

Science Notebook

Glencoe Science

Physical Science with Earth Science

Consultant

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Note-Taking Tips

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

- Be an active listener. Listen for important concepts. Pay attention to words, examples, and/or diagrams your teacher emphasizes.
- Write your notes as clearly and concisely 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	\approx
with	w/	therefore	\therefore
without	w/o	versus	vs

- Use a symbol such as a star (★) or an asterisk (*) to emphasis 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.

Note-Taking Don'ts

- **Don't** write every word. Concentrate on the main ideas and concepts.
- **Don't** use someone else's notes—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.

Using Your Science Notebook

This note-taking guide is designed to help you succeed in learning science content. Each chapter includes:

Language-Based Activities
Activities cover the content in your science book including vocabulary, writing, note-taking, and problem solving.

Anticipation Guide/KWL Charts
Think about what you already know before beginning a lesson and identify what you would like to learn from reading.

Science Journal
Write about what you know.

Writing Activities
These activities help you think about what you're learning and make connections to your life.

Vocabulary Development
Vocabulary words help you to better understand your science lessons. Learning the *Academic Glossary* can help you score higher on standardized tests.

Name _____ Date _____

Properties of Atoms and the Periodic Table

Before you read the chapter, respond to these statements.

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

Before You Read	Properties of Atoms and the Periodic Table
	• An atom is the smallest unit of an element that still has all the properties of the element.
	• An atom is made up of a positively charged nucleus and negatively charged electrons.
	• Quarks are so tiny that they orbit the nucleus with the electrons.
	• Isotopes of an element only differ in their number of neutrons.
	• An element's chemical and physical properties may be predicted by its location on the periodic table.

FOLDABLES
Study Organizer

Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a few sentences telling what you know.

Properties of Atoms and the Periodic Table 219

Section 2 Masses of Atoms (continued)

Main Idea

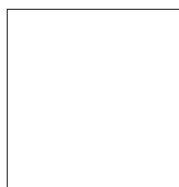
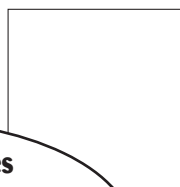
Isotopes

I found this information on page _____.

Details

Model carbon-12 and carbon-14 by sketching each atom.

- Remember that carbon's atomic number is 6.
- Label each atom's protons, neutrons, and electrons.
- Show the charges of the particles.



Carbon-14

Calculate the average atomic mass of an element. Use the calculation for the element Chlorine as an example. Chlorine makes up about $\frac{75}{100}$ of the abundance and $\frac{25}{100}$ of the abundance.

CONNECT IT

While exploring on your grandfather's farm, you find a piece of charcoal that might represent a campfire built by Native Americans. How could you find the age of the charcoal layer?

Properties of Atoms and the Periodic Table 225

Florida Science Academic Vocabulary Glossary

adapt: to gain, accomplish, attain, reach
adjust: to change to fit new conditions; to change in order to make suitable
adjacent: near, close, or adjoining
adult: fully developed; grown
affect: to bring about a change in
aggregate: material, such as sand or gravel, that is used to make concrete or mortar
analogy: a comparison involving a similarity between two otherwise dissimilar objects or situations
apparent: appearing to be but not necessarily so; seeming; readily seen, visible, readily understood or perceived; evident; obvious
approach: to come near
available: ready to use
benefit: something that helps or better a person or thing; advantage
bond: to cause to adhere or stick together
capable: able to do things; fit
category: group or class of things; a division in a classification system
chart: a sheet that gives information about something in the form of a diagram, graph, or table
chemical: any substance used in or obtained by a chemical process
code: (noun) set of signals representing letters or numerals, used to send messages; (verb) to put in the form of symbols of a code

collapse: to fall together, shrink
communicate: to make known or give information
compensate: to make up for
component: part of a machine or system
compound: made up of individual parts; made of two or more separate parts or elements
concentrate: to bring or come close together in one place
conduct: to transmit energy such as heat, light, sound, or electricity
constant: not changing, especially not changing over time
contact: the act or state of touching or meeting
contract: to draw together; shrink in size
controversy: argument or debate
convert: to change from one form or use to another; to alter the physical or chemical nature or properties of
coordinate: to cause to work well together
core: a central part; center
create: to bring into existence
cycle: a repeating sequence of events
decline: to become less in health, power, value, or number
define: to determine or identify the essential qualities or meaning of something
definite: clear; without doubt
derive: to get or receive from a source
detect: to perceive, discover, or uncover

Physical Science with Earth Science 329

Name _____ Date _____

Section 3 The Periodic Table (continued)

Main Idea

The Atom and the Periodic Table

I found this information on page _____.

Details

Analyze how electron dot diagrams show similarities between elements within a group.

Regions on the Periodic Table

I found this information on page _____.

Classify the regions of the periodic table as metals, nonmetals, or metalloids.

- Shade the regions on the blank periodic table.
- Label each region and write its characteristics.

Note-Taking Based on the Cornell Two-Column Format

Practice effective note-taking through the use of graphic organizers, outlines, and written summaries.

SYNTHESIS

Compare the similarities between chemistry and physics based on what you learned in the periodic table.

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Chapter Wrap-Up

This brings the information together for you. Revisiting what you thought at the beginning of the chapter provides another opportunity for you to discuss what you have learned.

Name _____ Date _____

Properties of Atoms and the Periodic Table Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Properties of Atoms and the Periodic Table	After You Read
• An atom is the smallest unit of an element that still has all the properties of the element.	
• An atom is made up of a positively charged nucleus and negatively charged electrons.	
• Quarks are so tiny that they orbit the nucleus with the electrons.	
• Isotopes of an element only differ in their number of neutrons.	
• An element's chemical and physical properties may be predicted by its location on the periodic table.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, I learned about the properties _____

Review Checklist

This list helps you assess what you have learned and prepare for your chapter tests.

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Name _____ Date _____

Section 3 The Periodic Table (continued)

Main Idea

Organizing the Elements

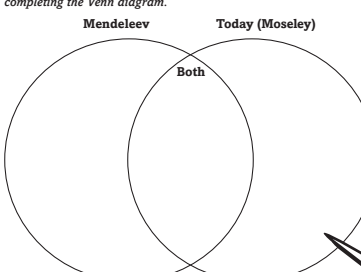
I found this information on page _____.

Details

Compare Mendeleev's early periodic table to that of today by completing the Venn diagram.

Mendeleev

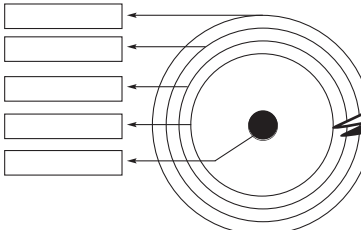
Today (Moseley)



The Atom and the Periodic Table

I found this information on page _____.

Sequence the energy levels in the electron cloud diagram and write the maximum number of electrons that can be contained in each level.



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Graphic Organizers

A variety of visual organizers help you to analyze and summarize information and remember content.

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The Nature of Science

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	The Nature of Science
	• A scientific theory will always be true.
	• A scientific experiment is valid as long as you don't vary more than two factors.
	• By choosing an appropriate unit of measurement, you can avoid working with large-digit numbers and with many decimal places.
	• Any type of graph is appropriate for displaying any type of information.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List possible reasons that scientists study space.

<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

The Nature of Science

Section 1 The Methods of Science

Skim the headings and bold words in this section. Write four steps scientists might take to solve a problem.

Review Vocabulary

investigation

Define investigation to show its scientific meaning.

New Vocabulary

Read the definitions below, then write the key term on the blank in the left column.

- _____
- variable whose value changes as a result of changes in other variables
- _____
- standard used to compare the results of the experiment
- _____
- a factor that can cause a change in the results of an experiment
- _____
- the application of science to help people
- _____
- a factor in an experiment that does not change
- _____
- represents an idea, event, or object to help people observe or test it
- _____
- the variable you change to see how it affects another variable
- _____
- occurs when a scientist's expectations change how the results are viewed

Academic Vocabulary

survey

Use a dictionary to define survey.

Section 1 The Methods of Science (continued)

Main Idea

What is science?

*I found this information
on page _____.*

**Scientific
Methods**

*I found this information
on page _____.*

**Visualizing with
Models**

*I found this information
on page _____.*

Details

Identify the three main categories of science. Summarize the topic studied in each category.

1. _____

2. _____

3. _____

Sequence the common steps found in scientific methods in the correct order. The first step has been completed for you.

- | | |
|----------------------|----------|
| 1. State the problem | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | 6. _____ |

Organize the advantages and disadvantages of a pilot flying a real airplane and flying a simulator.

	Advantages	Disadvantages
Real airplane		
Simulator		

Section 1 The Methods of Science (continued)

Main Idea	Details
<p>Scientific Theories and Laws</p> <p><i>I found this information on page _____.</i></p>	<p>Distinguish <i>between a scientific theory and a scientific law.</i></p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>The Limitations of Science</p> <p><i>I found this information on page _____.</i></p>	<p>Complete <i>the paragraph about the limitations of science.</i></p> <p>Science _____ explain or solve everything. A scientist has to make sure his or her guesses can be _____ and _____.</p> <p>Science cannot answer questions about _____ and _____.</p> <p>For example, a _____ of people’s opinions about such questions would not prove that the opinions are true for everyone.</p>
<p>Using Science—Technology</p> <p><i>I found this information on page _____.</i></p>	<p>Create <i>your own real-world example of how the application of a scientific discovery has helped create a new technology.</i></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>

CONNECT IT

Summarize the steps a scientist might take to determine if a new drug works in cancer patients.

The Nature of Science

Section 2 Standards of Measurement

Skim the headings in Section 2. Write three questions that come to mind about measurement.

1. _____
2. _____
3. _____

Review Vocabulary

measurement

Define measurement to show its scientific meaning.

New Vocabulary

precision

Use your book to define the following terms.

accuracy

volume

mass

density

Academic Vocabulary

ratio

Define ratio to show its scientific meaning. Then use it in a sentence as a noun.

Section 2 Standards of Measurement (continued)

Main Idea

Units and Standards

I found this information on page _____.

International System of Units

I found this information on page _____.

Measuring Distance

I found this information on page _____.

Measuring Volume

I found this information on page _____.

Details

Summarize why measurement standards are necessary.

Complete the table of SI base units used to measure various quantities.

Quantity Measured	Unit	Symbol
Time		s
	kilogram	
		K
	candela	
Length		
	mole	
		A

Create an example of a real-world object that could be appropriately measured using each SI unit.

meter _____

kilometer _____

millimeter _____

micrometer _____

Organize the steps for finding the volume of a rectangular solid by listing them below.

6 The Nature of Science

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Section 2 Standards of Measurement (continued)

Main Idea

Measuring Matter

*I found this information
on page _____.*

*I found this information
on page _____.*

**Measuring Time
and Temperature**

*I found this information
on page _____.*

Details

Identify *two pairs of objects that have about the same size but different masses.*

Complete *the table below. Place an X in the appropriate box to indicate the type of each measurement unit.*

Measurement	SI Unit	Derived Unit
gram per centimeter cubed (g/cm ³)		
decimeter (dm)		
liter (L)		
meter cubed (m ³)		
kilogram (kg)		

Model *three thermometers, a Fahrenheit scale, a Kelvin scale, and a Celsius scale. Label each to include the boiling and freezing points of water.*

SYNTHESIZE IT

Compare the advantages and disadvantages of converting our system of measurement in the United States from the English system to the International System of units.

The Nature of Science

Section 3 Communicating with Graphs

Scan the headings, figures, and captions in Section 3 of your text.
Write three questions that came to mind as you scanned this section.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

Define data to show its scientific meaning.

data _____

New Vocabulary

Use your book to define graph to show its scientific meaning.

graph _____

Academic Vocabulary

Use a dictionary to define the word detect.

detect _____

A Visual Display

I found this information on page _____.

Distinguish between the three types of graphs described in this section. Draw and label a simple example of each graph.

Section 3 Communicating with Graphs (continued)

Main Idea

A Visual Display

I found this information on page _____.

Line Graphs

I found this information on page _____.

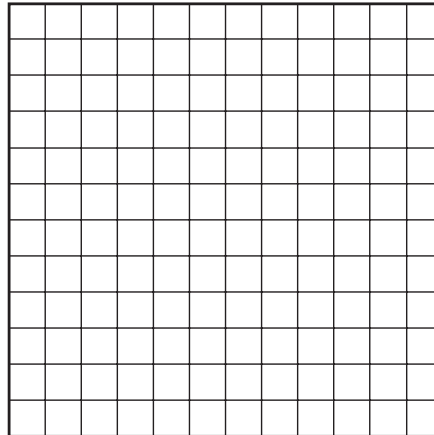
Bar Graphs

I found this information on page _____.

Details

Summarize four reasons scientists graph the results of their experiments.

Evaluate the effectiveness of two fertilizers on plant growth by plotting the following data on a line graph. Be sure to label each axis.



Week	Type A	Type B
1	2 cm	2 cm
2	7 cm	9 cm
3	15 cm	19 cm
4	20 cm	24 cm

Identify the features of the bar graph in your book titled "Classroom Size (January 20, 2004)" by completing the table.

Feature	Description	Feature	Description
x-axis		maximum bar height	5
y-axis		minimum bar height	1
horizontal scale		maximum class size	27
vertical scale		minimum class size	20

Section 3 Communicating with Graphs (continued)

Main Idea

Details

Circle Graphs

I found this information
on page _____.

I found this information
on page _____.

Complete the following paragraph.

A _____ graph is used to show how a certain quantity is _____ into parts. The circle represents the _____ and the segments represent the _____ of the whole. The segments are usually given as _____ of the whole.

Analyze the circle graph titled “Heating Fuel Usage” in your book to complete the first column in the table. Then use the formula provided for you in the table to complete the second column. Remember to use the decimal form of the percent of whole in the formula when finding angle of slice. The first one has been done for you.

Heating Fuel	Percent of whole	Angle of Slice [percent of whole × 360° = angle of slice°]
Gas	50	$0.5 \times 360^\circ = 180^\circ$
Steam		
Coal		
Electric		
Other		

SUMMARIZE IT

Describe when you would use each type of graph (line graph, bar graph, and circle graph) to show information.

Tie It Together

The Nature of Science

Engage your imagination and sharpen your writing skills to produce a draft of an article for a science magazine. You have recently conducted a scientific experiment, and you want to report the results to your colleagues. Use the outline below to help you organize your draft. Provide as much detail as possible, and include units of measurement with all of your data.

1. Identify the problem that interested you in this experiment.

2. Summarize your background information.

3. State your hypothesis.

4. Describe your experiment.

5. Present and analyze your data.
Include a graphical display.



6. Draw a conclusion.

The Nature of Science

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

The Nature of Science	After You Read
• A scientific theory will always be true.	
• A scientific experiment is valid as long as you don't vary more than two factors.	
• By choosing an appropriate unit of measurement, you can avoid working with large-digit numbers with many decimal places.	
• Any type of graph is appropriate for displaying any type of information.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about the nature of science.

Science, Technology, and Society

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Science, Technology, and Society
	<ul style="list-style-type: none">• The study of science usually leads to a better understanding of the world around you.
	<ul style="list-style-type: none">• The development of technology is not affected by society.
	<ul style="list-style-type: none">• Engineers use scientific information to develop products or solve problems.
	<ul style="list-style-type: none">• Building a prototype is usually the first step taken to find a technological solution.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List 10 types of technology you have used today.

<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Science, Technology, and Society

Section 1 Science and Technology

Scan the section headings, boldface words, and illustrations. Write four facts you discovered as you scanned the section.

- 1. _____
- 2. _____
- 3. _____
- 4. _____

Review Vocabulary

Define technology to show its scientific meaning.

technology

New Vocabulary

Use your book or a dictionary to define the key term.

agricultural
biotechnology

Academic Vocabulary

Use a dictionary to define technique. Then use the word technique in a sentence to show its scientific meaning.

technique

Section 1 Science and Technology (continued)

Main Idea

Scientific Discovery

I found this information on page _____.

Scientific Insight

I found this information on page _____.

What is technology?

I found this information on page _____.

Details

Complete *the statement about science.*

The study of science usually leads to _____

Now write three examples of science.

1. _____
2. _____
3. _____

Organize *examples of how scientific insight has contributed to disease prevention and improved weather forecasting.*

Disease Prevention	Weather Forecasting
1.	1.
2.	2.
3.	

Compare and contrast science *and* technology.

Section 1 Science and Technology (continued)

Main Idea

I found this information on page _____.

Global Technological Needs

I found this information on page _____.

Details

Organize information about types of technology by completing the concept web. Provide two examples of each type of technology.

Objects

1.

2.

Methods or Techniques

1.

2.

Knowledge or Skills

1.

2.

Systems

1.

2.

Types of Technology

Summarize how global technological needs differ in developing countries and industrialized countries.

Developing Countries

Global Technological Needs

Industrialized Countries

CONNECT IT

What is the most important piece of technology you use on a daily basis? Support your choice with an example.

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16 Science, Technology, and Society

Science, Technology, and Society

Section 2 Forces that Shape Technology

Predict three things that might be discussed in this section after you read the Section 2 title.

1. _____
2. _____
3. _____

Review Vocabulary

ecosystem

Define ecosystem to show its scientific meaning.

New Vocabulary

society

Use your book to define society. Then write a sentence that includes the term society and the term technology.

Definition: _____

Sentence: _____

Academic Vocabulary

benefit

Use a dictionary to define benefit to show its scientific meaning. List three examples of things that are benefits to people.

Examples: _____

Details

Section 2 Forces that Shape Technology (continued)

Main Idea

Responsible Technology

I found this information on page _____.

I found this information on page _____.

Details

Complete *the statement below about developing technology responsibly.*

To develop technology responsibly, people must evaluate both the _____ and the _____ consequences of the technology.

Summarize *the types of issues involved when developing technology responsibly by completing the table.*

Issues Involved when Developing Technology Responsibly		
Type of Issue	Description of Issue	Example
Environmental	how technology affects plants, animals, and ecosystems	
Moral		
Ethical		Humane treatment of organisms should occur during scientific investigations.

SYNTHESIZE IT

Evaluate how moral and ethical values related to animals and humans have affected the methods by which technology is developed.

Science, Technology, and Society

Section 3 Developing Technology

Preview the *What You'll Learn* statements for Section 3. Predict three topics that will be discussed in this section.

1. _____

2. _____

3. _____

Review Vocabulary

Define system to show its scientific meaning.

system

New Vocabulary

Write the correct vocabulary word next to each definition.

device or collection of devices used to monitor a system and limit system failures

researcher who uses scientific information or ideas to solve problems or human needs and bring technology to consumers

performance-testing method using a computer to imitate a process or procedure or to gather data

first full-scale model built to performance-test a new product

scaled-down version of real production equipment that closely models actual manufacturing conditions and is used to test a new manufacturing process

design limitations placed on products by outside factors, such as available materials, cost, and environmental impact

Academic Vocabulary

Use a dictionary to define factor to show its scientific meaning.

factor

Section 3 Developing Technology (continued)

Main Idea

Scientists and Engineers

I found this information on page _____.

I found this information on page _____.

Details

Summarize *important characteristics of scientists and engineers.*

A scientist is someone who studies _____.

Scientists often do research in _____, although some work is done in the _____.

Scientists may not know whether or how their work will be used.

An engineer is a _____ who is responsible for bringing _____ to the consumer. Engineers use scientific information or ideas to _____ or _____.

Identify *seven different areas in which engineers work.*

Some Areas in Which Engineers Work	
1.	
2.	
3.	
4.	
5.	
6.	
7.	

Section 3 Developing Technology (continued)

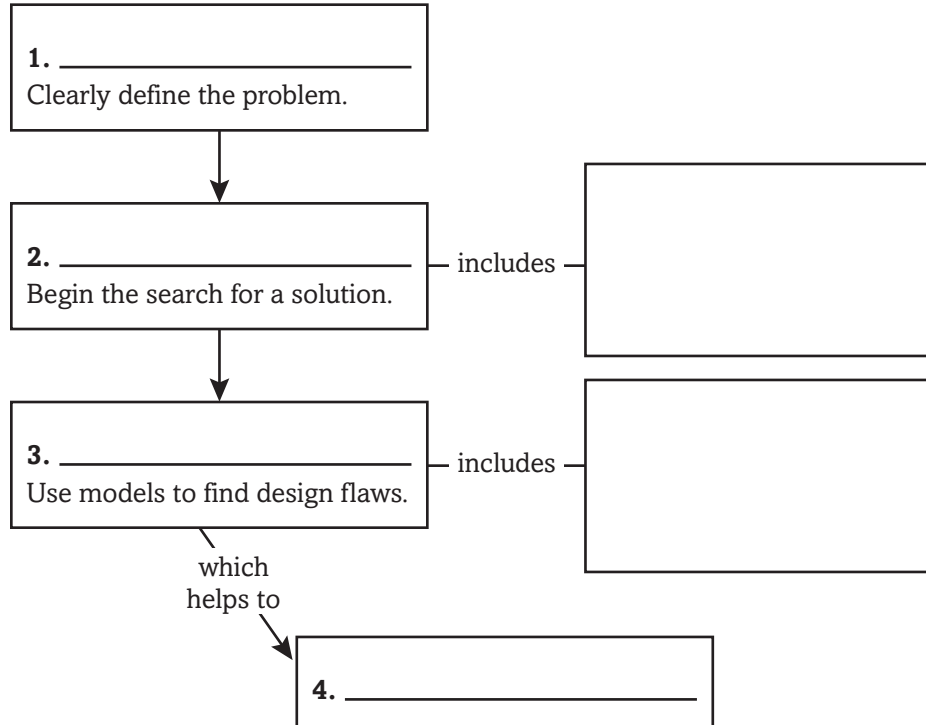
Main Idea

Details

Finding Solutions

I found this information
on page _____.

Complete the flowchart to identify the processes used by scientists and engineers to find technological solutions to problems. Use the information provided and your book to help you.



I found this information
on page _____.

Identify two types of intellectual property.

