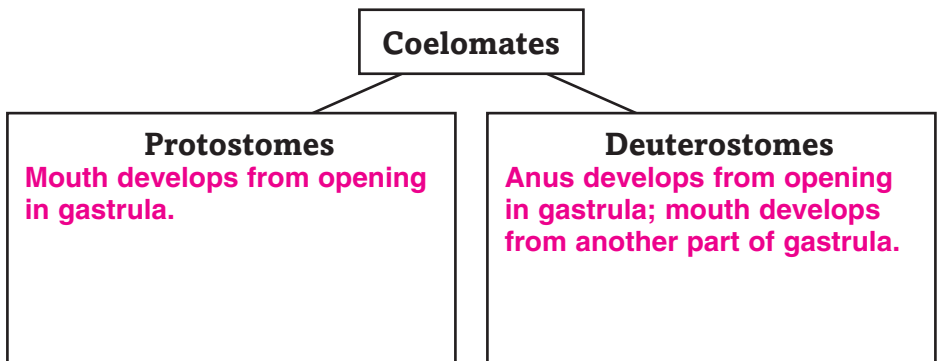
Acoelomate	Pseudocoelomate	Coelomate

Development in Coelomate Animals

I found this information on page _____.

SE, p. 703
RE, p. 289

Compare mouth development in the two major lines of coelomates.



Segmentation

I found this information on page _____.

SE, p. 703
RE, p. 289

Analyze two advantages of segmentation.

1. animal can survive damage to one segment; other segments
might be able to take over functions of damaged segment
2. movement more effective because segments can move
independently

SUMMARIZE

Describe the general evolutionary trend of animal body parts. Explain your description. **Accept all reasonable responses.**

The general trend is from simple to complex. Early animals lacked true tissues. As animals evolved, tissues developed. Tissues evolved into specialized tissues and organ systems.

Introduction to Animals

Section 24.3 Sponges and Cnidarians

Main Idea

Details

Skim Section 3 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define diploid.

diploid

cell with two of each kind of chromosome _____

New Vocabulary

Use your book or dictionary to define each term.

cnidocyte

stinging cell _____

filter feeder

organism that gets its food by filtering small particles from water _____

gastrovascular cavity

in cnidarians, large cavity where digestion takes place _____

medusa

cnidarian body form in which the body is umbrella-shaped with tentacles that hang down _____

nematocyst

capsule holding a coiled, threadlike tube containing poison and barbs _____

nerve net

nervous system of cnidarians that conducts impulses to and from all parts of the body _____

polyp

cnidarian body form in which the body is tube-shaped with a mouth surrounded by tentacles _____

sessile

organism that attaches to one place and stays there _____

Academic Vocabulary

Define survive to show its scientific meaning.

survive

to remain alive _____

Section 24.3 Sponges and Cnidarians (continued)

Main Idea

Details

Sponges

I found this information on page _____.

SE, pp. 705–709
RE, pp. 290–292

Model a sponge. Use the figure in your book to help you. Label the six parts that are listed in the table below on your diagram. Then describe the function of each part in the table below.

Diagrams should resemble the illustration on SE p. 706. Accept all reasonable responses.

Sponges	
Body Part	Function of Body Part
Osculum	water and wastes expelled through this mouthlike opening at the top of the sponge
Epithelial-like cells	thin, flat cells that contract (and close pores) in response to touch or an irritating chemical
Collar cells	cells that line the interior of the sponge; their agella whip back and forth to draw in water
Pores	cells that surround pores and allow water (with food and oxygen) into the sponge's body
Archaeocytes	carry nutrients to other cells, aid in reproduction, and produce spicule chemicals
Spicules	small, needlelike structures between cell layers that form the support structure

Section 24.3 Sponges and Cnidarians (continued)

Main Idea _____ **Details** _____

Cnidarians

I found this information on page _____.

SE, pp. 710–715
RE, pp. 292–294

Compare a polyp with a medusa by filling in the table.

	Polyp	Medusa
Body shape	tubelike	umbrella (bell)
Position of mouth	top side	underside
Position of tentacles	top side	underside

Model the complete life cycle of a jellyfish.

Diagrams should resemble SE p. 712. Accept all reasonable responses.

SUMMARIZE

Compare cnidarians and sponges.

Accept all reasonable responses. Both groups have one body opening and two cell layers, although cnidarian cell layers are organized into tissues. Cnidarians have radial symmetry, but sponges are asymmetrical. Most cnidarians have polyp and medusa stages in their life cycle. Most sponges have the same form throughout their life cycle.

Worms and Mollusks

Before You Read

Use the “What I Know” column to list the things you know about worms and mollusks. Then list the questions you have about these organisms in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Even the simplest organism has a role in the ecological community. Hypothesize the role of mollusks in their ecosystems. Why would people need to know about worms?

Accept all reasonable responses.

Worms and Mollusks

Section 25.1 Flatworms

Main Idea

Details

Scan the illustrations and read the captions in Section 1 of the chapter. List three characteristics of flatworms that you discovered.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define acoelomate.

acoelomate

an animal that has no body cavity _____

New Vocabulary

Use your book or dictionary to define each term.

flame cells

in flatworms, bubblelike cells lined with cilia that help move water and excretory substances out of the body _____

ganglion

group of nerve cell bodies that coordinates incoming and outgoing nerve signals in flatworms _____

pharynx

in planarians, the tubelike, muscular organ that extends from the mouth; aids in feeding and digestion _____

proglottid

a section of a tapeworm that contains muscles, nerves, flame cells, and male and female reproductive organs _____

regeneration

replacement or regrowth of missing body parts _____

scolex

knob-shaped head of a tapeworm, with hooks and suckers that attach to the intestinal lining of a host _____

Section 25.1 Flatworms (continued)

Main Idea

Details

Body Structure

I found this information on page _____.

SE, pp. 726–728

RE, pp. 295–297

Summarize facts about flatworms in the table.

Accept all reasonable responses.

Size Range 1mm to several meters	Number of Species about 20,000
Preferred Environments freshwater, marine, moist land and inside living bodies	Adaptations for Movement of Free-living Flatworm cilia on undersides, mucous production
Diet of a Free-living Flatworm dead or slow-moving organisms	Symmetry bilaterally symmetrical
What Happens When Free-living Flatworms Are Damaged can regenerate, or grow new body parts	Adaptations for Parasitic Lifestyle hooks and suckers, reduced or no digestive system

Model a flatworm. Label at least nine body parts.

Diagrams should resemble SE p. 727. Accept all reasonable responses.

Section 25.1 Flatworms (continued)

Main Idea

Diversity of Flatworms

I found this information on page _____.

SE. pp. 729–730
RE, p. 297

Details

Identify the correct flatworm class for each characteristic below and write it in the appropriate box. Some characteristics may belong in more than one class.

- parasitic
- free-living
- scolex
- eyespots
- flukes
- auricles
- proglottids
- planaria

Classes of Flatworms		
Trematodes	Cestodes	Turbellarians
parasitic flukes	parasitic scolex proglottids	free-living eyespots auricles planaria

Model the life cycle of a fluke.

Diagrams should resemble SE p. 729.

CONNECT

Identify and describe a human disorder that tapeworms and flukes can cause.

Group	Human Disorder Caused
Tapeworms	infestation of intestines, can burrow through intestinal walls, entering blood and eventually muscle
Flukes	Schistosomiasis, fluke eggs clog blood vessels, causing swelling and eventual tissue damage

Worms and Mollusks

Section 25.2 Roundworms and Rotifers

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all the section titles.
- Read all boldfaced words.
- Look at all illustrations and read the captions.
- Think about what you already know about worms.

Write three facts that you discovered about roundworms and rotifers.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define cilia.

cilia

short, numerous projections that look like hairs

New Vocabulary

Use your book or dictionary to define each term. Then write a sentence using the word to show its scientific meaning.

hydrostatic skeleton

fluid within a closed space that provides rigid support for muscles to work against

trichinosis

a disease caused by the roundworm *Trichinella* that can be ingested in raw or undercooked pork, pork products, or wild game

Section 25.2 Roundworms and Rotifers (continued)

Main Idea

Details

Body Structure of Roundworms

I found this information on page _____.
SE. pp. 731–733
RE, pp. 298–299

Organize information about roundworms by filling in the chart below. **Accept all reasonable responses.**

Phylum: Nematoda	Symmetry: bilateral
Habitats: everywhere from marine and freshwater habitats to land; some are parasites on plants and animals	
Body shape: cylindrical, unsegmented, tapered at both ends	
Food: some are predators on tiny invertebrates, others feed on decaying plant and animal matter, some feed on living hosts	
Digestive tract of free-living forms: one way, with food entering the mouth and wastes exiting through the anus at the other end	
Circulatory and respiratory organs: none, they depend on diffusion for moving nutrients and gases throughout the body	
Stimuli they can detect: touch and chemicals, some can detect differences between light and dark	
Reproduction method: sexual	Type of fertilization: internal

Analyze the movement of roundworms.

Roundworm Movement	
Thrashing Movement	They have muscles that run the length of their bodies. As one muscle contracts, another relaxes, causing a thrashing movement.
Role of Pseudocoelom	It acts as a hydrostatic skeleton. The fluid within the pseudocoelom provides rigid support for the muscles to work against.

Section 25.2 Roundworms and Rotifers (continued)

Main Idea

Diversity of Roundworms

I found this information on page _____.

SE, pp. 733–735
RE, pp. 299–300

Details

Identify *the roundworm that matches each description.*

Animal	Description
pinworm	most common roundworm parasite in the U.S.
hookworm	enters the human body through bare feet
Ascaris	world's most common roundworm infection
Trichinella	carried by infected, undercooked pork
nematode	causes plant diseases
filarial worm	mosquito acts as intermediate host

Identify *a negative and a positive effect of nematodes on plants.*

Negative: **By attaching themselves to plant roots, nematodes can cause the plants to sicken.**

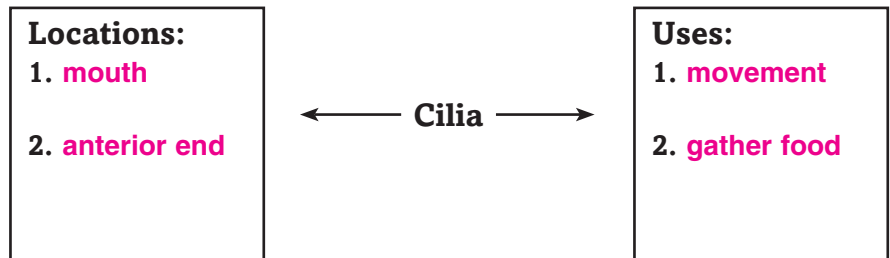
Positive: **If added to soil infected with crop pests, nematodes can control the spread of the pest insects.**

Rotifers

I found this information on page _____.

SE, p. 736
RE, p. 300

Analyze *the cilia of rotifers by completing the graphic organizer below.*



CONNECT

Compare the digestive tracts of roundworms with those in free-living flatworms. What does the comparison suggest about the probable evolutionary history of roundworms?

Accept all reasonable responses. Free-living flatworms have a digestive tract with only one opening; wastes are ejected through the mouth. Roundworms have digestive tracts with two openings; wastes are ejected through the anus. The digestive tract of roundworms is more advanced, so roundworms probably appeared later than flatworms.

Worms and Mollusks

Section 25.3 Mollusks

Main Idea

Details

Skim Section 3 of the chapter. Write two questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

herbivore

Use your book or dictionary to define herbivore.

an organism that eats only plants

New Vocabulary

closed circulatory system

Use your book or dictionary to define each term.

system in which blood moves through the body enclosed entirely in blood vessels

gills

respiratory structures on the mantle that consist of a system of filamentous projections; used to move water into and through mantle

mantle

a membrane that surrounds the internal organs of a mollusk; in mollusks with shells, it secretes the shell

nephridia

organs that remove metabolic wastes from an animal's body

open circulatory system

system in which blood moves through vessels into open spaces around the body organs

radula

in the mouth of many mollusks, the rasping, tonguelike organ with rows of teeth; used to drill, scrape, or tear up food

siphon

a tube in octopuses and squids used to expel water taken into the mantle cavity

Section 25.3 Mollusks (continued)

Main Idea _____

Details _____

Body Structure

I found this information on page _____.

SE, pp. 737–741

RE, pp. 301–303

Model *a snail and a squid. Label the body parts of each.*

Diagrams should resemble SE p. 738. Accept all reasonable responses.

List *the snail and squid structures that differ.*

the snail's foot, the squid's tentacles, and the squid's reduced

internal shell

Distinguish *two ways mollusks feed.*

Radula: a tonguelike organ with rows of teeth used to scrape, drill,

and tear up food

Filter feeders: draw in food from the water and strain it

Compare *the way mollusks reproduce in water and on land.*

in water: eggs and sperm are released at the same time and fertilization is external

on land: many land mollusks are hermaphrodites and produce both sperm and eggs, and fertilization takes place within the animal

Section 25.3 Mollusks (continued)

Main Idea

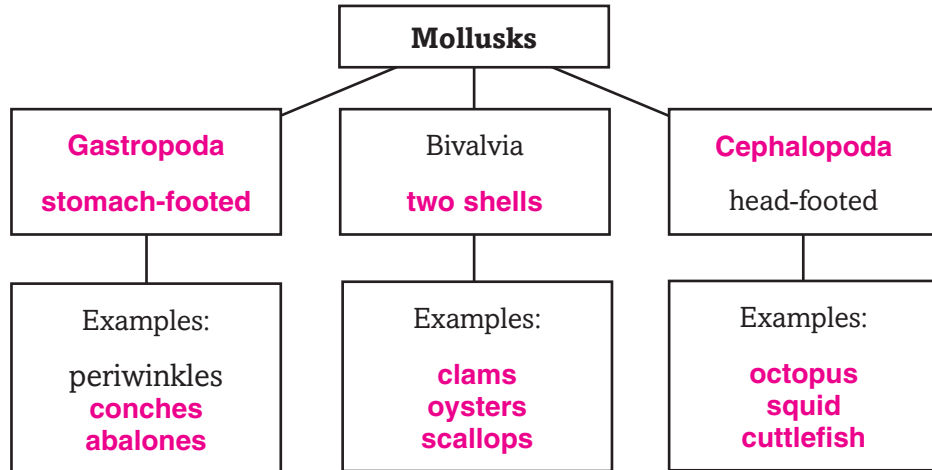
Diversity of Mollusks, Ecology of Mollusks

I found this information on page _____.

SE, pp. 742–743
RE, p. 304

Details

Analyze the three classes of mollusks and the meaning of each class name. Provide at least three examples of each class.



Classify each mollusk in the left column of the table. Place it in the proper class.

Class	Mollusk Characteristics
Gastropoda	has a single shell and a large foot under the body
Bivalvia	has no radula; has two shells connected with a ligament, and a large, muscular foot for digging in the sand
Gastropoda	is brightly colored and has a layer of mucus covering its body; has a large foot under the body and no shell
Cephalopoda	has a radula and tentacles; has no shell; squirts ink at predators

CONNECT

Compare mollusks' excretory structures with those of two or more groups that evolved earlier.

Accept all reasonable responses. Mollusks have nephridia, excretory structures that filter metabolic wastes from the coelom and remove the wastes from the body. Planarians have simpler structures called flame cells that move fluid along and eliminate water. A jellyfish has no excretory structures; water and salts move in and out of the body by osmosis.

Worms and Mollusks

Section 25.4 Segmented Worms

Main Idea

Details

Skim Section 4 of the chapter. Write three facts that you discovered about segmented worms.

1. **Accept all reasonable responses.**

2. _____

3. _____

Review Vocabulary

Use your book or dictionary to define protostome.

protostome

**an animal with a mouth that develops from the opening in the
gastrula**

New Vocabulary

Use your book or dictionary to define each term.

clitellum

**a thickened band of segments that produces a cocoon from which
young earthworms hatch**

crop

**part of the worm's digestive tract where food and soil taken in by the
mouth are stored before passing on to the gizzard**

gizzard

**muscular sac containing hard particles that help grind soil and food
before they pass into the intestine**

setae

**tiny bristles on each segment that push into the soil and anchor the
worm during movement**

Academic Vocabulary

Define convert to show its scientific meaning.

convert

to change from one form to another

Section 25.4 Segmented Worms (continued)

Main Idea _____

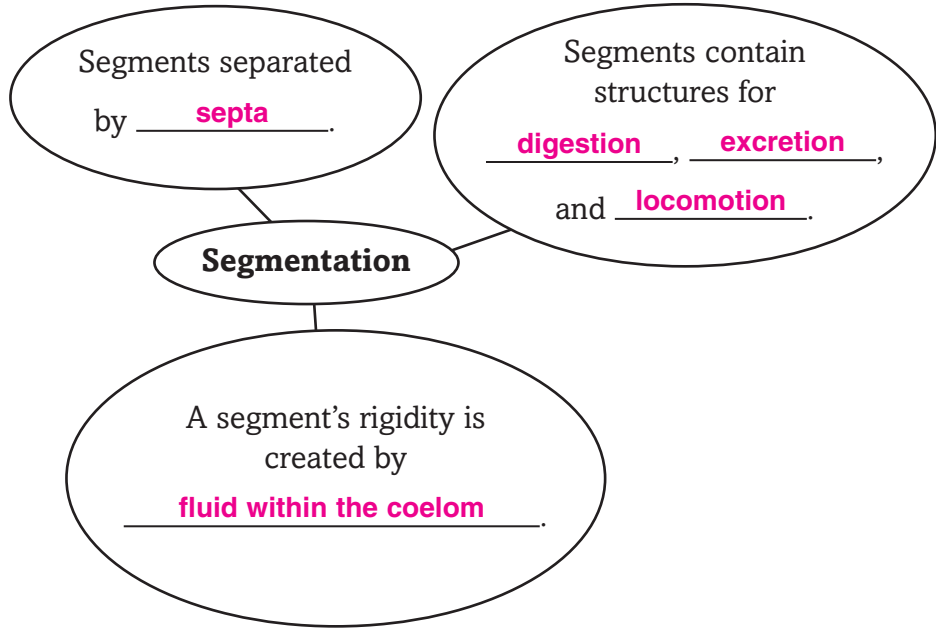
Details _____

Body Structure

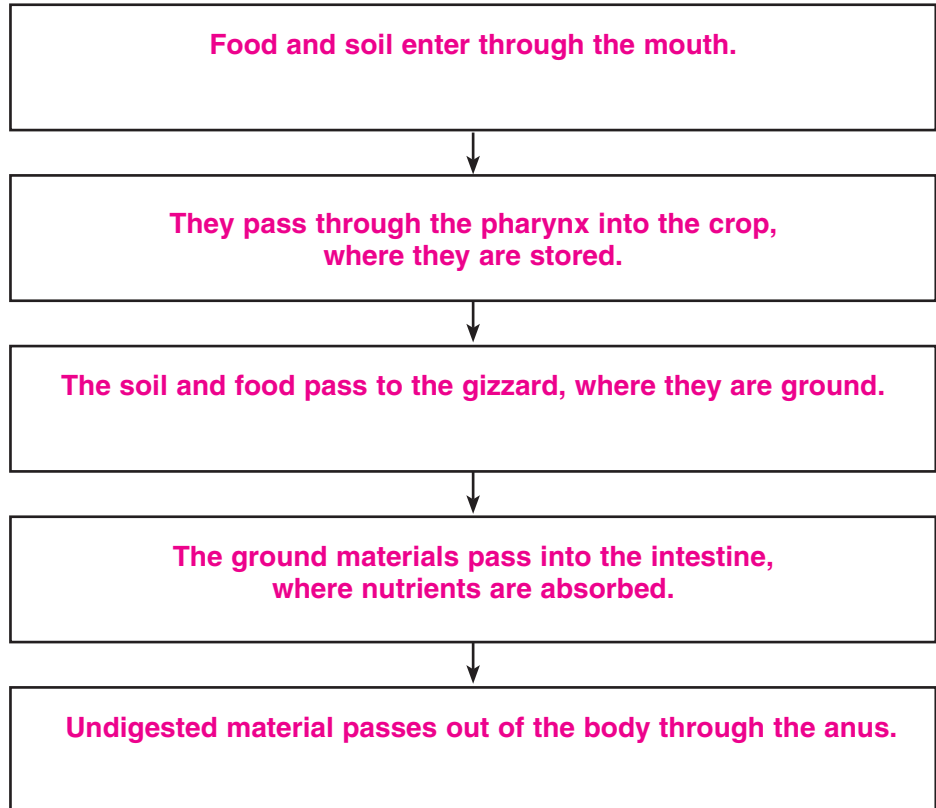
I found this information on page _____.

SE, pp. 745–748
RE, pp. 305–307

Summarize the characteristics of segmentation. **Accept all reasonable responses.**



Sequence the process of digestion in an earthworm.



Section 25.4 Segmented Worms (continued)

Main Idea

Diversity of Annelids/Ecology of Annelids/Evolution of Mollusks and Annelids

I found this information on page _____.
SE, pp. 748–751
RE, pp. 307–308

Details

Organize information about annelids. Identify two characteristics of each annelid. Then write the class to which they belong. **Accept all reasonable responses.**

fanworms bristleworms	leeches	earthworms
well-developed sense organs, including eyes; many setae; parapodia	flattened bodies; no setae; front and rear suckers; saliva contains chemical anesthetic	ingest soil to extract nutrients; aerate the soil
Class: Polychaeta	Class: Hirudinea	Class: Oligochaeta

Analyze two ways that each of these annelids benefit their ecosystem. **Accept all reasonable responses.**



Sequence these developments in the evolution of annelids: body suckers, parapodia, clitella.

From earliest to latest: **parapodia, clitella, body suckers**

SUMMARIZE

Compare the type of circulatory system found in annelids with that found in some mollusks. State the advantage of the annelid type.

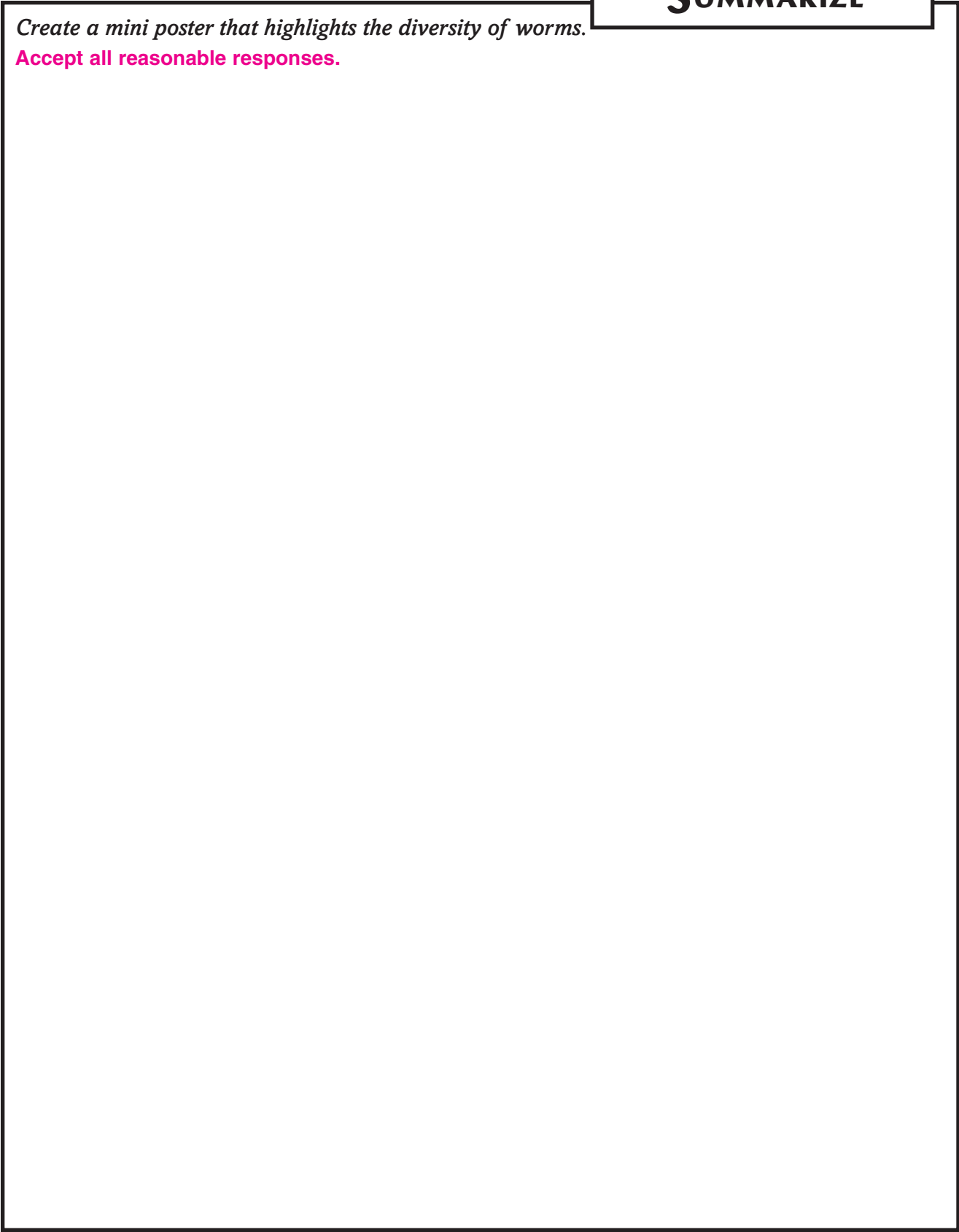
Accept all reasonable responses. Annelids have closed circulatory systems, with the blood entirely enclosed in blood vessels. Some mollusks also have open circulatory systems, in which the blood flows through vessels and in open spaces. A closed system provides a more efficient means for gas exchanges (oxygen and carbon dioxide) in the animal.

Tie It Together

SUMMARIZE

Create a mini poster that highlights the diversity of worms.

Accept all reasonable responses.



Arthropods

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Arthropods	After You Read
	<ul style="list-style-type: none"> • A lobster’s hard covering cannot grow as the animal grows. 	A
	<ul style="list-style-type: none"> • A spider begins digesting its food while the food is outside its body. 	A
	<ul style="list-style-type: none"> • When you try to swat a fly, it often escapes because it can sense changes in airflow. 	A
	<ul style="list-style-type: none"> • A newly hatched butterfly looks like an adult butterfly only smaller. 	D

Science Journal

Speculate about what would happen if cockroaches and other insects were to disappear.

Accept all reasonable responses. Because of their importance in food webs, the impact of extinguishing insect species might be disastrous.

Arthropods

Section 26.1 Arthropod Characteristics

Main Idea _____ **Details** _____

Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

ganglion

Use your book or dictionary to define ganglion.

a group of nerve cell bodies that coordinates messages

New Vocabulary

Write the correct term in the left column for each definition below.

cephalothorax	body structure consisting of fused thorax and head regions
spiracle	opening from the tracheae or book lungs to the outside of an arthropod's body
tracheal tube	tube that branches into smaller and smaller tubules to carry oxygen throughout the body
abdomen	body region of fused segments at the posterior end of an arthropod that contains digestive structures and reproductive organs
Malpighian tubule	in most arthropods, structure that removes cellular wastes from the blood and empties into the gut
book lung	saclike pocket with highly folded walls for respiration
molting	in arthropods, process of shedding an exoskeleton
thorax	middle body region, consisting of three fused main segments to which, in many arthropods, legs and wings are attached
appendage	structure that grows and extends from an animal's body
mandible	mouthpart in arthropods that can be adapted for biting and chewing
pheromone	chemical secreted by many animal species that influences the behavior of other animals of the same species

Academic Vocabulary

transport

Define transport to show its scientific meaning.

to transfer from one place to another

Section 26.1 Arthropod Characteristics (continued)

Main Idea

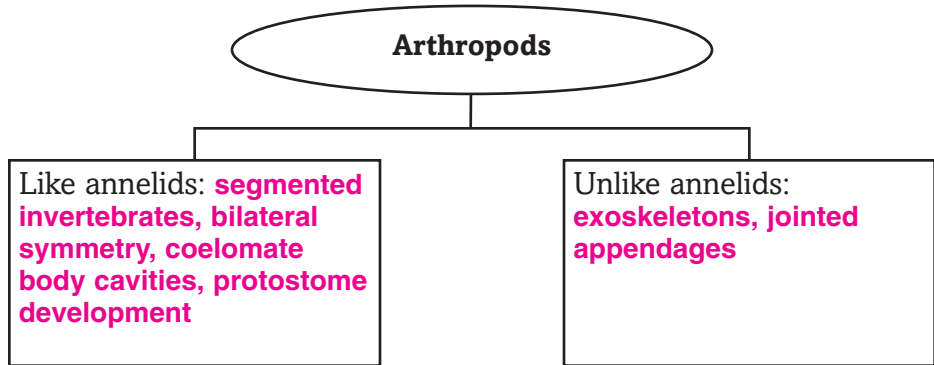
Arthropod Features

I found this information on page _____.

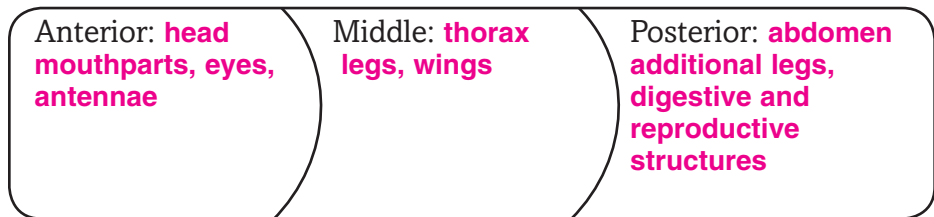
SE, pp. 762–764
RE, pp. 309–310

Details

Compare *arthropods to annelids by listing characteristics below.*



Identify *the structures attached to or contained in the main body regions of arthropods.*



What regions are fused in a cephalothorax? head and thorax

Analyze *the advantages and disadvantages of an exoskeleton.*

Advantages	Disadvantages
framework for support, protects soft body tissues, slows water loss in terrestrial animals, provides place for muscle attachment	adds weight, limits body size, made of nonliving material so must be shed to allow room to grow

Evaluate *the role of the body functions below in the molting process.*

Fluid secreted by skin glands: softens and eventually cracks the old exoskeleton

Increased blood circulation: puffs up the animal to make the new hardening exoskeleton larger for growing room

Section 26.1 Arthropod Characteristics (continued)

Main Idea

Body Structure of Arthropods

I found this information on page _____.

SE, pp. 765–769
RE, pp. 310–312

Details

Model three types of arthropod respiratory structures. Identify the habitat—aquatic or terrestrial—of the arthropods with that type of respiratory system. Label the spiracles.

No spiracles should appear in the diagram of gills.

Structure: _____

Gills _____

Habitat: Aquatic _____

Spiracles should appear and be labeled in the diagram of tracheal tubes.

Structure: _____

Tracheal tubes _____

Habitat: Terrestrial _____

Spiracles should appear and be labeled in the diagram of book lungs.

Structure: _____

Book lungs _____

Habitat: Terrestrial _____

Rephrase one key fact about arthropods for each function below.

Excretion: Malpighian tubules remove cellular wastes from the blood and help terrestrial arthropods preserve water balance.

Chemical communication: Pheromones signal behaviors such as mating and feeding, and ants use them to create scent trails.

Movement: Muscles attach to inner surface of exoskeleton and strength of contraction depends on nerve impulse rate.

SUMMARIZE

Identify three structures that arthropods use to respond to their environments. Explain how each structure is helpful to the arthropods.

Accept all reasonable responses. Compound eyes enable arthropods to analyze landscape changes as they fly. Tympanums or the forelegs of crickets allow for quick responses to sound waves. Limbs attached to the inside of exoskeletons facilitate rapid movement.

Arthropods

Section 26.2 Arthropod Diversity

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables, figures, graphs, and captions.

Write two facts you discovered as you scanned the section.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

Use your book or dictionary to define sessile.

sessile

an organism that is attached to and stays in one place

New Vocabulary

Use your book or dictionary to define each term.

chelicera

arachnid mouthpart that is adapted to function as a fang or pincer and often is connected to a poison gland

cheliped

front leg of a crustacean that has a large claw adapted to catch and crush food

pedipalp

arachnid appendage used to sense and hold prey; also used for reproduction in male spiders and as large pincers in scorpions

spinneret

structure located at the end of a spider's abdomen that spins secreted fluid protein into silk for web-building

swimmeret

crustacean appendage located behind the walking legs that is used as a flipper during swimming

Section 26.2 Arthropod Diversity (continued)

Main Idea _____

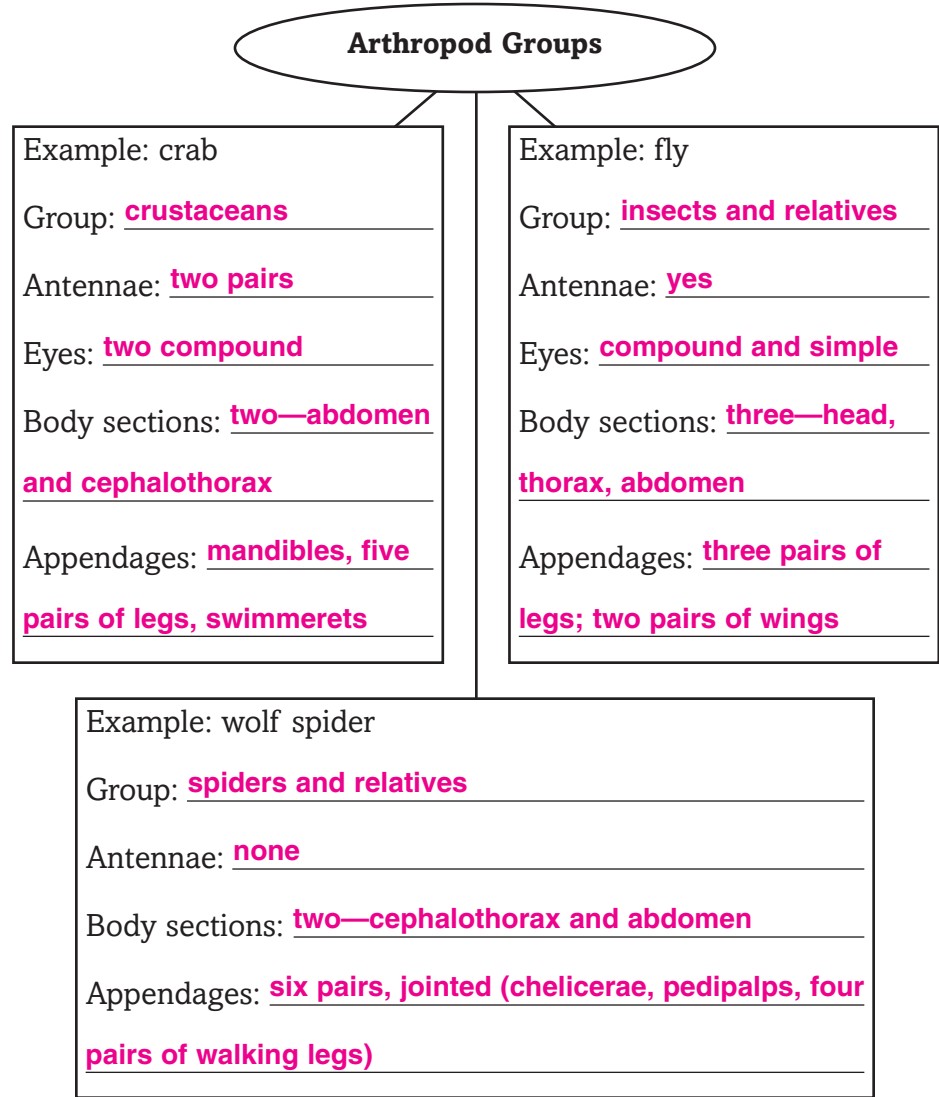
Details _____

Arthropod Groups

I found this information on page _____.

SE, p. 770
RE, p. 313

Compare the common characteristics of the major arthropod groups.



Crustaceans

I found this information on page _____.

SE, p. 771
RE, p. 314

Model a lobster and label its appendages.

Sketches should resemble the figure on SE p. 771. Accept all reasonable variations. Students should include: antennae, eye, chelipeds, walking legs, and swimmerets.

Section 26.2 Arthropod Diversity (continued)

Main Idea

Spiders and Their Relatives

I found this information on page _____.

SE, pp. 771–774

RE, pp. 314–315

Details

Distinguish the arachnid appendage for each description below. Names will be used more than once.

Appendage	Description
spinnerets	create silk from fluid protein
chelicerae	function as fangs or pincers
pedipalps	used for sensing and holding prey
chelicerae	often connected to a poison gland
spinnerets	located at the end of a spider’s abdomen
pedipalps	large pincers on scorpions

Analyze ways in which a spider uses the web it constructs.

- **to capture prey**
- **to wrap prey until the spider is ready to feed**
- **Male spider deposits sperm.**
- **Female spider lays her eggs in a cocoon of spun silk.**

Conclude why the leaflike plates on the posterior appendages are important to a female horseshoe crab during reproduction.

The posterior appendages are modified for digging. The female uses these appendages to dig a burrow into the sand to deposit her eggs.

After sperm is added, she uses them again to cover the eggs with sand.

SUMMARIZE

Create a concept web that you can use to identify arthropods.

Accept all reasonable responses.

Arthropods

Section 26.3 Insects and their Relatives

Main Idea

Details

Skim Section 3 of the chapter. Examine each illustration and read the caption. Write three facts that you learn about the structures of insects.

1. **Accept all reasonable responses.**

2. _____

3. _____

Review Vocabulary

subphylum

Use your book or dictionary to define subphylum.
a category in biological classification that is below a phylum and above a class

New Vocabulary

caste

Use your book or dictionary to define each term.
group of individuals within a society that performs specific tasks

metamorphosis

series of major changes from a larval form to an adult form

nymph

immature form of an insect that looks like a small adult without fully developed wings

pupa

nonfeeding stage of metamorphosis in which the animal changes from the larval form into the adult form

Section 26.3 Insects and their Relatives (continued)

Main Idea

Diversity of Insects

I found this information on page _____.
 SE, p. 775
 RE, p. 316

External Features

I found this information on page _____.
 SE, p. 775
 RE, p. 317

Insect Adaptations

I found this information on page _____.
 SE, pp. 776–780
 RE, pp. 317–320

Details

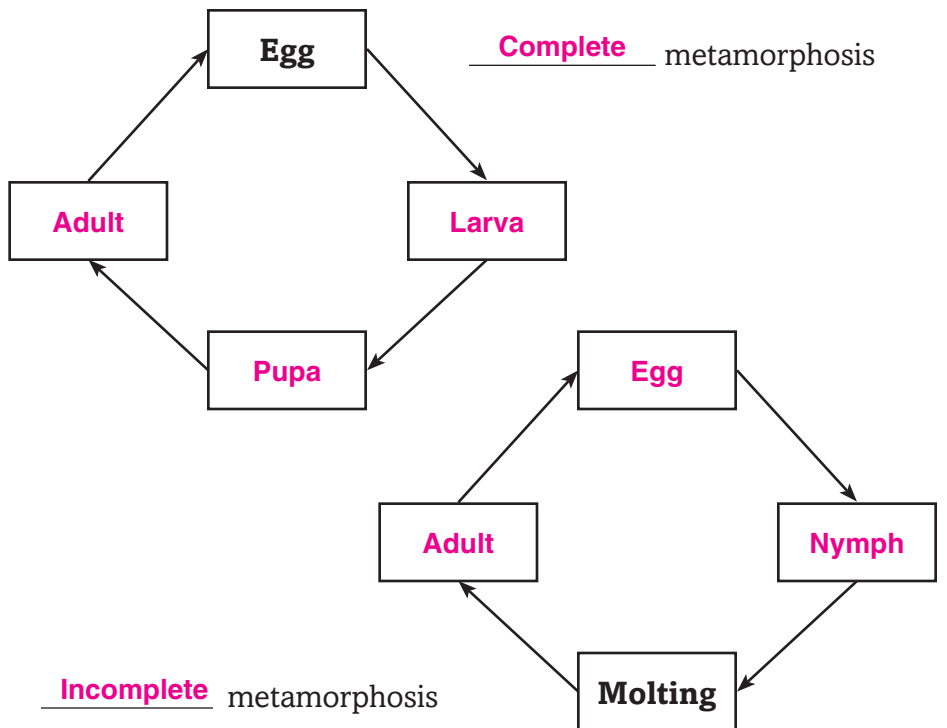
Conclude *how insects can live in many habitats.*

- **ability to fly and adapt**
- **small size for easy movement**
- **exoskeleton for protection and for keeping them from drying out**
- **capacity to produce large numbers of offspring**

Model *a cricket and label its external features.*

Drawings should resemble the figure on SE p. 775. Accept all reasonable variations. Body parts should be labeled.

Sequence *the stages in two types of metamorphosis by completing the flowcharts below. Identify each type of metamorphosis.*



Section 26.3 Insects and their Relatives (continued)

Main Idea

I found this information on page _____.

SE, pp. 776–780
RE, pp. 317–320

Details

Model the honeybee’s waggle dance in the space below. Use labels to explain how the dance communicates where the food is.

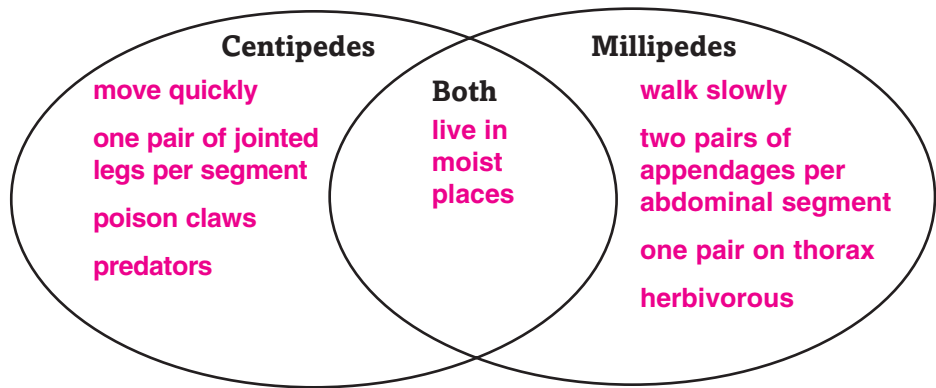
Sketches should resemble the figure on SE p. 779. Labels should indicate that the length of the straight line gives the distance to the food source. Also, the direction of the line relative to the vertical indicates the direction of the food relative to the Sun.

Centipedes and Millipedes

I found this information on page _____.

SE, p. 780
RE, p. 320

Compare centipedes and millipedes by listing their characteristics in the Venn diagram.



Evolution of Arthropods

I found this information on page _____.

SE, p. 781
RE, p. 320

Conclude in general how segmentation has evolved from ancestral arthropods to present-day arthropods.

Ancestral arthropods tended to have a large number of identical segments. This segmentation evolved into more specialized appendages and fewer segments in present-day arthropods.

SUMMARIZE

Compare and contrast insect features to other arthropod groups.

Accept all reasonable responses.

Echinoderms and Invertebrate Chordates

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Echinoderms and Invertebrate Chordates	After You Read
	<ul style="list-style-type: none"> • A sea star can make its stomach come out of its mouth. 	A
	<ul style="list-style-type: none"> • Many echinoderms can regrow lost body parts. 	A
	<ul style="list-style-type: none"> • A lancelet's body organs are visible through its skin. 	A
	<ul style="list-style-type: none"> • A tunicate is called a sea squirt because it is the smallest creature in the sea. 	D

Science Journal

Write what you know or stories you have heard about sea stars, sea urchins, and other spiny sea creatures.

Accept all reasonable responses.

Echinoderms and Invertebrate Chordates

Section 27.1 Echinoderm Characteristics

Main Idea

Details

Skim Section 1 of the chapter. Write three questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define endoskeleton.

endoskeleton

an internal skeleton that provides support and protection and can act as a brace for muscles to pull against

New Vocabulary

Use your book or dictionary to define each term.

ampulla

muscular sac on a tube foot that contracts, forcing water into the tube foot

madreporite

strainerlike opening to the water-vascular system in echinoderms

pedicellaria

small pincer on the skin of echinoderms that aids in catching food and in removing foreign materials from the skin

tube foot

small, muscular, fluid-filled tube that ends in a suction-cuplike structure and is used in movement, food collection, and respiration

water-vascular system

system of fluid-filled, closed tubes that work together to enable echinoderms to move and get food

Academic Vocabulary

Define aid to show its scientific meaning.

aid

to give assistance or to help

Section 27.1 Echinoderm Characteristics (continued)

Main Idea

Echinoderms Are Deuterostomes

I found this information on page _____.

SE, p. 792
RE, p. 321

Body Structure

I found this information on page _____.

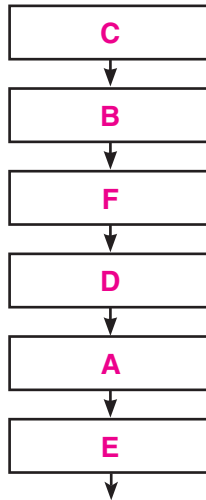
SE, pp. 793–796
RE, pp. 321–323

Details

Analyze *the importance of deuterostome development.*

Accept all reasonable responses. The evolutionary tree branches at deuterostomes, marking this development as a major transition in animal phylogeny. Only echinoderms and the chordates that evolved after echinoderms have this type of development.

Sequence *the steps that occur in the water-vascular system to enable an echinoderm to move. Complete the flowchart by writing the letters of the scrambled steps in the proper boxes.*



- A. Water is forced into the tube foot.
- B. Water moves through the stone canal to the ring canal.
- C. Water is drawn into the madreporite.
- D. The muscles of the ampulla contract.
- E. With hydraulic suction, the tube foot attaches to a surface.
- F. Water moves to the radial canals.

The echinoderm moves.

Identify *the echinoderm that moves in the described way.*

Echinoderm	Movement
sea urchin	burrows into rocky areas using movable spines
brittle star	makes snakelike movements using tube feet and arms
feather star	uses cirri to grasp soft sediments on the seafloor
sea cucumber	crawls using tube feet and body wall muscles

Section 27.1 Echinoderm Characteristics (continued)

Main Idea

Echinoderm Diversity

I found this information on page _____.

SE, pp. 797–800
RE, pp. 324–325

Ecology of Echinoderms

I found this information on page _____.

SE, p. 801
RE, p. 325

Details

Name *the class of each echinoderm described below.*

Echinoderm Class	Characteristics
Holothuroidea	cucumber shape; leathery covering; tentacles near mouth
Echinoidea	body encased in a test; burrows
Ophiuroidea	often five arms; arms regenerate; no suction cups on tube feet
Asteroidea	often five arms; tube feet used for feeding and movement
Concentricycloidea	no arms; tube feet located around a central disk
Crinoidea	sessile for some part of life

List *echinoderm strategies for coping with potential predators.*

sea stars: protected by spiny skin

brittle stars: release an arm and regenerate it later

sea urchins: protected by venomous spines and pedicellariae

sea cucumbers: cast out some internal organs and regenerate them

Analyze *the effect of echinoderms on other organisms in the following situations.*

Activity as bioturbators: make nutrients available to other organisms

by stirring up sediment on ocean floor

Unexplained population explosions of crown-of-thorns sea stars:

consume so many coral polyps that they destroy reefs

CONNECT

Give an example of regeneration in humans. Then give an example of regeneration in echinoderms that is beyond the capability of humans.

Accept all reasonable responses. Humans regenerate tissues to replace shed skin cells and repair broken bones. Humans cannot regenerate whole body parts like echinoderms can.

Echinoderms and Invertebrate Chordates

Section 27.2 Invertebrate Chordates

Main Idea

Details

Scan the illustrations and read the captions in Section 2. Write two facts you discovered about invertebrate chordates.

1. **Accept all reasonable responses.**
2. _____

Review Vocabulary

deuterostome

Use your book or dictionary to define deuterostome.

animal whose mouth develops from cells other than those at the opening of the gastrula

New Vocabulary

chordate

Use your book or dictionary to define each term.

animal belonging to phylum Chordata that has four distinctive features—a dorsal tubular nerve cord, a notochord, pharyngeal pouches, and a postanal tail—at some point during development

dorsal tubular nerve cord

tube-shaped nerve cord located dorsal to the digestive organs

invertebrate chordate

member of phylum Chordata that has a dorsal tubular nerve cord, a notochord, pharyngeal pouches, a postanal tail, and possibly an ancestral thyroid gland but no backbone

notochord

flexible, rodlike structure that extends the length of the body and is located just below the dorsal tubular nerve cord

pharyngeal pouch

structure that occurs in pairs in all chordate embryos; connects the muscular tube that links the mouth cavity and the esophagus

postanal tail

structure used primarily for locomotion and is located behind the digestive system and anus

Section 27.2 Invertebrate Chordates (continued)

Main Idea

Invertebrate Chordate Features

I found this information on page _____.

SE, pp. 802–804
RE, pp. 326–327

Details

Identify *the four distinctive features of chordates and their location on the animal. Describe how each feature benefits the animal.*

Feature	Location	Benefits
notochord	just below the dorsal tubular nerve cord and runs the length of the body	enables body to bend, rather than shorten, during contraction of muscle segments; for first time enabled side-to-side, fishlike swimming motion
postanal tail	behind the digestive system and anus	can propel an animal with more powerful movements than the body structure of invertebrates without a postanal tail
dorsal tubular nerve cord	above the digestive organs	during development, anterior end becomes the brain and posterior end becomes the spinal cord
pharyngeal pouches	connect the muscular tube that links the mouth cavity and esophagus	evolved into gills in aquatic chordates; develop into structures such as tonsils and thymus gland in terrestrial chordates

Analyze *the importance of an endostyle.*

An endostyle represents an early form of thyroid gland.

Diversity of Invertebrate Chordates

I found this information on page _____.

SE, pp. 804–805
RE, pp. 327–328

Describe *the following features of lancelets.*

Phylum: Chordata	Subphylum: Cephalochordata
Skin: lacks color and scales; body structures visible through skin	
Feeding method: filter feeders; digestion in stomach-like structure	
Movement: segmented muscle blocks enable fishlike swimming	
Sensory structures: light receptors and small sensory tentacles near mouth	
Blood circulation: pumping action of blood vessels; no heart	

Section 27.2 Invertebrate Chordates (continued)

Main Idea

I found this information on page _____.

SE, pp. 804–805
RE, pp. 327–328

Evolution of Echinoderms and Invertebrate Chordates

I found this information on page _____.

SE, pp. 806–807
RE, p. 328

Details

Model *a tunicate. Label its parts. Identify its subphylum.*

Subphylum: **Urochordata**

Drawings should resemble SE p. 805.