1. _____

2. _____

CONNECT IT

A prototype is a model. Think of a time when you have used a prototype to study or learn about something. Identify an advantage of a model. Identify a disadvantage.

Tie It Together

Synthesize It

Suppose you are part of a team that designs robots. In the spaces provided, describe the robot you would like to build and some things you would have to consider to actually build it. Use the writing prompts to help you.

Jobs my robot would do:

Features my robot would need:

Constraints of building my robot:

Science, Technology, and Society

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Science, Technology, and Society	After You Read
• The study of science usually leads to a better understanding of the world around you.	
• The development of technology is not affected by society.	
• Engineers use scientific information to develop products or solve problems.	
• Building a prototype is usually the first step taken to find a technological solution.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about science, technology, and society.

Motion, Acceleration, and Forces

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Motion, Acceleration, and Forces
	• Distance and displacement are the same thing.
	• Velocity and speed are the same thing.
	• Whenever an object accelerates, its speed increases.
	• It takes force to change an object's direction of motion.
	• Objects in motion tend to slow down and come to rest unless acted on by outside forces.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a paragraph describing three rides in an amusement park and how rides cause you to move.

Motion, Acceleration, and Forces

Section 1 Describing Motion

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

1. _____
2. _____

Review Vocabulary

Analyze why the word *instantaneous*, as used in the book, does not mean “sudden.”

instantaneous

New Vocabulary

Define each vocabulary term by writing it next to the correct definition.

- the distance and direction that something moved from a starting point
- a quantity that is specified by size and direction
- the distance an object travels in an amount of time
- a measure of the speed of an object and the direction it is traveling

Contrast the average speed and the instantaneous speed of a runner in a race.

average speed

instantaneous speed

Academic Vocabulary

Use a dictionary to define *constant* to show its scientific meaning.

constant

Section 1 Describing Motion (continued)

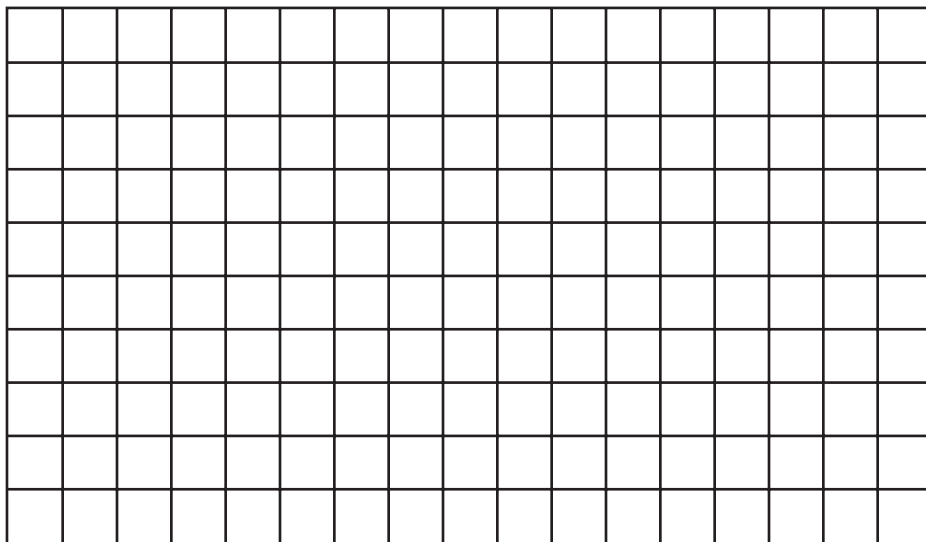
Main Idea

Motion

I found this information
on page _____.

Details

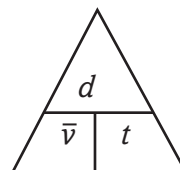
Draw a winding path that covers a distance of 70 miles and finishes with a displacement 20 miles southwest of the starting point. Label your diagram with the distance and direction traveled.



Speed

I found this information
on page _____.

Analyze the formula for average speed by looking at the diagram and filling in the prompts.



Put your finger over the \bar{v} on the diagram. Now write the formula for average speed. _____

Put your finger over the d on the diagram. Write the calculation to find total distance if you know average speed and total time. _____

Prove to yourself that these formulas are correct by checking the units.

$$\bar{v} = d/t$$

- d has units of _____, and t has units of _____.
- Therefore, \bar{v} has units of _____.

$$d = \bar{v}t$$

- \bar{v} has units of _____, and t has units of _____.
- Therefore, d has units of _____.

Section 1 Describing Motion (continued)

Main Idea

Velocity
I found this information on page _____.

Graphing Motion
I found this information on page _____.

Details

Critique *the phrase “airspeed velocity of a swallow”.*

Model *a swallow in flight.*

- Use an arrow to show the swallow’s velocity.
- Label the arrow to indicate the swallow’s speed.

Create *a graph to show the progress of a runner who runs a 1-kilometer race in 3 minutes. The runner gets off to a fast start, runs the middle of the race at a more moderate pace, and then sprints to the finish.*

Graphing Checklist:

- title
- scale on x axis
- units on x axis
- label on x axis
- scale on y axis
- units on y axis
- label on y axis

ANALYZE IT

Analyze the following statement. “A boat traveled at 10 km/h for one hour, then at 13 km/h for two hours, and finally at 11 km/h for another hour. The average speed over the whole trip was 15 km/h.” Support your analysis with a calculation.

Motion, Acceleration, and Forces

Section 2 Acceleration

Scan Use the checklist below to preview Section 2 of your book.

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

Review Vocabulary

velocity

Define velocity in a sentence to show its scientific meaning.

New Vocabulary

acceleration

Use your book to define the word acceleration.

Analyze why we say an object is accelerating, when we usually mean that it is speeding up. An object that is slowing down also is accelerating.

Academic Vocabulary

positive

Use a dictionary to define the word positive. Then write a scientific sentence that includes the word.

Section 2 Acceleration (continued)

Main Idea

Calculating Acceleration

I found this information on page _____.

Details

Analyze *why the SI unit of acceleration is m/s^2 .*

Compare *the results of applying the acceleration equation in the following two cases: (1) an object that goes from 0 to 10 m/s in 4 s, and (2) then goes from 10 m/s to 30 m/s in 8 s.*

$$(1) a = (v_f - v_i)/t$$

$$= \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

$$(2) a = (v_f - v_i)/t$$

$$= \underline{\hspace{2cm}} = \underline{\hspace{2cm}}$$

Amusement Park Acceleration

I found this information on page _____.

Predict *the acceleration of a roller coaster that goes from 0 to 190 km/h in 4 s. Express your answer in km/s^2 . Round to three decimal places.*

SYNTHESIZE IT

Distinguish between average acceleration and instantaneous acceleration.

Motion, Acceleration, and Forces

Section 3 Motion and Forces

Predict *Read the title of Section 3. List three things that might be discussed in this section.*

1. _____

2. _____

3. _____

Review Vocabulary

Define *vector in a sentence to show its scientific meaning.*

vector

New Vocabulary

Use your book or dictionary to define the following terms.

force

net force

balanced forces

unbalanced forces

Academic Vocabulary

Use a dictionary to define survive.

survive

Section 3 Motion and Forces (continued)

Main Idea

What is force?

I found this information
on page _____.

Details

Model an apple hanging from a tree and a falling apple. Include arrows with labels to show all forces acting on the apples.

Hanging Apple

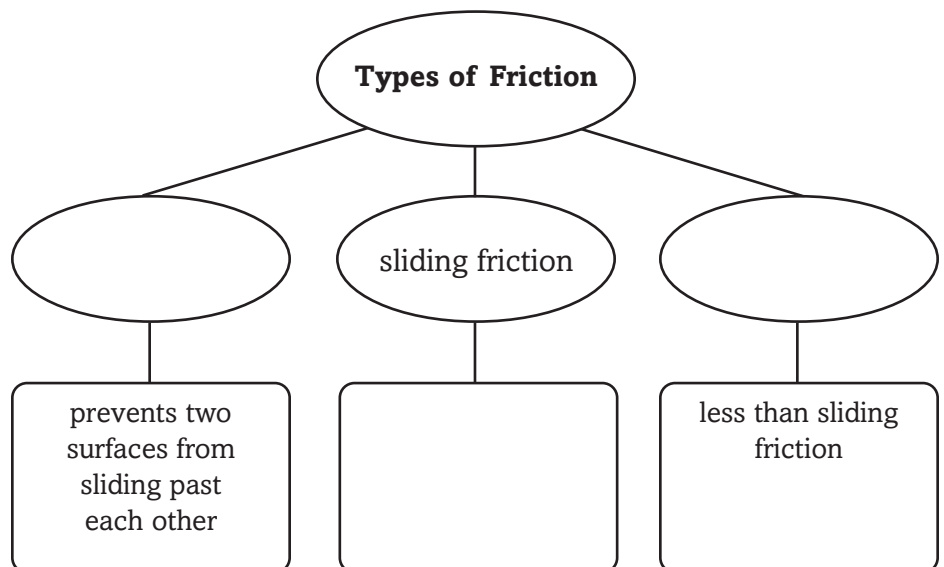
Falling Apple

Analyze the forces acting on the apple in each drawing and how they combine to form the net force.

Friction

I found this information
on page _____.

Complete the concept map about types of friction.



Section 3 Motion and Forces (continued)

Main Idea

Air Resistance

I found this information
on page _____.

Details

Contrast the terminal velocity of a parachutist with an open chute to the terminal velocity of the same parachutist with a closed chute. Draw sketches below to show the forces in each case.

SYNTHESIZE IT

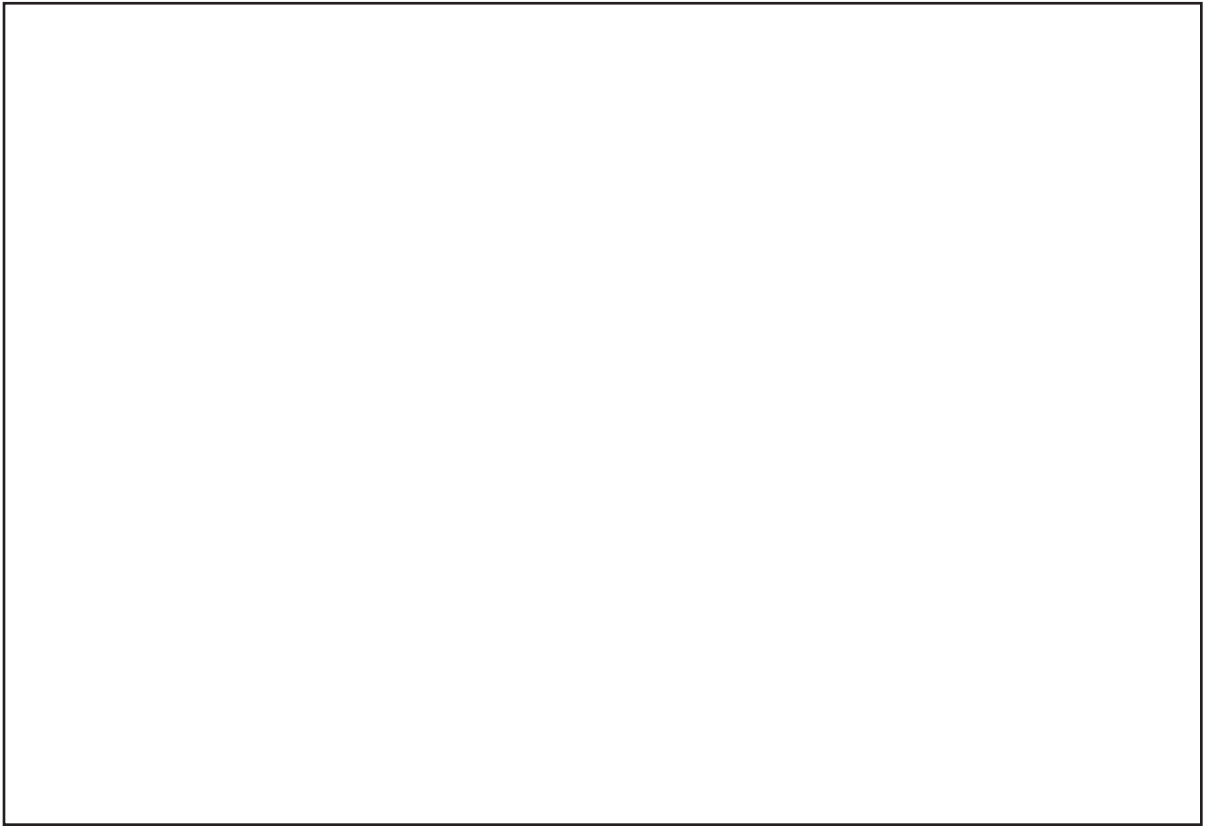
Since rolling is a type of motion, and *static* means “not moving,” it doesn’t seem that rolling friction could be a type of static friction—and yet it is. Explain why this is so, using the example of a tire rolling down a road. Describe what happens when the tire skids.

Tie It Together

Motion, Acceleration, and Forces

Analyze *the motion of a water balloon you toss at a partner during a contest. You launch the balloon in a steep arc, it reaches the top of its flight, and then it falls back to Earth, landing with a splat in your partner's hands.*

1. Draw the balloon's path and include arrows showing the forces acting on the balloon at several points along the path.



2. Describe the forces acting on the balloon. Identify the effects they have on the balloon's horizontal speed and vertical speed during its flight.

Motion, Acceleration, and Forces

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Motion, Acceleration, and Forces	After You Read
• Distance and displacement are the same thing.	
• Velocity and speed are the same thing.	
• Whenever an object accelerates, its speed increases.	
• It takes force to change an object’s direction of motion.	
• Objects in motion tend to slow down and come to rest unless acted on by outside forces.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about motion, acceleration, and forces.

The Laws of Motion

Before You Read

Before you read the chapter, use the “What I know” column to list three things you know about motion. Then list three questions you have about motion in the “What I want to find out” column.

K What I know	W What I want to find out



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Explain which would be a safer car—a car with a front end that crumples in a crash or one with a front end that doesn’t crumple.

The Laws of Motion

Section 1 The First Two Laws of Motion

Objectives *Read the section objectives. Then write three questions that come to mind from reading these statements.*

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

Explain how the idea of a sum is important for thinking about net force.

net force

New Vocabulary

Define *each vocabulary term by writing it next to the correct definition.*

if the net force acting on an object is zero, the object remains at rest, or if the object is moving, it continues in a straight line with constant speed

the tendency of an object to resist a change in its motion

the acceleration of an object is in the same direction as the net force on the object

Academic Vocabulary

Define the term period using a dictionary.

period

Section 1 The First Two Laws of Motion (continued)

Main Idea

The First Law of Motion

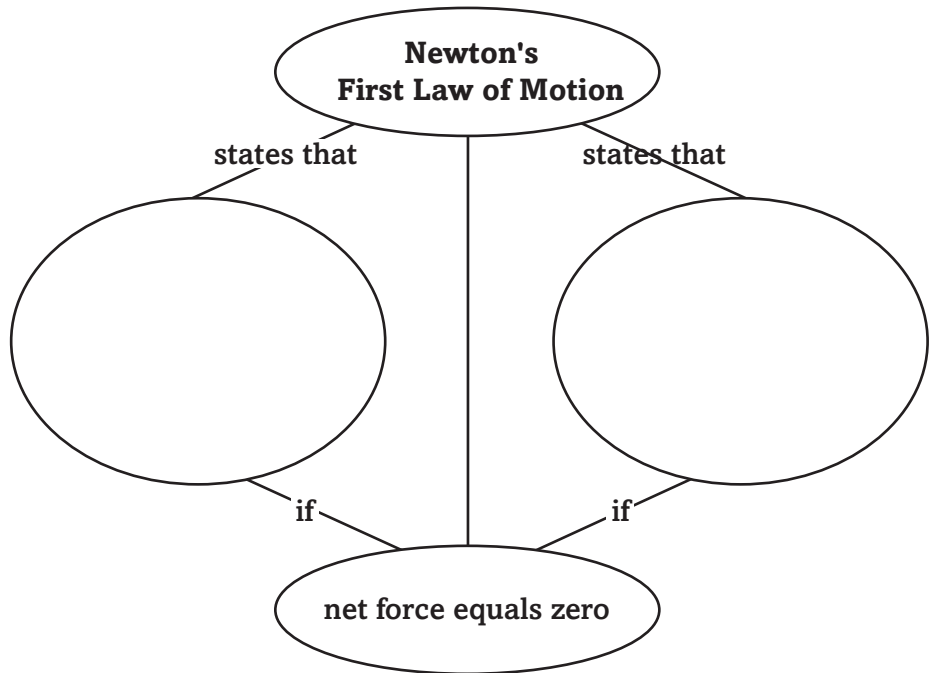
I found this information on page _____.

Inertia and Mass

I found this information on page _____.

Details

Complete *the concept map by defining Newton's first law of motion.*



Summarize *the concept of inertia by completing the statements.*

Inertia is the _____
 _____. The amount of inertia that an object has
 depends on its _____. A large truck, for example, has
 _____ than a small car. This is why it is more difficult
 to stop a _____ in a short distance.

Section 1 The First Two Laws of Motion (continued)

Main Idea

What happens in a crash?

I found this information on page _____.

The Second Law of Motion

I found this information on page _____.

Details

Analyze *the effects on a passenger riding in a car traveling at 50 km/h that collides head-on with a solid object.*

Without Restraints	With Safety Belts and Air Bags

Organize *the three variables related by Newton’s second law in the table. Show equations to find each variable if you know the values of the other two variables.*

Newton’s Second Law of Motion		
Unknown Variable	Known Variables	Equations
Acceleration		
Net force		
Mass		

SUMMARIZE IT

Summarize the relationship between a moving object’s mass, its inertia, and the forces acting on it.

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40 *The Laws of Motion*

The Laws of Motion

Section 2 Gravity

Scan Use the checklist below to preview Section 2 of your book.

- ☐ Read all section titles.
- ☐ Read all bold words.
- ☐ Read all equations.
- ☐ Look at all the pictures and read their captions.
- ☐ Mentally review what you already know about gravity.

Review Vocabulary

acceleration

Suppose an object's acceleration is negative. Use the formula for acceleration to explain what this implies about the initial and final velocities.

New Vocabulary

gravity

Define the following key terms using a dictionary or your book.

weight

centripetal acceleration

centripetal force

Academic Vocabulary

range

Use the word range in a scientific sentence.

Section 2 Gravity (continued)

Main Idea

What is gravity?

I found this information on page _____.

The Law of Universal Gravitation

I found this information on page _____.

Earth's Gravitational Acceleration

I found this information on page _____.

Details

Complete the concept map to explain why the force of gravity varies

Gravitational force

increases if

increases

decreases if

increases

Summarize the law of universal gravitation by writing the equation in the space below. Define each variable or constant in the equation.

Analyze the formula $W = mg$ to explain how an object's weight can change even when its mass remains constant.

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42 The Laws of Motion

Section 2 Gravity (continued)

Main Idea

Weightlessness and Free Fall

I found this information on page _____.

Projectile Motion

I found this information on page _____.

Centripetal Force

I found this information on page _____.

Details

Distinguish between an object that is truly weightless and an object that is weightless because it is in free fall.

Model a ball thrown horizontally. Sketch the path of the ball and draw arrows showing its horizontal and vertical velocity at three points along the path. Vary the length of your arrows to show the magnitude of the velocities.

Create a top view of an object moving in a circle at constant speed, such as a ball on a string. Show at least two positions of the object. At each position, draw an arrow for the object's velocity and another arrow for the centripetal acceleration of the object.

SUMMARIZE IT

The force of gravity between two objects is $F = G m_1 m_2 / d^2$, and the force of gravity between Earth and object of mass m on Earth's surface is $F = mg$. Use $F = F$ to make an equation for g in terms of the variables of the universal gravitation equation. [Hint: the distance between Earth and an object on its surface is measured from the object to Earth's center.]

The Laws of Motion

Section 3 The Third Law of Motion

Skim through Section 3 of your book. Write three questions that come to mind from reading the headings and the illustration captions.

1. _____

2. _____

3. _____

Review Vocabulary

Describe the difference between velocity and speed.

speed

velocity

New Vocabulary

State Newton’s third law of motion as found in your book.

third law of motion

Define the following key terms using a dictionary or your book.

momentum

law of conservation of momentum

Academic Vocabulary

Use a dictionary to define initial. Then use it as an adjective in a sentence to show its scientific meaning.

initial

Section 3 The Third Law of Motion (continued)

Main Idea

Newton's Third Law

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

Summarize Newton's third law of motion *in your own words*.

Predict the corresponding reaction for each action.

Action	Reaction
A high-jumper lands on a mat.	
A fisherman tosses an anchor away from his boat.	
An airplane's jet engine pushes air toward the back of the airplane.	

Analyze the motion of a child on a swing. The child swings forward, then back. Explain why the backward swing is not an example of reaction in the sense of Newton's third law.

Section 3 The Third Law of Motion (continued)

Main Idea

Momentum

I found this information
on page _____.

I found this information
on page _____.

I found this information
on page _____.

Details

Analyze the property of momentum *in words and with an equation. Include units and identify all variables.*

Words

Equation

Predict *why momentum is a property of moving objects, but not of stationary objects.*

Create *an example of a situation in which momentum is conserved. Explain how the law of conservation of momentum applies to your example.*

CONNECT IT

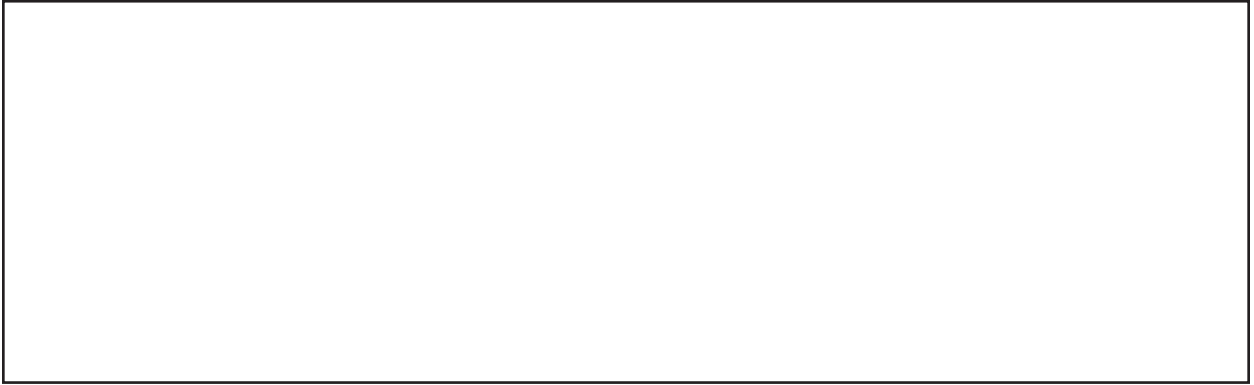
Use what you know about force and momentum to explain why a baseball player’s position determines the amount of padding in the baseball glove.