Analyze *why tunicates are called sea squirts.*

When threatened, tunicates can eject a stream of water through the excurrent siphon, possibly distracting the potential predator.

Identify *key developments in the evolution of echinoderms and invertebrate chordates by completing the following paragraph.*

Probably echinoderms evolved from ancestors with **bilateral** symmetry because echinoderms have this kind of symmetry in the **larval** stage. Echinoderms develop **radial** symmetry in the adult stage. **Deuterostome** development links echinoderms to chordates. The key features of **chordates** shared by lancelets and tunicates show their close relationship, though **tunicates** have these features only as larvae. A key development in the evolution of chordates was the **notochord**, which provided support and a place for **muscles** to attach, leading to the first large animals.

SUMMARIZE

Why do lancelets excite the scientific community?

Accept all reasonable responses. Fossil evidence and recent molecular data show that lancelets are one of the closest living relatives of vertebrates. Humans are more closely related to lancelets than to any other invertebrate.

Tie It Together

SYNTHESIZE

You plan to visit a large aquarium. You want to be able to identify specific echinoderms and invertebrate chordates among the many sea creatures on display. Create an identification guide by listing two observable features that distinguish each animal below. Features can be physical or behavioral.

Accept all reasonable responses. Listed features must be observable.

<p>Sea Star:</p> <ul style="list-style-type: none"> • generally five arms; clings to rocks with suckers on tube feet • spiny skin 	<p>Brittle Star:</p> <ul style="list-style-type: none"> • moves by rowing with snakelike movements of thin, flexible arms • no suckers on tube feet
<p>Sea Urchin:</p> <ul style="list-style-type: none"> • body encased in test with spines • burrows in rocky crevices 	<p>Sand Dollar:</p> <ul style="list-style-type: none"> • body encased in test that reflects five-part pattern of arms in sea stars • burrows in sand
<p>Sea Lily:</p> <ul style="list-style-type: none"> • sessile • flower-shaped body at top of long stalk 	<p>Feather Star:</p> <ul style="list-style-type: none"> • long-branched arms radiating upward from central area • sessile
<p>Sea Cucumber:</p> <ul style="list-style-type: none"> • shaped like a cucumber • outer body appears leathery 	<p>Lancelet:</p> <ul style="list-style-type: none"> • translucent, scaleless skin—can see internal body structures through skin • eel-like body about 5 cm long
<p>Tunicate:</p> <ul style="list-style-type: none"> • small, saclike body with siphons • sessile; might live in masses 	

Fishes and Amphibians

Before You Read

Use the “What I Know” column to list the things you know about fishes and amphibians. Then list the questions you have about them in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Hypothesize what factors might be responsible for amphibian species becoming extinct.

Accept all reasonable responses. Most biologists think amphibians are disappearing because the habitats of amphibians are becoming smaller or unusable; but pollution, temperature variations, and other factors have also been suspected.

Fishes and Amphibians

Section 28.1 Fishes

Main Idea _____ **Details** _____

Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

notochord

Use your book or dictionary to define notochord.

a flexible rodlike structure that extends the length of the body

New Vocabulary

Write the correct term in the left column for each definition below.

- _____ **lateral line system**
- _____ **spawning**
- _____ **ventricle**
- _____ **neural crest**
- _____ **atrium**
- _____ **scale**
- _____ **swim bladder**
- _____ **cartilage**
- _____ **operculum**
- _____ **nephron**

receptors that enable fishes to detect movement in the water and help keep them upright and balanced

external fertilization in which male and female fishes release their gametes near each other in the water

chamber of the heart that pumps blood to the gills

in vertebrates, group of cells that develop from the nerve cord and contribute to the development of other important features

chamber of the heart that receives blood from the body

small, flat, platelike structure near the skin surface of most fishes

gas-filled space in bony fishes that allows a fish to control its depth

tough, flexible material making up the skeletons or parts of skeletons of vertebrates

movable flap that covers the gills and protects them

filtering unit within the kidney that helps maintain the salt and water balance of the body and remove cellular waste

Academic Vocabulary

precision

Define these terms to show their scientific meaning.

act of moving forward by means of a force that causes motion

propulsion

characterized by accurate action

Section 28.1 Fishes (continued)

Main Idea

Characteristics of Vertebrates

I found this information on page _____.

SE, pp. 820–821
RE, pp. 329–330

Details

Summarize information about two major characteristics of vertebrates.

	Vertebral Column	Neural Crest
Formation	It replaces the notochord during embryonic development.	As the nerve cord is forming in the embryo, a layer of ectoderm pinches off just before the tube closes.
Functions	It surrounds and protects the dorsal nerve.	Important vertebrate features develop from it, including parts of the brain, skull, sense organs, pharyngeal pouches, nerve fibers and insulation, and glands.

Characteristics of Fishes

I found this information on page _____.

SE, pp. 821–827
RE, pp. 330–335

Model the flow of blood through the body of a fish by writing the following terms in the correct boxes in the flowchart.

- gills
- throughout body
- ventricle
- atrium

Blood enters heart



Summarize the reproduction method of most fishes.

Most fishes use an external fertilization process called spawning.

Male and female fishes release gametes near each other in the water.

Embryos feed on the yolk of the egg.

Section 28.1 Fishes (continued)

Main Idea _____

Details _____

I found this information on page _____.

SE, pp. 821–827
RE, pp. 330–335

Organize facts about characteristics of fishes. Accept all reasonable responses.

Characteristic	Facts
habitats	most aquatic environments, including the ocean floor and freezing waters of polar regions
adaptive advantages of jaws	enable fishes to prey on a larger range of animals, including fishes that are larger and more active; enable a biting defense
benefits of paired fins	reduce chance of rolling to the side; allow for better steering during swimming
four types of scales and their composition	ctenoid and cycloid: bone; placoid: toothlike materials; ganoid: enamel and bone
functions of gills	take in oxygen from water and give off carbon dioxide
functions of pyloric ceca	secrete enzymes for digestion and absorb nutrients into the bloodstream
functions of nephrons	maintain salt and water balance in body and remove cellular waste from blood
sensory abilities	sense of smell can detect chemicals in the water; color vision; lateral line system to detect movement in the water
process for controlling depth in water	fish sinks when gases diffuse out of swim bladder; fish rises when gases from the blood diffuse into the swim bladder

CONNECT

Design a graphic organizer to summarize the adaptations and functions of fish. **Accept all reasonable responses.**

Fishes and Amphibians

Section 28.2 Diversity of Today's Fishes

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all headings.
- Read all boldfaced words.
- Read all diagrams.
- Look at all pictures and read the captions.

Write three facts that you discovered about fishes.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

adaptive radiation

Use your book or dictionary to define adaptive radiation.

the process of evolution that produces many species from an _____

ancestral species _____

New Vocabulary

tetrapod

Use your book or dictionary to define the following term.

four-footed animal with legs that have feet and toes that have joints; _____

thought to have evolved from lobe-finned fishes _____

Use tetrapod in a sentence describing its possible place in the evolution of fishes.

Accept all reasonable responses. _____

Section 28.2 Diversity of Today's Fishes (continued)

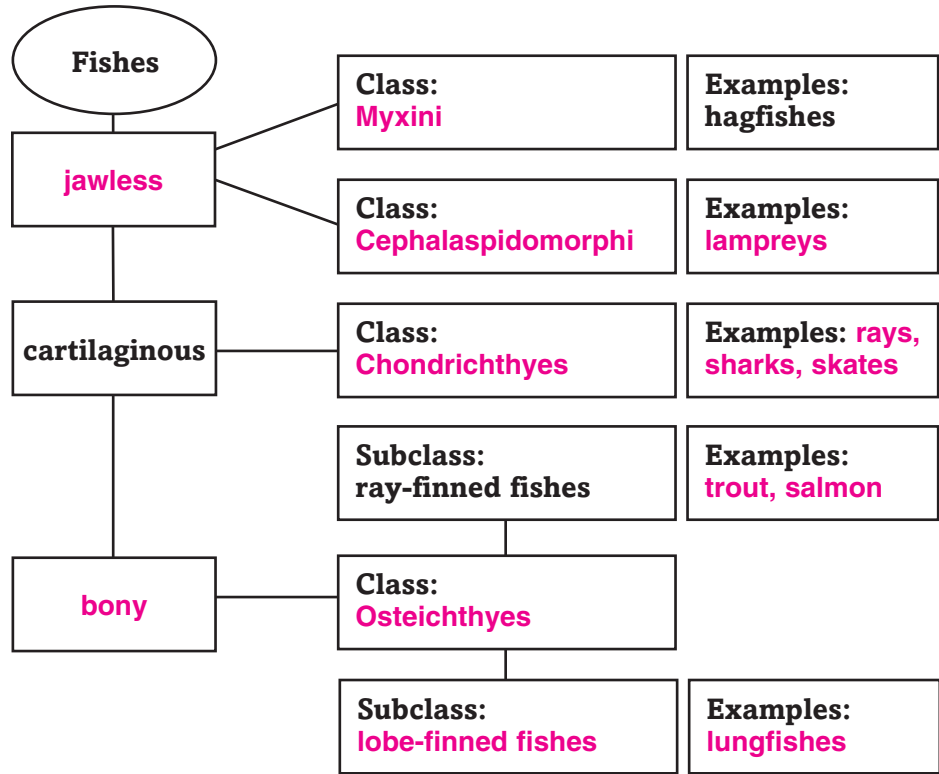
Main Idea

Details

Classes of Fishes

I found this information on page _____.
SE, pp. 828–831
RE, pp. 336–338

Classify fishes and provide an example in the organizer below.



Compare and contrast how each pair of fishes are alike and how they differ. **Accept all reasonable responses.**

Hagfish and lamprey

Alike: **both lack jaws, scales, paired fins, and bony skeletons**

Different: **lamprey is parasite; hagfish is not**

Great white shark and whale shark

Alike: **both have cartilaginous skeletons**

Different: **great white is predator; whale shark is filter feeder**

Trout and lungfish

Alike: **both have bony skeleton**

Different: **trout has ray fins; lungfish has lobes and joints**

Section 28.2 Diversity of Today's Fishes (continued)

Main Idea

Details

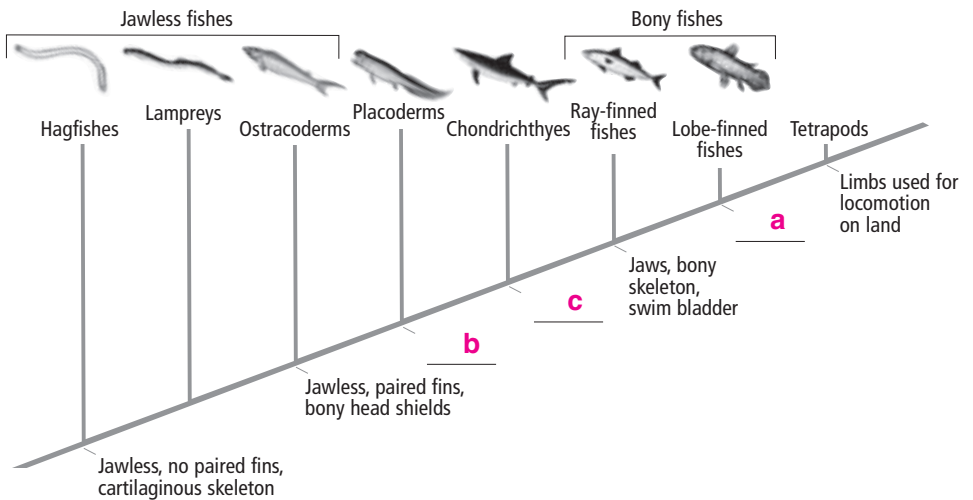
Evolution of Fishes

I found this information on page _____.

SE, p. 832
RE, pp. 338–339

Sequence the evolution of fishes by writing the letter of the following features on the cladogram in the order in which they appeared.

- a. jaws, bony skeleton, primitive lung
- b. jaws, paired fins, bony plates covering body
- c. jaws, placoid scales, cartilaginous skeleton



Ecology of Fishes

I found this information on page _____.

SE, p. 833
RE, p. 339

Analyze the effects of human activities on fishes.

Damming rivers in Pacific Northwest: interfere with migration of salmon to spawning areas; decline of salmon

Polluting waterways: decline in number and diversity of fishes

CONNECT

Describe ways in which humans can use water resources with less impact on aquatic ecosystems. Identify how an individual could support this effort.

Accept all reasonable responses. The government can enforce standards that require businesses to reduce water pollutants. Dam builders can find ways to reduce the impact of a dam on fish ecology, such as providing a way for migrating salmon to get around the dam. Individuals can support these efforts by staying informed, voting for politicians who support conservation, and expressing disapproval to companies that pollute.

Fishes and Amphibians

Section 28.3 Amphibians

Main Idea _____ **Details** _____

Skim Section 3 of the chapter. Name two characteristics of amphibians.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

metamorphosis

Use your book or dictionary to define metamorphosis.

a series of developmental changes in the form or structure of an organism

New Vocabulary

cloaca

Use your book or dictionary to define each term.

chamber that receives the digestive wastes, urinary waste, and eggs or sperm before they leave the body

ectotherm

animal that cannot regulate its body temperature

nictitating membrane

transparent eyelid that can move across the eye to protect it underwater and keep it from drying out on land

tympanic membrane

eardrum of an amphibian; in frogs, a thin external membrane on each side of the head that hears high-pitched sounds

Academic Vocabulary

diversify

Define and use diversify in a sentence to show its scientific meaning.

to produce variety

Section 28.3 Amphibians (continued)

Main Idea

Details

Evolution of Tetrapods

I found this information on page _____.

SE, pp. 834–835
RE, pp. 340–341

Characteristics of Amphibians

I found this information on page _____.

SE, pp. 835–838
RE, pp. 341–343

Amphibian Diversity

I found this information on page _____.

SE, pp. 838–839
RE, p. 343

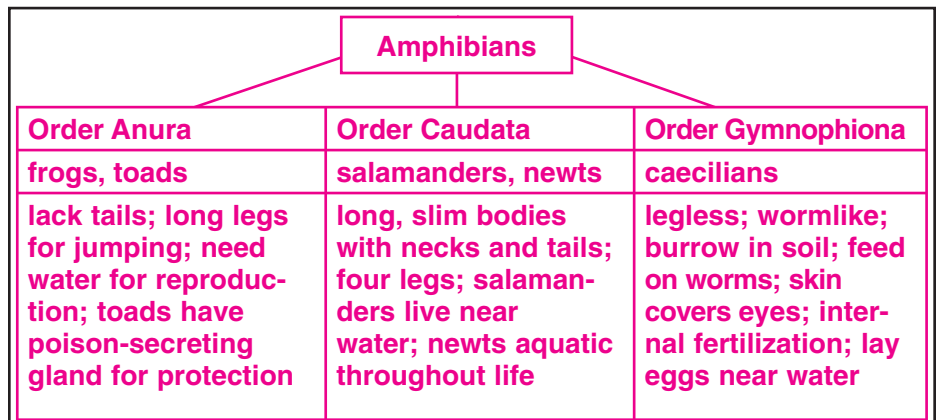
Identify three adaptations that helped amphibians leave water for life on land. **Accept all reasonable responses.**

1. **skeletal and muscular systems, including limbs**
2. **lungs for obtaining oxygen from air**
3. **ears to sense sound waves traveling through air**

Summarize the characteristics of amphibians. **Accept all reasonable responses.**

Characteristics of Amphibians
Feeding and digestion: adults predatory; digest in stomach and intestine; wastes collect in cloaca before exiting body
Excretion: kidneys filter wastes from blood; aquatic amphibians excrete ammonia; land amphibians excrete urea
Respiration: larvae exchange gases through gills and skin; adults breathe through lungs and skin
Circulation: double-loop circulation; three chambered heart including two atria and one ventricle
Brain and senses: forebrain detects odors; vision important; nictitating membrane protects eyes; tympanic membrane for hearing; ectotherms, so cannot regulate body temperature
Reproduction: eggs laid and fertilized in water; embryo feeds on yolk; tadpoles change to adults through metamorphosis

Create a concept map to show characteristics and examples of each order of amphibians. **Accept all reasonable responses.**



Section 28.3 Amphibians (continued)

Main Idea _____ **Details** _____

Evolution of Amphibians

I found this information on page _____.

SE, p. 840
RE, p. 344

Identify the evolutionary adaptations that make the branching points for each amphibian group.

Amphibian Group	Evolutionary Branching Points
Rhipidistians	lobe-finned, nostril-like structures on top of mouth
Igthyostegans	heavier leg bones, ankle and wrist joints, stronger muscles
Tetrapods	five toes on front and hind limbs
Caecilians	legless
Salamanders	most have four legs
Frogs and toads	four legs, no tail

Ecology of Amphibians

I found this information on page _____.

SE, p. 841
RE, p. 344

Describe factors in the worldwide decline of amphibians and explain how each factor affects the ability of amphibians to survive.

Local factors: habitat destruction, such as draining wetlands to build buildings; introduction of exotic species

Effects: less water available for amphibian reproduction; exotic species compete with amphibians for food and space or might be predators of amphibians

Global factors: global climate change, such as changes in temperature, length of dry season, soil moisture, and rainfall

Effects: can kill amphibians or stress their bodies, making them more susceptible to disease

SUMMARIZE

Compare amphibians with fishes. List some important evolutionary advances seen in amphibians.

Accept all reasonable responses. Amphibians have a double-loop circulatory system and a three-chambered heart. Fishes have a single loop and two chambers. Amphibians have lungs during part of their life cycle; fish breathe by using gills. Most amphibians have limbs.

Reptiles and Birds

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Reptiles and Birds	After You Read
	<ul style="list-style-type: none"> • Snakes flick their tongue to smell odors. 	A
	<ul style="list-style-type: none"> • Some scientists hypothesize that a meteorite crashed to Earth, causing extinction of the dinosaurs. 	A
	<ul style="list-style-type: none"> • All birds have feathers. 	A
	<ul style="list-style-type: none"> • All birds can fly. 	D

Science Journal

Think about the lives of fishes compared to the lives of reptiles and the lives of birds. What adaptations do birds and reptiles have to suit them to life on land and in the air?

Accept all reasonable responses.

Reptiles and Birds

Section 29.1 Reptiles

Main Idea

Details

Skim Section 1 of the chapter. Read the headings and illustration captions. Write three questions that come to mind.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define embryo.

embryo

the earliest stage of development of plants and animals after an egg has been fertilized

New Vocabulary

Use your book or dictionary to define each term.

amnion

fluid-filled membrane that surrounds a developing embryo inside an amniotic egg

amniotic egg

egg that is covered with a protective shell and has several internal membranes with fluids contained between the membranes

carapace

dorsal part of a turtle's shell

Jacobson's organ

saclike structure on the roof of a snake's mouth that senses odors

plastron

ventral part of a turtle's shell

Academic Vocabulary

Define interpretation to show its scientific meaning.

interpretation

a particular adaptation or version of a work, method, or style

Section 29.1 Reptiles (continued)

Main Idea

Details

Characteristics of Reptiles

I found this information on page _____.

SE, pp. 852–856
RE, pp. 345–348

Identify *the adaptations reptiles made to survive on land.*

Needed for Life on Land	Adaptation
protect embryo from drying out	amniotic egg
prevent excessive loss of water and minerals from the body	dry, scaly skin; cloaca that reabsorbs water from urine before excretion
exchange gases other than through skin	lungs with larger surface area and ability to inhale and exhale through muscular contraction
crocodile’s need for more oxygen delivered to cells to help move its large body	four-chambered heart
snake’s need to swallow prey larger than itself	loosely joined bones of the skull and jaw that can spread apart
complex vision and muscle function	larger optic lobes and cerebellum
move faster and bear more body weight	limbs rotated farther under the body; claws on toes

Model *a reptilian egg. Label the amnion, embryo, allantois, yolk sac, chorion, and shell.*

Diagrams should resemble SE p. 853. Accept all reasonable responses.

Section 29.1 Reptiles (continued)

Main Idea

Details

Diversity of Modern Reptiles

I found this information on page _____.
SE, pp. 856–857
RE, pp. 348–349

Evolution of Reptiles

I found this information on page _____.
SE, pp. 858–859
RE, p. 349

Ecology of Reptiles

I found this information on page _____.
SE, p. 860
RE, p. 349

Contrast *characteristics of each order in class Reptilia.*
Accept all reasonable responses.

<p>Squamata examples: snakes, lizards key features: lizards: long legs, claws, movable eyelids, and hinge joint on lower jaw, tympanic membranes; snakes: legless, shorter tails, movable lower jaw, lack movable eyelids and tympanic membranes</p>	<p>Crocodylia examples: crocodiles, alligators key features: four-chambered heart, long snout, sharp teeth, powerful jaws; alligators: broad snout, upper jaw wider than lower jaw; crocodiles: jaws about same width, teeth visible when mouth closed</p>
<p>Testudinata examples: turtles, tortoises key features: shell; vertebrae and ribs fused to inside of carapace; pull in heads and legs for protection; turtles aquatic; tortoises live on land</p>	<p>Sphenodonta examples: tuataras key features: on islands near New Zealand; spiny crest down back; scaly third eye senses sunlight; two rows of teeth in upper jaw, one row in lower jaw</p>

Identify *each animal's ancestors as diapsids, anapsids, or synapsids.*

diapsids → birds diapsids → lizards
synapsids → mammals anapsids → turtles

Analyze *how loss of a reptile species could upset the balance of an ecosystem.*

Accept all reasonable responses. Reptiles are both predator and prey. Removing a species could cause its prey to increase out of control. Also, predators that feed on the species would decline.

SUMMARIZE

Evaluate whether a meteorite crashing to Earth could have doomed the dinosaurs. Discuss the catastrophic effects of such a crash and adaptations needed to survive the event.

Accept all reasonable responses. The dust cloud caused by the crash could have blocked the Sun, killing plants on which dinosaurs and their prey fed. Earth would have cooled rapidly. Dinosaurs might not have been able to adapt quickly enough to the colder climate to survive.

Reptiles and Birds

Section 29.2 Birds

Main Idea

Details

Skim Section 2 of the chapter. Identify characteristics of birds that make them different from reptiles.

Accept all reasonable responses. Present-day birds have feathers, bones with cavities of air, and beaks. Most species can fly. Birds are endotherms with a high metabolic rate. They lay hard-shelled eggs.

Review Vocabulary

Use your book or dictionary to define terrestrial.

terrestrial

living on or in land

New Vocabulary

Use your book or dictionary to define each term.

air sac

saclike structure located at the anterior and posterior of a bird's respiratory system

contour feather

type of feather that covers the body, wings, and tail of a bird

down feather

soft feather located beneath contour feathers

endotherm

organism that generates its body heat internally by its own metabolism

feather

specialized outgrowth of the skin of birds that provides insulation and enables flight

incubate

maintain favorable conditions for hatching

preen gland

gland located near the base of a bird's tail that secretes oil for waterproofing feathers

sternum

breastbone

Section 29.2 Birds (continued)

Main Idea

Characteristics of Birds

I found this information on page _____.

SE, pp. 861–866
RE, pp. 350–353

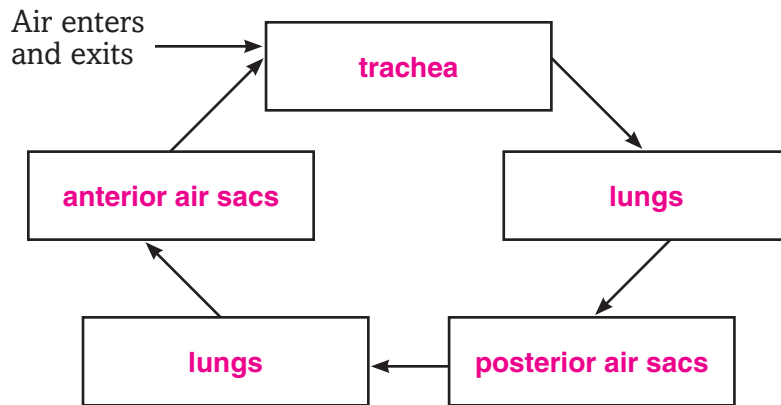
Details

Model a contour feather and a down feather. Label the structures. Write brief captions describing the characteristics or functions of each feather. **Accept all reasonable responses. For each feather, students should label the shaft and barbs.**

Down feathers	Contour feathers
The caption for the down feather should note that the loose structure can trap air for insulation.	The caption for the contour feather should note that the barbs are joined with hooks, and that preening rejoins separated barbs.

Sequence the respiratory organs of a bird. Place the organs from the list below in the proper sequence. One organ appears more than once.

- lungs
- anterior air sacs
- posterior air sacs
- trachea



Analyze how eye position reflects a bird's life habits.

Accept all reasonable responses. Predatory birds need to focus both eyes on distant prey, so their eyes are in the front of their head. The eyes of grain-feeding birds are on the sides of their head, enabling them to detect predators in any direction.

Section 29.2 Birds (continued)

Main Idea

Diversity of Modern Birds

I found this information on page _____.
SE, pp. 866–867
RE, p. 353

Details

Identify the order and one member of the order for each distinguishing characteristic listed below.

Characteristic	Order/Member
builds nests in cavities	<i>Piciformes</i> /woodpecker
flipper-like wings; solid bones	<i>Sphenisciformes</i> /penguin
flightless; includes largest living birds	<i>Struthioniformes</i> /ostrich
sing; feet adapted for perching	<i>Passeriformes</i> /blue jay
marine; tube-shaped nostrils	<i>Procellariiformes</i> /albatross
long legs for wading	<i>Ciconiiformes</i> /heron
nocturnal; large eyes; talons	<i>Strigiformes</i> /owl
aquatic; round beak	<i>Anseriformes</i> /duck

Evolution of Birds

I found this information on page _____.
SE, p. 868
RE, p. 354

Compare features of dinosaurs found in fossil records that are similar to features of present-day birds.

One species of dinosaur had a coat of downy, featherlike fibers.

Two others had feathers on their front appendages and tails.

***Archaeopteryx* had asymmetrical feathers and a brain much like present-day birds. Another species had features for hovering flight.**

Ecology of Birds

I found this information on page _____.
SE, p. 869
RE, p. 354

Analyze how birds are key to the survival of many plants.

Birds disperse seeds. Seeds eaten or caught in feathers move with birds to new locations, where the seeds are eliminated after digestion or drop off feathers. Hummingbirds pollinate plants as they feed on nectar.

SUMMARIZE

Compare and contrast ectothermy and endothermy.

Accept all reasonable responses. Endotherms can alter their metabolism to regulate their body temperature and produce a large amount of ATP to power complex movement. Ectotherms must regulate body temperature through behavior. Endotherms must eat large amounts of food to maintain their high metabolic rate. Ectotherms need less food energy.

Tie It Together

SUMMARIZE

Create a profile of one bird and one reptile common to your area. Identify the animal's order and species. Sketch each animal and label characteristics that distinguish it from other birds or reptiles. Write a brief summary of its life habits from your research. Point out characteristics on the sketches that are adapted for the animal's life habits.

Accept all reasonable responses.

Reptile species:
Order:

Bird species:
Order:

Mammals

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Mammals	After You Read
	• If an animal has hair, it is a mammal.	A
	• Mammals produce their body heat internally.	A
	• A duck-billed platypus is not a true mammal because it lays eggs.	D
	• The first mammals probably evolved from reptiles.	A

Science Journal

Mammals are one of the most successful groups of animals on Earth. Think about a specific mammal and some of its characteristics. Write about how you think some of these characteristics help the mammal to survive and be successful.

Accept all reasonable responses.

Mammals

Section 30.1 Mammalian Characteristics

Main Idea

Details

Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

metabolic rate

Use your book or dictionary to define metabolic rate.
the rate at which all the chemical reactions that occur within an organism take place

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- mammary gland** _____
- diaphragm** _____
- cerebral cortex** _____
- cerebellum** _____
- gland** _____
- uterus** _____
- placenta** _____
- gestation** _____

- produces and secretes milk that nourishes developing young
- sheet of muscle located beneath the lungs that separates the chest cavity from the abdominal cavity; its contraction and relaxation allows air to move into and out of the lungs
- highly folded outer layer of the cerebrum; responsible for coordinating conscious activities, memory, and ability to learn
- part of the brain responsible for balance and coordinating movement
- group of cells that secretes fluid to be used elsewhere in the body
- saclike muscular organ in which embryos develop
- organ that provides food and oxygen to and removes waste from the developing young
- amount of time the young stay in the uterus until they are born

Academic Vocabulary

retain

Define retain to show its scientific meaning.
to keep in possession or use

Section 30.1 Mammalian Characteristics (continued)

Main Idea

Hair and Mammary Glands

I found this information on page _____.

SE, pp. 880–881
RE, pp. 355–356

Details

Analyze the importance of hair by identifying the six functions of hair and giving an example of each function.

Accept all reasonable responses.

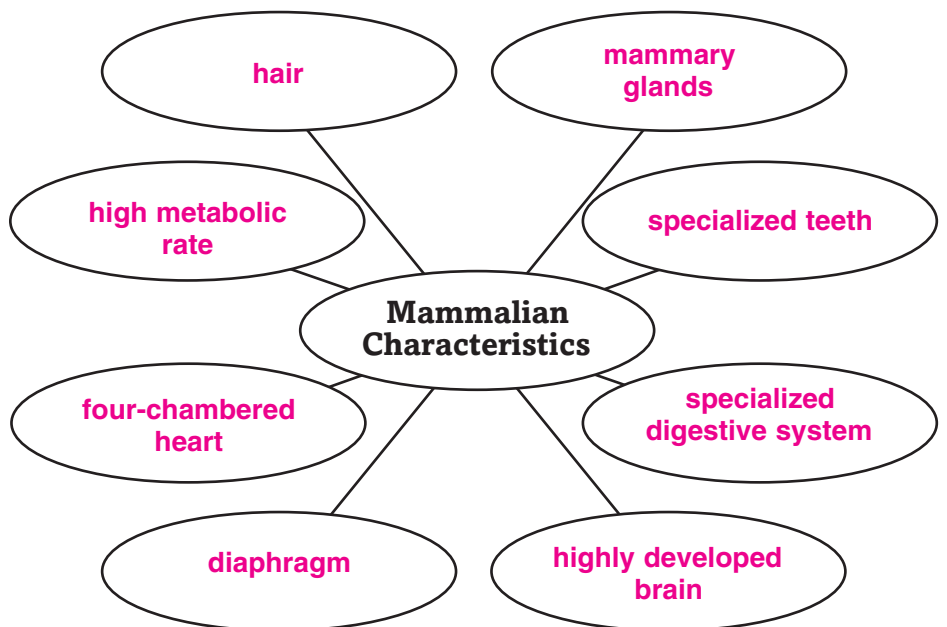
Functions	Examples
insulation	a fox's fur traps body heat
camouflage	a tiger's stripes help it blend into its habitat
sensory devices	a seal uses its sensitive whiskers to track prey
waterproofing	a sea otter's hair keeps water from reaching the skin
signaling	a white-tailed deer raises its tail to show the white underside for others to follow
defense	a porcupine's quills stab predators that touch it

Other Characteristics

I found this information on page _____.

SE, pp. 881–888
RE, pp. 356–361

Organize mammalian characteristics by completing the concept map.



Section 30.1 Mammalian Characteristics (continued)

Main Idea _____

I found this information on page _____.

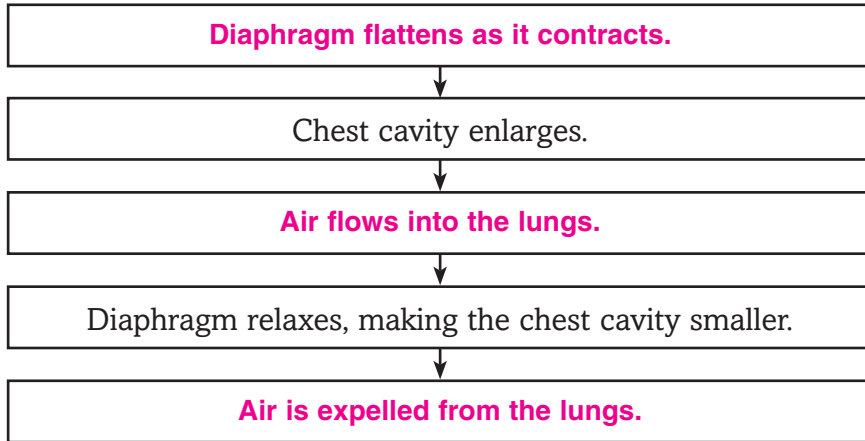
SE, pp. 881–888
RE, pp. 356–361

Details _____

Classify each description below as a characteristic of insectivores, herbivores, carnivores, or omnivores.

Classification	Characteristic
herbivores	have longest digestive tract
omnivores	feed on both plants and animals
insectivores	have long, curved incisors to seize prey
carnivores	have long, sharp canines to pierce prey

Sequence how the diaphragm works in respiration.



Describe the functions of each type of gland listed below.

Sweat glands: help maintain body temperature	Scent glands: mark territory and attract a mate
Mammary glands: produce and secrete milk to nourish developing young	Oil glands: maintain quality of hair and skin

SUMMARIZE

Create a graphic organizer showing characteristics of mammals. The organizer should distinguish characteristics common to all mammals from characteristics common to only certain species. **Accept all reasonable responses.**

Mammals

Section 30.2 Diversity of Mammals

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables and graphs.
- Look at all illustrations and read the captions.
- Think about what you already know about mammals.

Write two facts that you discovered about the subgroups of mammals.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define chromosome.

chromosome

cell structure that carries genetic material that is copied and passed from generation to generation of cells

New Vocabulary

Use your book or dictionary to define the following terms.

marsupial

pouched mammal that has a short period of development in the uterus

monotreme

mammal that reproduces by laying eggs

placental mammal

mammal that has a placenta and gives birth to young that do not need further development within a pouch

therapsid

extinct vertebrate with both mammalian and reptilian features, from which the first mammals probably arose

Section 30.2 Diversity of Mammals (continued)

Main Idea

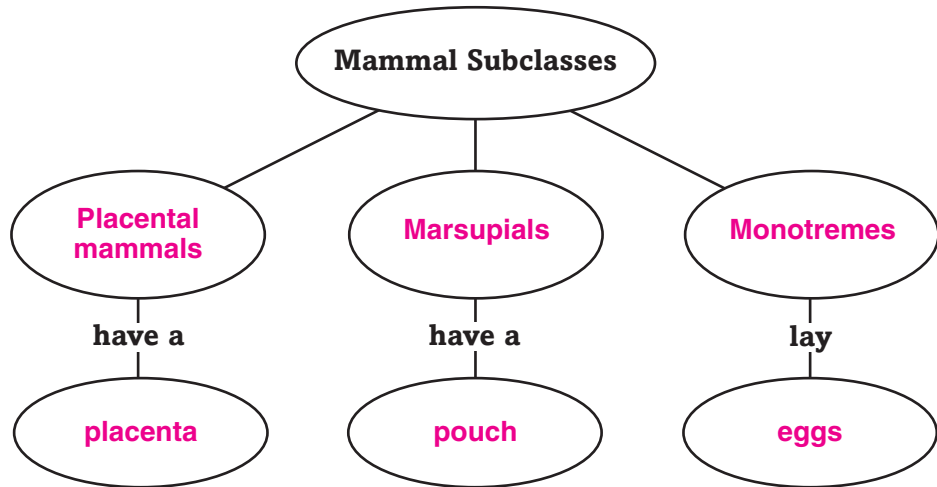
Details

Mammal Classification

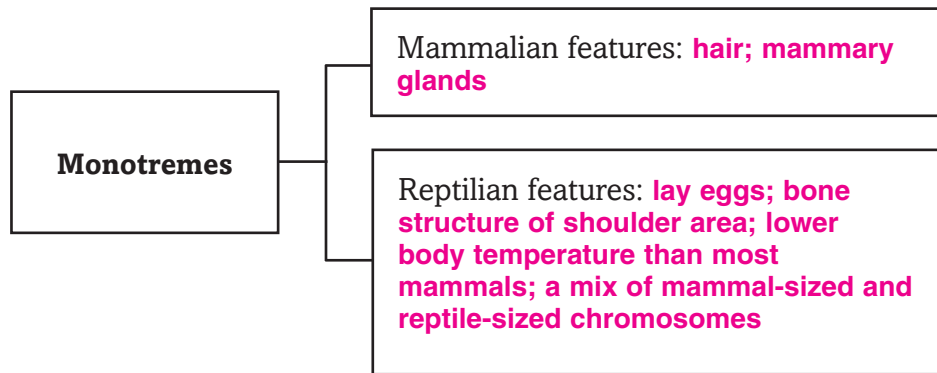
I found this information on page _____.

SE, pp. 889–895
RE, pp. 362–365

Organize information about the three subclasses of mammals by completing the concept map below.



Analyze characteristics of monotremes by identifying their mammal-like and reptilelike features.



Compare and contrast the development of young in a placental mammal with the development of young in a marsupial.

Accept all reasonable responses.

Marsupial	Placental Mammal
The young develop for a short time in the uterus. Immediately after birth, the young crawl into the mother's pouch, where they continue to develop while receiving nourishment from the milk of the mother's mammary glands.	The young receive food and oxygen from the placenta as they develop in the uterus. After birth, the young do not need further development within a pouch, but continue to nurse from their mother.

Section 30.2 Diversity of Mammals (continued)

Main Idea

I found this information on page _____.

SE, pp. 889–895
RE, pp. 362–365

Details

Contrast orders of placental mammals. List characteristics that distinguish each order.

Order	Characteristics
Chiroptera	the only mammals that truly fly
Xenarthra	have no teeth or simple, peglike teeth
Carnivora	predators; teeth adapted for tearing flesh
Primates	most developed brains of all mammals
Artiodactyla	hoofed mammals with even number of toes
Perissodactyla	hoofed mammals with odd number of toes
Cetacea	front flippers and tail of fleshy flukes

Evolution of Mammals

I found this information on page _____.

SE, pp. 886–897
RE, pp. 365–366

Sequence the environmental developments that led to the expansion of mammalian diversity during the Cenozoic era.

Dinosaurs disappeared at the end of the Mesozoic era.



Flowering plants flourished, providing new sources of nutrition and new habitats.



Mammals evolved to fill the new niches that became available.

SUMMARIZE

Describe what the mammals of Australia might be like today if the movement of Earth’s plates had not separated Australia from other continents. Explain your reasoning.

Accept all reasonable responses. Had the separation not occurred, marsupials might be rare or even extinct in Australia today, because placental mammals had adaptive advantages, such as limbs with greater functionality and a more complex cerebral cortex. In the protective isolation of Australia, marsupials could fill the niches occupied by placental mammals elsewhere in the world.

Tie It Together

SYNTHESIZE

Describe the ideal adaptations that would be needed by a mammal who lived in a high desert with broad temperature ranges, limited food and water, and predatory birds and reptiles. Identify the likely distinguishing characteristics in the areas of hair functions, teeth, senses, limb types, movement, and metabolic rate.

Accept all reasonable responses.

Animal Behavior

Before You Read

Use the “What I Know” column to list the things you know about animal behavior. Then list the questions you have about animal behavior in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Describe two behavior patterns in humans.

Accept all reasonable responses.

Animal Behavior

Section 31.1 Basic Behaviors

Main Idea

Details

Scan the titles, boldfaced words, illustrations, and captions in Section 1. Write two facts you discovered about animal behavior.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

natural selection

Use your book or dictionary to define natural selection.

process by which traits that result in the greatest number of offspring eventually become the most common traits in the population

New Vocabulary

behavior

classical conditioning

cognitive behavior

fixed action pattern

habituation

imprinting

innate behavior

learned behavior

operant conditioning

Use the new vocabulary words to complete the paragraph below.

Any way that an animal responds to a stimulus is **behavior**. Some behaviors, such as **innate behavior**, are genetically based. An animal that carries out a specific set of actions, in the same order, in response to a stimulus is exhibiting a **fixed action pattern**. Behavior that results from an interaction between genetically based behaviors and past experiences is **learned behavior**. An example is **habituation**, in which the response decreases after repeated exposure to a stimulus that has no positive or negative effects. An animal can learn to associate two different kinds of stimuli through **classical conditioning**. Learning through **operant conditioning** involves rewards and punishments. One type of permanent learning, called **imprinting**, occurs only within a specific time period. When an animal solves a problem, it is exhibiting **cognitive behavior**.

Academic Vocabulary

inanimate

Define inanimate to show its scientific meaning.

not having life; not alive

Section 31.1 Basic Behaviors (continued)

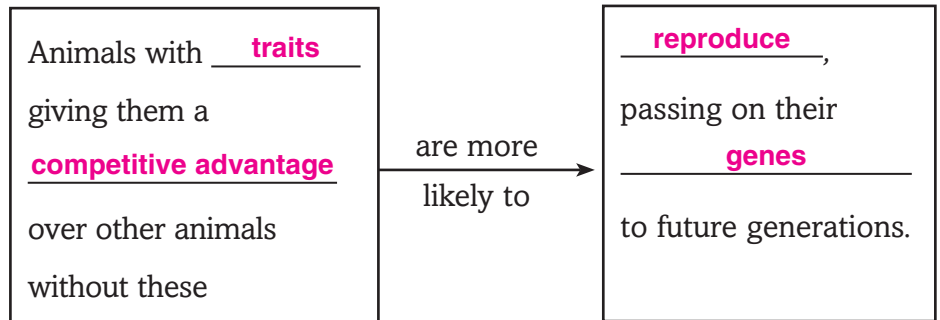
Main Idea

Details

Behavior

I found this information on page _____.
SE, pp. 908–909
RE, pp. 367–368

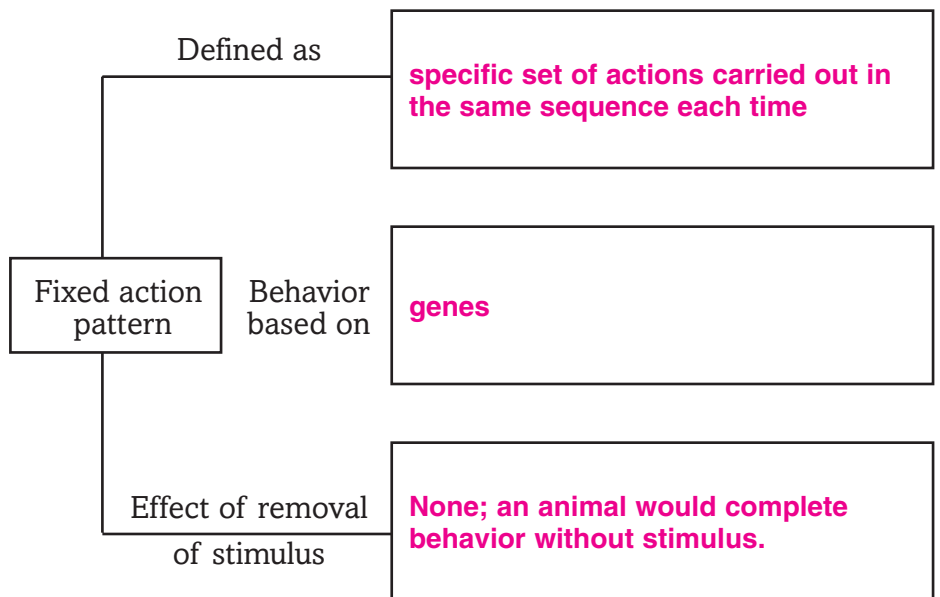
Analyze the relationship of behavior and natural selection by completing the graphic organizer.



Innate Behavior

I found this information on page _____.
SE, p. 910
RE, p. 368

Complete the fixed action pattern by completing the diagram.



Learned Behavior

I found this information on page _____.
SE, pp. 911–915
RE, pp. 369–370

Contrast learned behavior to innate behavior. Give an example of a behavior in response to a particular stimulus.

Accept all reasonable responses. Innate behavior is influenced by genes alone. Learned behavior results from an interaction between genes and past experiences. An example of a learned behavior is studying in response to an upcoming test.

Section 31.1 Basic Behaviors (continued)

Main Idea _____

Details _____

I found this information on page _____.

SE, pp. 911–915
RE, pp. 369–370

Organize information about the different kinds of learned behavior in the chart. **Accept all reasonable responses.**

Learned Behavior	Description	Example
Habituation	lack of response after repeated exposure to a stimulus with no positive or negative effects	a horse ignoring noisy cars that pass by its pasture
Classical conditioning	learning to associate two different kinds of stimuli	a cat rushing to its food bowl at the sound of a can opener because its food is opened with a can opener
Operant conditioning	learning to associate a response to a stimulus with a reward or punishment	learning to follow the rules when playing a sport to avoid a penalty
Imprinting	learning that can occur only within a specific time period in an animal's life and is permanent	a duck following its mother because the mother was the first thing the duck saw after birth
Cognitive behavior	thinking, reasoning, and processing information to understand complex concepts and solve problems	a chimpanzee using a stone to crack open nuts

SUMMARIZE

Animals respond to both internal and external stimuli. Give an example of a response to an internal stimulus and a response to an external stimulus.

Accept all reasonable responses. Students might note that feelings of hunger are an internal stimulus that prompts them to go to the refrigerator to find something to eat. They might suggest that the external stimulus of a parent who promises a reward might motivate them to clean up their room.

Animal Behavior

Section 31.2 Ecological Behaviors

Main Idea

Details

Skim Section 2 of the chapter. Write three questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.**

2.

3.

Review Vocabulary

Use your book or dictionary to define colony.

colony

group of unicellular or multicellular organisms that live together in close association

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

agonistic behavior

threatening or combative interaction between two individuals of the same species

dominance hierarchy

ranking within a group, in which a top-ranked animal gets access to resources without conflict from others in the group

territorial behavior

attempt to adopt and control a physical area over other animals of the same species

foraging behavior

finding and eating food

migratory behavior

moving long distances seasonally to new locations

circadian rhythm

cycle that occurs daily

language

auditory communication in which animals use vocal organs to produce groups of sounds that have shared meanings

courting behavior

behavior designed to attract a mate

nurturing behavior

parental care of offspring in early stages of development

altruistic behavior

action that benefits another individual at a cost to the actor

Section 31.2 Ecological Behaviors (continued)

Main Idea

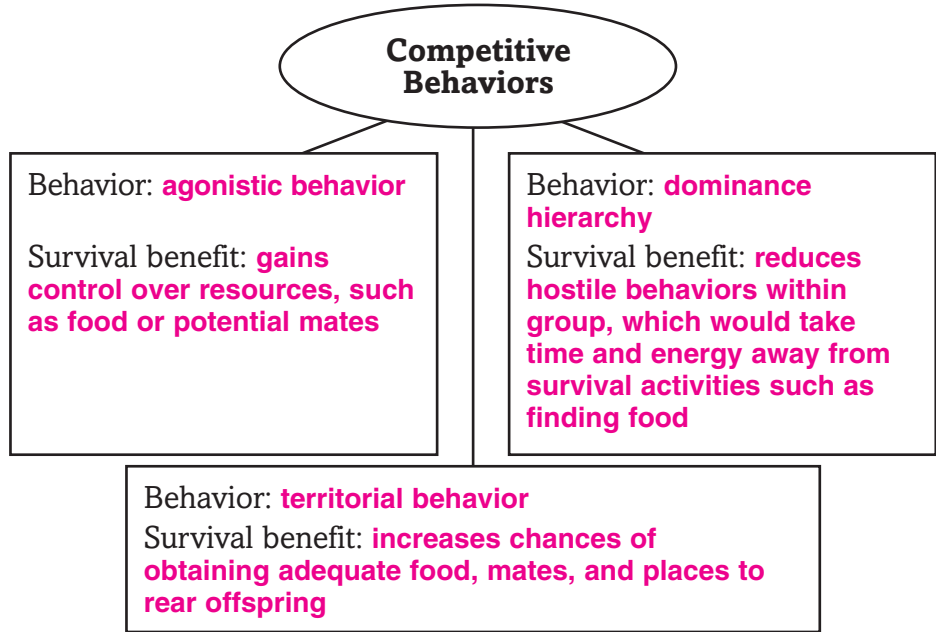
Details

Types of Behaviors

I found this information on page _____.

SE, pp. 916–919
RE, pp. 371–372

Analyze competitive behaviors by describing the survival benefits of each behavior.



Communication Behaviors

I found this information on page _____.

SE, p. 920
RE, p. 373

Contrast language with communication. Give an example of communication and an example of language.

Accept all reasonable responses. Animals can communicate simple information, such as their location, with sounds, such as chirps, and with odors, such as through pheromones. Language, however, is the use of sounds to communicate complex information. For example, humans can communicate ideas through language.

Courting and Nurturing Behaviors

I found this information on page _____.

SE, p. 921
RE, p. 373

Infer why a peacock fans and shakes his large, colorful tail in the presence of a pea hen during mating season.

Accept all reasonable responses. Often a female animal chooses to mate with a male that appears relatively larger and healthier than his rivals. Probably the peacock fans his tail to appear large, and the brightness of the colors and vigor of the shaking might attract attention and indicate his state of health.

Section 31.2 Ecological Behaviors (continued)

Main Idea

Details

Cooperative Behaviors

I found this information on page _____.

SE, p. 922
RE, p. 374

Analyze why an animal might engage in altruistic behavior, even though the behavior does not promote its own reproductive success.

Accept all reasonable responses. The theory of kin selection holds that altruistic behavior evolves because it increases the number of copies of a gene that is common to a population. As nonreproductive members work to feed and protect the reproductive members of the colony, they ensure that genes similar to their own will pass to future generations.

Advantages and Disadvantages

I found this information on page _____.

SE, p. 923
RE, p. 374

Organize the costs and benefits for survival and reproductive success of the behaviors listed below. Accept all reasonable responses.

Behavior	Benefit	Cost
Geese fly south before winter in North America.	increases chances for survival by moving to an area where food and climate conditions are favorable	moving long distances consumes energy and increases chances of predation
Male lions fight to establish a territory.	promotes survival and reproductive success by controlling an area containing resources, such as food and mates	fighting to gain and defend a territory costs energy and can result in injury
Hawk parents fly many kilometers daily to find food for their young.	offspring have increased chance of survival, ensuring the continuation of the parents' genes	energy spent in caring for offspring can endanger the parents' health and safety

CONNECT

You have dominance hierarchies in your life similar to some animals. Although they function differently, some of the benefits are the same. Describe one of these hierarchies and its advantages.

Accept all reasonable responses. There is a dominance hierarchy in my classroom. My teacher is dominant. He or she makes the classroom rules and leads the class in discussions. This makes the class flow more smoothly and be more organized so we can learn more.