Tie It Together

The Laws of Motion

Combine some of what you have learned about forces in this chapter into a picture of a wooden block sliding across a table. Use arrows to show the following:

- As the block slides, friction with the table slows the block down.
- Gravity pulls the block downward.
- The force of gravity is balanced by an upward force exerted by the table on the block.



Suppose the block has a mass of 0.2 kg. Use $W = mg$, with $g = 9.8 \text{ m/s}^2$, to calculate the weight of the block.

The block continues to slide until it strikes a second block. Draw this event below. Use arrows to show the following:

- During the collision, the first block exerts a force on second block which causes the second block to move.
- The second block exerts an equal and opposite reaction force on the first block, slowing it down.



The Laws of Motion chapter Wrap-Up

In the left column, copy the questions you listed in the Chapter Preview. In the right column, write down the answers you discovered as you worked through the chapter.

W What I wanted to find out	L What I learned

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about the laws of motion.

Energy

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Energy
	<ul style="list-style-type: none">• The total amount of energy in the universe never changes.
	<ul style="list-style-type: none">• Any two objects on the same shelf of a cupboard have the same potential energy.
	<ul style="list-style-type: none">• Energy is lost when an object is motionless.
	<ul style="list-style-type: none">• A lightbulb transforms electrical energy into light and thermal energy.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Which takes more energy: walking up stairs or taking an escalator? Explain your reasoning.

Energy

Section 1 The Nature of Energy

Scan Section 1 to find at least four forms of energy.

**Review
Vocabulary**

Define gravity to show its scientific meaning.

gravity

**New
Vocabulary**

Read the definitions below, then write the key term for each one in the left column.

- the ability to do work
- energy a moving object has because of its motion
- the standard unit for measuring energy
- energy stored in an object
- energy stored by things that stretch or shrink
- energy stored in chemical bonds
- energy stored in objects because of their position above Earth's surface

**Academic
Vocabulary**

Use a dictionary to define analogy.

analogy

Section 1 The Nature of Energy (continued)

Main Idea

What is energy?

I found this information
on page _____.

Details

Identify at least eight familiar items that consume energy. Group items by the form of energy they use.

Chemical	Electrical

Create an analogy to show how energy is like water.

Kinetic Energy

I found this information
on page _____.

Complete the formula for the kinetic energy equation of a moving object. Use mass (kg), speed (m/s), and kinetic energy (joules) in your equation.

word equation:

$$\underline{\hspace{2cm}} = \left(\frac{1}{2}\right) \underline{\hspace{2cm}} \times [\underline{\hspace{2cm}}]^2$$

symbol equation:

Section 1 The Nature of Energy (continued)

Main Idea

Potential Energy

I found this information
on page _____.

Details

Analyze the types of potential energy being used by an athlete competing in each of these athletic events.

archery

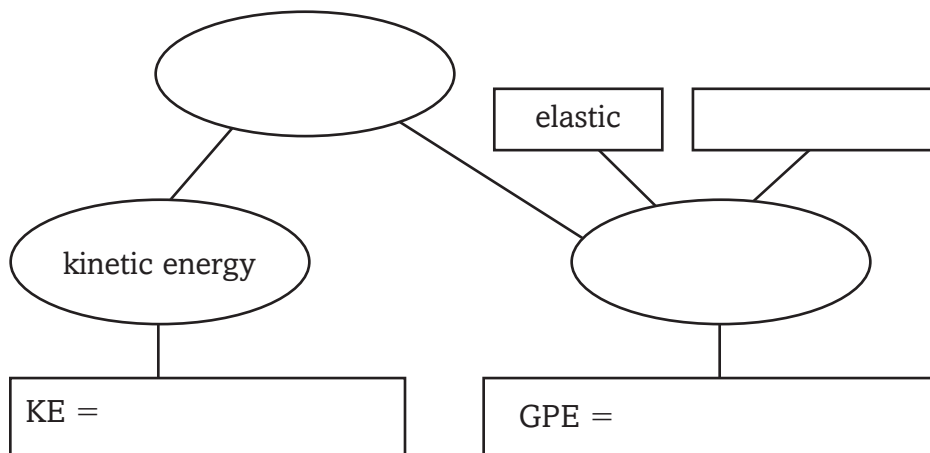
sprinting

platform diving

Complete the concept map by entering each term or phrase in the appropriate location.

- chemical
- energy
- gravitational

- mgh
- potential energy
- $\frac{1}{2} \text{ mass} \times \text{velocity}^2$



ANALYZE IT

Make an analogy comparing energy and money.

Energy

Section 2 Conservation of Energy

Predict three things you think might be discussed in this section.
Read the section title to help you make your predictions.

1. _____
2. _____
3. _____

Review Vocabulary

friction

Define friction in a sentence that shows its scientific meaning.

New Vocabulary

mechanical energy

*law of conservation
of energy*

Use your book to define the following key terms.

Academic Vocabulary

convert

Find convert in a dictionary, and then use it as a verb in a scientific sentence.

Section 2 Conservation of Energy (continued)

Main Idea	Details
<div>Changing Forms of Energy <i>I found this information on page _____.</i></div>	<div>Sequence <i>four energy transformations, such as those related to fossil fuels.</i> <div><div>1. _____</div><div>_____</div><div>2. _____</div><div>_____</div><div>3. _____</div><div>_____</div><div>4. _____</div><div>_____</div></div></div>
<div>Conversions Between Kinetic and Potential Energy <i>I found this information on page _____.</i></div>	<div>Create <i>a drawing of an apple falling from a tree. Label where:</i><ul style="list-style-type: none">• kinetic energy is low and gravitational potential energy is high• kinetic energy is high and gravitational potential energy is low• kinetic energy is about equal to gravitational potential energy<div></div></div>
<div>The Law of Conservation of Energy <i>I found this information on page _____.</i></div>	<div>Predict <i>the energy transformations when a fast-moving roller coaster finishes its ride and comes to a stop. Give three possibilities.</i> <div><div>1. _____</div><div>_____</div><div>2. _____</div><div>_____</div><div>3. _____</div><div>_____</div></div></div>

Section 2 Conservation of Energy (continued)

Main Idea

The Law of Conservation of Energy

I found this information on page _____.

I found this information on page _____.

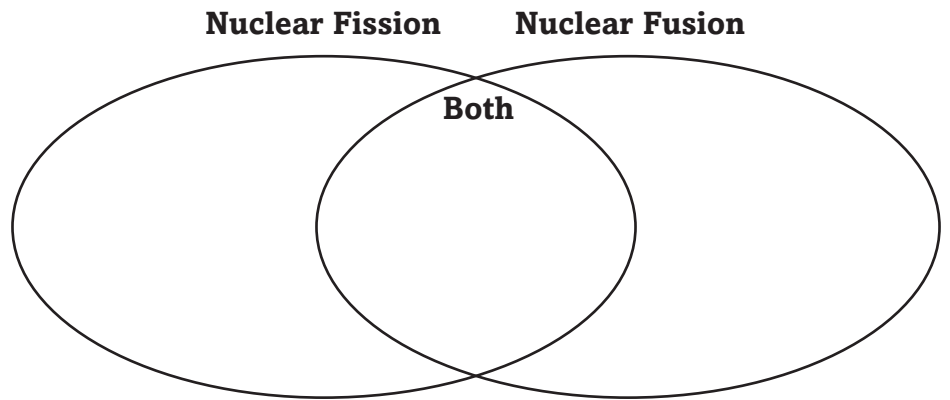
The Human Body-Balancing the Energy Equation

I found this information on page _____.

Details

Create *two examples of changes that might be brought about by thermal energy produced through friction when two materials rub together. Remember, energy is defined as the ability to cause change.*

Compare and contrast nuclear fission *and* nuclear fusion. *Complete the Venn diagram with at least six facts.*



Analyze *information in your book to explain why athletes need to monitor their intake of chemical potential energy.*

CONNECT IT

Describe an experience where it would have been helpful for you or someone you know to understand how energy can change form.

Energy chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Energy	After You Read
• The total amount of energy in the universe never changes.	
• Any two objects on the same shelf of a cupboard have the same potential energy.	
• Energy is lost when an object is motionless.	
• A lightbulb transforms electrical energy into light and thermal energy.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about energy.

Work and Machines

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Work and Machines
	<ul style="list-style-type: none">• A person does work on a heavy object while holding it up above the ground.
	<ul style="list-style-type: none">• Machines are tools for making work easier.
	<ul style="list-style-type: none">• A machine is a device that creates energy.
	<ul style="list-style-type: none">• A baseball bat can be considered a machine.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Diagram a bicycle and identify the parts you think are simple machines.

Work and Machines

Section 1 Work

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

1. _____

2. _____

3. _____

Review Vocabulary

Define the word energy in a sentence to show its scientific meaning.

energy

New Vocabulary

Use your book or a dictionary to define the terms work and power.

work

power

Sometimes the word power means ability to do something. Explain why this is not how the word is used in physical science.

Academic Vocabulary

Use a dictionary to define the term transfer.

transfer

Section 1 Work (continued)

Main Idea

What is work?

*I found this information
on page _____.*

Work and Energy

*I found this information
on page _____.*

Details

Create *three sketches showing the following situations involving work.*

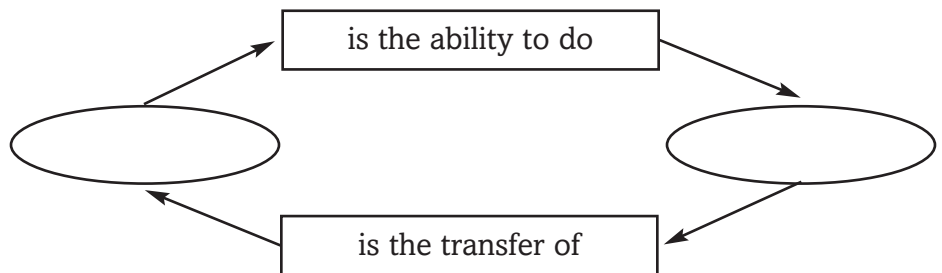
A force is doing work.

A force is not doing work because there is no motion.

A force is not doing work because the force is not in the direction of motion.

--	--	--

Complete *the concept map relating work and energy.*



Complete *the equation for the calculation of work when force and distance are known.*

Work (in joules) = _____

W = _____

Describe *the relationship between joules, meters, and newtons.*

Section 1 Work (continued)

Main Idea

Power

I found this information
on page _____.

I found this information
on page _____.

Details

Analyze the meaning of the equation $P = W/t$ by completing the sentences.

To increase power, one must either do _____ in
_____ time or _____
in _____ time.

To decrease power, one must either do _____ in
_____ time or _____
in _____ time.

Evaluate A candle is a device that converts chemical energy into heat energy. Start by writing the power equation. Then assume the wax in your candle contains 216,000 joules of energy, and it takes 3 hours for all of the wax to be consumed. Then calculate the candle's power output, and compare it to that of a 60-watt light bulb.

Power (in watts) =

CONNECT IT

A child sits at the top of a slide at a playground. He wiggles forward slightly, and then slides all the way down with no further effort. Explain the source of the force acting on the child, and how you would calculate the work being done.

Work and Machines

Section 2 Using Machines

Read the section What You'll Learn statements. Then write three questions that come to mind from reviewing these statements.

1. _____
2. _____
3. _____

Review Vocabulary

Define the word force in a sentence that shows its scientific meaning.

force

New Vocabulary

Read through the section to find a key term to match each definition below.

the force applied by a machine

the force that is applied to a machine

a device that makes doing work easier

ratio of output work done by a machine to the input work done on the machine

the ratio of the output force to the input force

Academic Vocabulary

Look up the words per and cent in a dictionary. Then explain why 68 percent is the same as 68/100.

percent

Section 2 Using Machines (continued)

Main Idea

What is a machine?

I found this information on page _____.

Details

Summarize the three different ways machines make work easier. Give an example of each, and explain why the work is easier.

1. _____

2. _____

3. _____

The Work Done by Machines

I found this information on page _____.

Create a diagram of a machine. Show the input force and the output force.

Analyze the input work and output work of your machine.

Section 2 Using Machines (continued)

Main Idea

Mechanical Advantage, Efficiency

I found this information on page _____.

I found this information on page _____.

Details

Organize *your knowledge of the mechanical advantage and the efficiency of a machine. Complete the table of definitions.*

	Mechanical Advantage	Efficiency
Define in Words		
Equation		

Predict *what happens to the mechanical advantage of a machine if friction is reduced through the use of oil or some other means.*

Analyze *why it might be useful to know a machine's efficiency.*

ANALYZE IT

Suppose that someone claims to have invented a machine with an efficiency greater than 100%. Explain what would have to be true for the person's claim to be correct.

Work and Machines

Section 3 Simple Machines

Predict Read the title of Section 3. List three things that might be discussed in this section.

1. _____

2. _____

3. _____

Review Vocabulary

Use the meaning of the word **compound** to predict the meaning of compound machine.

compound

New Vocabulary

Read the definitions below, then write the key term for each one in the left column.

- a bar that is free to pivot or turn around a fixed point
- a sloping surface that reduces the amount of force required to do work
- an inclined plane wrapped in a spiral around a cylindrical post
- an inclined plane with one or two sloping sides
- a grooved wheel with a rope, chain, or cable running along the groove
- a simple machine consisting of a shaft, or axle, attached to the center a larger wheel so that the wheel and axle rotate together
- a machine that does work with only one movement of the machine
- two or more simple machines that operate together

Academic Vocabulary

Define *reverse* as a verb using a dictionary.

reverse

Section 3 Simple Machines (continued)

Main Idea

Types of Simple Machines

I found this information on page _____.

Levers

I found this information on page _____.

Pulleys

I found this information on page _____.

Details

Identify *two types of simple machines and two examples of each.*

Organize *information about levers in the chart below.*

Class	Force Closest to Fulcrum	Direction of Output Force	Is the IMA greater than 1?	Example
First				
Second				
Third				

Compare *the three types of pulleys that can be used to lift an object. Sketch a diagram of the input and output force for each pulley type.*

Pulley Type	Direction of Output Force	Input Force Needed	Sketch
Fixed			
Movable			
Block and Tackle			

Section 3 Simple Machines (continued)

Main Idea

Wheel and Axle

I found this information on page _____.

Inclined Planes, the Screw, the Wedge

I found this information on page _____.

Compound Machines

I found this information on page _____.

Details

Distinguish between the two ways to use a wheel and axle. Explain how the forces differ when (1) the input force turns the wheel, and (2) the input force turns the axle.

Summarize the factors that increase the ideal mechanical advantage of each of the following machines.

Inclined plane _____

Screw _____

Wedge _____

Create a compound machine, showing the input force and the final output force. Include at least one lever, one pulley, one wheel and axle, one inclined plane, one screw, and one wedge.

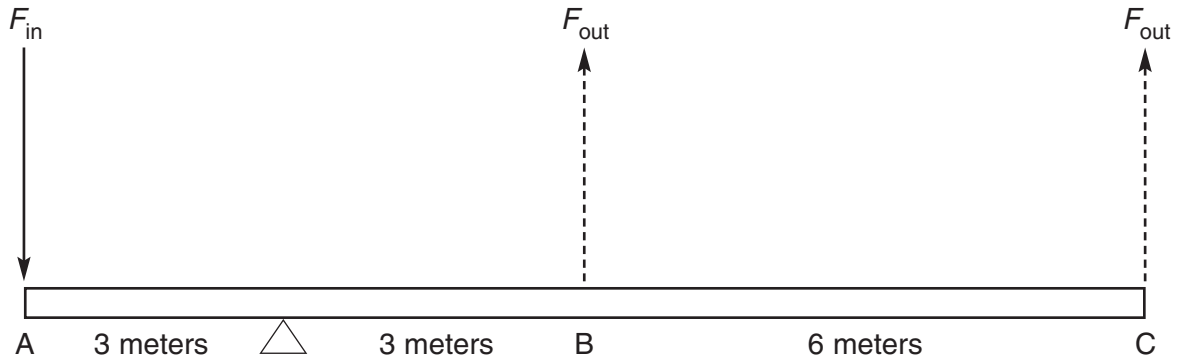
SYNTHESIZE IT

A student states, “A lever whose ideal mechanical advantage (IMA) is less than 1 can still be a useful machine.” Analyze this statement. State whether you agree or disagree and why.

Tie It Together

Work and Machines

Combine what you have learned about work and machines in this chapter into an analysis of the ideal machine pictured below.



Complete the table, assuming that the output force is located at point B.

F_{in}	W_{in}	IMA	F_{out}	W_{out}
15 newtons	3 joules	1		
	2 joules		21 newtons	
36 newtons				4 joules
			18 newtons	2.5 joules

Complete the table, assuming the output force is located at point C.

F_{in}	W_{in}	IMA	F_{out}	W_{out}
12 newtons				7 joules
	1.5 joules		10 newtons	
	2 joules		6 newtons	
21 newtons				11 joules

Predict what happens to the Ideal Mechanical Advantage of any machine if the input force and the output force trade places. (In the above diagram, imagine the input force at C and the output force at A.)

Work and Machines

chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Work and Machines	After You Read
• A person does work on a heavy object while holding it up above the ground.	
• Machines are tools for making work easier.	
• A machine is a device that creates energy.	
• A baseball bat can be considered a machine.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about work and machines.

The Earth-Moon-Sun System

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	The Earth-Moon-Sun System
	• Earth's orbit around the Sun is shaped like an ellipse.
	• Seasons on Earth change partly because Earth is tilted on its axis.
	• Mountains exist on the Moon.
	• The same side of the Moon always faces Earth.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Research to discover what landforms or events are affected by the Moon's gravitational force on Earth.

The Earth-Moon-Sun System

Section 1 Earth in Space

Skim the headings in Section 1. Write three questions that come to mind.

1. _____

2. _____

3. _____

Review Vocabulary

orbit

Define orbit to show its scientific meaning.

New Vocabulary

sphere

Use your book to define each vocabulary term.

gravity

ellipse

Academic Vocabulary

physical

Use a dictionary to define physical to show its scientific meaning.

Section 1 Earth in Space (continued)

Main Idea

Earth's Size and Shape

I found this information on page _____.

Earth's Magnetic Field

I found this information on page _____.

Details

Summarize *four pieces of evidence that indicate that Earth is a sphere.*

1. _____

2. _____

3. _____

4. _____

Model Earth's magnetic field.

- Draw Earth. Show Earth's tilt on its axis in your drawing.
- Add a line through Earth to show where Earth's magnetic field is centered.
- Label important features on the diagram with the following terms.
 - north magnetic pole • south magnetic pole
 - Van Allen belts • magnetic axis
- Identify with Xs the two points where Earth's magnetic field is strongest.



Section 1 Earth in Space (continued)

Main Idea

Earth Orbits the Sun

I found this information on page _____.

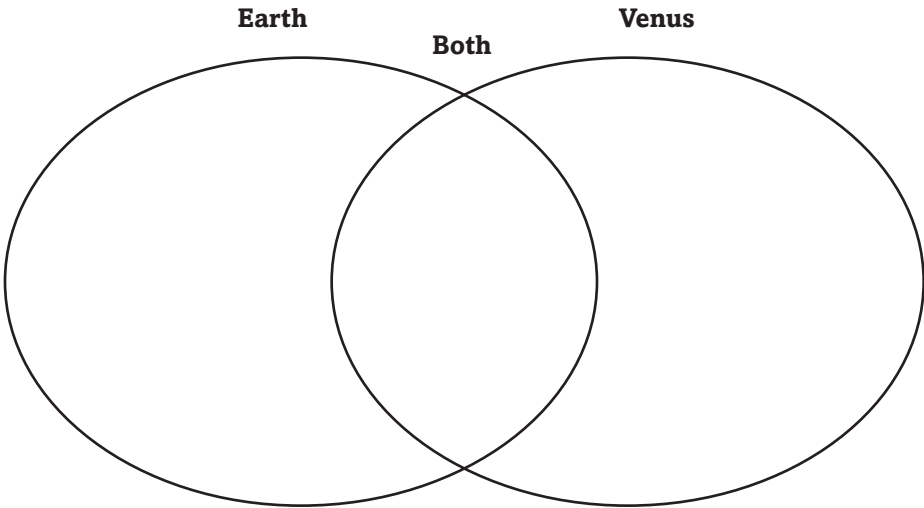
I found this information on page _____.

Details

Organize information about Earth’s orbit around the Sun by completing the paragraph.

The average distance between Earth and the Sun is _____ kilometers. Because Earth’s orbit is an _____, the actual distance between Earth and the Sun varies throughout the year. Earth comes closest to the Sun on _____ when it is _____ kilometers away from the Sun. Earth is farthest from the Sun on _____ when it is _____ kilometers from the Sun.

Compare and contrast Earth and Venus. Complete the Venn diagram with at least eight different facts.



CONNECT IT

Imagine the shape of Earth’s orbit. If Earth is nearest the Sun in winter and farthest from the Sun in summer, analyze at which two times of the year Earth is nearest to its average distance from the Sun. Predict the approximate dates of these events.

The Earth-Moon-Sun System

Section 2 Time and Seasons

Scan the section headings, bold words, and illustrations. Write two facts that you discovered as you scanned the section.