Tie It Together

FURTHER INQUIRY

*Observe animal behaviors and take notes. Select two behaviors you observe, and analyze them, using the forms below. Conduct further research, as needed, to complete your behavior report thoroughly. **Accept all reasonable responses.***

Animal:	
Description of behavior:	
Innate or learned?	Type of behavior:
Description of stimulus:	
Internal or external?	
Advantages of behavior for survival or reproductive success:	
Costs of behavior in terms of survival or reproductive success:	

Animal:	
Description of behavior:	
Innate or learned?	Type of behavior:
Description of stimulus:	
Internal or external?	
Advantages of behavior for survival or reproductive success:	
Costs of behavior in terms of survival or reproductive success:	

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Integumentary, Skeletal, and Muscular Systems

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Integumentary, Skeletal, and Muscular Systems	After You Read
	<ul style="list-style-type: none"> • Skin is an organ. 	A
	<ul style="list-style-type: none"> • Use of a tanning bed will not put you at risk for skin cancer. 	D
	<ul style="list-style-type: none"> • All joints of the skeleton allow the bones to move. 	D
	<ul style="list-style-type: none"> • Some muscles in your body are not under your conscious control. 	A

Science Journal

Think about a sport you or someone you know plays. Describe how your skin, skeleton, and muscles help you play that sport.

Accept all reasonable responses.

Integumentary, Skeletal, and Muscular Systems

Section 32.1 The Integumentary System

Main Idea

Details

Scan Use the checklist below to preview Section 1 of the chapter.

- Read all section titles.
- Read all boldfaced words.
- Look at all pictures and read the captions.
- Think about what you already know about skin.

Write two facts you discovered about skin as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

integument

Use your book or dictionary to define integument.

an enveloping layer of an organism

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- _____ **melanin**
- _____ **sebaceous gland**
- _____ **keratin**
- _____ **hair follicle**
- _____ **epidermis**
- _____ **dermis**

- a pigment manufactured by cells in the inner layer of epidermis that protects from ultraviolet radiation
- structure that produces oil that lubricates skin and hair
- protein found in the outer layers of epidermal cells that waterproofs and protects the cells and tissues underneath
- narrow cavity in the dermis from which hair cells grow
- the outer superficial layer of skin
- the inner, thicker layer of skin

Academic Vocabulary

function

Define function, then write a sentence to show its scientific meaning.

action, purpose

Section 32.1 The Integumentary System (continued)

Main Idea

The Structure of Skin

I found this information on page _____.

SE, pp. 936–938
RE, pp. 375–376

Details

Analyze *the four types of body tissues in the integumentary system, and give the function of each one.*

1. **epithelial tissue; covers surfaces of the body**
2. **connective tissue; provides support and protection**
3. **muscle tissue; involved in body movement**
4. **nerve tissue; body’s communication network**

Classify *each phrase as describing the dermis or epidermis. Write each phrase under the correct skin layer.*

- consists of connective tissue
- has inner and outer portions
- contains dead cells that shed
- contains keratin
- contains melanin
- contains muscle fibers, nerve cells, sweat glands, and oil glands
- outer layer of skin
- inner, thicker portion of skin

Main Layers of Skin	
Dermis	Epidermis
<p>consists of connective tissue; contains muscle fibers, nerve cells, sweat glands, and oil glands; inner, thicker portion of skin</p>	<p>has inner and outer portions; contains dead cells that shed; contains keratin; contains melanin; outer layer of skin</p>

Summarize *the diagram of the integumentary system in your book.*

Accept all reasonable responses. Encourage students to describe how each part looks and the arrangement of the parts around each other.

Section 32.1 The Integumentary System (continued)

Main Idea

Functions of the Integumentary System

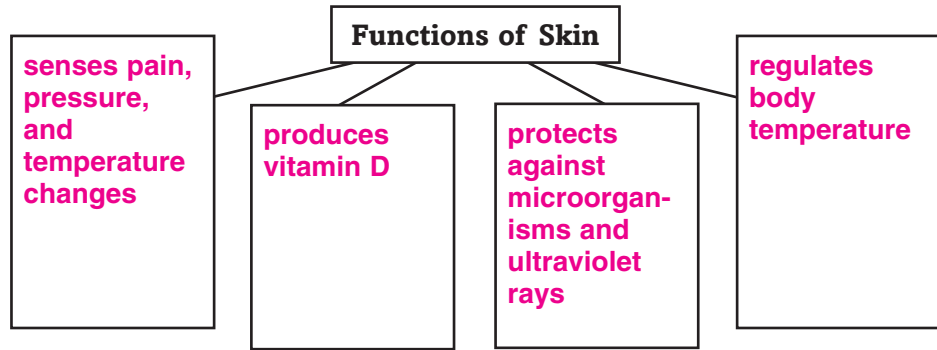
I found this information on page _____.
 SE, pp. 938–939
 RE, pp. 376–377

Damage to the Skin

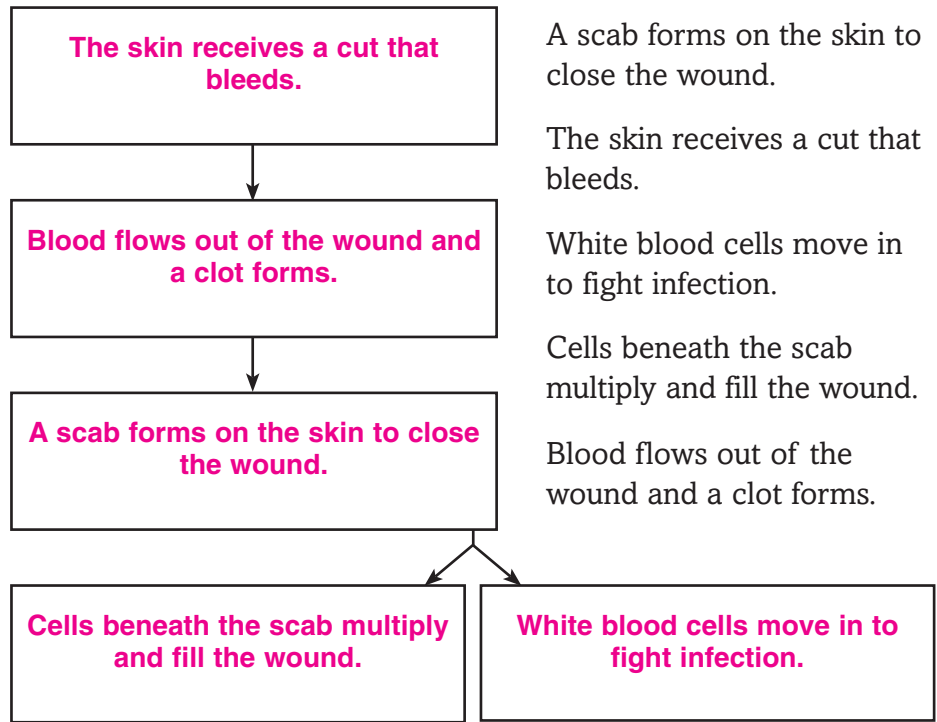
I found this information on page _____.
 SE, pp. 939–940
 RE, p. 377

Details

Organize information about the four functions of skin.



Sequence the steps that occur during skin healing.



CONNECT

Your skin changes as you age. Describe some things you can do to protect your skin so that it can better protect your body.

Accept all reasonable responses. I can wear sunscreen when I am out in sunlight or just not stay out in sunlight too long. I can avoid tanning beds. I can also use lotion to help my skin stay moisturized. I can eat a healthy diet and exercise.

Integumentary, Skeletal, and Muscular Systems

Section 32.2 The Skeletal System

Main Idea

Details

Skim Section 2 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define cartilage.

cartilage

tough, flexible connective tissue that forms the skeleton of embryos and later covers the surface of bones that move against each other in joints

New Vocabulary

Use your book or dictionary to define each term.

compact bone

dense and strong outer layer of all bones

osteocyte

living bone cell

spongy bone

less dense bone with cavities containing bone marrow

red bone marrow

substance in bone that produces red and white blood cells and platelets

yellow bone marrow

substance in bone that consists of stored fat

osteoblast

bone-forming cell

ossification

formation of bone from osteoblasts

osteoclast

cell that breaks down bone cells

ligament

tough band of connective tissue that attaches one bone to another

Section 32.2 The Skeletal System (continued)

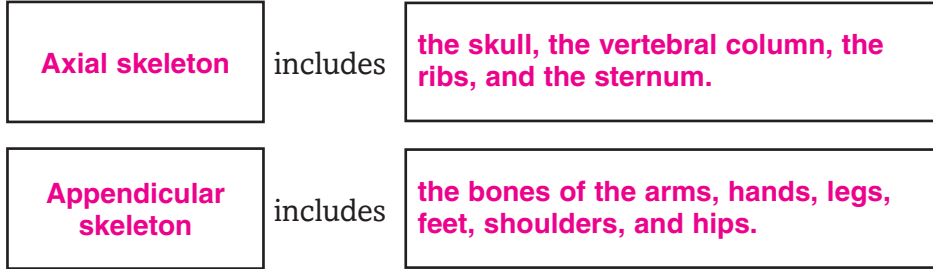
Main Idea

Structure of the Skeletal System

I found this information on page _____.
 SE, pp. 941–943
 RE, pp. 378–380

Details

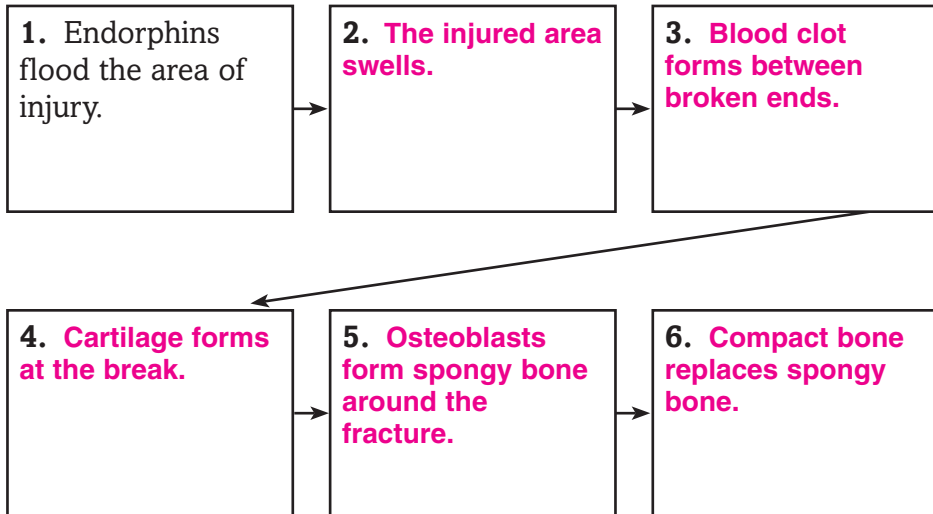
Identify the two main divisions of the human skeleton and the bones each includes.



Create a sketch of a bone. Show and label compact bone, spongy bone, and the location of osteons. Use the figure in your book to help you.

Students should sketch a simple bone showing compact bone, spongy bone, and osteons in the area along the length of compact bone. Sketches may resemble those in the book. Accept all reasonable responses.

Sequence the steps in the repair of fractured bone. The first step has been completed for you. **Accept all reasonable responses.**



Section 32.2 The Skeletal System (continued)

Main Idea

Joints

I found this information on page _____.
SE, pp. 944–945
RE, pp. 380–381

Function of the Skeletal System

I found this information on page _____.
SE, p. 946
RE, p. 381

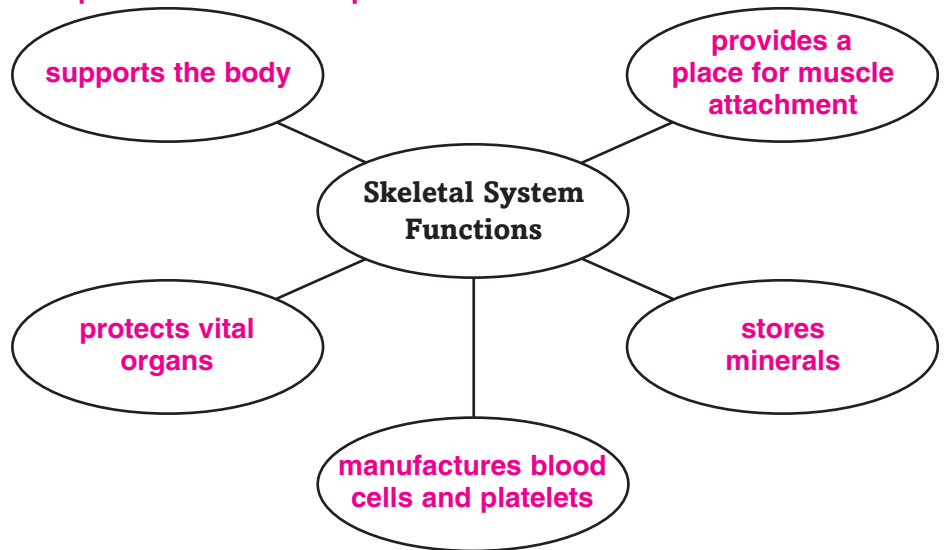
Details

Classify each bone joint listed below as one or more of the following types:

- gliding
- hinge
- ball-and-socket
- suture
- pivot

knee joint hinge skull bone joint suture
 elbow joint pivot, hinge shoulder joint ball-and-socket
 hip joint ball-and-socket wrist joint gliding
 ankle joint gliding vertebral joint gliding

Complete the concept map about the skeletal system functions. **Accept all reasonable responses.**



SUMMARIZE

Compare yellow bone marrow and red bone marrow.

Red bone marrow is found in the femur, humerus, sternum, ribs, vertebrae, and pelvis. This marrow makes red blood cells, white blood cells, and platelets needed for clotting. Yellow bone marrow does not produce any blood cells. It is stored fat that can be used at times when the body needs it.

Integumentary, Skeletal, and Muscular Systems

Section 32.3 The Muscular System

Main Idea

Details

Skim Section 3 of the chapter. Write two facts you discovered about muscles.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define anaerobic.

anaerobic

chemical reactions that do not require the presence of oxygen

New Vocabulary

Use your book or dictionary to define each term.

actin

protein filament that, along with myosin, makes up a myofibril

cardiac muscle

involuntary muscle present only in the heart

involuntary muscle

muscle that cannot be controlled consciously

myofibril

small unit of muscle fiber, made up of myosin and actin

myosin

protein filament that, along with actin, makes up a myofibril

sarcomere

the functional unit of a muscle and the part that contracts

skeletal muscle

muscle attached to bone by tendons and when contracted, causes movement

smooth muscle

involuntary muscle that lines many hollow internal organs

tendon

tough band of connective tissue that connects muscle to bone

voluntary muscle

muscle under conscious control

Section 32.3 The Muscular System (continued)

Main Idea

Three Types of Muscle

I found this information on page _____.

SE, pp. 947–948
RE, pp. 382–383

Details

Identify the three types of muscles. Classify each as voluntary or involuntary.

1. **smooth muscle—involuntary**
2. **cardiac muscle—involuntary**
3. **skeletal muscle—voluntary**

Distinguish between voluntary muscles and involuntary muscles.

Voluntary muscles are muscles you have to think about moving.

They contract under conscious control. Involuntary muscles are muscles that contract by themselves. You do not consciously control involuntary muscles.

Model the structure and appearance of each type of muscle. Label the nucleus and striation if the muscle is striated. Next to each muscle, describe its function.

Muscle Model	Muscle Function
Smooth Muscle Sketches might resemble Figure 32.11 on page 948 of the SE. The muscle fiber and nucleus should be labeled.	for example, moves food through the digestive tract
Cardiac Muscle The muscle fiber, nucleus, and striation should be labeled.	allows heart to contract efficiently and rhythmically
Skeletal Muscle The muscle fiber, nucleus, and striation should be labeled.	contraction causes movement

Section 32.3 The Muscular System (continued)

Main Idea

Skeletal Muscle Contraction

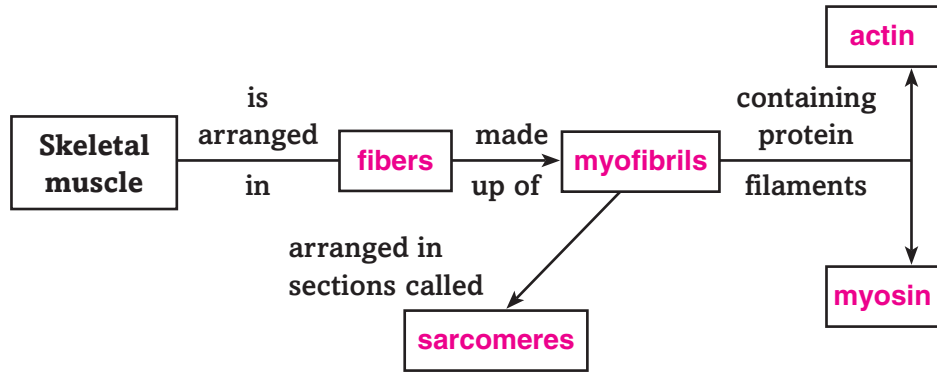
I found this information on page _____.
 SE, pp. 948–950
 RE, pp. 383–384

Skeletal Muscle Strength

I found this information on page _____.
 SE, pp. 950–951
 RE, p. 384

Details

Analyze muscle tissue by completing the graphic organizer.



Summarize the sliding filament theory.

Accept all reasonable responses. When a nerve impulse reaches the muscle to be moved, calcium is released into the myofibrils. Calcium causes myosin and actin to attach to each other, pulling the actin filaments toward the center of the sarcomere. This causes the muscle to shorten or contract. ATP is needed for this step. When the muscle relaxes, the filaments slide back.

Contrast the abilities of slow-twitch and fast-twitch muscles.

Slow-twitch	Fast-twitch
contract more slowly than fast-twitch muscles, but have more endurance	fatigue easily, but provide great strength for rapid, short movements

CONNECT

Contract your biceps muscle. Describe what you did to contract the muscle and which muscle is relaxed. Try the opposite and contract the muscle that was relaxed and describe what happens.

Accept all reasonable responses. I contracted my biceps by bending my arm. The triceps was relaxed. Then I contracted my triceps by straightening my arm and the biceps muscle was relaxed.

Nervous System

Before You Read

Use the “What I Know” column to list the things you know about the nervous system. Then list the questions you have about this system in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

Think about a time you have been frightened. Describe how you felt and how your body responded.

Accept all reasonable responses.

Nervous System

Section 33.1 Structure of the Nervous System

Main Idea

Details

Skim Section 1 of the chapter. Focus on the headings, subheadings, boldfaced words, and main ideas. Write two facts you discovered about the structure of the nervous system.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

diffusion

Use your book or dictionary to define diffusion.

random movement of particles from an area of higher concentration to an area of lower concentration resulting in even distribution

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

dendrite	region of a neuron that receives impulses from other neurons and conducts them to the cell body
node	gap in the myelin sheath along the length of an axon
action potential	nerve impulse
reflex arc	nerve pathway that consists of a sensory neuron, an interneuron, and a motor neuron; the basic structure of the nervous system
threshold	minimum stimulus to cause an action potential to be produced
cell body	contains the nucleus of a neuron and many of the cell organelles
neurotransmitter	chemical that diffuses across a synapse and binds to receptors on the dendrite of a neighboring cell
axon	region of a neuron that carries the nerve impulse from the cell body to other neurons and muscles
synapse	small gap between the axon of one neuron and the dendrite of another neuron
neuron	specialized cell that helps you gather, interpret, and react to information about your environment

Section 33.1 Structure of the Nervous System (continued)

Main Idea

Neurons

I found this information on page _____.

SE, pp. 962–963
RE, pp. 385–386

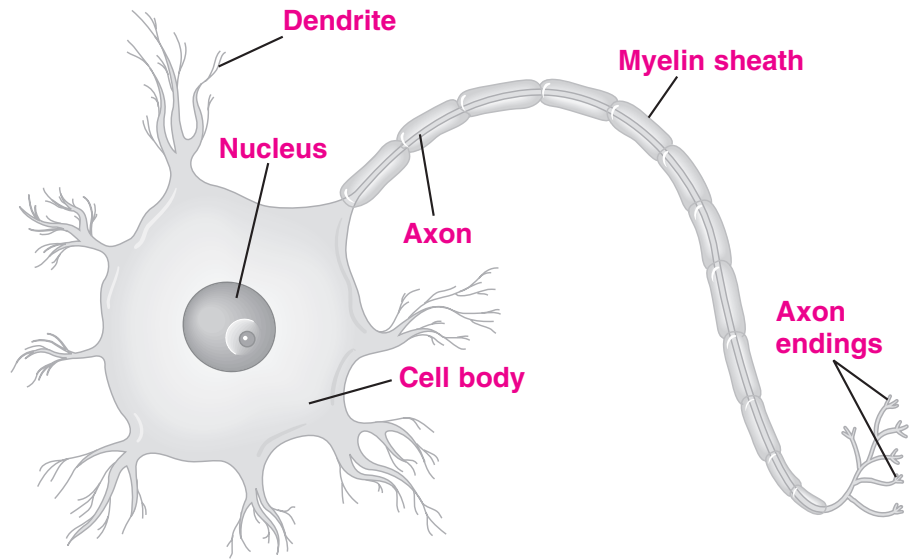
A Nerve Impulse

I found this information on page _____.

SE, pp. 963–967
RE, pp. 386–388

Details

Label the neuron. Include the axon, axon endings, cell body, dendrites, nucleus, and myelin sheath. Draw arrows to show the direction that impulses move through the neuron.



Arrows should point from the dendrite to the cell body and away from the cell body through the axon.

Analyze how the myelin sheath increases the speed at which impulses move.

The myelin sheath keeps the ions from diffusing across the plasma membrane of the axon. This makes the ions move quickly down the axon until they find a gap in the sheath through which they can pass. This makes the impulses jump from gap to gap so they move faster.

Evaluate how neurotransmitters move across synapses. Write one question and answer about the diagram above.

Question: Accept all reasonable responses.

Answer: _____

Section 33.1 Structure of the Nervous System (continued)

Main Idea

I found this information on page _____.

SE, pp. 963–967
RE, pp. 386–388

Details

Sequence the steps in how a nerve impulse moves from one neuron to another neuron, by writing the numbers 1 to 5 in the squares to the left of the steps.

5	The neurotransmitter drifts across the synapse and binds to receptors on the dendrite of a neighboring neuron.
3	An electrical impulse is sent along an axon, jumping from node to node in axons covered with myelin.
1	The neuron is at rest, with more sodium ions outside the cell and more potassium ions inside the cell.
4	The impulse reaches the synapse, where channels again open. Vesicles fuse with the plasma membrane and release a neurotransmitter by exocytosis.
2	The threshold for an action potential is reached at a dendrite, opening channels in the plasma membrane and causing a reversal in electrical charge.

SUMMARIZE

Give an example of an impulse that would be carried by a neuron with myelin and by a neuron without myelin.

Accept all reasonable responses. A sharp pain would be carried by a neuron with myelin.

A dull, throbbing pain would be carried by a neuron without myelin.

Nervous System

Section 33.2 Organization of the Nervous System

Main Idea

Details

Skim Section 2 of the chapter, taking note of headings, illustrations, photos, and captions. Then identify two facts that drew your interest.

Fact 1: Accept all reasonable responses.

Fact 2: _____

Review Vocabulary

sensory

Use your book or dictionary to define sensory.

conveying nerve impulses from the sense organs to the nerve centers

New Vocabulary

Classify each term in the left column as being part of the nervous system or part of the brain. Write a brief definition of each term.

	Part of Nervous System (4 terms)	Part of Brain (4 terms)
<i>autonomic nervous system</i>	autonomic nervous system: part of the peripheral nervous system that carries impulses from the central nervous system to the heart and other organs; involuntary	cerebrum: largest part of the brain, responsible for thought processes involved with learning, memory, language, speech, voluntary body movement, and sensory perception
<i>cerebrum</i>		
<i>hypothalamus</i>	parasympathetic nervous system: branch of the autonomic nervous system most active when the body is relaxed	hypothalamus: brain structure that regulates body temperature, thirst, appetite, water balance, blood pressure, sleep, aggression, fear, and sexual behavior
<i>medulla oblongata</i>		
<i>parasympathetic nervous system</i>	somatic nervous system: part of the peripheral nervous system that relays information from sensory receptors to the central nervous system and from the central nervous system to the skeletal muscles	medulla oblongata: part of the brain stem that helps control breathing rate, heart rate, and blood pressure
<i>pons</i>		
<i>somatic nervous system</i>		
<i>sympathetic nervous system</i>	sympathetic nervous system: branch of the autonomic nervous system most active in times of emergency and stress	pons: part of the brain stem that helps control breathing rate

Section 33.2 Organization of the Nervous System (continued)

Main Idea _____

Details _____

The Central Nervous System

I found this information on page _____.

SE, pp. 968–970
RE, pp. 389–391

Identify *two body parts that make up the central nervous system.*

1. **brain** _____ 2. **spinal cord** _____

Compare and contrast *the central nervous system and the peripheral nervous system.*

The central nervous system coordinates all of the body's activities.

The peripheral nervous system carries messages to and from the central nervous system.