1. _____

2. _____

Review Vocabulary

latitude

Define latitude to show its scientific meaning.

New Vocabulary

Write the vocabulary term that matches each definition.

twice yearly time at which the Sun reaches its greatest distance north or south of the equator

movement of Earth in its orbit around the Sun; used to measure time in years

15°-wide area on Earth's surface in which the time is the same

twice yearly time when the Sun is directly over Earth's equator and the number of daylight and nighttime hours are equal worldwide

plane that contains Earth's orbit around the Sun

spinning of Earth on its imaginary axis and causes day and night to occur

Academic Vocabulary

intense

Use a dictionary to define intense to show its scientific meaning.

Section 2 Time and Seasons (continued)

Main Idea

Measuring Time on Earth

I found this information on page _____.

I found this information on page _____.

Details

Summarize information about how Earth movements are related to time. Complete the diagram.

Earth Movement		Relationship to Time
	→	Time is measured in days, which last 24 hours.
Earth spins 15° in one hour.	→	
Earth orbits the Sun in 365 days.	→	

Define the international date line. Explain why it is necessary.

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74 The Earth-Moon-Sun System

Section 2 Time and Seasons (continued)

Main Idea

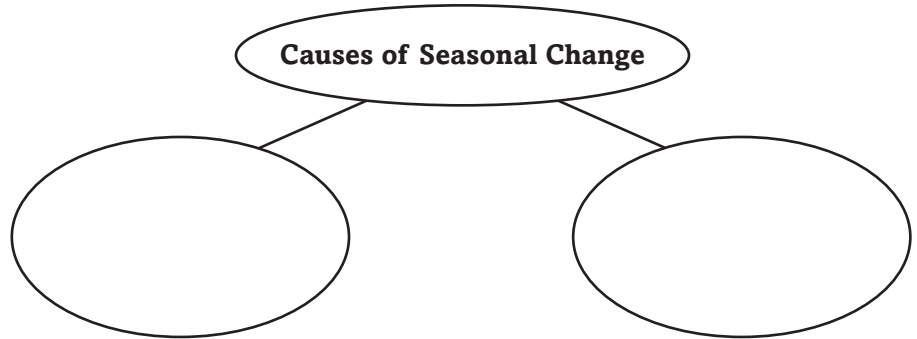
Why do seasons change?

I found this information on page _____.

I found this information on page _____.

Details

Identify the two factors that cause seasonal change.



Complete the paragraphs with key characteristics of equinoxes and solstices.

An equinox occurs when the Sun is _____. During an equinox, the number of _____ hours are equal all over the world. Equinoxes occur twice a year, in the _____ and in the _____.

A _____ occurs when the Sun reaches _____ of the equator. On the summer solstice, there are more hours of _____ than on any other day of the year. On the winter solstice, there are more _____ hours than on any other day of the year.

SYNTHESIZE IT

The southern hemisphere has summer when the northern hemisphere has winter. Explain why the southern hemisphere has warmer temperatures at this time of the year.

The Earth-Moon-Sun System

Section 3 Earth's Moon

Preview *the What You'll Learn statements for Section 3. Predict three topics that will be discussed in this section.*

1. _____
2. _____
3. _____

Review Vocabulary

lava

Define lava to show its scientific meaning.

New Vocabulary

Read the definitions below. Write the key term on the blank in the left column.

periodic rise and fall in sea level caused by the gravitational attraction among Earth, the Moon and the Sun

change in appearance of the Moon as viewed from Earth, due to the relative positions of Earth, the Sun, and the Moon

occurs when the Moon passes between the Sun and Earth, and casts a shadow on part of Earth

occurs when Earth's shadow falls on the Moon

relatively flat, dark-colored regions on the Moon's surface

layer of loose, ground-up rock on the lunar surface formed by the accumulation of impact material

Academic Vocabulary

phase

Use a dictionary to define phase to show its scientific meaning.

Section 3 Earth's Moon (continued)

Main Idea

Movement of the Moon

I found this information on page _____.

How does the Moon affect Earth?

I found this information on page _____.

Moonlight

I found this information on page _____.

Details

Identify and summarize *the 2 movements of the Moon.*

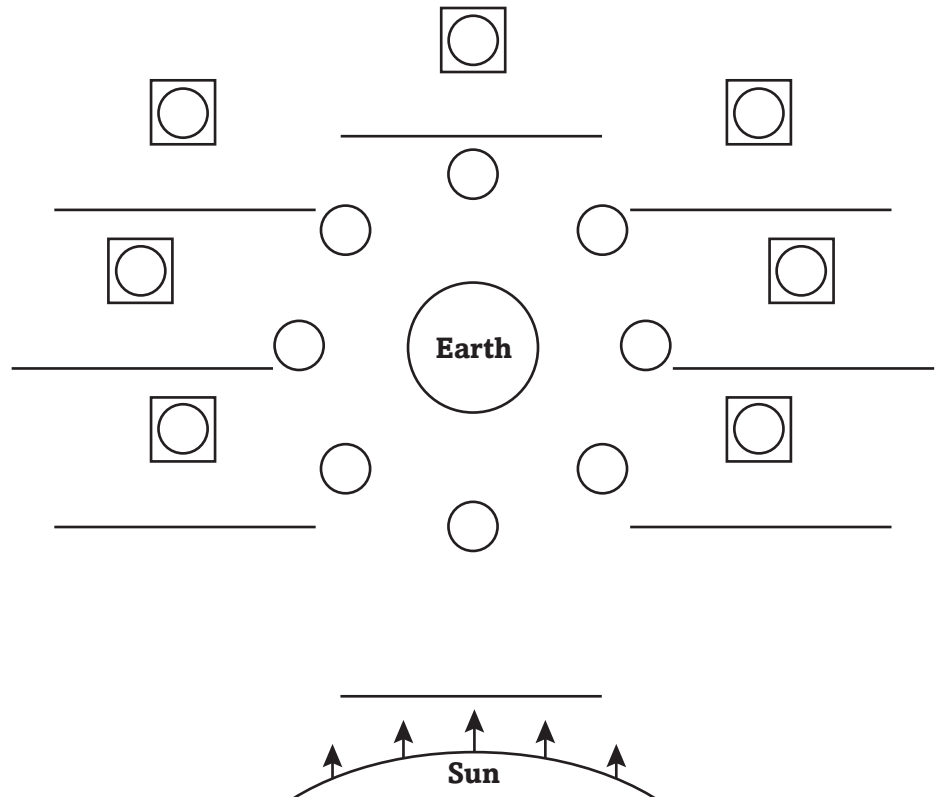
Model *the Earth-Moon-Sun system during spring and neap tides.*

- Show the positions of each body during each type of tide.
- Label Earth, the Sun, the Moon, and the Tidal bulge.

Spring Tide

Neap Tide

Create and label *a cycle diagram of the phases of the Moon.*



Section 3 Earth’s Moon (continued)

Main Idea

Eclipses

I found this information on page _____.

The Moon’s Surface

I found this information on page _____.

The Moon’s Interior

I found this information on page _____.

Exploring the Moon

I found this information on page _____.

Origin of the Moon

I found this information on page _____.

Details

Model the 2 types of eclipses to show the positions of Earth, the Sun, and the Moon.

Lunar eclipse	Solar eclipse
---------------	---------------

Distinguish features on the Moon’s surface.

Crater: _____

Maria: _____

Mountains: _____

Sequence the 4 parts of the Moon’s interior.

outermost	Moon’s Interior		innermost

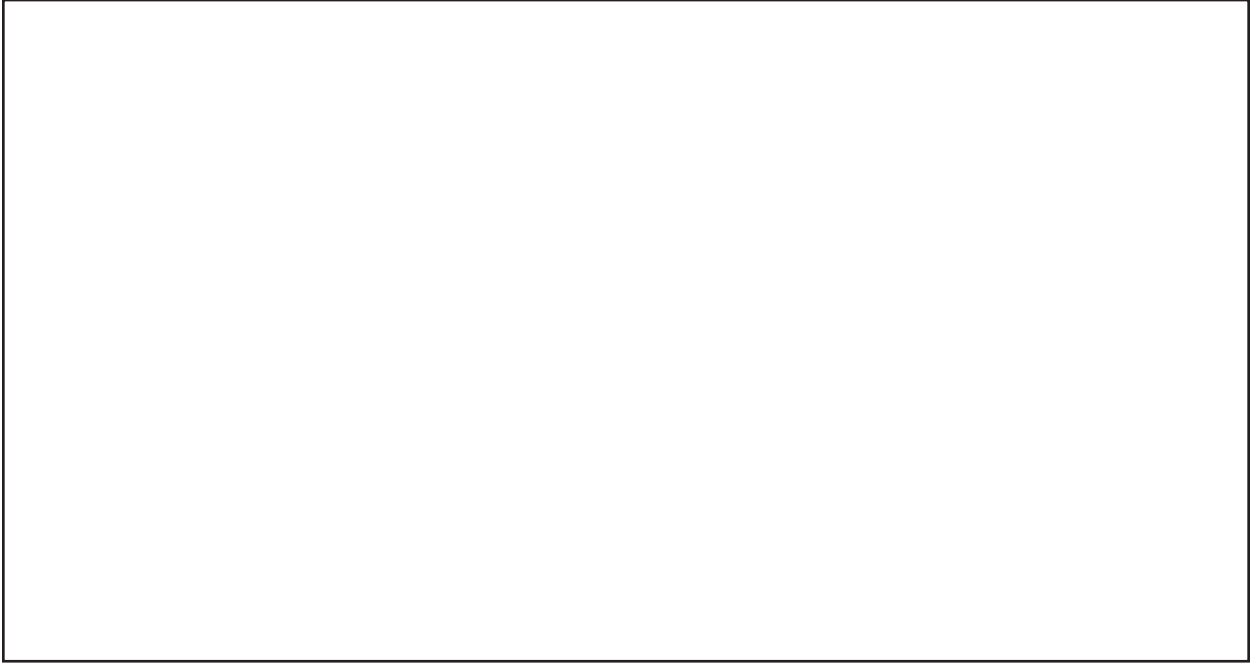
Summarize results from Clementine and Lunar Prospector.

Summarize the current theory of the Moon’s origin.

Tie It Together

Synthesize It

Make a drawing of the Earth-Moon-Sun system in the space below. Use arrows to show orbital motion.



List and explain at least three ways that objects in the Earth-Moon-Sun system affect each other.

1. _____

2. _____

3. _____

The Earth-Moon-Sun System

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

The Earth-Moon-Sun System	After You Read
• Earth’s orbit around the Sun is shaped like an ellipse.	
• Seasons on Earth change partly because Earth is tilted on its axis.	
• Mountains exist on the Moon.	
• The same side of the Moon always faces Earth.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about the Earth-Moon-Sun system.

The Solar System

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	The Solar System
	• The planets of the solar system orbit Earth.
	• Mercury, Venus, Earth, and Mars are the planets nearest the Sun.
	• Uranus has no moons.
	• Life as we know it is carbon-based and requires water for survival.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a hypothesis about whether life exists beyond Earth, or even beyond the solar system. Write how you would test the hypothesis.

The Solar System

Section 1 Planet Motion

Preview *the What You'll Learn statements for Section 1. Predict three topics that will be discussed in this section.*

1. _____

2. _____

3. _____

Review Vocabulary

ellipse

Define *ellipse to show its scientific meaning.*

New Vocabulary

Use your book to define the following terms.

geocentric model

heliocentric model

astronomical unit

extrasolar planet

Academic Vocabulary

sphere

Use a dictionary to define sphere to show its scientific meaning.

Section 1 Planet Motion (continued)

Main Idea

Models of the Solar System

I found this information on page _____.

Understanding the Solar System

I found this information on page _____.

I found this information on page _____.

Details

Compare and contrast *the geocentric and heliocentric models of the solar system.*

	Geocentric Model	Heliocentric Model
What it is		
Evidence that supported the model		
Model devised by		

Model *the shape of the planets' orbits as described by Copernicus and Kepler. Write the name of each shape next to your drawing.*

Copernicus	Kepler
------------	--------

Identify and describe three ways to classify the planets of the solar system.

- _____
- _____
- _____

Section 1 Planet Motion (continued)

Main Idea

Understanding the Solar System

I found this information on page _____.

Other Solar Systems

I found this information on page _____.

Details

Complete the sentences in the sequence of events that led to the formation of the solar system.

- 1. A nebula began contracting about _____ billion years ago.
It might have been caused by a _____.
- 2. The contracting nebula broke into _____. The
fragment that became the solar system _____,
causing it to flatten into _____.
- 3. Temperature rose near the _____ of the disk.
- 4. _____ began to fuse to form helium.
- 5. The _____ formed.
- 6. Leftover matter in the cloud fragment formed _____
_____.

Evaluate why scientists are eager to detect Earth-like planets around other stars.

CONNECT IT

Describe two ways to classify Mars according to its location.
Name one way to classify Mars that shows it has characteristics similar to Earth's.
Support your responses with details from the section.

The Solar System

Section 2 The Inner Planets

Scan the section headings, bold words, and illustrations. Write two facts you find as you scan the section.

1. _____

2. _____

Review Vocabulary

robot lander

Define robot lander to show its scientific meaning.

New Vocabulary

Write the vocabulary term that matches each definition.

third planet from the Sun; the only planet known to support life and the only planet to have temperatures that allow water to exist as a gas, a liquid, and a solid

second planet from the Sun; has a dense atmosphere of mostly carbon dioxide and very high surface temperatures

fourth planet from the Sun; called the red planet because of high concentrations of iron oxide in the soil

closest planet to the Sun; has a larger than expected iron core

Academic Vocabulary

Use a dictionary to define core to show its scientific meaning. Then use the term in a sentence that reflects the scientific meaning.

core

Section 2 The Inner Planets (continued)

Main Idea

Mercury
I found this information on page _____.

Venus and Earth
I found this information on page _____.

Mars
I found this information on page _____.

Details

Summarize *information about Mercury by filling in the blanks.*

1. Relative size and location: _____

2. Surface features: _____

3. Atmosphere: _____

Contrast *Earth with Venus.*

Property	Earth	Venus
Atmospheric temperature and pressure		
Presence of water		
Presence of life		

Compare and contrast *Mars and Earth in the Venn diagram.*

Mars

Both

Earth

Section 2 The Inner Planets (continued)

Main Idea

NASA on Mars

I found this information
on page _____.

I found this information
on page _____.

Details

Summarize NASA missions to Mars *in the table*.

Mission	Year(s)	What Was Studied/Learned
<i>Mariner 9</i>		
<i>Viking 1</i> and <i>Viking 2</i>		

Organize discoveries resulting from each mission to Mars.

1. *Global Surveyor*: _____

2. *Mars Odyssey*: _____

3. *Mars Pathfinder* and *Sojourner*: _____

4. *Opportunity* rover: _____

5. *Spirit* rover: _____

SYNTHESIZE IT

Some rovers sent to Mars are similar to the radio-controlled vehicles that people use as toys on Earth. Describe features or special equipment you would include if you designed a rover to travel to Mars or another planet.

The Solar System

Section 3 The Outer Planets

Skim the headings in Section 3. Write three questions that come to mind.

1. _____

2. _____

3. _____

Review Vocabulary

Define space probe to show its scientific meaning.

space probe _____

New Vocabulary

Write the vocabulary term that matches each definition.

unofficial name for object 2003 VB12, a distant planetoid with a very elliptical orbit

rocky solar system object that often is a piece from a comet or an asteroid

second-largest planet and sixth from the Sun; has the most complex system of rings

eighth planet from the Sun; has storms similar to Jupiter's and appears blue because of atmospheric methane

dwarf planet with three moons, a thin atmosphere, and an ice-rock surface

rocky solar system object of widely varying size often found between the orbits of Mars and Jupiter

mass of dust, rock particles, frozen water, methane, and ammonia that travels through space and develops a bright, distinctive tail as it approaches the Sun

seventh planet from the Sun; appears blue-green because of atmospheric methane; axis of rotation is tilted on its side

largest and fifth planet from the Sun; has continuous, swirling, high-pressure gas storms, the largest of which is the Great Red Spot

Section 3 The Outer Planets (continued)

Main Idea

Why are the outer planets so different?

I found this information on page _____.

Jupiter and Saturn

I found this information on page _____.

Uranus and Neptune

I found this information on page _____.

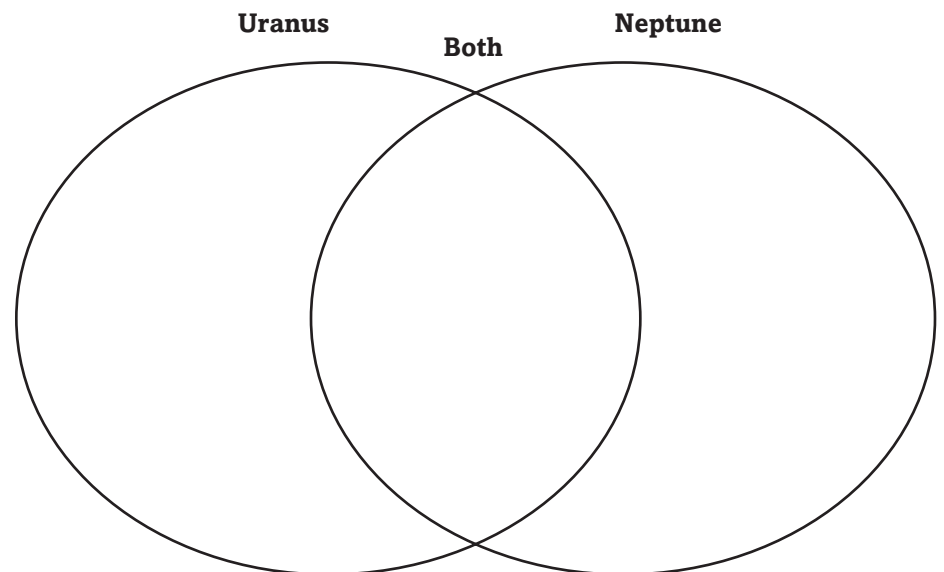
Details

Contrast *the main difference between the outer planets and the inner planets.*

Organize *information about Jupiter and Saturn in the table.*

Feature	Jupiter	Saturn
Relative size		
Sequence from Sun		
Number of moons		
Special features		

Compare and contrast *Uranus and Neptune. Complete the Venn diagram with at least nine different facts.*



Section 3 The Outer Planets (continued)

Main Idea

Details

Pluto

I found this information
on page _____.

Distinguish three ways dwarf planets are more like
asteroids and comet than planets.

1. _____
2. _____
3. _____
- _____
- _____

Comets and
Other Objects

I found this information
on page _____.

Analyze comets, asteroids, meteoroids, and Sedna by
completing the table.

Body	Description
Comet	
Asteroid	
Meteoroid	
Sedna	

CONNECT IT

Describe why scientists are puzzled about how to classify Sedna.

The Solar System

Section 4 Life in the Solar System

Preview *the What You'll Learn statements for Section 4. Predict three topics that will be discussed in this section.*

1. _____
2. _____
3. _____

Review Vocabulary

Define *fossil to show its scientific meaning.*

fossil

New Vocabulary

Define *the vocabulary term.*

extraterrestrial life

Academic Vocabulary

Use a dictionary to define *environment. Write a sentence about planets that includes the term and shows its scientific meaning.*

environment

Section 4 Life in the Solar System (continued)

Main Idea	Details
<p>Life as We Know It</p> <p><i>I found this information on page _____.</i></p> <p><i>I found this information on page _____.</i></p> <p><i>I found this information on page _____.</i></p>	<p>Identify <i>two substances that are required for life as we know it.</i></p> <p>1. _____</p> <p>2. _____</p> <p>Create <i>a concept web showing at least three ways scientists might determine whether life as we know it exists or once existed on another planet.</i></p> <div style="border: 1px solid black; height: 250px; width: 100%;"></div> <p>Create <i>a flow chart to show how organisms in extreme volcanic vent ecosystems on Earth get the energy they need to carry out life processes.</i></p> <div style="border: 1px solid black; height: 250px; width: 100%;"></div>

Section 4 Life in the Solar System (continued)

Main Idea

Can life exist on other worlds?

I found this information on page _____.

I found this information on page _____.

Details

Summarize features of each planet listed that make it unlikely that life could exist there.

1. Mercury: _____
2. Venus: _____
3. Jupiter: _____

Compare and contrast the features of the planet and moons listed that suggest that these objects may be capable of supporting life, or may have supported life in the past.

Mars	
Europa	
Titan	

SYNTHESIZE IT

A news report states that large organisms capable of movement have been identified on the surface of Pluto. Critique this statement. Explain if you think it is reasonable or not.

The Solar System

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

The Solar System	After You Read
• The planets of the solar system orbit Earth.	
• Mercury, Venus, Earth, and Mars are the planets nearest the Sun.	
• Uranus has no moons.	
• Life as we know it is carbon-based and requires water for survival.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about the solar system.

Heat and States of Matter

Before You Read

Before you read the chapter, use the “What I Know” column to list three things you know about heat and thermal energy. Then list three questions you have about thermal energy in the “What I Want to Find Out” column.

K What I know	W What I want to find out



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe things you do to make yourself feel warmer and cooler.

Heat and States of Matter

Section 1 Temperature and Thermal Energy

Read the section objectives. Write three questions that come to mind.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

Define kinetic energy by using it in a sentence.

kinetic energy _____

New Vocabulary

Use your book or a dictionary to define the following key terms.

kinetic theory _____

temperature _____

thermal energy _____

heat _____

specific heat _____

Academic Vocabulary

Look up the word random in a dictionary. Then use the definition to describe the phrase random motion.

random _____

Section 1 Temperature and Thermal Energy (continued)

Main Idea

Temperature

I found this information
on page _____.

Thermal Energy

I found this information
on page _____.

Heat

I found this information
on page _____.

Specific Heat

I found this information
on page _____.

Details

Compare the motion of hot molecules to cold molecules.

Analyze how each of the three actions in the table increases the kinetic, potential, or total thermal energy of a substance.