Organize *the information about three main sections of the brain in the table below.*

	Cerebrum	Cerebellum	Medulla Oblongata
Description	divided into two halves that are connected by bundles of nerves; halves are called hemispheres	located at the back of the brain	part of the brain stem
Function	controls all conscious activity, intelligence, memory, language, skeletal muscle, and senses	controls balance, posture, and coordination	controls involuntary activities such as breathing and heart rate

Section 33.2 Organization of the Nervous System (continued)

Main Idea

The Peripheral Nervous System

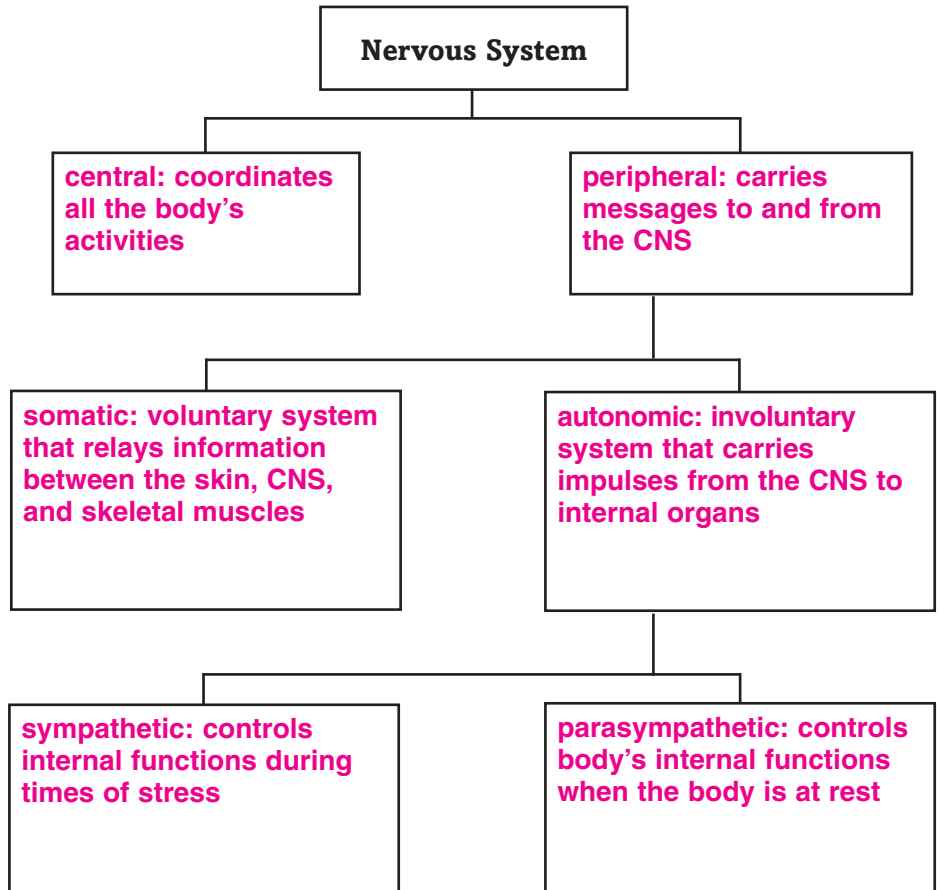
I found this information on page _____.

SE, pp. 971–972
RE, p. 391

Details

Organize and summarize each division of the nervous system and its function.

- autonomic
- central
- parasympathetic
- peripheral
- somatic
- sympathetic



SUMMARIZE

Compare and contrast a voluntary response of the somatic nervous system and a reflex.

Accept all reasonable responses. A voluntary response would be deciding to take a drink of hot cocoa. I would voluntarily control the muscles that moved my hand and arm to grasp and lift the cup and bring it to my mouth. If the cup of hot cocoa were too hot to grasp, I would pull my hand away as a reflex. It would happen without my brain even thinking about it.

Nervous System

Section 33.3 The Senses

Main Idea _____ **Details** _____

Skim Section 3 of the chapter. Write two questions that come to mind from reading the headings and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

Use your book or dictionary to define stimulus.

stimulus **anything in the internal or external environment that causes an organism to react**

New Vocabulary

Use your book or dictionary to define each term.

cochlea **snail-shaped structure in the inner ear containing fluid and hairs; produces electrical impulses that the brain interprets as sound**

lens **structure of the eye that inverts an image, focuses it, and projects it onto the retina**

retina **thin layer of tissue found at the back of the eye made up of light receptors and sensory neurons**

rod **receptor cell in the retina that is adapted for vision in dim light; also helps detect shape and movement**

semicircular canal **structure in the inner ear containing fluid and hairs that help the body maintain balance**

taste bud **sensory receptor located on the tongue; involved in taste perception**

Academic Vocabulary

Define interpret to show its scientific meaning.

interpret **to explain or tell the meaning of**

Section 33.3 The Senses (continued)

Main Idea

Taste and Smell

I found this information on page _____.

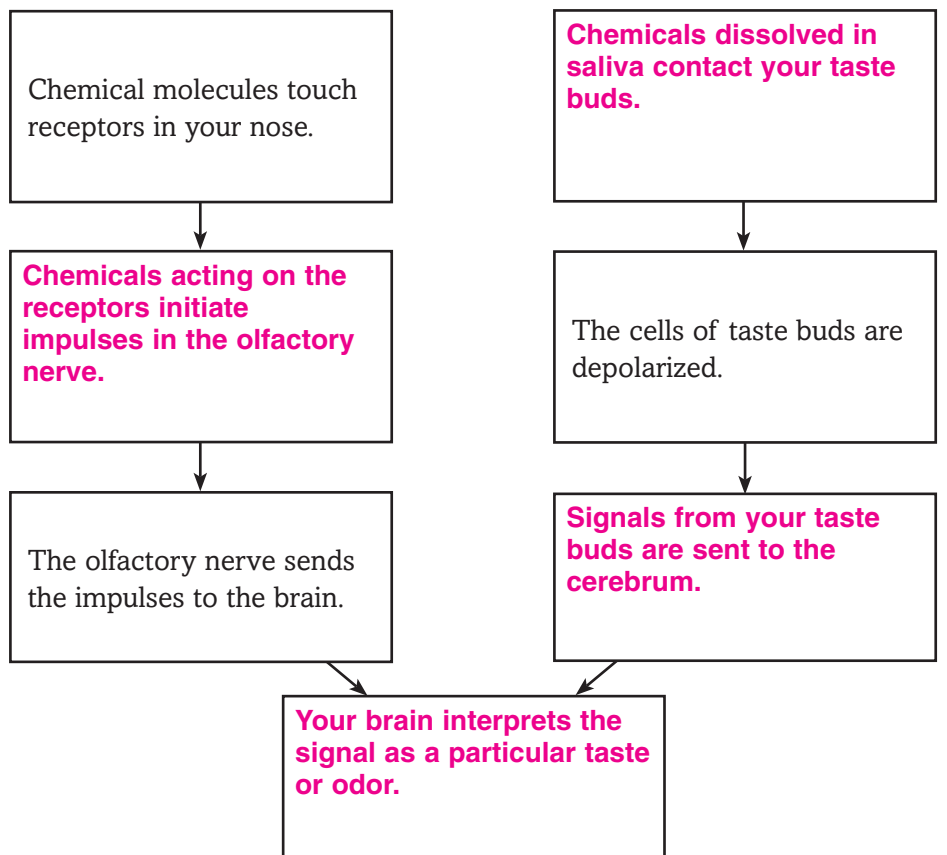
SE, p. 973
RE, p. 392

Details

Identify the sensory receptors in the mouth and nasal cavity.



Compare the steps in smelling and tasting. Write the steps for smelling on the left. Write the steps for tasting on the right. Some steps have been completed for you.

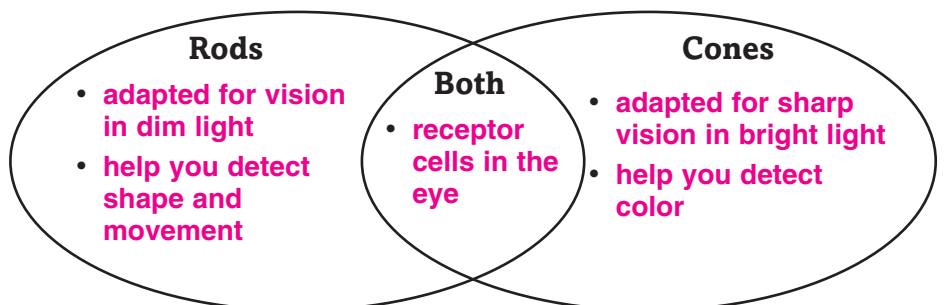


Sight

I found this information on page _____.

SE, p. 974
RE, p. 392–393

Compare how rods and cones in your eyes help you to sense light.



Section 33.3 The Senses (continued)

Main Idea

Hearing and Balance and Touch

I found this information on page _____.

SE, pp. 974–976
RE, pp. 393–394

Details

Sequence the steps in how your sense of hearing works, by writing the numbers 1 to 5 in the squares to the left of the steps.

5

The hairs produce electric impulses that travel to the cerebrum, where they are interpreted as sound.

3

The stapes causes the membrane of the oval window to move back and forth.

1

Sound waves enter your ear and travel down to the end of the ear canal.

2

Sound waves strike the eardrum and cause it to vibrate. The vibrations pass to the bones in the middle ear.

4

Fluid in the cochlea moves, causing the hair cells to bend.

Identify three stimuli to which receptors in the dermis of the skin respond.

1. temperature 2. pressure 3. pain

CONNECT

Predict how damage to the semicircular canals in the ears would affect balance. Support your reasoning.

Accept all reasonable responses. If the semicircular canals were damaged, you would not be able to balance as well. The hairs in the semicircular canals are responsible for telling the brain if you are balanced.

Nervous System

Section 33.4 Effects of Drugs

Main Idea

Details

Scan Section 3 of the chapter and identify two legal and two illegal drugs. **Accept all reasonable responses.**

Legal Drugs	Illegal Drugs
1.	1.
2.	2.

Review Vocabulary

Use your book or dictionary to define threshold.

threshold

the certain strength of a stimulus that causes an action potential to be generated

New Vocabulary

Use your book or dictionary to define the following terms.

addiction

psychological and/or physiological drug dependence

depressant

type of drug that lowers or depresses the activity of the nervous system

dopamine

neurotransmitter found in the brain that is involved with the control of body movement and feelings of pleasure or reward

drug

chemical substance that affects body function

stimulant

drug that increases the activity of the central and sympathetic nervous systems

tolerance

the body becomes less responsive to a drug and an individual needs larger or more frequent doses of the drug to achieve the same effect

Section 33.4 Effects of Drugs (continued)

Main Idea

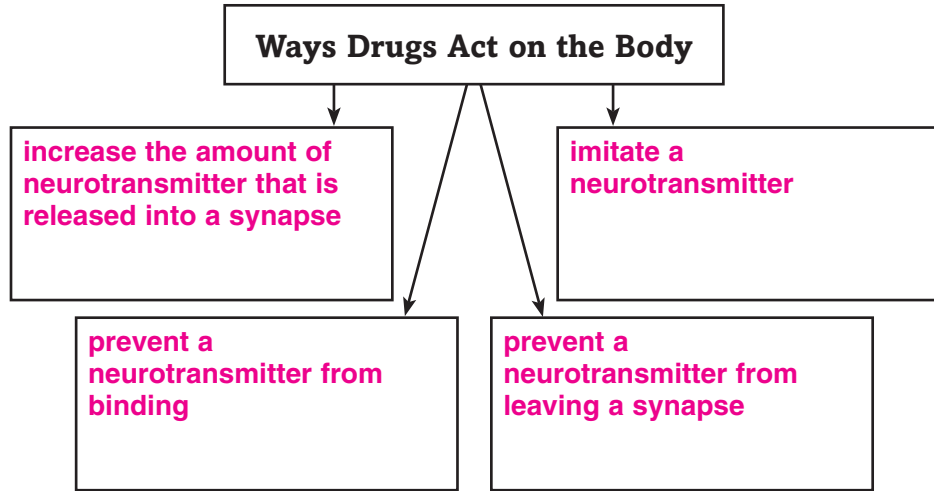
How Drugs Work

I found this information on page _____.

SE, pp. 977–978
RE, p. 395

Details

Summarize *four ways drugs can act on the body.*

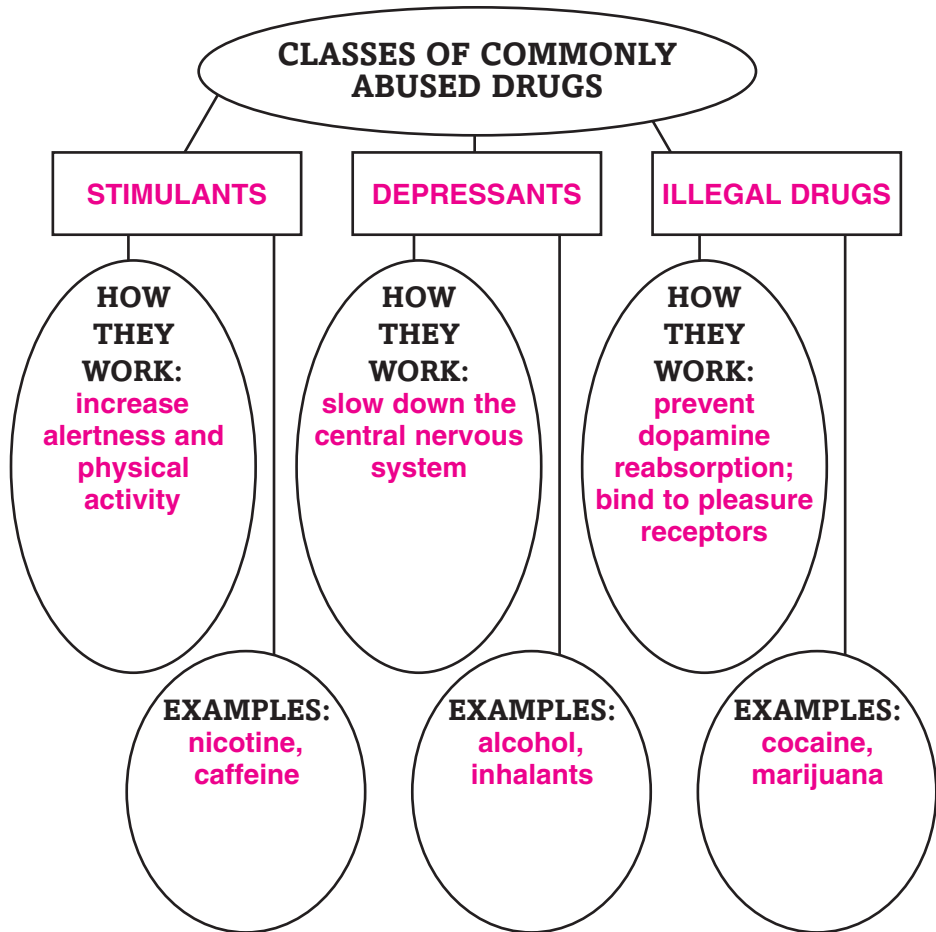


Classes of Commonly Abused Drugs

I found this information on page _____.

SE, pp. 978–980
RE, pp. 396–398

Compare *the three main classes of commonly abused drugs.* Identify each class, how it works in the body, and common examples.



Section 33.4 Effects of Drugs (continued)

Main Idea

I found this information on page _____.

SE, pp. 978–980

RE, pp. 396–398

Details

Analyze the short-term and long-term risks of smoking marijuana.

Short-term risks: problems with memory and learning, loss of coordination, increased heart rate, anxiety, paranoia, panic attacks

Long-term risks: lung cancer, emphysema

Tolerance and Addiction

I found this information on page _____.

SE, p. 981

RE, p. 398

Identify the following scenarios as tolerance, physiological dependence, or psychological dependence.

psychological dependence “I just can’t go to that party without having some alcohol. I need it to feel like I fit in.”

tolerance “I used to take two painkillers a day, but lately I have to take three or four pills to get the same effect as before.”

physiological dependence “When I try to go for a day without my caffeine, I get a terrible headache and nausea.”

CONNECT

Analyze why some stimulants are illegal and others are not.

Accept all reasonable responses. Stimulants like amphetamines have a much greater effect on the nervous system than stimulants like caffeine. For example, amphetamines cause irregular heartbeat, chest pain, and paranoia. Caffeine causes increased alertness and mood swings. Its adverse effects are much less severe than amphetamines.

Tie It Together

You have read about the structures and functions of the human nervous system, as well as the effects of drugs on it. Create a mini poster that informs readers of the importance of the nervous system to the body's health.

Accept all reasonable responses.

Circulatory, Respiratory, and Excretory Systems

Before You Read

Before you read the chapter, respond to these statements. **Accept all reasonable responses.**

1. Write an **A** if you agree with the statement.
2. Write a **D** if you disagree with the statement.

Before You Read	Circulatory, Respiratory, and Excretory Systems	After You Read
	<ul style="list-style-type: none"> • Your pulse rate is the number of times your heart beats each minute. 	A
	<ul style="list-style-type: none"> • If you need a blood transfusion, the donated blood must be the same type as yours. 	D
	<ul style="list-style-type: none"> • Breathing and respiration are two names for the same process. 	D
	<ul style="list-style-type: none"> • The components of the excretory system are the lungs, skin, and kidneys. 	A

Science Journal

When you breathe in, oxygen enters your lungs. Describe what you understand about how oxygen from the air reaches the cells in your body.

Accept all reasonable responses.

Circulatory, Respiratory, and Excretory Systems

Section 34.1 Circulatory System

Main Idea

Details

Scan Section 1 of the chapter. Identify and list the functions of blood.

Accept all reasonable responses.

- carrying oxygen and nutrients to cells _____
- removing cellular wastes _____
- carrying disease-fighting materials _____
- transporting chemical messengers _____
- forming clots _____
- regulating body temperature _____

Review Vocabulary

muscle contraction

Use your book or dictionary to define muscle contraction.

muscle cells or fibers shorten in response to stimuli _____

New Vocabulary

arteries
 atherosclerosis
 capillaries
 heart
 pacemaker
 plasma
 platelets
 red blood cells
 valves
 veins
 white blood cells

Use the new vocabulary terms to complete the paragraph below.

Large blood vessels called arteries carry oxygenated blood away from the heart. The blood flows into microscopic capillaries, where the blood exchanges oxygen and wastes with body cells. Then veins carry deoxygenated blood back to the heart. In these large vessels, flaps of tissue called valves prevent blood from flowing backward. The hollow, muscular heart pumps blood throughout the body. A pacemaker in the right atrium sends out signals that tell the heart muscle to contract. Over half of blood is made up of a clear, yellowish fluid called plasma. The function of red blood cells is to carry oxygen to all body cells. The white blood cells are the body's disease fighters. Cell fragments called platelets help to form blood clots at a wound site. Blood clots, fat deposits, or other materials can block the flow of blood through the arteries, resulting in a condition called atherosclerosis.

Section 34.1 Circulatory System (continued)

Main Idea

Functions of the Circulatory System

I found this information on page _____.

SE, p. 992
RE, p. 399

Blood Vessels and The Heart

I found this information on page _____.

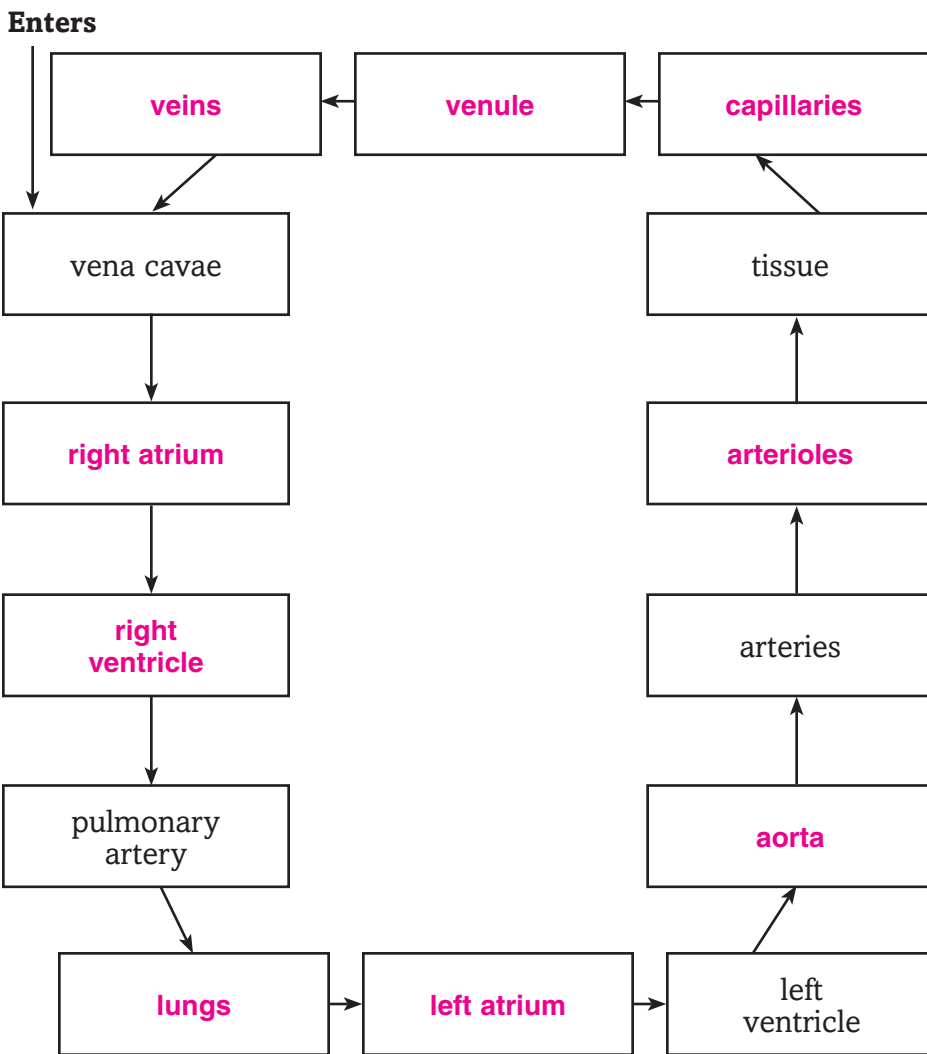
SE, pp. 993–996
RE, pp. 399–403

Details

Analyze how the circulatory system functions as the body's transport system.

Accept all reasonable responses. The main job of the circulatory system is to carry oxygen and nutrients to the cells and remove waste products from the cells. In addition, the circulatory system transports disease-fighting materials and blood-clotting fragments and distributes heat through the body.

Sequence the path blood takes through the human body by completing the flowchart below.



Section 34.1 Circulatory System (continued)

Main Idea

Details

Blood Components

I found this information on page _____.
SE, pp. 997–998
RE, p. 403

Identify the components of blood, and list the characteristics of each.

Blood Component	Characteristics
White blood cells	surround and kill invaders
Red blood cells	mostly made up of the protein hemoglobin; resemble pinched-in discs with no nuclei
Plasma	carries most of the carbon dioxide waste; transports glucose, fats, and chemical messengers
Platelets	releases chemicals that produce the protein fibrin

Blood Types

I found this information on page _____.
SE, pp. 998–999
RE, p. 404

Distinguish between blood type, by putting checks in the boxes to show which marker molecules and antibodies it contains.

Blood Type	Marker A	Marker B	Anti-A Antibody	Anti-B Antibody
A	✓			✓
B		✓	✓	
AB	✓	✓		
O			✓	✓

Circulatory System Disorders

I found this information on page _____.
SE, p. 999
RE, p. 404

Compare heart attacks to strokes.

	Heart Attack	Stroke
Causes	blood does not reach heart muscle	blood clots in vessels supplying oxygen to brain
Effects	damage to heart or death	ruptured blood vessels; internal bleeding; parts of brain die

SUMMARIZE

Create an analogy that explains the one way flow of blood through the circulatory system.

Accept all reasonable responses. Students might suggest a racetrack analogy with the heart and lungs functioning as pitstops.

Circulatory, Respiratory, and Excretory Systems

Section 34.2 Respiratory System

Main Idea

Details

Skim Section 2 of the chapter. Read the headings and illustration captions. Write three questions that come to mind.

1. **Accept all reasonable responses.**

2.

3.

Review Vocabulary

Use your book or dictionary to define ATP.

ATP

biological molecule that provides the body's cells with chemical energy

New Vocabulary

Use your book or dictionary to define each term.

alveolus

individual air sac at the end of a bronchiole where oxygen and carbon dioxide exchange occurs

breathing

mechanical movement of air in and out of the lungs

bronchus

large tube that branches from the trachea and leads to the lungs

external respiration

exchange of gases between the atmosphere and the blood

internal respiration

exchange of gases between the blood and the body's cells

lung

largest organ in the respiratory system and the location of gas exchange

trachea

long tube in the chest cavity; also called the windpipe

Section 34.2 Respiratory System (continued)

Main Idea

The Importance of Respiration

I found this information on page _____.

SE, p. 1000
RE, p. 405

The Path of Air

I found this information on page _____.