Actions that Increase Thermal Energy	Explanation
raise the temperature of the object	
pull atoms or molecules that attract one another farther apart	
add mass to the object, without changing its temperature	

Model the flow of heat from a hot object to a cold one. Show the heat flow and some particles in the hot and cold objects.

Compare and contrast what happens in a metal to what happens to a mass of water when each is heated.

Section 1 Temperature and Thermal Energy (continued)

Main Idea	Details
<p><i>I found this information on page _____.</i></p>	<p>Evaluate <i>the amount of energy lost from a 0.5 kg glass casserole dish when it is placed in water. The dish’s temperature changes from 110°C to 50°C.</i></p> <p>Hints: 1. Start by writing the equation for the change in thermal energy of an object.</p> <p>2. Find the specific heat for glass in the table in your book.</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p>
<p>Measuring Specific Heat</p> <p><i>I found this information on page _____.</i></p>	<p>Sequence <i>steps to use a calorimeter to find the specific heat of a material. Include steps for measurement and steps for calculation.</i></p> <p>1. _____</p> <p>_____</p> <p>_____</p> <p>2. _____</p> <p>_____</p> <p>_____</p> <p>3. _____</p> <p>_____</p> <p>_____</p>

CONNECT IT

Describe some processes in nature or daily life that depend on the high specific heat of water.

Heat and States of Matter

Section 2 States of Matter

Scan the headings, figures, and captions in Section 1 of your book. Write four facts about the states of matter you learned.

1. _____
2. _____
3. _____
4. _____

Review Vocabulary

Define force.

force

New Vocabulary

Read the definitions below. Write the term that matches the definition on the blank in the left column.

state of matter consisting of positively and negatively charged particles

the amount of energy required for 1 kg of a liquid at its boiling point to become a gas

the amount of energy required to change 1 kg of a substance from solid to liquid at its melting point

Academic Vocabulary

Use a dictionary to define the term potential.

potential

Section 2 States of Matter (continued)

Main Idea	Details
Four States of Matter	Complete the outline as you read about the states of matter.
<i>I found this information on page _____.</i>	States of Matter I. Solid A. Example: _____ B. Particle kinetic energy: _____ _____ C. Other fact(s): _____ _____
<i>I found this information on page _____.</i>	II. Liquid A. Example: _____ B. Particle kinetic energy: _____ _____ C. Other fact(s): _____ _____
<i>I found this information on page _____.</i>	III. Gas A. Example: _____ B. Particle kinetic energy: _____ _____ C. Other fact(s): _____ _____
<i>I found this information on page _____.</i>	IV. Plasma A. Example: _____ B. Particle kinetic energy: _____ _____ C. Other fact(s): _____ _____

Section 2 States of Matter (continued)

Main Idea

Thermal Expansion

I found this information on page _____.

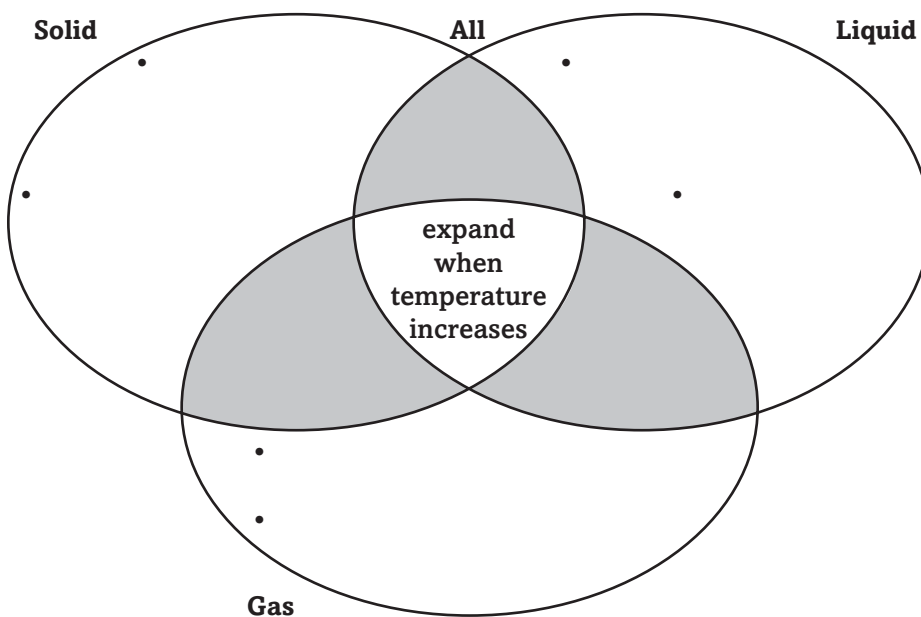
I found this information on page _____.

Details

Sequence *the kinetic energy, temperature, and density of most solids, liquids, and gases. Use 1 to represent the lowest kinetic energy and 3 to represent the highest.*

	Solid	Liquid	Gas
Kinetic energy			
Temperature			
Density			

Compare and contrast *the thermal expansion of solids, liquids, and gases by filling in two facts about each in the concept organizer.*



SYNTHESIZE IT

Refer to the graph titled "The Heating Curve of Water." Imagine that you reverse the process to remove heat from water vapor. Describe the changes to the temperature and energy at each level (a – d) in the reverse process.

Heat and States of Matter

Section 3 Transferring Thermal Energy

Skim Section 3 of your text. Read the headings and the illustration captions. Write four questions that come to mind.

1. _____
2. _____
3. _____
4. _____

Review Vocabulary

Define density in a sentence that shows its scientific meaning.

density

New Vocabulary

Use your book or a dictionary to define the following key terms.

conduction

convection

radiation

thermal insulator

Academic Vocabulary

Use a dictionary to define the word adapt.

adapt

Section 3 Transferring Thermal Energy (continued)

Main Idea

Details

Complete the table with what you have learned about the different ways thermal energy can be transferred.

Conduction

*I found this information
on page _____.*

Convection

*I found this information
on page _____.*

Radiation

*I found this information
on page _____.*

Description	Sketch	Examples
Conduction:		
Convection:		
Radiation:		

Section 3 Transferring Thermal Energy (continued)

Main Idea

Details

The Flow of Thermal Energy

I found this information on page _____.

Organize the heat-controlling features of some animals in the following table. Write the feature and describe its role in helping the animal control heat.

Animal	Feature	Role
Antarctic fur seal		
Emperor penguin		
Desert spiny lizard		

Thermal Insulators

I found this information on page _____.

Analyze how the vacuum between the inner and outer walls of a vacuum bottle limits heat loss through conduction and convection.

CONNECT IT

List the methods you use to control the flow of heat to and from your body. Explain the purpose of each method.

Heat and States of Matter

Section 4 Using Thermal Energy

Predict Read the title of Section 4. List three things that might be discussed in this section.

1. _____
2. _____
3. _____

Review Vocabulary

Define the word *work* in a sentence to reflect its scientific meaning.

work

New Vocabulary

Read the definitions below, then write the key term for each one in the left column.

heat cannot flow from a cool object to a warmer object unless work is done

a measure of how dispersed, or spreadout, energy is

the increase in thermal energy of a system equals the work done on the system plus the heat transferred to the system

Academic Vocabulary

Use a dictionary to define the word *cycle*.

cycle

Section 4 Using Thermal Energy (continued)

Main Idea

Details

Heating Systems
I found this information on page _____.

Compare and contrast forced-air, radiator-based, *and* electric heating systems *for buildings*.

System Type	Description
Forced air	
radiator-based	
electric	

Thermodynamics
I found this information on page _____.

Complete *the equation to define the first law of thermodynamics.*

Increase in

of system

=

on system

+

to system

Contrast *the characteristics of an open system and a closed system.*

Converting Thermal Energy to Work
I found this information on page _____.

Refer *to your textbook to fill in the blanks in the paragraph below.*

A car has an internal combustion engine, or _____ engine. Fuel burns inside the internal combustion engine in _____ called _____. A typical car engine has _____ or more cylinders. Inside the cylinders, _____ move up and down. A _____ refers to each up-and-down movement a piston makes. A car engine has a _____ cycle.

Section 4 Using Thermal Energy (continued)

Main Idea

Moving Thermal Energy

I found this information on page _____.

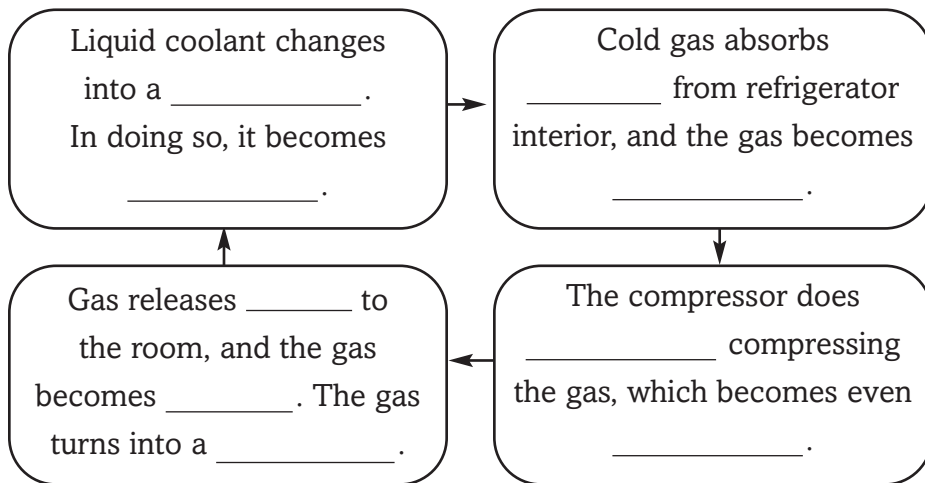
Entropy

I found this information on page _____.

Details

Summarize the steps a refrigerator takes to transfer heat by filling in the blanks with words from the word bank. Some words may be used more than once.

colder gas heat liquid warmer work



Define entropy. Then use an example from your physical education class to explain briefly how entropy increases. Sketch a picture of your example.

ANALYZE IT

A refrigerator is a device that causes heat to flow from a cool object (such as a pitcher of water) to a warm object (the air in the kitchen). Explain why this does not violate the second law of thermodynamics.

Heat and States of Matter

Chapter Wrap-Up

In the left column, copy the questions you listed in the Chapter Preview. In the right column, write down the answers you discovered as you worked through the chapter.

W What I wanted to find out	L What I learned

Review

Use this checklist to help you study.

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SUMMARIZE IT

After reading this chapter, identify three things you have learned about thermal energy.

Waves

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Waves
	• Waves move only through water.
	• Waves can bend.
	• Waves can be different sizes and move at different speeds.
	• When a wave moves, the substance in which it travels moves with it.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write down three things you already know about waves, and one thing you would like to learn about waves.

Waves

Section 1 The Nature of Waves

Predict *Read the title of Section 1. List three things that might be discussed in this section.*

1. _____

2. _____

3. _____

Review
Vocabulary

Define energy to show its scientific meaning.

energy

New
Vocabulary

Use your book or a dictionary to define the following key terms.

wave

medium

transverse wave

compressional wave

Academic
Vocabulary

Use a dictionary to define transfer.

transfer

Section 1 The Nature of Waves (continued)

Main Idea

What's in a wave?

I found this information on page _____.

Waves and Energy

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

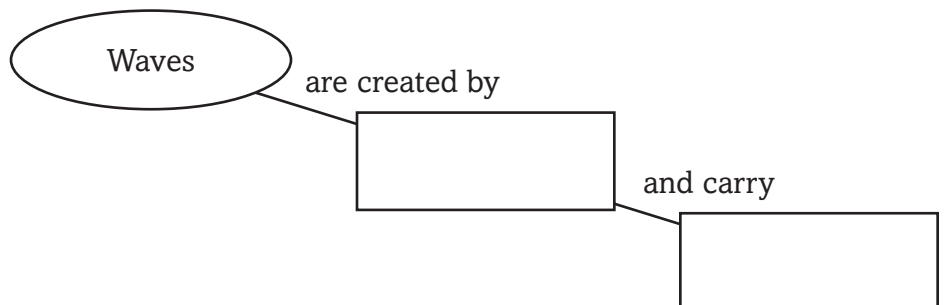
Distinguish *one way in which ocean waves and waves from earthquakes are different.*

Model *energy transfer in waves.*

- Draw a sketch of a pebble being dropped in the water and creating waves.
- Draw arrows to show the direction of the energy that is being transferred in the waves.

Analyze *what happens when waves come into contact with a boat. Explain why they do not move the boat to a different position.*

Complete *the graphic organizer about waves.*



Section 1 The Nature of Waves (continued)

Main Idea

Details

Mechanical Waves

I found this information on page _____.

I found this information on page _____.

Classify each type of wave, mechanical wave or not and by whether or not it needs a medium to move through.

Type of Wave	Is a medium required?	Is it a mechanical wave?
ocean wave		
sound wave		
radio wave		
light wave		

Compare and contrast the 2 types of mechanical waves.

- Draw a cross section of the ocean.
- Use arrows to show how transverse and compressional waves each move the water.

CONNECT IT

Design an experiment to show that water waves are both transverse waves and compressional waves. Explain how your experiment will work.

Waves

Section 2 Wave Properties

Skim Section 2 of your book. Write three questions that come to mind from reading the headings and the illustration captions.

1. _____
2. _____
3. _____

Review Vocabulary

Define vibration to show its scientific meaning.

vibration _____

New Vocabulary

Read the definitions below. Then write the key term on the blank in the left column.

the highest points of a transverse wave

the amount of time it takes one wavelength to pass a fixed point

the least dense compression regions of a wave

the lowest points of a transverse wave

measure of the energy carried by a wave

the number of wavelengths that pass a fixed point in one second

the distance between one point on a wave and the nearest point just like it

Academic Vocabulary

Use a dictionary to define impact.

impact _____

Section 2 Wave Properties (continued)

Main Idea

The Parts of a Wave and Wavelength

I found this information on page _____.

Frequency and Period

I found this information on page _____.

Details

Model two transverse waves, one with a short wavelength and one with a longer wavelength. Identify a crest, trough and wavelength for each wave.

Model two compressional waves, one with a small wavelength and one with a larger wavelength. Identify a rarefaction and compression in each wave. Label the wavelength.

Complete the flow chart to help you understand the relationship between frequency and wavelength.

When the frequency of a wave

the wavelength of the wave

increases,

114 Waves

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Section 2 Wave Properties (continued)

Main Idea

Wave Speed

I found this information
on page _____.

Amplitude and Energy

I found this information
on page _____.

I found this information
on page _____.

Details

Evaluate the speed of an ocean wave that has a wavelength of 4.0 m and a frequency of 400 Hz.

$f = \underline{\hspace{2cm}}$	$\lambda = \underline{\hspace{2cm}}$
$v = f \times \lambda$ $v = \underline{\hspace{2cm}} \times \underline{\hspace{2cm}}$ $v = \underline{\hspace{2cm}} \text{ m/s}$	

Model two compressional waves by drawing them with two different colors. One wave should have more energy than the other. Label the energy of each wave.

Identify how the amplitude of a transverse wave is measured. Make a sketch to show your answer.

CONNECT IT

Contrast the amplitude and energy of the sound waves you make when you shout across a room with the sound waves you make when you speak softly.

Waves

Section 3 The Behavior of Waves

Scan Write three facts you discovered about the behavior of waves as you scanned the headings and illustrations.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

perpendicular

Define perpendicular to show its scientific meaning.

New Vocabulary

Write the correct vocabulary term next to each definition.

- the bending of a wave caused by a change in its speed as it moves from one medium to another
- a wave pattern that forms when waves of equal wavelength and amplitude but traveling in opposite directions continually interfere with each other
- process by which an object vibrates by absorbing energy at its natural frequencies
- the process by which two or more waves overlap to form a new wave
- the bending of a wave around an obstacle

Academic Vocabulary

negate

Use a dictionary to define the word negate.

Section 3 The Behavior of Waves (continued)

Main Idea

Reflection

*I found this information
on page _____.*

Details

Summarize the law of reflection by completing the sentence below.

The angle of _____ is equal to _____.

Create a diagram showing a flashlight shining on a mirror. Label your diagram with the terms given.

- angle of incidence
- incident beam
- the normal
- angle of reflection
- reflected beam

Refraction

*I found this information
on page _____.*

Summarize why a spoon placed in a clear glass of water appears to be crooked. Make a sketch to help you explain.

Diffraction

*I found this information
on page _____.*

Evaluate one similarity and one difference between refraction and diffraction.

Similarity	
Difference	

Section 3 The Behavior of Waves (continued)

Main Idea

Details

Interference

I found this information
on page _____.

Complete the table describing the 2 types of interference.

Constructive Interference	Destructive Interference
Cause:	Cause:
Result:	Result:

Standing Waves

I found this information
on page _____.

Summarize what causes a standing wave to form.

Resonance

I found this information
on page _____.

Analyze why an opera singer singing a high note into a microphone
can cause a nearby drinking glass to shatter.

EVALUATE IT

While in the mountains, you yell to a friend and hear your voice three times—Janet, Janet, Janet. Explain.

Tie It Together

Waves

Predict *how resonance can cause earthquakes to do greater damage to some buildings than others.*

Analyze *If two astronauts were able to go on a space walk without wearing space suits, explain why they would not be able to talk to one another.*

Describe *how you could use interference to make a wave smaller in amplitude. Give a real world example.*

Waves

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Waves	After You Read
• Waves move only through water.	
• Waves can bend.	
• Waves can be different sizes and move at different speeds.	
• When a wave moves, the substance in which it travels moves with it.	

Review

Use this checklist to help you study.

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SUMMARIZE IT

After reading this chapter, identify three things you have learned about waves.

Sound and Light

Before You Read

Preview the chapter and section titles and the section headings. Complete the two columns of the table by listing at least two ideas in each column.

K What I know	W What I want to find out



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write three things you would like to learn about sound.

Sound and Light

Section 1 Sound

Preview the photos and illustrations in Section 1. Read the captions. Write three things you think will be discussed in this section.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

Define vibration in a sentence that shows its scientific meaning.

vibration

New Vocabulary

Define the following key terms.

intensity

loudness

decibel

pitch

Doppler effect

Academic Vocabulary

Use a dictionary to define expand to shows its scientific meaning.

expand

Section 1 Sound (continued)

Main Idea

Sound Waves

I found this information
on page _____.

I found this information
on page _____.

**The Speed
of Sound**

I found this information
on page _____.

Details

Summarize how sound forms on the lines below. Include one example of an object that is making sound.

Complete the sentence about sound waves.

Sound waves are _____, which are waves that consist of alternating _____ and _____.

Model a sound wave moving through air in the space below. Draw molecules as the molecules would appear in compressions and in rarefactions. Label each region.

Sequence the words liquid, solid, and gas on the continuum below. Then describe how temperature affects the speed of sound on the lines below.

sound travels slowest
sound travels fastest

Section 1 Sound (continued)

Main Idea

Details

Intensity and Loudness

I found this information on page _____.

Pitch and Frequency

I found this information on page _____.

The Doppler Effect

I found this information on page _____.

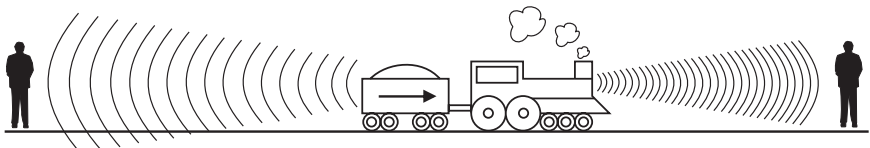
Identify *the following key characteristics of sound intensity.*

- how sound intensity is measured _____
- level of sound intensity that damages human hearing _____
- level of the faintest sound humans can hear _____

Organize *information about sound frequencies in the table.*

Name	Frequencies	Can humans hear?	Use or Examples
Infrasonic			
Sonic	20 Hz–20,000 Hz		
Ultrasonic			

Complete *the graphic organizer about the Doppler effect.*



When the source of sound is moving _____ you, compressions are _____, so the sound has a _____ frequency and a _____ pitch.

When the source of sound is moving _____ you, compressions are _____, so the sound has a _____ frequency and a _____ pitch.

CONNECT IT

Design a simple experiment to show younger students that sound intensity decreases with distance.

Sound and Light

Section 2 Reflection and Refraction of Light

Scan the headings, boldfaced words, figures, and captions in Section 2 of your book. Write four facts about light you learned as you scanned the section.

1. _____

2. _____

3. _____

4. _____

Review Vocabulary

visible light

Define visible light to show its scientific meaning.

New Vocabulary

Read the definitions below. Then write the key term for each one in the left column.

allows some light to pass through

transmits almost all light

absorbs or reflects all light

ratio of the speed of light in a vacuum to the speed of light in a material

Academic Vocabulary

individual

Use a dictionary to define individual **to show its scientific meaning.**

Section 2 Reflection and Refraction of Light (continued)

Main Idea

The Interaction of Light and Matter

I found this information on page _____.

Reflection of Light

I found this information on page _____.

I found this information on page _____.

Details

Summarize each term below in your own words. Give three examples of a material that has the light-transmitting property.

Opaque: _____

Example: _____

Translucent: _____

Example: _____

Transparent: _____

Example: _____

Model a light wave that hits a plane mirror at a 25° angle and reflects. Use a protractor to draw the angles. Include these labels.

- the angle of incidence
- the angle of reflection
- the normal



Contrast regular reflection and diffuse reflection. Provide two examples of each.

Section 2 Reflection and Refraction of Light (continued)

Main Idea

Refraction of Light

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

Analyze a spoon resting in a glass of water. Explain how you can tell water has a different index of refraction than air.

Evaluate how a prism separates white light by completing the statements.

A triangular prism _____ light twice—once when it _____ the prism and again when it _____ the prism.

_____ wavelengths of light are refracted _____ than shorter wavelengths, so _____ light is bent the least.

Because of the different amounts of _____, the different colors are _____ when they emerge from the prism.

Summarize how mirages form.

SYNTHESIZE IT

Create a concept map on a separate sheet of paper to summarize facts and effects of reflection and refraction you learned in this chapter.

Sound and Light

Section 3 Mirrors, Lenses, and the Eye

Predict *Read the title of Section 3. List three things that might be discussed in this section.*

1. _____

2. _____

3. _____

Review Vocabulary

reflection

Define *reflection by using it in a sentence.*

New Vocabulary

Read the definitions below, then write the key term for each one in the left column.

- a flat, smooth mirror
- a curved mirror with edges that are closer to the viewer than the center of the mirror
- a curved mirror with a center that is closer to the viewer than the edges of the mirror are
- a lens that is thicker in the middle than at the edges
- a lens that is thinner in the middle and thicker at the edges

Academic Vocabulary

source

Use a dictionary to define the term source as a noun.

Section 3 Mirrors, Lenses, and the Eye (continued)

Main Idea

Mirrors

I found this information on page _____.

I found this information on page _____.

Details

Sequence the steps in the path that light rays take when a girl sees her image in a plane mirror. The steps are written in scrambled order on the right. Rewrite them in the correct order in the boxes.

The light source puts out rays of light.



Some of the reflected light rays hit the mirror.

The girl sees her image in the mirror.

The light source puts out rays of light.

Some of the reflected light rays hit the girl's eyes.

The light rays reflect off of the mirror in all directions.

The light rays reflect off of the girl in all directions.

Some of the light rays strike the girl.

Contrast concave and convex mirrors below by filling in the table.

Mirror	Direction of Curvature	Direction of Reflected Light
Concave		
Convex		

Section 3 Mirrors, Lenses, and the Eye (continued)

Main Idea

Details

Lenses
I found this information on page _____.

Contrast *convex lenses with concave lenses. Draw how light rays travel through each type of lens in the space below. Label the optic axis in each drawing. Label the focal point and focal length of the convex lens.*

Convex Lens

Concave Lens

Vision Problems
I found this information on page _____.

Organize *information on common vision problems.*

Problem	Can See	Cause	Image Location	Eyeglass Lens Shape
Near-sighted				
Far-sighted				

SYNTHESIZE IT

Explain how glasses help nearsighted and farsighted people see clearly and in focus.

Sound and Light

Section 4 Light and Color

Predict Read the title of Section 4. List three topics that might be discussed in this section.

1. _____
2. _____
3. _____

Review Vocabulary

retina

Define retina to show its scientific meaning. Write a sentence to demonstrate the meaning.

New Vocabulary

pigment

Use your book to define pigment. Write a sentence to demonstrate the scientific meaning.

Academic Vocabulary

visible

Use a dictionary to define the term visible. Write a sentence to show its scientific meaning.

Section 4 Light and Color (continued)

Main Idea

Details

A black object

Why Objects Have Color

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Complete the graphic organizer about white and black objects.

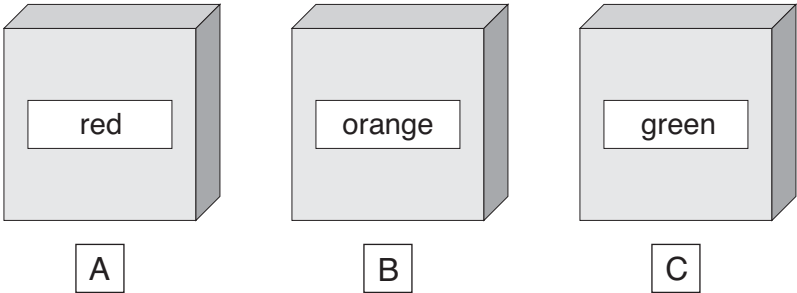
A white object

_____ all _____ of light back to your eyes.

A black object

_____ all colors of light and reflects little or no light back to your eyes.

Distinguish the color reflected from the colors absorbed by each block. Fill in the table below. Part of the table has been filled in for you.



Color(s)	Block A	Block B	Block C
Reflected			
Absorbed	orange, yellow, green, blue, indigo, violet		

Complete the following paragraph about filters.

A filter is a _____ material that transmits _____ but _____ all others. The name of the color of a _____ is the color of the _____ that it _____.

Section 4 Light and Color (continued)

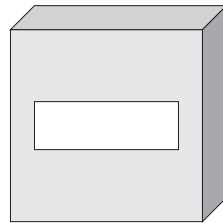
Main Idea

Seeing Color

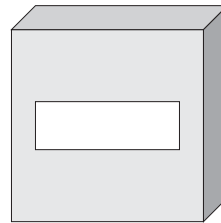
I found this information
on page _____.

Details

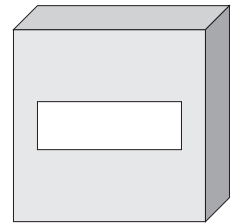
Distinguish between the color blocks A (red), B (orange), and C (green) would look through a red filter. Label each block according to the color that it appears through the red filter.



A

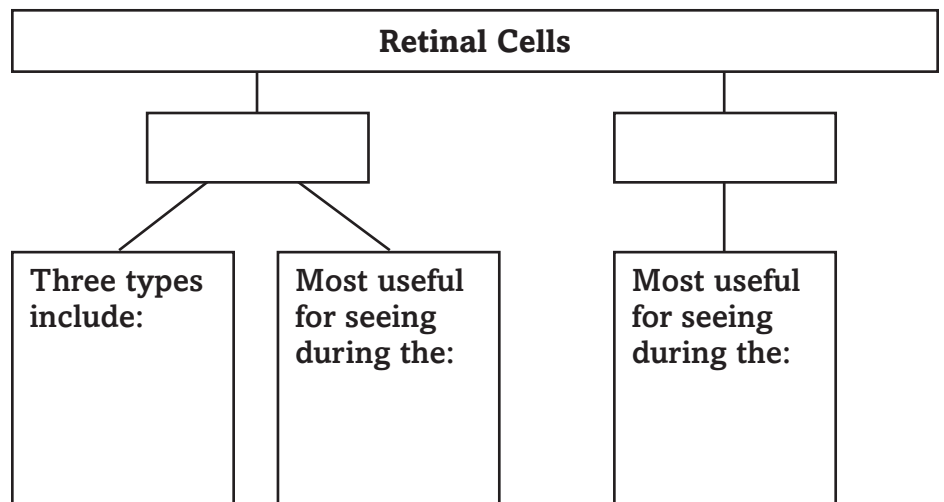


B



C

Organize information about retinal cells.



CONNECT IT

Describe how a rainbow would look if viewed through an indigo filter. Explain why the rainbow would appear this way.

Sound and Light chapter Wrap-Up

Review the ideas that you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column. How do your ideas about what you know now compare with those you provided at the beginning of the chapter?

K What I know	W What I want to find out	L What I learned

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about sound and light.

Earth's Internal Processes

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Earth's Internal Processes
	• Scientists believe that Earth's continents were once joined as a single landmass.
	• Earthquakes are distributed randomly around Earth.
	• Earth's core is made of metal.
	• There are several kinds of volcanoes.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Do you know of any volcanic eruptions that have happened? Explain the effects of volcanoes that you know about.

Earth’s Internal Processes

Section 1 Evolution of Earth’s Crust

Skim the headings in Section 1. Then write three questions that come to mind.

1. _____
2. _____
3. _____

Review
Vocabulary

Define hypothesis to show its scientific meaning.

hypothesis

New
Vocabulary

Write the vocabulary term that matches each definition.

- _____
- plate tectonic boundary where lithospheric plates are moving apart
- _____
- a continuous system of twin mountain ranges with a rift valley between them that extends around Earth on the seafloor
- _____
- plate tectonic boundary that exists as a large fault, or crack, along which lithospheric plates move in a horizontal direction
- _____
- long, linear, dropped-down valley between twin, parallel mountain ranges produced by faulting
- _____
- plate tectonic boundary where lithospheric plates collide
- _____
- occurs when lithospheric plates converge and the edge of one plate is forced downward beneath another

Academic
Vocabulary

Use a dictionary to define theory to show its scientific meaning.

theory

Section 1 Evolution of Earth's Crust (continued)

Main Idea

Continental Drift

*I found this information
on page _____.*

*I found this information
on page _____.*

**Seafloor
Spreading
Hypothesis**

*I found this information
on page _____.*

Details

Summarize *the continental drift hypothesis.*

Identify *three pieces of evidence that support Wegener's hypothesis about continental drift.*

1. _____

2. _____

3. _____

Create *a flow chart or concept diagram to sequence the steps in the process of seafloor spreading.*

Section 1 Evolution of Earth’s Crust (continued)

Main Idea

Details

Theory of Plate Tectonics

I found this information on page _____.

Model and label the 3 types of plate motion.

- Make a drawing to show the movement of plates.
- Use arrows to show the direction the plates move.
- Label the lithosphere, continental crust, and oceanic crust in your drawings.

What drives the plates?

I found this information on page _____.

Identify four factors that affect plate movement.

1. _____

2. _____
3. _____

4. _____

CONNECT IT

Convection plays an important role in the movement of tectonic plates. Describe three other activities that rely on convection to occur.

Earth's Internal Processes

Section 2 Earthquakes

Scan the section headings, bold words, and illustrations. Write two facts that you discovered as you scanned the section.

1. _____

2. _____

Review Vocabulary

friction

Define friction to show its scientific meaning.

New Vocabulary

Write the vocabulary term that matches each definition.

point of origin of an earthquake

sudden energy release that accompanies fault movement and causes earthquakes, or seismic vibrations

crack in Earth's crust along which movement has taken place

point on Earth's surface directly above an earthquake's focus

Academic Vocabulary

infer

Use a dictionary to define infer to show its scientific meaning.

Section 2 Earthquakes (continued)

Main Idea	Details
<p>Global Earthquake Distribution</p> <p><i>I found this information on page _____.</i></p> <p><i>I found this information on page _____.</i></p>	<p>Describe <i>the distribution of earthquakes on Earth.</i></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Complete <i>each sentence below about the depths of earthquakes.</i></p> <p>1. Boundaries associated with transform faulting produce _____.</p> <p>2. Areas of convergent boundaries that are near the trench produce _____.</p> <p>3. Areas of convergent boundaries that are far from the trench produce _____.</p> <p>Explain <i>the concept of deformation.</i></p> <p>_____</p> <p>_____</p> <p>_____</p> <p>_____</p> <p>Distinguish <i>four types of stress that cause deformation of Earth's crust.</i></p> <p>1. _____</p> <p>_____</p> <p>2. _____</p> <p>_____</p> <p>3. _____</p> <p>_____</p> <p>4. _____</p> <p>_____</p>
<p>Causes of Earthquakes</p> <p><i>I found this information on page _____.</i></p> <p><i>I found this information on page _____.</i></p>	

Section 2 Earthquakes (continued)

Main Idea

Earthquake Waves

I found this information on page _____.

Details

Compare and contrast the 2 main types of earthquake waves by completing the table.

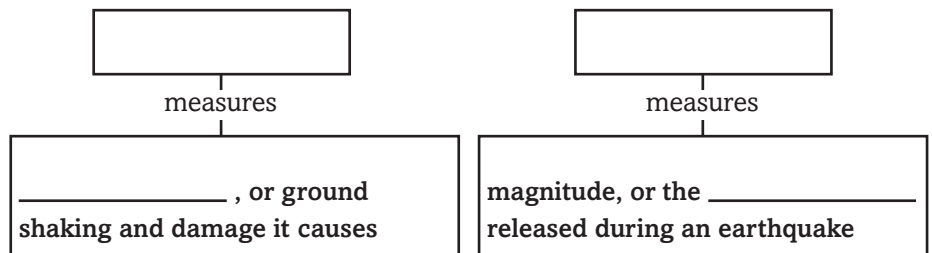
Body Waves	Where they travel:
	Types/Descriptions:
	Materials they travel through:
Surface Waves	Where they travel:
	Description:

Earthquake Measurement

I found this information on page _____.

Compare and contrast the two ways to measure earthquakes.

Earthquake Measurement Scales



SYNTHESIZE IT

In 1906, a major earthquake struck the city of San Francisco. It measured 8.3 on the Richter scale, and its epicenter was along the San Andreas fault. Use the information you have been given and your knowledge of earthquakes to hypothesize what types of damage may have occurred in the city.

Earth's Internal Processes

Section 3 Earth's Interior

Preview *the What You'll Learn statements for Section 3. Predict two topics that will be discussed in this section.*

1. _____

2. _____

Review Vocabulary

refraction

Define *refraction to show its scientific meaning.*

New Vocabulary

shadow zone

Write the definition for each vocabulary term. Use your book or a dictionary for help.

asthenosphere

discontinuity

Academic Vocabulary

uniform

Use a dictionary to define uniform to show its scientific meaning.

Section 3 Earth's Interior (continued)

Main Idea

What's inside?

I found this information
on page _____.

Earthquake Observations

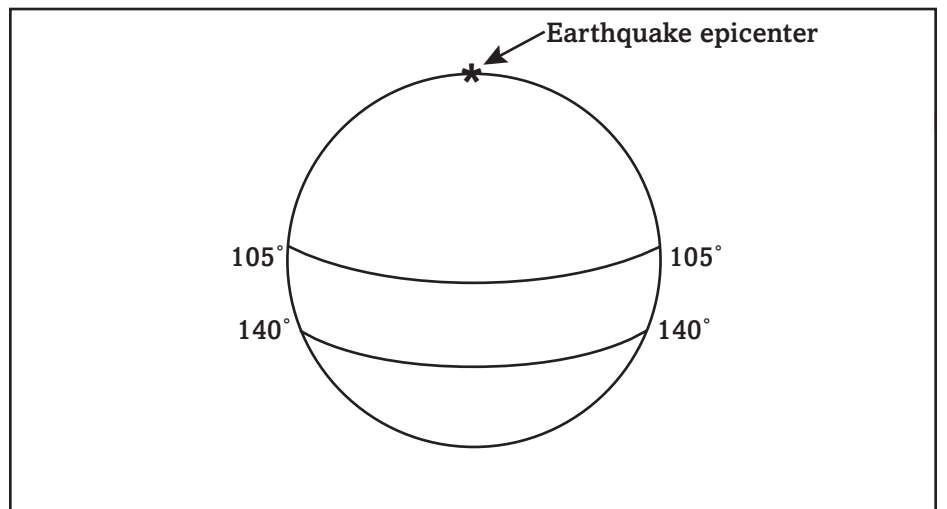
I found this information
on page _____.

I found this information
on page _____.

Details

Summarize how scientists are able to use seismic waves to show that Earth is not uniform in its structure and composition.

Model the shadow zone by labeling the illustration below. Mark the region where both P-waves and S-waves are absent and the region where only S-waves are absent.



Complete the sentences below about Earth's solid inner core. Use your book to help you choose correct words or phrases.

Deep inside Earth _____ and _____ are very high. Earth materials _____ at high temperatures. In the outer core, temperatures are high enough to overcome the _____ and the material is _____. In the inner core _____ overcomes the effects of _____ and the inner core material is _____.

Section 3 Earth’s Interior (continued)

Main Idea

Details

Composition of Earth’s Layers

I found this information on page _____.

I found this information on page _____.

Distinguish the layers of Earth to complete the table below.

Earth’s Layers	Description
Crust	
	below the lithosphere; made of weaker, plasticlike rock
	below the asthenosphere; made of silicates similar to crust and mantle, mineral structure is different because of higher pressure
Outer core	
	innermost layer composed of solid metallic materials, including nickel and iron

Summarize how astronomers believe early Earth formed.

CONNECT IT

Explain why scientists must infer what Earth’s interior looks like.

Earth's Internal Processes

Section 4 Volcanoes

Scan the section headings, bold words, and illustrations. Write two facts you discovered as you scanned the section.

1. _____

2. _____

Review Vocabulary

Define melting point to show its scientific meaning.

melting point

New Vocabulary

Use your book to define each vocabulary term.

viscosity

cinder cone volcano

shield volcano

composite volcano

Academic Vocabulary

Use a dictionary to define generate to show its scientific meaning.

generate

Section 4 Volcanoes (continued)

Main Idea

Eruptive Styles

*I found this information
on page _____.*

**Types of
Volcanoes**

*I found this information
on page _____.*

Details

Compare and contrast *the types of eruptions that occur at each location by completing the table.*

Location of Eruption	Eruption Style (Description of Eruption)
	violent volcanic eruptions with a variety of magma types
	most activity under water and unseen by people; usually low viscosity, basaltic lava may occur on land with a variety of lava compositions
	magma moves to surface in plumes; lava is fluid and basaltic

Model *the shapes and sizes of the 3 types of volcanoes.*

CONNECT IT

The Cascade Range in the northwestern United States has many volcanoes, including Mount St. Helens. The Cascades are at a convergent plate boundary. Identify the type of volcano you would most expect to find in the Cascade Range and the nature of the eruptions.

Earth’s Internal Processes

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Earth’s Internal Processes	After You Read
• Scientists believe that Earth’s continents were once joined as a single landmass.	
• Earthquakes are distributed randomly around Earth.	
• Earth’s core is made of metal.	
• There are several kinds of volcanoes.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about Earth’s internal processes.

Electricity

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Electricity
	• Electrical forces act at a distance.
	• Electric charges can be created and destroyed.
	• All circuits contain electrical resistance.
	• Electricity can flow only through an open circuit.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List five devices that use electrical energy. Write the forms of energy into which electrical energy is converted by each device.

Electricity

Section 1 Electric Charge

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

1. _____

2. _____

3. _____

Review
Vocabulary

Describe the structure of an atom.

atom

New
Vocabulary

Read the definitions below. Write the key term that matches each definition in the left column.

- a material in which electrons are able to move easily
- when electrons on a neutral object are moved by a charged object
- the buildup of electric charge on an object
- a material in which electrons cannot move easily
- the process of transferring charge by touching or rubbing
- charge can be transferred from one thing to another, but it cannot be created or destroyed

Academic
Vocabulary

Define the term create to show its scientific meaning.

create

Section 1 Electric Charge (continued)

Main Idea

Positive and Negative Charge

I found this information on page _____.

I found this information on page _____.

Conductors and Insulators

I found this information on page _____.

Details

Model charges *and* forces of two items that have just been removed from a clothes dryer.

Compare the force of electricity to the force of gravity. Provide examples to complete the table.

Location of Force	Force	Example
Within an atom	Electricity	
Between atoms	Electricity	
Between objects	Gravity	
Between objects	Electricity	

Classify five conductors *and* five insulators in the correct space below.

Conductors

Insulators

Section 1 Electric Charge (continued)

Main Idea

Details

Charging Objects

I found this information
on page _____.

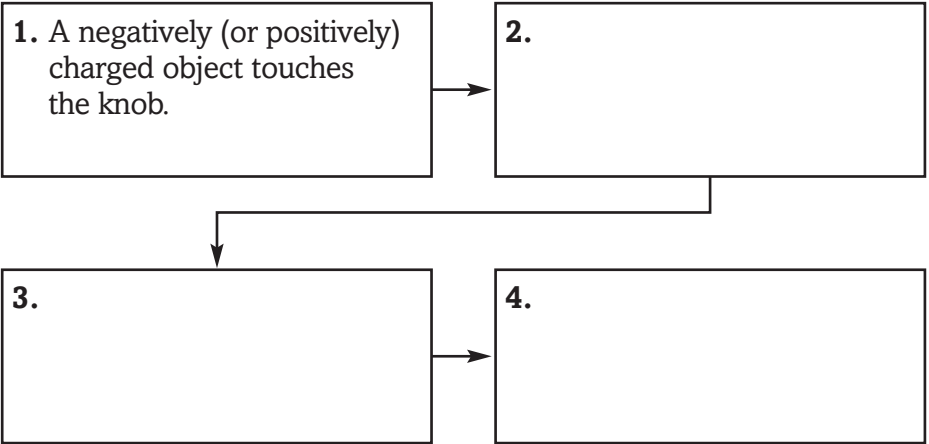
Describe the type of charging that occurs in each event.

1. Lightning strikes a lightning rod on a tall building.
- _____
- _____
- _____
2. The lightning rod moves excess charges to Earth’s surface.
- _____
- _____
- _____

Detecting
Electric Charge

I found this information
on page _____.

Sequence the events that occur when an electroscope is used to
detect a charge on an object.



CONNECT IT

Hypothesize what might happen if you use electrical
appliances while standing or sitting in water.

Electricity

Section 2 Electric Current

Scan Use the checklist below to preview Section 2 of your book.

- ☐ Read all section titles.
- ☐ Read all bold words.
- ☐ Read all charts and graphs.
- ☐ Look at all the pictures and read their captions.
- ☐ Think about what you already know about electricity.

Write two facts you discovered about electric currents as you scanned the section.

1. _____

2. _____

Review Vocabulary

Use the term *pressure* in a scientific sentence.

pressure

New Vocabulary

Define the following key terms.

electric current

voltage difference

circuit

resistance

Ohm's law

Academic Vocabulary

Use a dictionary to define *terminate*.

terminate

Section 2 Electric Current (continued)

Main Idea

Current and Voltage Difference

I found this information on page _____.

Batteries

I found this information on page _____.

Details

Create a drawing of an electric circuit that has a battery powering a digital clock. Show the direction of electron flow, and describe the movement of the electrons in the circuit.

Compare dry-cell batteries to wet-cell batteries. Describe the components of each type of battery. In your own words, explain how each works.

Battery Type	Components	How It Works
Dry-cell		
Wet-cell		

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154 Electricity

Section 2 Electric Current (continued)

Main Idea

Resistance

I found this information
on page _____.

I found this information
on page _____.

The Current in a Simple Circuit

I found this information
on page _____.

Details

Summarize the source of resistance in a material.

Organize the factors that affect the electrical resistance of a material. Write each word in one of the boxes below.

hotter cooler longer shorter thicker thinner

More Resistance

Less Resistance

Define the three equations that come from Ohm's law.

Unknown Value	Known Values	Equation
Current	Voltage difference Resistance	
Resistance		
Voltage difference		

SYNTHESIZE IT

Electricians use different thickness of copper wire when they create the electrical circuits in a home. Use your knowledge of resistance to explain why an electrician would choose a thicker wire for a circuit that will provide power to a high-current appliance.