SE, p. 1001
RE, p. 406

Details

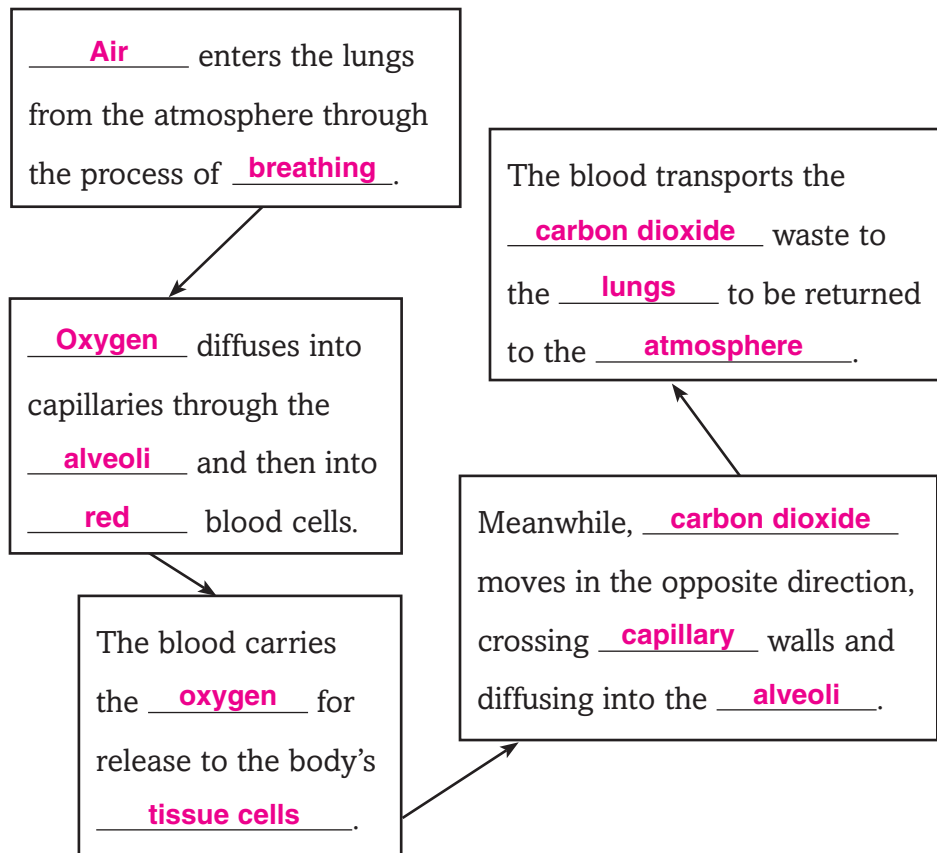
Contrast *breathing and respiration.*

Accept all reasonable responses. Breathing is a mechanical process of moving air in and out of the lungs and helps external respiration to occur. Respiration is an exchange of gases, which occurs with both external respiration and internal respiration.

Identify *three structures that filter air as it enters through the nose on its way to the lungs.*

1. hairs in the nose
2. cilia that line the nasal passages and other respiratory tubes
3. mucous membranes beneath the cilia in the nasal passages

Sequence *the process of gas exchange by completing the sentences in the flow chart below.*



Section 34.2 Respiratory System (continued)

Main Idea

Details

Breathing

I found this information on page _____.

SE, pp. 1002–1003
RE, p. 407

Model the lungs during inhalation and exhalation. Label and describe the position of the diaphragm during each process.

Inhalation	Exhalation
Diagrams may resemble Figure 34.13 in the text. Accept all reasonable responses. Labels should clearly indicate that the diaphragm contracts during inhalation and relaxes during exhalation.	

Respiratory Disorders

I found this information on page _____.

SE, p. 1004
RE, p. 407

Summarize each of the following common respiratory disorders.

Respiratory Disorder	Description
Pneumonia	lung infection causing mucus buildup in alveoli
Emphysema	breakdown of alveoli
Lung cancer	uncontrolled cell growth in lung tissue
Asthma	constriction of bronchioles
Bronchitis	infection of respiratory pathways
Pulmonary tuberculosis	infection of lungs by a specific bacterium

SUMMARIZE

Discuss the importance of respiration to the body.

Accept all reasonable responses. Respiration allows the body's cells to receive oxygen and get rid of carbon dioxide.

Circulatory, Respiratory, and Excretory Systems

Section 34.3 Excretory System

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables, figures, and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about the excretory system.

Write three facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

pH

Use your book or dictionary to define pH.

measure of acidity and alkalinity of a solution

New Vocabulary

kidney

Use your book or dictionary to define each term.

bean-shaped organ that filters out wastes, water, and salts from the blood

urea

nitrogenous waste product that is a component of urine

Academic Vocabulary

inhibit

Define inhibit to show its scientific meaning.

to hold back, restrain, or block the action or function of something

Section 34.3 Excretory System (continued)

Main Idea

Parts of the Excretory System

I found this information on page _____.

SE, p. 1005
RE, p. 408

The Kidneys

I found this information on page _____.

SE, pp. 1006–1007
RE, pp. 408–409

Details

Describe *three functions of the excretory system that help maintain homeostasis of the body.*

1. **removes metabolic wastes from the body**
2. **regulates the amount of fluid and salts in the body**
3. **maintains the pH of the blood**

Identify *the main waste products secreted by the following components of the excretory system.*

lungs: **carbon dioxide**

skin: **water and salts**

Model *the structure of a kidney, including a diagram of a nephron. Label each major component.*

Drawings should resemble the figure on SE p. 1006. Accept all reasonable responses. Labels should include the glomerulus, Bowman's capule, renal vein, renal artery, and collecting tubule.

Section 34.3 Excretory System (continued)

Main Idea

Details

Kidney Disorders

I found this information on page _____.
SE, p. 1008
RE, p. 410

Summarize information about kidney disorders in the table below.

Disorder	Symptoms	Common Causes	Treatments
Kidney infection	fever, chills, and mid- to low-back pain	bladder infection that spreads; obstructions in kidney	antibiotics
Nephritis	blood in urine; swelling of body tissues; protein in urine	large particles in bloodstream lodge in glomeruli, causing inflammation	special diet; prescription drugs
Kidney stones	pain	crystallized solids, such as calcium, form in kidney	ultrasonic sound waves; surgery

Kidney Treatments

I found this information on page _____.
SE, p. 1009
RE, p. 410

Contrast the two types of dialysis by explaining how they differ in the following areas.

Filtering device: One method uses a machine to filter, and the other uses the membrane lining of the patient's abdomen.

Frequency and duration of treatment: The machine method requires three sessions of three to four hours each week. The other method requires 30 to 40 minutes daily.

SUMMARIZE

Analyze the path wastes take from the kidney out of the body by making a list of the order of the structures through which wastes flow.

- | | |
|----------------------------|---------------------------|
| 1. <u>kidneys</u> | 5. <u>renal tubule</u> |
| 2. <u>renal artery</u> | 6. <u>urethra</u> |
| 3. <u>glomerulus</u> | 7. <u>urinary bladder</u> |
| 4. <u>Bowman's capsule</u> | 8. <u>ureter</u> |

Digestive and Endocrine Systems

Before You Read

Use the “What I Know” column to list the things you know about the digestive and endocrine systems. Then list the questions you have about these systems in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

What can go wrong with your digestive and endocrine systems? Describe your own experience, that of someone you know, or items you have heard about in the media.

Accept all reasonable responses.

Digestive and Endocrine Systems

Section 35.1 The Digestive System

Main Idea

Details

Skim Section 1 of the chapter. Write two questions that come to mind from reading the headings and the illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

nutrients

Use your book or dictionary to define nutrients.

vital components of foods that provide energy and materials for growth and for body functions

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

mechanical digestion

process that breaks food into smaller pieces by chewing and by the churning action of smooth muscles in the stomach and small intestine

small intestine

longest part of the digestive tract, which connects the stomach and the large intestine and where digestion is completed

esophagus

muscular tube that connects the pharynx to the stomach

amylase

enzyme found in saliva that begins chemical digestion by breaking down starches into sugars

villi

fingerlike structures in the small intestine through which chemical digestion is completed and most nutrients from food are absorbed

pepsin

enzyme in the stomach that helps digest proteins

liver

largest internal organ of the body; produces bile, which helps to break down fats

chemical digestion

action of digestive enzymes in breaking down large molecules of food into smaller molecules that can be absorbed by cells

peristalsis

rhythmic contraction of smooth muscles that moves food through the digestive tract

large intestine

end portion of the digestive tract, which includes the colon, rectum, and appendix

Section 35.1 The Digestive System (continued)

Main Idea

Functions of the Digestive System

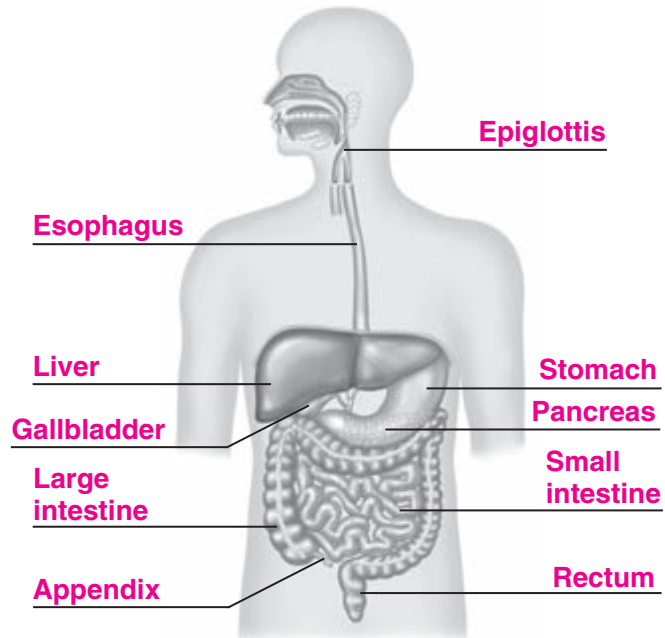
I found this information on page _____.

SE, pp. 1020–1024

RE, pp. 411–413

Details

Label the parts of the digestive system in the figure below.



Summarize how each organ below mechanically and chemically digests food.

Organ	Mechanical Digestion	Chemical Digestion
Mouth	chewing breaks food into smaller pieces	amylase breaks down starches into sugars
Stomach	churning of the smooth muscles breaks food into smaller pieces	gastric glands secrete acid that aids the action of pepsin, which breaks down proteins
Small intestine	smooth muscle contractions continue to break food into smaller pieces	concludes chemical digestion with help of pancreas, liver, and gallbladder
Pancreas	does not apply	produces enzymes that digest carbohydrates, proteins, and fats; secretes alkaline fluid that aids enzyme action
Liver	does not apply	produces bile, which helps break down fats

Section 35.1 The Digestive System (continued)

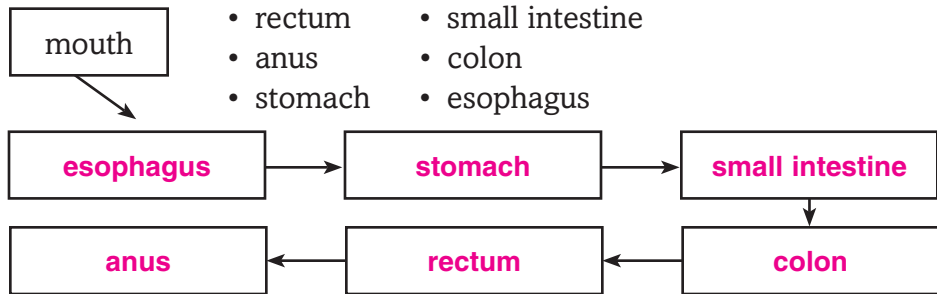
Main Idea

I found this information on page _____.

SE, pp. 1020–1024
RE, pp. 411–413

Details

Sequence the path of food through the digestive tract by placing the terms from the following list in the proper order on the flowchart.



Analyze why a sandwich would progress through your digestive tract, even if you ate it while standing on your head.

Accept all reasonable responses. Peristalsis, or the rhythmic contraction of smooth muscles that line the digestive tract, moves food through the system. Gravity is not required.

Contrast the digestive functions of the small intestine with those of the large intestine. Accept all reasonable responses.

Small Intestine	Large Intestine
<ul style="list-style-type: none"> • digestion completed • most nutrients absorbed 	<ul style="list-style-type: none"> • eliminating indigestible wastes • colon absorbs water from chyme • converts it to feces for passage through the rectum • elimination from the anus

CONNECT

Describe how your body’s ability to benefit from food would change if your small intestine did not have villi. Explain why.

Accept all reasonable responses. Without villi, the body would obtain less benefit from the food ingested. Without villi, a person would have to consume more food because digestion would be less efficient.

Digestive and Endocrine Systems

Section 35.2 Nutrition

Main Idea

Details

Scan Section 2 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables, figures, and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about nutrition.

Write three facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define amino acids.

amino acids

basic building blocks of proteins

New Vocabulary

Use your book or dictionary to define each term.

Calorie

unit used to measure the energy content of foods

mineral

inorganic compound that is used by the body as building material and is involved with metabolic functions

nutrition

process by which a person takes in and uses food

vitamin

organic compound that is needed in small amounts for metabolic activities

Section 35.2 Nutrition (continued)

Main Idea

Details

Calories

I found this information on page _____.

SE, p. 1025
RE, p. 414

Evaluate Assume that playing soccer requires 540 Calories per hour. On a particular day, you ate 2,000 Calories in food. You played soccer for 2.5 hours. Your body used 800 Calories in other activities. Did you use more energy than you consumed on this day? Show your work.

Yes; you used $800 + (540 \times 2.5 \text{ hours}) = 2,150$ Calories. You took in 2,000 Calories. You took in 150 fewer Calories than you used.

Carbohydrates and Fats and Proteins

I found this information on page _____.

SE, pp. 1026–1027
RE, p. 415

Summarize information about carbohydrates, fats, and proteins by completing the table below.

	Break Down Into	Importance to the Body
Carbohydrates	simple sugars	provide energy for cells; cellulose helps food move through digestive tract
Fats	fatty acids and glycerol	provide energy; building blocks for body; protect some internal organs; store and transport some vitamins
Proteins	amino acids	cells assemble amino acids into proteins needed for body structures and functions

Food Pyramid

I found this information on page _____.

SE, p. 1027
RE, p. 416

Classify all the foods you ate yesterday in the appropriate food groups. **Accept all reasonable responses.**

Grains	Fruits	Milk
Vegetables	Oils	Meat and Beans

Section 35.2 Nutrition (continued)

Main Idea

Vitamins and Minerals and Nutrition Labels

I found this information on page _____.

SE, pp. 1028–1030
RE, p. 416

Details

Examine the food label below, and complete the table below assuming you ate the contents of the entire container.

NUTRITION FACTS	
Serving Size: 1 cup (237 g)	
Servings Per Container: 2	

Amount Per Serving	
Calories 100	Calories from Fat 20

	% Daily Value
Total Fat 2 g	3%
Saturated Fat 0.5 g	3%
Cholesterol 20 mg	7%
Sodium 960 mg	40%
Total Carbohydrate 13 g	4%
Dietary Fiber 1 g	5%
Sugars 1 g	
Protein 9 g	

Vitamin A 30%	Vitamin C 0%
Calcium 2%	Iron 4%

Calories Consumed	Grams of Saturated Fat	Grams of Protein	Percent of Daily Value of Calcium
200	1 g	18 g	4%

SUMMARIZE

Typically men need more Calories per day than women, and teenagers need more Calories than adults. Analyze why Calorie needs differ between these groups.

Accept all reasonable responses. Usually men are larger and have higher metabolic rates than women and would need more Calories to support their body mass and higher metabolic rate.

Teenagers are still growing and need more Calories to support their growth. Also, teenagers tend to be more physically active than adults, and physical activity uses Calories.

Digestive and Endocrine Systems

Section 35.3 The Endocrine System

Main Idea

Details

Scan the titles, boldfaced words, figures, and captions in Section 3. Write two facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

homeostasis

Use your book or dictionary to define homeostasis.

regulation of an organism's internal environment to maintain life

New Vocabulary

Write the correct term in the left column for each definition below.

hormone	acts on target cells and tissues to produce a specific response
thyroxine	hormone that causes cells to have a higher rate of metabolism
endocrine gland	any gland that produces hormones, which are released into the bloodstream and distributed to body cells
calcitonin	thyroid hormone that is partly responsible for the regulation of calcium, blood clotting, nerve function, and muscle contraction
parathyroid hormone	increases blood calcium by stimulating the bones to release calcium
aldosterone	steroid hormone secreted by the adrenal glands that primarily affects the kidneys and is important for reabsorbing sodium
cortisol	steroid hormone secreted by the adrenal glands that raises blood glucose levels and also reduces inflammation
pituitary gland	secretes hormones that regulate many body functions as well as other endocrine glands
glucagon	pancreatic hormone that signals liver cells to convert glycogen to glucose and release the glucose into the blood
insulin	pancreatic hormone that signals liver and muscle cells to accelerate the conversion of glucose to glycogen, which is stored in the liver
antidiuretic hormone	hormone produced by the hypothalamus, regulates water balance

Section 35.3 The Endocrine System (continued)

Main Idea

Action of Hormones

I found this information on page _____.
SE, pp. 1031–1032
RE, p. 417

Negative Feedback

I found this information on page _____.
SE, p. 1032
RE, p. 418

Endocrine Glands and Their Hormones

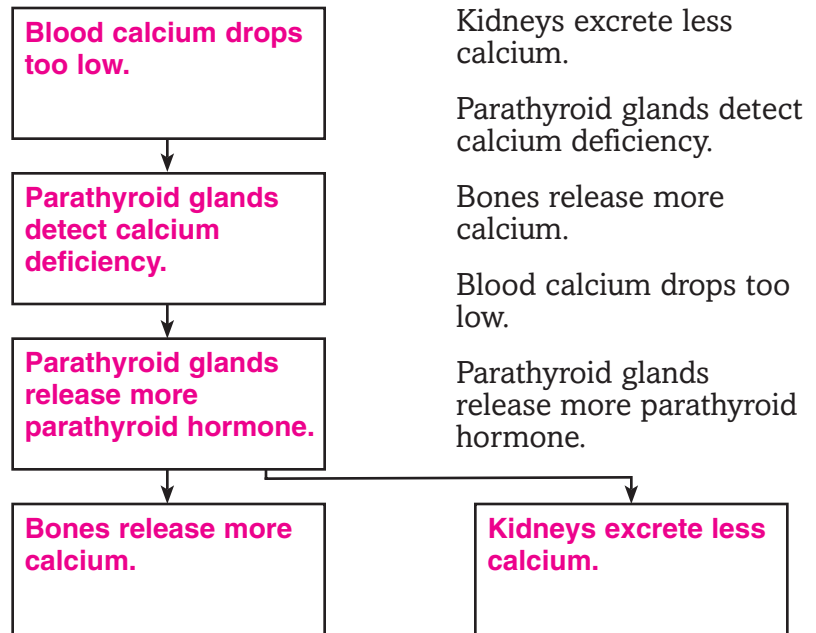
I found this information on page _____.
SE, pp. 1032–1035
RE, pp. 418–419

Details

Contrast *the action of steroid hormones and amino acid hormones.*
Accept all reasonable responses.

Steroid Hormones	Amino Acid Hormones
<p>cause target cells to initiate protein synthesis; soluble in lipids so can diffuse through plasma membrane of target cell; bind with receptors in cytoplasm; move together into nucleus; bind with DNA, activating specific genes</p>	<p>cannot diffuse through plasma membrane, so bind with receptors on membrane of target cell; receptors activate enzyme inside, which initiates a biochemical pathway, resulting in desired response</p>

Sequence *the steps in a portion of the negative feedback system.*
Steps in the regulation of calcium are written in scrambled order at right. Write the steps in the correct order in the boxes.



Explain *how the endocrine system functions as a communication system.*

Serves as messengers	hormones
Produces messengers	endocrine glands
Receives the messages	target cells and tissues

Section 35.3 The Endocrine System (continued)

Main Idea

Details

**Links to the Endocrine/
Nervous System**

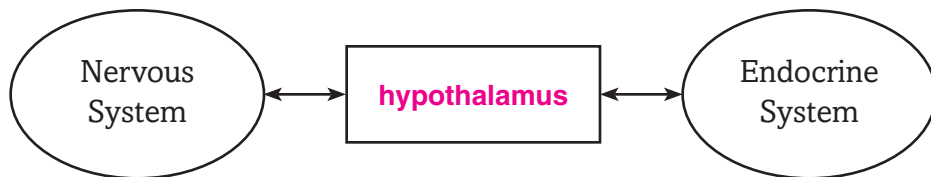
I found this information on page _____.

SE, p. 1037
RE, p. 420

Compare the hormone functions of the glands listed below.

Gland/ Location	Hormones Produced	Body Functions Regulated
Pituitary Location: base of brain	human growth hormone (hGH), among others	hGH regulates physical growth; others regulate many body functions and other endocrine glands
Thyroid Location: throat	thyroxine	causes cells to have a higher metabolic rate
	calcitonin	calcium levels in blood, blood clotting, nerve function, muscle contraction
Parathyroid Location: throat	parathyroid hormone	calcium levels
Pancreas Location: below stomach	insulin	lowers blood glucose levels
	glucagon	raises blood glucose levels
Adrenal Location: just above kidneys	aldosterone	reabsorption of sodium
	cortisol	raises blood glucose and reduces inflammation

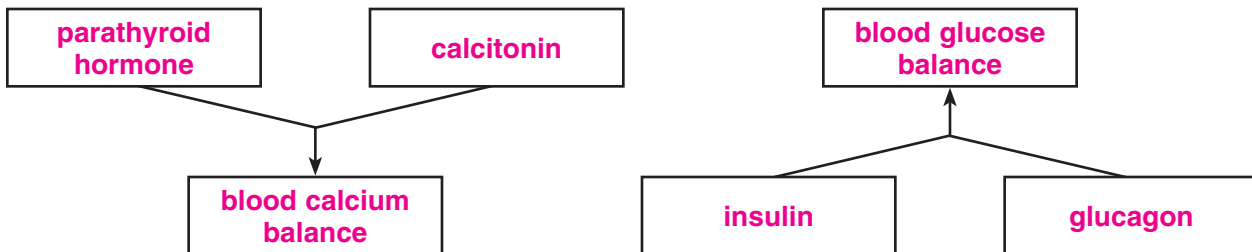
Identify the key link in the diagram below.



SUMMARIZE

Create a concept map showing two pairs of hormones that work together and the effect of their cooperation on homeostasis.

Accept all reasonable responses.



Human Reproduction and Development

Before You Read

Use the “What I Know” column to list the things you know about reproduction and development. Then list the questions you have about these topics in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

As you have grown and developed since birth, you have gone through many changes. Write about some of the physical changes you have experienced since you were born.

Accept all reasonable responses.

Human Reproduction and Development

Section 36.1 Reproductive Systems

Main Idea

Details

Skim Section 1 of the chapter. Read the headings and illustration captions. Write three questions that come to mind.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

Use your book or dictionary to define hypothalamus.

hypothalamus

portion of the brain that connects the endocrine and nervous systems and which controls the pituitary gland

New Vocabulary

Classify each vocabulary term. Give a brief description of each. One term fits in both categories.

	Male Reproductive System	Female Reproductive System
<i>epididymis</i>	epididymis: single coiled tube where sperm mature	menstrual cycle: changes in the female reproductive cycle each month
<i>menstrual cycle</i>	puberty: time when secondary sex characteristics develop	oocyte: immature egg that develops into an ovum
<i>oocyte</i>	semen: combination of sperm and fluids	oviduct: tube that carries an egg from ovary to uterus
<i>oviduct</i>	seminiferous tubule: tubule in each testis in which sperm develops	polar body: is formed at the first and second meiotic divisions
<i>polar body</i>	urethra: tube that carries both semen and urine out of the body through the penis	puberty: time when secondary sex characteristics develop
<i>puberty</i>	vas deferens: duct that carries sperm from the epididymis toward the ducts that will force the sperm out of the body	
<i>semen</i>		
<i>seminiferous tubule</i>		
<i>urethra</i>		
<i>vas deferens</i>		

Section 36.1 Reproductive Systems (continued)

Main Idea

Human Male Reproductive System

I found this information on page _____.

SE, pp. 1048–1049

RE, pp. 421–422

Details

Model the structures of the male reproductive system below. Label the testes, epididymus, vas deferens, and urethra. Describe the function of each.

Sketches should resemble SE p. 1048

testes—where sperm are produced; epididymus—tube where sperm mature; vas deferens—duct that carries sperm toward the ducts that will push them out of the body; urethra—carries sperm out of body

Create a diagram to show how the negative feedback system works to control FSH and LH in the male body.

Accept all reasonable diagrams that show that as the levels of testosterone in the blood increase, the body decreases the production of FSH and LH. Increased sperm production also decreases the production of these. When the levels of testosterone drop, the body increases production of FSH and LH.

Human Female Reproductive System

I found this information on page _____.

SE, p. 1050

RE, p. 423

Identify the three main functions of the female reproductive system.

to produce eggs, to receive sperm, and to provide an environment in which a fertilized egg can develop

Model the structures of the human female reproductive system below. Label the oviduct, cervix, ovary, and uterus. Describe the function of each.

Sketches should resemble SE p. 1050.

ovary—produces eggs; oviduct—moves eggs to the uterus; uterus—where a fetus develops; cervix—lower end of the uterus that leads to the vagina; vagina—leads to outside the female body

Section 36.1 Reproductive Systems (continued)

Main Idea

Sex Cell Production

I found this information on page _____.

SE, p. 1051
RE, p. 424

The Menstrual Cycle

I found this information on page _____.

SE, pp. 1051–1053
RE, pp. 424–425

Details

Summarize the results of each meiotic division in the production of eggs.

First Meiotic Division	Second Meiotic Division
a polar body, which eventually disintegrates, and a cell that contains most of the cytoplasm and eventually becomes an egg	completed only if the egg is fertilized; polar body, which disintegrates, and the zygote

Sequence the steps in the menstrual cycle. Describe the changes in hormones, the uterus, and the ovary at each stage.

1. The Flow Phase		
Hormone Changes Level of FSH in blood begins to rise.	Uterine Changes Endometrium is shed; uterine muscle contracts to help expel endometrium.	Ovary Changes A follicle in one ovary begins to mature; meiosis of the prophase I cells goes on.
2. The Follicular Phase		
Hormone Changes Estrogen stimulates the repair of the endometrial lining; production of FSH and LH slows. Estrogen peaks causing sharp increase in release of LH.	Uterine Changes Endometrial cells undergo mitosis and uterine lining thickens.	Ovary Changes Follicle ruptures and egg is released into oviduct.
3. The Luteal Phase		
Hormone Changes Progesterone and estrogen are produced. If egg not fertilized, release of FSH and LH blocked, hormone levels drop.	Uterine Changes If egg is not fertilized, lining sheds. If egg is fertilized, endometrium secretes fluid rich in nutrients.	Ovary Changes Corpus luteum develops from ruptured follicle. If egg is not fertilized, corpus luteum breaks up.

SUMMARIZE

Draw a concept web that shows sex cell production in males and females. **Accept all reasonable responses.**

Human Reproduction and Development

Section 36.2 Human Development Before Birth

Main Idea

Details

Skim Section 2 of the chapter. Write two questions that come to mind from reading the heading and illustration captions.

1. **Accept all reasonable responses.** _____
2. _____

Review Vocabulary

lysosome

Use your book or dictionary to define lysosome.

organelle that contains digestive enzymes

New Vocabulary

amniotic fluid

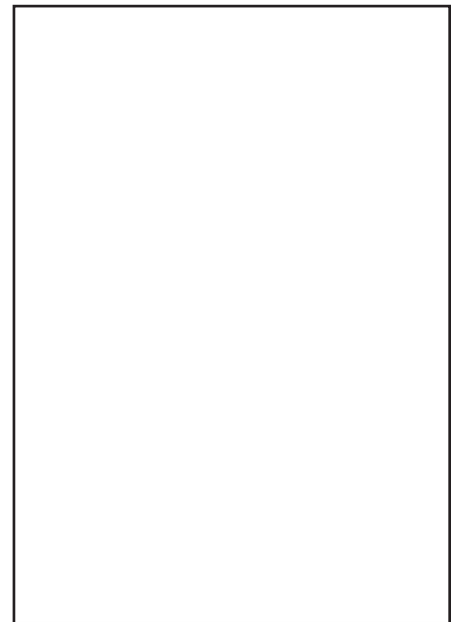
liquid that protects, cushions,
and insulates the embryo

blastocyst

hollow ball of cells formed by
the fifth day of pregnancy;
attaches to the endometrium

morula

solid ball of cells at the point at
which the zygote leaves the
oviduct and enters the uterus



Academic Vocabulary

enable

Define enable to show its scientific meaning. Write a sentence using the term.

to make able or feasible

Section 36.2 Human Development Before Birth (continued)

Main Idea

Fertilization and Early Development

I found this information on page _____.
 SE, pp. 1054–1058
 RE, pp. 426–429

Details

Sequence *the steps of fertilization of an egg and implantation of a blastocyst. The steps are written in scrambled order at right. Write the steps in the correct order in the boxes.*

300 million to 500 million sperm are released in the female's vagina.

The sperm that survive the acidic vagina swim through the vagina into the uterus.

A few hundred sperm make it into the two oviducts.

One sperm penetrates the egg, which changes the electrical charge of the egg's membrane so other sperm cannot enter.

The nucleus of the sperm and the nucleus of the egg unite, forming a zygote.

The zygote moves down the oviduct and begins to divide by mitosis.

The zygote moves into the uterus and becomes a blastocyst.

The blastocyst attaches to the uterine lining.

The zygote moves into the uterus and becomes a blastocyst.

300 million to 500 million sperm are released in the female's vagina.

The nucleus of the sperm and the nucleus of the egg unite, forming a zygote.

A few hundred sperm make it into the two oviducts.

The zygote moves down the oviduct and begins to divide by mitosis.

The blastocyst attaches to the uterine lining.

Section 36.2 Human Development Before Birth (continued)

Main Idea

I found this information on page _____.

SE, pp. 1055–1058

RE, pp. 426–429

Three Trimesters of Development

I found this information on page _____.

SE, pp. 1058–1059

RE, pp. 429–430

Diagnosis in the Fetus

I found this information on page _____.

SE, pp. 1060–1061

RE, p. 430

Details

Model a placenta and umbilical cord attached to an embryo. Draw arrows to show the route oxygen and nutrients take from the mother’s blood to the embryo and how wastes are removed.

Accept all reasonable diagrams. See SE p. 1056.

Compare development of an embryo into a fetus during each trimester. Describe the changes that occur.

First Trimester	Second Trimester	Third Trimester
organ systems form; fetus can move arms, legs, fingers, and toes, and make facial expressions	period of marked growth; hair forms; eyes can open; fetus cannot maintain a constant body temperature and lungs not fully developed	rapid growth; fat accumulates under the skin; rapid development of nerve cells in the brain

Analyze one of the methods of diagnosis in the fetus and describe its benefits and risks.

Accept all reasonable responses. The three methods discussed in the text are ultrasound, amniocentesis, and chorionic villi sampling.

SUMMARIZE

Use the analogy of plant growth to compare to the growth and development of a fetus over nine months.

Accept all reasonable responses. A developing plant is similar to a fetus growing. The seed sprouts and the young plant begins to grow. This is similar to the first trimester growth of a fetus. The plant is developing new parts. In the second trimester, the plant makes its way above the surface of the soil. In the third trimester, the plant continues to grow and grow.

Human Reproduction and Development

Section 36.3 Birth, Growth, and Aging

Main Idea

Details

Scan the illustrations and read the captions in Section 3 of the chapter. Predict two things you will read about birth and growth.

1. **Accept all reasonable responses.**

2. _____

Review Vocabulary

growth

Use your book or dictionary to define growth.

increase in the amount of living material and formation of new structures in an organism

New Vocabulary

adolescence

Use your book or dictionary to define the following terms.

major phase of development that begins with puberty and ends at adulthood

adulthood

phase of development that begins when physical development is complete

dilation

opening of the cervix prior to giving birth

expulsion stage

phase of labor in which strong uterine contractions push the fetus out through the vagina

infancy

first two years of life

labor

birthing process

placental stage

phase of labor after birth, during which the placenta detaches from the uterus and leaves the mother's body through the vagina

Section 36.3 Birth, Growth, and Aging (continued)

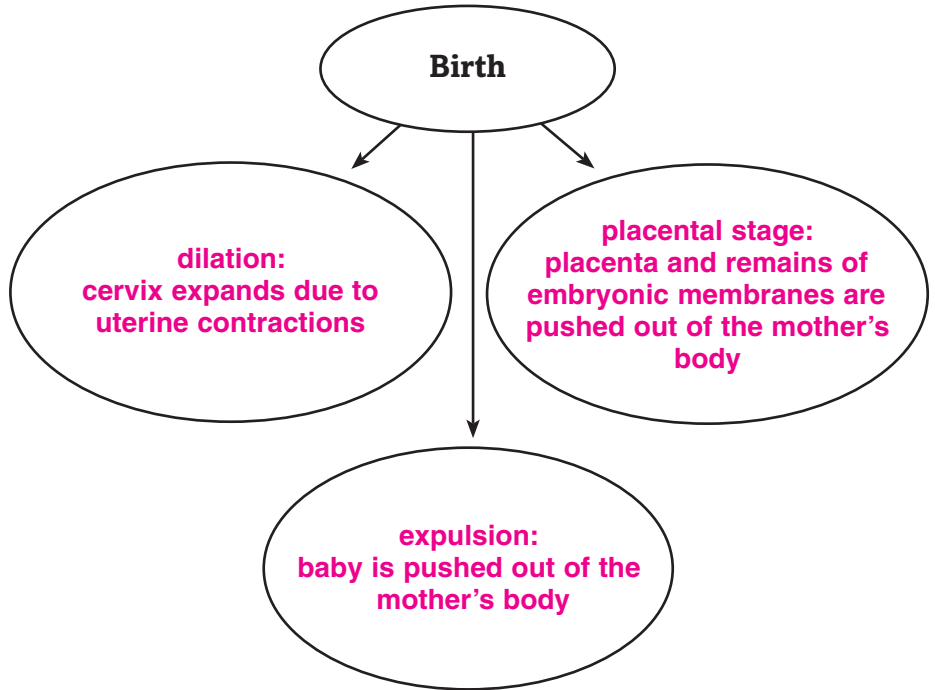
Main Idea

Details

Birth

I found this information on page _____.
 SE, pp. 1062–1063
 RE, p. 431

Identify and describe the three stages of birth in the graphic organizer below.



Growth and Aging

I found this information on page _____.
 SE, pp. 1063–1065
 RE, p. 432

Analyze the primary way the following hormones affect human growth.

Hormone	Effect on Growth
Human growth hormone	increases the rates of protein synthesis and breakdown of fats
Thyroxine	increases the overall metabolic rate
Steroids	activate certain genes that promote the formation of proteins, causing cell sizes to increase

Section 36.3 Birth, Growth, and Aging (continued)

Main Idea

I found this information on page _____.

SE, pp. 1063–1065
RE, p. 432

Details

Describe the changes that occur at each stage of growth and development.

1. Infancy
Infancy describes the first two years of life. The child grows tremendously, increasing physical coordination and mental development. The infant’s birth weight triples in the first year. Infants learn to control their legs and arms, roll over, sit, crawl, and walk. The child may begin to talk toward the end of this stage.

2. Childhood
Childhood lasts from the end of infancy to adolescence. The child develops ability to reason and solve problems.

3. Adolescence
Adolescence follows childhood and begins at puberty. Teenagers have growth spurts that can be surprisingly large. Adolescents gain their maximum height. By the time adulthood is reached, physical growth is complete.

4. Adulthood
During adulthood, metabolism slows down, the skin begins to lose its elasticity, wrinkles appear, and hair begins to turn white. Disks between vertebrae compress, so people become shorter. Vision and hearing might diminish.

SUMMARIZE

Create a flowchart of the stages of human development from newborn to adulthood. Write the approximate age when an individual moves from one stage to the next. **Accept all reasonable responses.**

The Immune System

Before You Read

Use the “What I Know” column to list the things you know about disease and immunity. Then list the questions you have about disease and immunity in the “What I Want to Find Out” column. **Accept all reasonable responses.**

K What I Know	W What I Want to Find Out	L What I Learned

Science Journal

When you get a cold, your immune system fights it and you eventually feel better. Hypothesize how people with weakened immune systems might need to live their lives differently to stay healthy.

Accept all reasonable responses.

The Immune System

Section 37.1 Infectious Diseases

Main Idea

Details

Skim Section 1 of the chapter and list three ways that diseases spread from person to person.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

protozoan

Use your book or dictionary to define protozoan.

unicellular, heterotrophic, animal-like protist

New Vocabulary

antibiotic

Use your book or dictionary to define each term.

prescription drug containing a substance that can kill or inhibit the growth of other microorganisms

endemic disease

disease continually found in small amounts within the population

epidemic

large outbreak in an area that afflicts many people with the same disease

infectious disease

disease that is caused when a pathogen is passed from one organism to another, disrupting homeostasis in the organism's body

Koch's postulates

rules for demonstrating that an organism causes a disease

pandemic

epidemic that is widespread throughout a large region, such as a country, continent, or the entire globe

pathogen

cause of infectious disease

reservoir

for diseases, a source of the pathogen in the environment

Section 37.1 Infectious Diseases (continued)

Main Idea

Details

Pathogens Cause Infectious Disease

I found this information on page _____.

**SE, p. 1076
RE, p. 433**

Germ Theory and Koch's Experiments

I found this information on page _____.

**SE, pp. 1076–1077
RE, pp. 433–434**

Spread of Disease

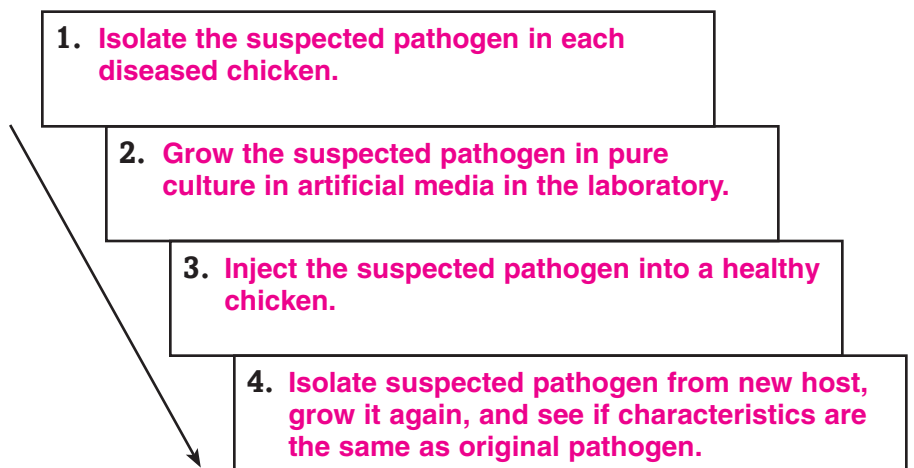
I found this information on page _____.

**SE, pp. 1078–1080
RE, pp. 435–436**

Identify facts about harmful and helpful microorganisms.

<p>Five types of pathogens:</p> <ol style="list-style-type: none"> bacteria viruses protozoans fungi parasites 	<p>Four places that helpful microorganisms live in your body:</p> <ol style="list-style-type: none"> intestinal tract reproductive tract skin hair follicles
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Design the experimental steps you would use to identify the virus that caused bird flu in a flock of chickens using Koch's postulates.



Analyze how diseases spread.

<p>Three disease reservoirs:</p> <ol style="list-style-type: none"> animals people inanimate objects, such as contaminated soil, water, or food 	<p>Four main ways diseases are transmitted to humans:</p> <ol style="list-style-type: none"> direct contact indirectly through the air through vectors indirectly through touching contaminated object
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Section 37.1 Infectious Diseases (continued)

Main Idea

Symptoms of Disease

I found this information on page _____. SE, pp. 1080–1081 RE, p. 436

Disease Patterns

I found this information on page _____. SE, p. 1081 RE, p. 437

Treating and Fighting Diseases

I found this information on page _____. SE, pp. 1082–1083 RE, p. 437

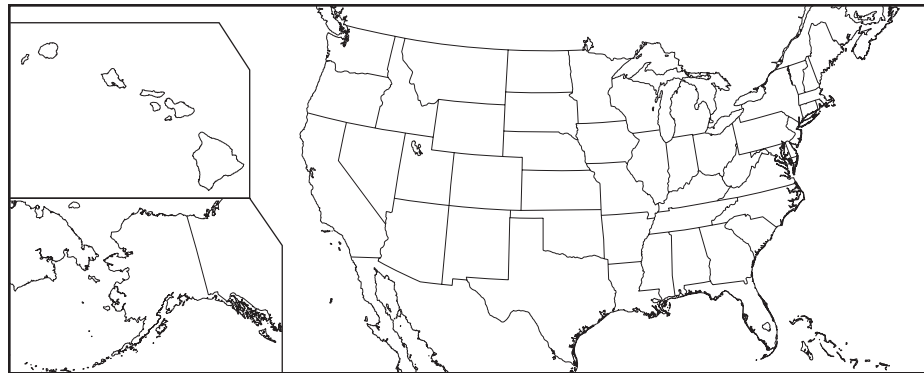
Details

Contrast how viruses and bacteria cause symptoms of disease.

Viruses: multiply in cells; damage or kill the cells when they leave by exocytosis or by bursting the cells

Bacteria: produce toxins that can be carried throughout the body in the bloodstream, damaging various parts of the body

Compare endemic, epidemic, and pandemic disease by using different colors or patterns to represent each disease pattern. Add a key to explain your map. Accept all reasonable responses.



Analyze the relationship between natural selection and the increase in antibiotic-resistant bacteria.

Accept all reasonable responses. Natural selection occurs when organisms with favorable variations survive, reproduce, and pass their variations to the next generation. Bacteria with a trait that enables them to survive a particular antibiotic will pass on this favorable trait. Bacteria reproduce quickly, resulting in increased numbers with resistance.

SUMMARIZE

Critique what people can do to help keep antibiotics effective in disease fighting.

Accept all reasonable responses. People should use antibiotics only when necessary.

This will keep them from being overused, which can lead to bacteria becoming resistant.

The Immune System

Section 37.2 The Immune System

Main Idea

Details

Skim Section 2 of the chapter. Identify the system responsible for the body's specific immunity.

the lymphatic system

Review Vocabulary

Use your book or dictionary to define white blood cells.

white blood cells

large, nucleated blood cells that play a major role in protecting the body from foreign substances and microorganisms

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- _____ cytotoxic T cell
- _____ memory cell
- _____ antibody
- _____ immunization
- _____ interferon
- _____ complement protein
- _____ helper T cell
- _____ lymphocyte
- _____ B cell

lymphocyte that destroys pathogens and releases cytokines

long-living cell that is exposed to an antigen during the primary immune response and will respond rapidly if the body encounters the same pathogen later

protein produced by B lymphocytes that specifically reacts to a foreign pathogen

deliberate exposure of the body to an antigen so that a primary response and immune memory will develop

protein secreted by virus-infected cells that binds to neighboring cells and stimulates these cells to produce antiviral proteins

protein that enhances phagocytosis by helping the phagocytic cells bind better to pathogens, activating the phagocytes, and enhancing the destruction of the pathogen's membrane

lymphocyte that activates antibody secretion in B cells and another type of T cell that aids in killing microorganisms

type of white blood cell that is produced in red bone marrow and plays a role in specific immunity

antibody-producing cell that is present in all lymphatic tissues

Section 37.2 The Immune System (continued)

Main Idea

Details

Nonspecific Immunity

I found this information on page _____.
SE, pp. 1084–1085
RE, p. 438–439

Summarize *nonspecific immune defenses by completing the table.*

Defense	How it Works
Skin	layer of dead skin cells forms barrier against invasion; bacteria living symbiotically on the skin produce acids that inhibit pathogens
Saliva, tears, and nasal secretions	contain enzyme lysozyme that breaks down bacterial cell walls, killing these pathogens
Mucus	blocks bacteria from sticking to inner epithelial cells; inner surfaces secrete extra mucus when infected, triggering coughing that helps move infected mucus out of the body
Stomach acid	hydrochloric acid in the stomach kills many microorganisms found in food
Phagocytosis	phagocytes surround and internalize foreign microorganisms, and then release digestive enzymes that destroy the microorganisms
Interferon	virus-infected cells secrete interferon, which binds to neighboring cells and stimulates these cells to produce antiviral proteins
Inflammatory response	chemicals released by invaders and body cells attract phagocytes, increase blood flow to area, and make blood vessels more permeable to allow white blood cells to escape; result is more white blood cells in the area

Specific Immunity

I found this information on page _____.
SE, p. 1086
RE, pp. 439–440

Compare *the functions of these organs of the lymphatic system.*

Lymph Nodes	Tonsils	Spleen	Thymus Gland
filter the lymph and remove foreign materials from the lymph	form protective ring between nasal and oral cavities, protecting against pathogens in nose and mouth	stores blood and destroys damaged red blood cells; contains lymphatic tissue that responds to foreign substances in blood	helps activate T cells, which are produced in bone marrow but mature in the thymus gland

Section 37.2 The Immune System (continued)

Main Idea

B Cell Response, T Cell Response

I found this information on page _____.

SE, pp. 1086–1088

RE, pp. 441–442

Passive and Active Immunity

I found this information on page _____.

SE, pp. 1088–1090

RE, p. 442

Immune System Failure

I found this information on page _____.

SE, pp. 1090–1091

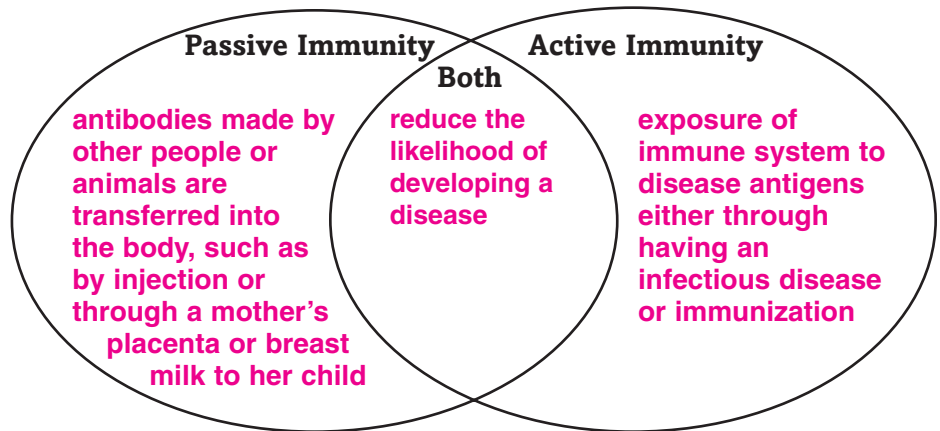
RE, p. 442

Details

Sequence *B cell and T cell responses. Write the numbers 1–5 next to the activities below to show the order in which they occur.*

- 2 A processed antigen is displayed on the membrane of the macrophage.
- 4 The activated helper T cell reproduces and attaches to a B cell or cytotoxic T cell.
- 1 A macrophage digests a pathogen.
- 5 The B cell begins to make antibodies and the cytotoxic T cell releases cytokines.
- 3 The macrophage binds with a helper T cell.

Contrast *passive immunity and active immunity.*



Analyze *why AIDS patients often die from a secondary infection caused by a different pathogen.*

Accept all reasonable responses. The HIV virus infects helper T cells, which produce viruses that infect other helper T cells. Eventually, loss of helper T cells makes AIDS patients susceptible to diseases.

SUMMARIZE

Classify AIDS as an endemic, an epidemic, or a pandemic disease. Explain your reasoning.

Accept all reasonable responses. Students should recognize from Section 1 that AIDS is at least an epidemic and probably a pandemic. Infection is widespread over many nations and continents. An estimated 40 million people globally were living with HIV infection in 2004.

The Immune System

Section 37.3 Noninfectious Disorders

Main Idea

Details

Scan Section 3 of the chapter. Use the checklist as a guide.

- Read all section titles.
- Read all boldfaced words.
- Read all tables, figures, and graphs.
- Look at all pictures and read the captions.
- Think about what you already know about noninfectious disorders.

Write three facts you discovered as you scanned the section.

1. **Accept all reasonable responses.** _____
2. _____
3. _____

Review Vocabulary

cancer

Use your book or dictionary to define cancer.

uncontrolled cell division that might be caused by environmental factors and/or changes in enzyme production in the cell cycle

New Vocabulary

Write the correct vocabulary term in the left column for each definition below.

- anaphylactic shock
- metabolic disease
- degenerative diseases
- allergy

- severe allergic reaction to particular allergens, which causes a massive release of histamine; smooth muscles in the bronchioles contract, restricting air flow into and out of the lungs
- disease that results from an error in a biochemical pathway
- diseases that result when a part of the body wears out
- a response to environmental antigens

Section 37.3 Noninfectious Disorders (continued)

Main Idea

Genetic Disorders, Degenerative Diseases, Metabolic Diseases, Cancer

I found this information on page _____.

SE, pp. 1092–1093
RE, p. 443–444

Details

Classify each noninfectious disorder according to whether it is caused strictly by a person’s genes, or by genes combined with environmental factors.

- arteriosclerosis
- Down syndrome
- coronary artery disease
- hemophilia
- sickle cell anemia
- Type 1 diabetes
- leukemia
- albinism

Causes of Noninfectious Disorders

Genes Only	Genes and Environmental Factors
Down syndrome	arteriosclerosis
hemophilia	coronary artery disease
sickle cell anemia	Type 1 diabetes
albinism	

Evaluate ways that an individual can increase his or her chance of surviving one of the noninfectious diseases that are partly caused by environmental factors.

Accept all reasonable responses.

Identify the causes of noninfectious disorders.

Noninfectious Disorders	Causes
genetic disorders	inheritance of genes that do not function properly; also abnormal number of chromosomes
degenerative diseases	a part of the body wears out, sometimes due to aging and sometimes sooner than expected in a lifetime
metabolic diseases	error in a biochemical pathway
cancer	abnormal cell growth due to loss of the body’s normal control over cell division

Section 37.3 Noninfectious Disorders (continued)

Main Idea

Inflammatory Diseases

I found this information on page _____.
 SE, pp. 1094–1095
 RE, p. 444

Details

Compare and contrast *the pairs of disorders in the table below.*
Accept all reasonable responses.

Inflammatory response to infectious disease and inflammatory disease:
Inflammatory response to infectious disease enhances the overall immune response to infection. In inflammatory disease, the body produces an inflammatory response to a common substance. This response is not helpful to the body.

Simple allergic reaction and anaphylactic shock:
Both react to particular allergens by releasing histamine from white blood cells. In anaphylactic shock, however, the release is massive and the result is life threatening. Smooth muscles in the bronchioles contract, restricting air flow. In a simple allergic reaction, symptoms are less severe.

Degenerative arthritis and rheumatoid arthritis:
Rheumatoid arthritis is an autoimmune disorder. The body makes antibodies that attack its own proteins. Degenerative arthritis results from part of the body wearing out rather than from autoimmunity.

Identify *the parts of the body attacked by antibodies in each of the following autoimmune disorders.*

Rheumatic fever	Lupus	Rheumatoid arthritis
valves of the heart	cell nuclei	joints

SUMMARIZE

Make a table of the types of noninfectious disorders, listing one cause and one example of each disorder.