Electricity

Section 3 Electrical Energy

Predict *Read the title of Section 3. List three things that might be discussed in this section.*

1. _____

2. _____

3. _____

Review Vocabulary

energy

Define *energy to show its scientific meaning.*

New Vocabulary

series circuit

Use your book or a dictionary to define the following key terms.

parallel circuit

electrical power

Academic Vocabulary

parallel

Use a dictionary to define parallel. Use the term in a sentence to show its scientific meaning.

Section 3 Electrical Energy (continued)

Main Idea

Series and Parallel Circuits

I found this information on page _____.

I found this information on page _____.

Household Circuits

I found this information on page _____.

Details

Analyze *what happens when you turn on a hair dryer. Explain each of the following results.*

Electric charges move:

Heat is produced:

Air is moved:

Describe *the circuits in three strings of patio lights. One whole string does not light, but all bulbs in the other two strings do.*

Compare *a fuse to a circuit breaker.*

Similarities	Differences

Section 3 Electrical Energy (continued)

Main Idea

Electric Power

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

Identify three ways electrical energy is converted to other types of energy, and provide an example of each.

Electrical Energy		Converted to		Example
Electrical energy	→	_____	→	_____
Electrical energy	→	_____	→	_____
Electrical energy	→	_____	→	_____

Evaluate the three equations that come from the definition of electric power.

Unknown Value	Known Values	Equation
Electric power		
Current		
Voltage difference		

Distinguish between electric power and electrical energy. Include units in your answer.

COMPARE IT

A man-hour is defined as “a unit of one hour’s work by one person.” Describe how the unit *man-hour* is similar to the *kilowatt hour*, the unit of electrical energy. Then explain how the two units are different.

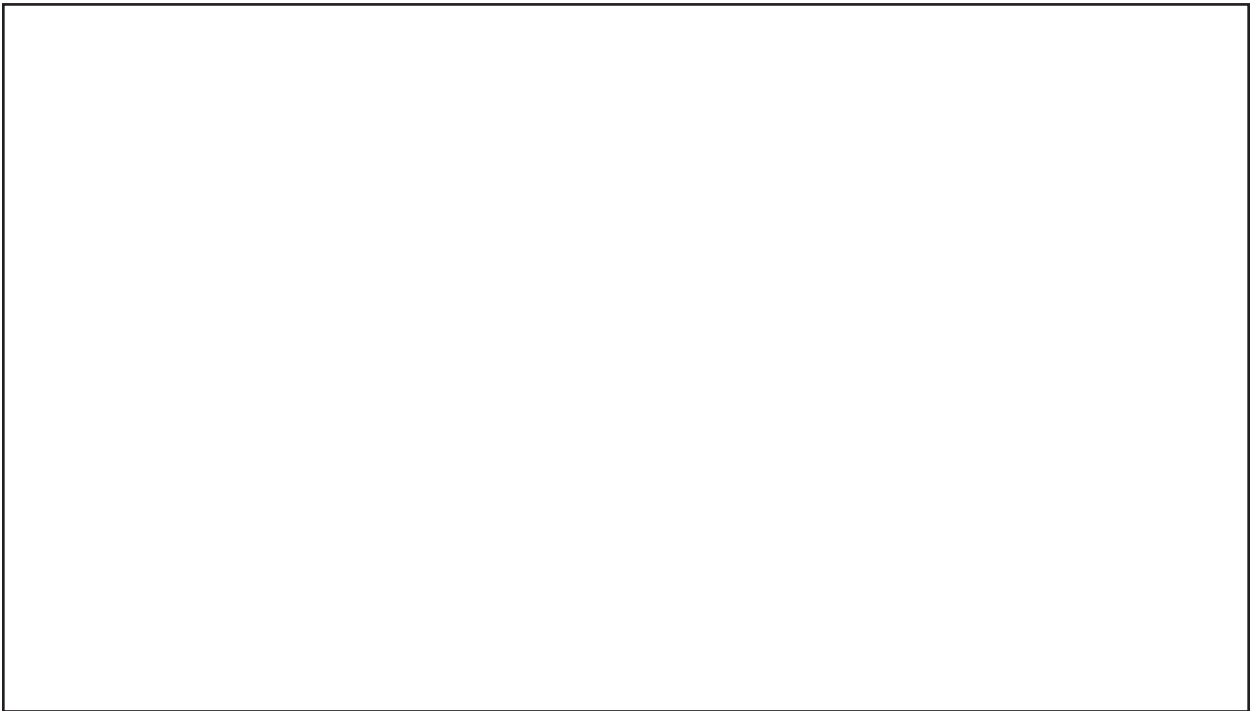
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Tie It Together

Electricity

Use your knowledge of electricity to become an “Electrical Detective.” Draw a wiring diagram of a room in your house, and imagine that a problem has occurred. One of the appliances has suddenly stopped working, and it is your job to figure out why. Describe the steps you might take to analyze the problem and list several possible causes and solutions. Be creative!



Electricity

chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Electricity	After You Read
• Electrical forces act at a distance.	
• Electric charges can be created and destroyed.	
• All circuits contain electrical resistance.	
• Electricity can flow only through an open circuit.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned that will help you make better decisions about electricity use.

Magnetism

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Magnetism
	<ul style="list-style-type: none">• A magnetic field is weakest close to the magnet.
	<ul style="list-style-type: none">• The north pole of a compass always points to Earth's south magnetic pole.
	<ul style="list-style-type: none">• Moving charges can produce magnetic fields.
	<ul style="list-style-type: none">• Windmills change chemical energy into electrical energy.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List three things you know about magnets.

Magnetism

Section 1 Magnetism

Skim through Section 1 of your book. Read the headings and the illustration captions. Write three questions that come to mind.

1. _____

2. _____

3. _____

Review Vocabulary

electric field

Define electric field to show its scientific meaning.

New Vocabulary

Read the definitions below, then write the vocabulary term for each one in the left column.

groups of atoms with aligned magnetic poles

properties and interactions of magnets

a region where a magnet’s force is strongest

something that exerts a force on magnets and objects made of magnetic materials

Academic Vocabulary

region

Define region as it might be used in science.

Section 1 Magnetism (continued)

Main Idea

Magnets

*I found this information
on page _____.*

Details

Organize *important facts about magnets by completing the outline.*

Magnets

A. Magnetic force

1. _____
2. _____
3. _____

B. Magnetic field

1. _____
2. _____
3. _____

C. Magnetic poles

1. _____
2. _____
3. _____

4. Interaction of two magnets

- a. _____
- b. _____

D. Compass

1. _____
2. _____
3. _____

E. Earth as a magnet

1. _____
2. _____
3. _____

Section 1 Magnetism (continued)

Main Idea

Magnetic Materials

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

Classify each metal as magnetic or nonmagnetic.

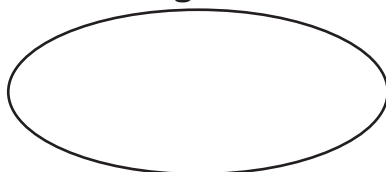
aluminum
iron

cobalt
mercury

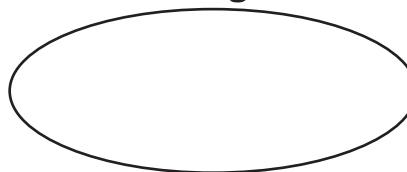
copper
nickel

gold
silver

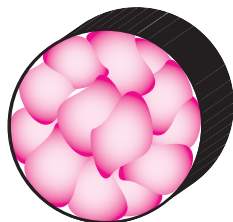
Magnetic



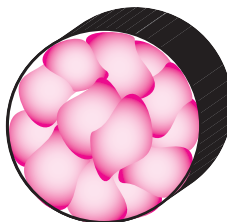
Nonmagnetic



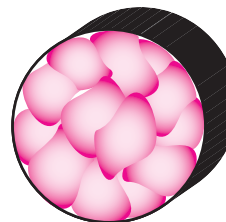
Model a close-up of the magnetic domains of the cross sections of an iron rod in each of these situations.



normal state

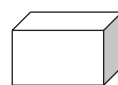
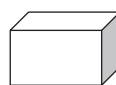
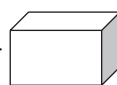


rod is brought near magnet



magnet is removed

Identify the poles of a magnet before and after it is sliced into three pieces.



CONNECT IT

Outline the steps a recycling company might use to separate metallic, nonmetallic, and other recyclable materials. (Hint: Some of the materials are magnetic.)

Magnetism

Section 2 Electricity and Magnetism

Scan the headings, figures, and captions in Section 2 of your text.
Write three questions that come to mind.

1. _____
2. _____
3. _____

Review Vocabulary

Define electric current to show its scientific meaning.

electric current

New Vocabulary

Use your book or a dictionary to define the following key terms.

electromagnet

solenoid

galvanometer

electric motor

Academic Vocabulary

Use temporary in a sentence that shows its scientific meaning.

temporary

Section 2 Electricity and Magnetism (continued)

Main Idea

Electric Current and Magnetism, Electromagnets

I found this information on page _____.

I found this information on page _____.

Details

Evaluate *the magnetic fields that surround two identical pieces of wire carrying the same electric current. One wire is straight, and the other wire is coiled into a solenoid.*

Sequence *the steps in the explanation of how electromagnets make sound when you listen to a CD. Some terms from the word bank may be used more than once.*

amount	current	direction	electromagnet
magnetic field	repels	reproduces	voltage

The CD player produces a _____.

↓

The _____ produces an electric _____ in the electromagnet next to the speaker cone.

↓

The CD contains information that changes the _____ of current and its _____.

↓

The changing electric current changes the direction and strength of the _____ around the electromagnet.

↓

The electromagnet attracts or _____ the permanent magnet.

↓

The moving _____ vibrates the speaker cone and _____ the sound recorded on the CD.

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Section 2 Electricity and Magnetism (continued)

Main Idea

Electromagnets

*I found this information
on page _____.*

Details

Model *and label a galvanometer and describe how it works.*

Electric Motors

*I found this information
on page _____.*

Sequence *the steps an electric motor uses to change electrical energy to mechanical energy. Make a sketch and label the motor.*

1. _____

2. _____

3. _____

SYNTHESIZE IT

Describe the properties of magnets that make them useful to humans. Include an example for each property.

Magnetism

Section 3 Producing Electric Current

Scan the headings, figures, and captions in Section 3 of your book.
Write three questions that come to mind.

1. _____
2. _____
3. _____

Review
Vocabulary

Define voltage difference to show its scientific meaning.

voltage difference

New
Vocabulary

Use your book to define the following vocabulary terms.

electromagnetic
induction

generator

turbine

direct current (DC)

alternating current
(AC)

transformer

Academic
Vocabulary

Use a dictionary to define regulate as it might be used in science.

regulate

Section 3 Producing Electric Current (continued)

Main Idea

From Mechanical to Electrical Energy

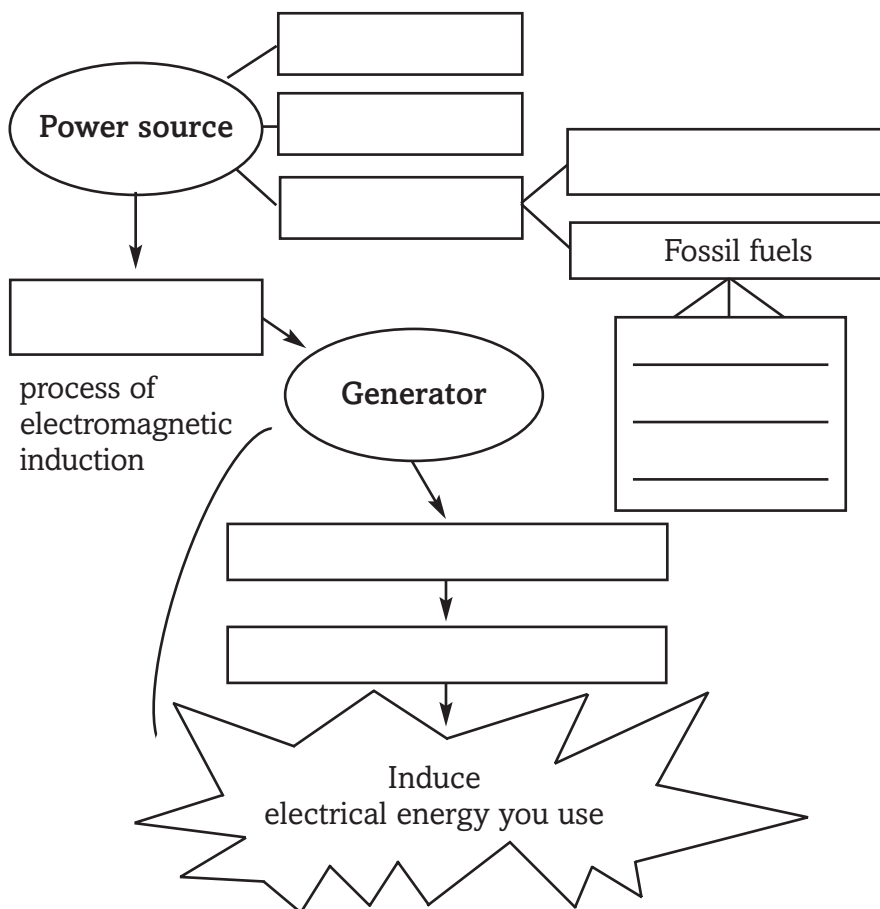
I found this information on page _____.

Direct and Alternating Currents

I found this information on page _____.

Details

Organize the process of changing mechanical energy to electrical energy. Complete the concept map.



Predict and list three electrical devices that will stop working in a power failure, and three that will continue to work. Describe the type of current used by these devices.

	Works	Doesn't Work
Devices		
Description of Current		

Section 3 Producing Electric Current (continued)

Main Idea

Details

Transmitting Electrical Energy

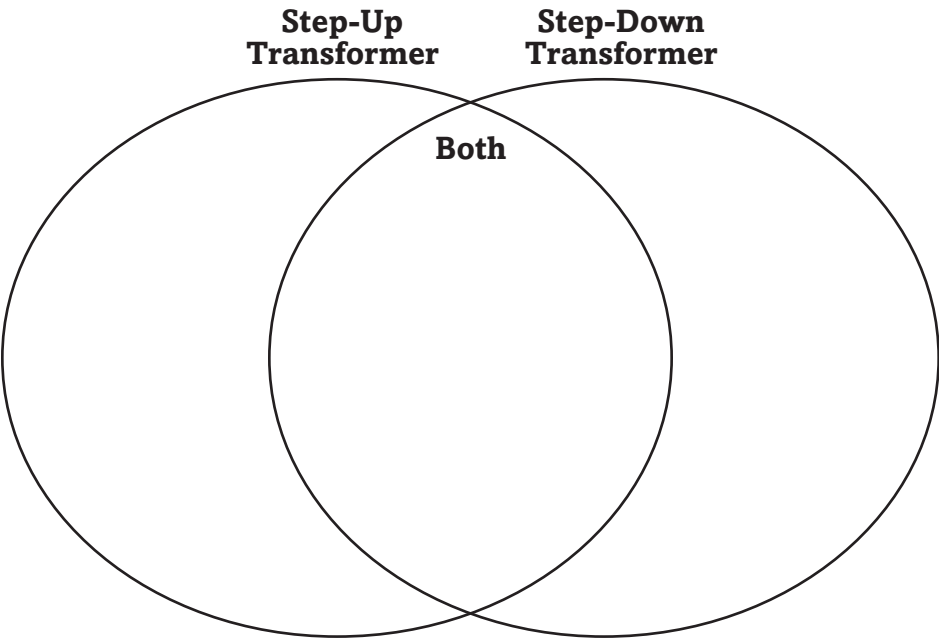
I found this information on page _____.

Analyze why a transformer is needed to provide power at the correct voltage to your home.

Transformers

I found this information on page _____.

Compare the two types of transformers using a Venn diagram. List at least two pieces of information in each category.



SYNTHESIZE IT

Evaluate how the current produced from a hand-crank generator would change as the handle is rotated forward and then backward.

Tie It Together

Magnetism

Plan *an expedition to find Earth's south magnetic pole. Plan an experiment to see how near the south magnetic pole is to the geographic north pole. Don't forget that you will require power on your trip to run various communication and scientific equipment.*

Equipment list:

State your hypothesis.

Describe your experiment.

Analyze and interpret your predicted data.

Draw a top view of Earth from your hypothesis and proposed data. Include some meridians and the positions of both poles.

Magnetism

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Magnetism	After You Read
• A magnetic field is weakest close to the magnet.	
• The north pole of a compass always points to Earth’s south magnetic pole.	
• Moving charges can produce magnetic fields.	
• Windmills change chemical energy into electrical energy.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three ways magnets are used.

Electromagnetic Radiation

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Electromagnetic Radiation
	• Electromagnetic waves can be transmitted only through matter.
	• Electromagnetic waves are produced by vibrating electric charges.
	• Visible light is only a small part of the electromagnetic spectrum.
	• Communications satellites send out microwaves.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List six objects around you that emit light or feel warm.

<hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/> <hr/>

Electromagnetic Radiation

Section 1 What are electromagnetic waves?

Scan the headings, bold words, figures, and captions in Section 1 of your book. Write four facts you learned about electromagnetic waves as you scanned the section.

- 1. _____

- 2. _____

- 3. _____

- 4. _____

Review Vocabulary

Define hertz.

hertz

New Vocabulary

Read the definitions below. Then write the key term for each definition in the left column.

waves made by vibrating electric charges that can travel through space where there is no matter

energy carried by an electromagnetic wave

an electromagnetic wave that behaves like a particle and whose energy depends on the frequency of the wave

Academic Vocabulary

Use a dictionary to define enable.

enable

Section 1 What are electromagnetic waves? (continued)

Main Idea

Waves in Space

I found this information
on page _____.

Electric and Magnetic Fields

I found this information
on page _____.

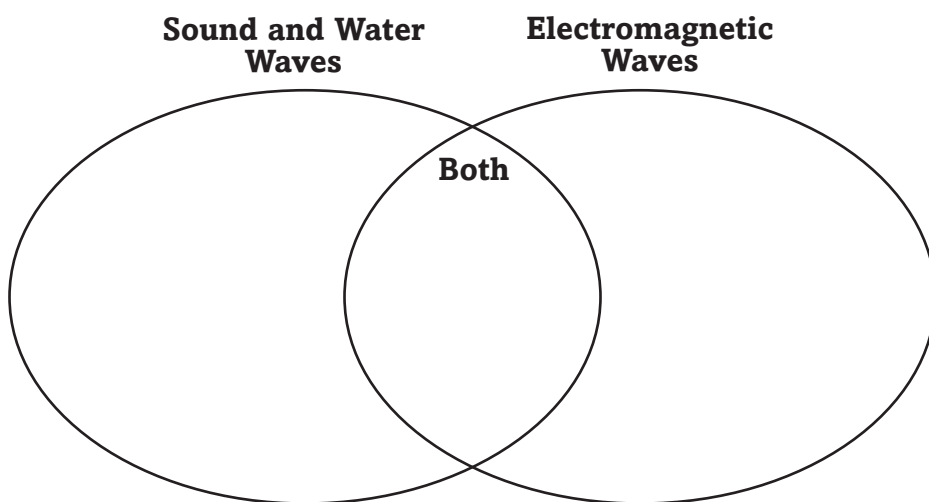
Making Electromagnetic Waves

I found this information
on page _____.

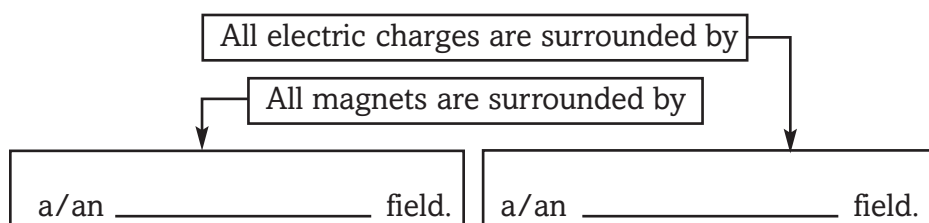
Details

Compare sound and water waves *with* electromagnetic waves *by completing the Venn diagram. Place each characteristic in the correct place in the diagram.*

- carry energy from one place to another
- do not require matter to transfer energy
- must move through matter
- transfer energy between vibrating electric and magnetic fields
- transfer energy from particle to particle
- produced by vibrations



Complete the information about electric and magnetic fields.



Sequence steps as vibrating electric and magnetic fields become a wave that travels through space.

1. The changing electric field
2.
3.

Section 1 What are electromagnetic waves? (continued)

Main Idea

Properties of Electromagnetic Waves

I found this information on page _____.

Waves and Particles

I found this information on page _____.

Details

Model *an electromagnetic wave with a 1-m wavelength. Beneath this, model a second wave whose wavelength is shorter than the first one.*

Analyze *which wave above has a greater frequency.*

Summarize *waves and particles by completing the paragraph. Model a diagram of the electron wave pattern described below.*

All _____ can behave like _____. One example of this behavior is electrons passing through two slits to form _____.

SYNTHESIZE IT

Predict how jewelers could use electromagnetic waves to determine the composition of unknown materials in the course of their job.

Electromagnetic Radiation

Section 2 The Electromagnetic Spectrum

Skim Section 2 of your book. Read the headings and the illustration captions. Write two questions that come to mind.

1. _____

2. _____

Review Vocabulary

Define spectrum to reflect its scientific meaning.

spectrum

New Vocabulary

Use your book to define the following key terms.

radio waves

microwaves

infrared waves

visible light

ultraviolet waves

X rays

gamma rays

Academic Vocabulary

Use a dictionary to define internal to show its scientific meaning.

internal

Section 2 The Electromagnetic Spectrum (continued)

Main Idea

Details

A Range of Frequencies

I found this information on page _____.

Radio Waves, Infrared Waves, Visible Light, Ultraviolet Waves, and X Rays and Gamma Rays

I found this information on page _____.

I found this information on page _____.

Organize electromagnetic waves of different frequencies.

Waves with Lower Frequency Than Visible Light	Waves with Higher Frequency Than Visible Light
1.	1.
2.	2.
3.	3.

Summarize the different types of electromagnetic waves by completing the following paragraph.

Radio waves are _____ with wavelengths longer than about 1 mm. Radio waves that are less than 30 cm, called _____, make it possible to _____. Some _____ are used for finding the location of planes and boats by a method called _____. Satellites may have _____ to help identify vegetation on Earth. Near the middle of the frequency range, _____ makes it possible for us to _____. Some electromagnetic waves can be dangerous. Both _____ and _____ can kill _____. This is useful in treating _____, but doctors must be careful not to kill healthy cells as well.

Identify the key features of some electromagnetic waves by filling in the table below.

Wave	Feature
radio	
	radio waves that produce thermal energy
infrared	
	short wavelength waves that can cause sunburn

Section 2 The Electromagnetic Spectrum (continued)

Main Idea

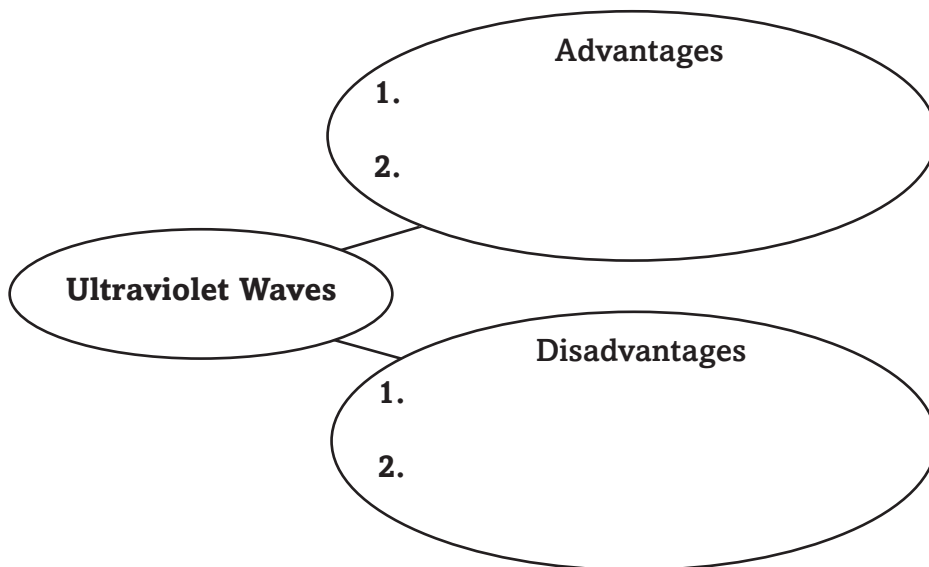
Ultraviolet Waves

I found this information
on page _____.

I found this information
on page _____.

Details

Compare the advantages and disadvantages to humans of ultraviolet waves by filling in the blanks in the following graphic organizer.



Analyze how chlorofluorocarbons are destroying Earth's ozone layer and why this is a concern to scientists.

CONNECT IT

MRIs and X rays are both useful for diagnosing and treating some medical conditions. Explain why X rays are still being used even though MRIs are safer.

Electromagnetic Radiation

Section 3 Radio Communication

Predict *three topics that might be discussed in Section 3.*

1. _____
2. _____
3. _____

**Review
Vocabulary**

modulate

Define *modulate to show its scientific meaning.*

**New
Vocabulary**

Use your book to define the following key terms.

carrier wave

cathode-ray tube

transceiver

*Global Positioning
System (GPS)*

**Academic
Vocabulary**

transmit

Use a dictionary to define transmit.

Section 3 Radio Communication (continued)

Main Idea

Radio Transmission

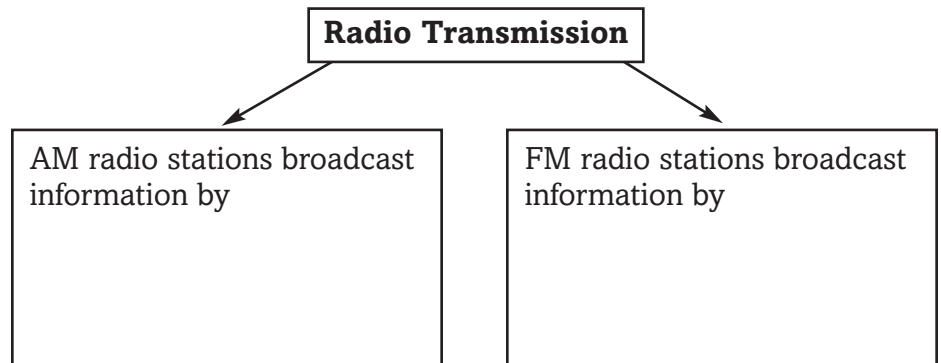
I found this information on page _____.

Television

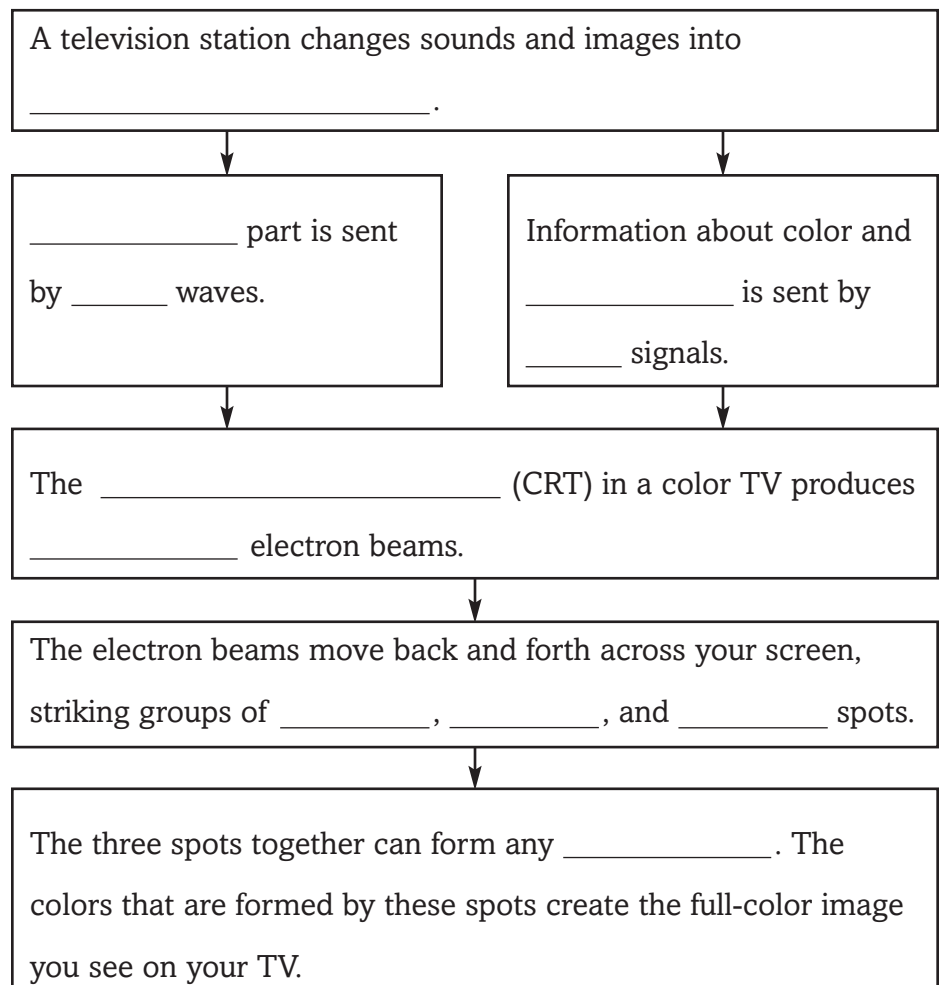
I found this information on page _____.

Details

Compare AM and FM radio transmission *by completing the organizer below.*



Complete the flowchart below to describe the transmission of television signals.



Section 3 Radio Communication (continued)

Main Idea

Details

Telephones

I found this information
on page _____.

Organize what you have learned about telephones by completing the table below.

Type	Features	Advantage	Disadvantage
Corded	stays in one place	sends/receives consistent signal	must use in one place
		not linked to the base	
Pager			
			tower needed

Communications
Satellites,
The Global
Positioning
System

I found this information
on page _____.

Model how a satellite telephone system works.

- Use arrows to show the path of the signal.
- Include the sender, a satellite, and the ground system in your sketch.

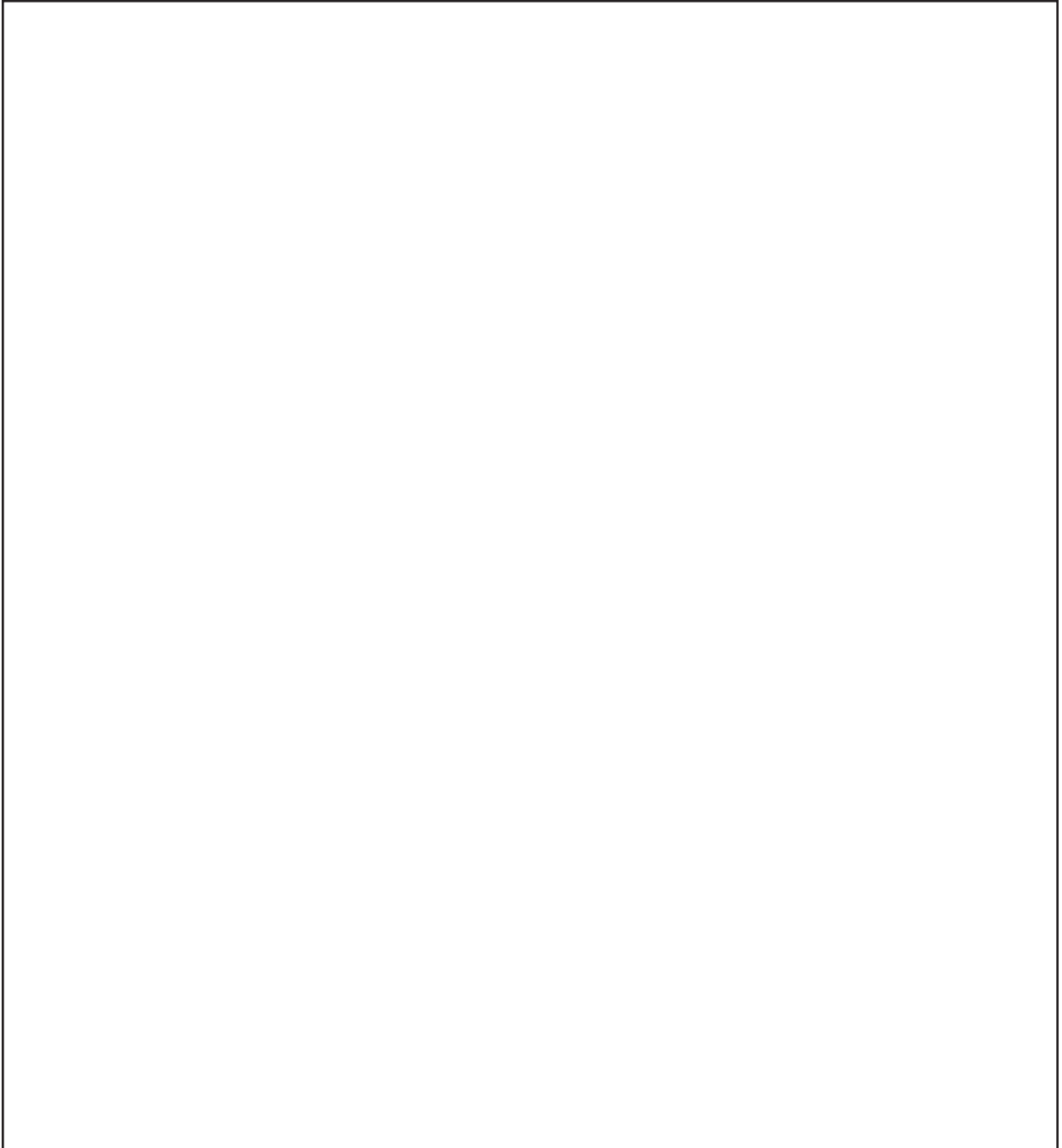
ANALYZE IT

Analyze the information on GPS. Infer why the system uses 24 satellites to get 24-hour around-the-world coverage.

Tie It Together

Electromagnetic Radiation

Synthesize It Draw a large diagram of part of Earth and the sky above it. Add the ozone layer, and show its effect on one type of radiation. Include a few communication satellites, vehicles, and buildings. (One building should be a hospital.) Your drawing will not be to scale. Show and label the following where they may be expected: radio waves, radar, infrared waves, gamma rays, microwaves, visible light waves, UV waves, X rays.



Electromagnetic Radiation

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Electromagnetic Radiation	After You Read
• Electromagnetic waves can be transmitted only through matter.	
• Electromagnetic waves are produced by vibrating electric charges.	
• Visible light is only a small part of the electromagnetic spectrum.	
• Communications satellites send out microwaves.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about Electromagnetic Radiation.

Energy Sources

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Energy
	<ul style="list-style-type: none">• According to the law of conservation of energy, energy cannot be created or destroyed.
	<ul style="list-style-type: none">• Nonrenewable resources cannot quickly be replaced by natural processes.
	<ul style="list-style-type: none">• Nuclear power plants produce about eight percent of the energy consumed in the United States.
	<ul style="list-style-type: none">• Nuclear fusion releases energy when nuclei are split.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe how your day would be different if the electric power were off all day.

Energy Sources

Section 1 Fossil Fuels

Skim through Section 1 of your book. Identify three fuels made from fossil materials.

_____, _____, and _____

Review Vocabulary

Define chemical potential energy.

chemical potential energy

New Vocabulary

Read the definitions below. Then write the key term for each one in the left column.

fuel formed from the decayed remains of ancient organisms

a liquid fossil fuel formed from remains of decayed organisms

resource that cannot be replaced by natural processes as quickly as it is used

Academic Vocabulary

Use a dictionary to define generate.

generate

Using Energy

I found this information on page _____.

Analyze the Energy Usage and Sources of Energy graphs in your book to complete the statements.

More energy is used for _____ in the United States than for anything else. _____ users use 17 percent less energy than industry. Petroleum and natural gas together supply _____ of our energy needs. _____ supply only 3 percent of our energy needs. _____ supplies 4 percent of energy needs in the United States. Almost 85 percent of the energy used comes from burning _____, _____, and _____.

Section 1 Fossil Fuels (continued)

Main Idea

Making Fossil Fuels

I found this information on page _____.

I found this information on page _____.

Petroleum

I found this information on page _____.

Details

Sequence *the steps involved in the formation of oil and natural gas. The first step has been done for you.*

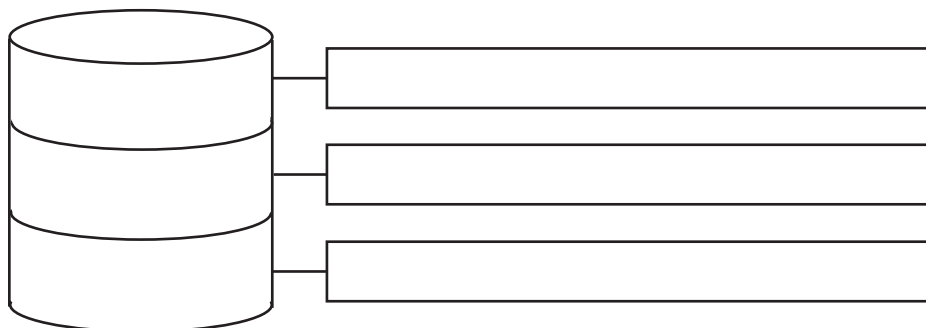
1. Plants and animals die.
- 2.
3. Organic matter is
- 4.
5. Chemical reactions change matter into

Complete *the paragraph about fossil fuels.*

Fossil fuels store _____ energy in _____. When a fossil fuel burns, a chemical reaction takes place. _____ and _____ in the fuel combine with _____ in the air to form _____, water, _____, and light. Chemical potential energy in fossil fuels is more _____ than other fuels. Burning _____ releases two to three times as much energy as burning _____.

Label *the fractional distillation tower with the contents of each chamber.*

- crude oil
- hydrocarbons with high boiling points
- hydrocarbons with low boiling points



Section 1 Fossil Fuels (continued)

Main Idea

**Natural Gas,
Coal, Generating
Electricity,
Efficiency of
Power Plants,
The Costs
of Using
Fossil Fuels,
Nonrenewable
Resources,
Conserving
Fossil Fuels**

*I found this information
on page _____.*

Details

Complete the paragraphs below.

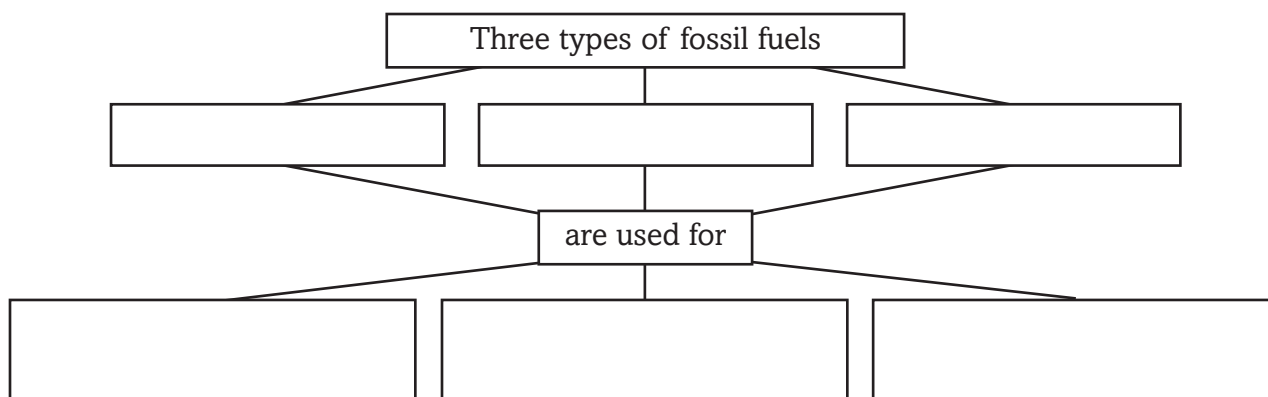
Because fossil fuels are _____, their supply is _____.
As the human population grows and _____ demands
_____, reserves are _____. This means that
_____ the remaining supplies is extremely important.

In addition to being limited, fossil fuels cause air _____
in the form of _____, _____, and _____.
Natural gas contains more _____ and burns more
cleanly than other _____. _____ is mainly used
in _____ to _____. When the fuel is
_____, chemical energy is converted to _____.
This energy heats water, which changes to _____ and turns a
_____ connected to a _____, producing _____.

When fossil fuels are converted from _____ to other
forms, the _____ of the conversion varies greatly. Overall,
it is only _____. Much of the remaining
65 percent is _____.

SUMMARIZE IT

Use the diagram to summarize the types and uses of fossil fuels.



Energy Sources

Section 2 Nuclear Energy

Scan the headings, figures, and captions in Section 2 of your book. Write three questions that come to mind.

1. _____
2. _____
3. _____

Review Vocabulary

Define nuclear fission.

nuclear fission

New Vocabulary

Read the definitions below. Then write the key term for each one in the left column.

system that generates electricity from controlled nuclear reactions
any radioactive by-product of the use of radioactive materials

Using Nuclear Energy

I found this information on page _____.

Analyze nuclear energy use by filling in the correct numeral in the left column for each statement.

- _____ percent of all electricity produced in the United States that comes from nuclear power plants
- _____ percent of energy used in the United States produced by nuclear plants
- _____ number of nuclear power plants in the United States in 2003
- _____ number of nuclear reactors contained in these power plants

Section 2 Nuclear Energy (continued)

Main Idea

Nuclear Reactors

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

Describe the four common parts of all nuclear reactors.

1. _____

2. _____

3. _____

4. _____

Sequence a uranium nuclear fission reaction by completing the flow chart below. The first step has been done for you.

1. A neutron splits the nucleus of a U-235 atom.

2. _____

3. _____

Model and label the control rods in a nuclear reactor. Use arrows to show how the rods would be moved to slow the reaction.

Summarize how the control rods affect the rate of reaction in the nuclear reactor.

Predict what would happen if the control rods were completely removed from a nuclear reaction.

190 Energy Sources

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Section 2 Nuclear Energy (continued)

Main Idea

Nuclear Power Plants

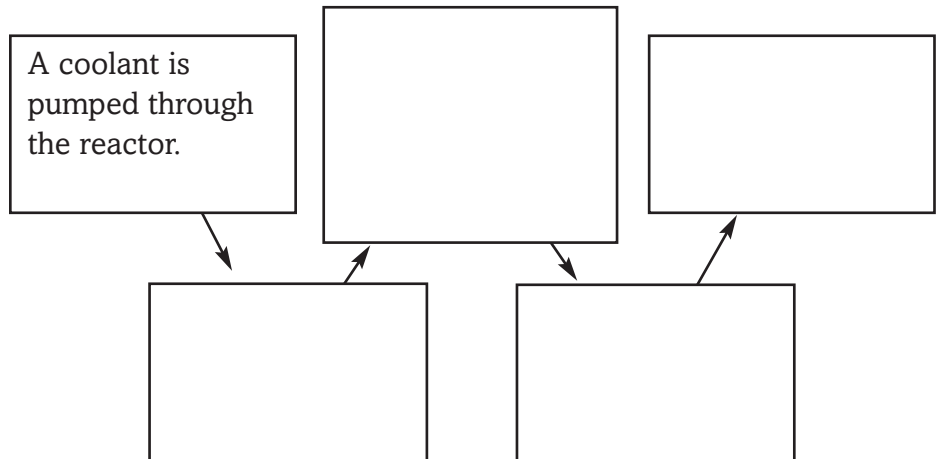
I found this information on page _____.

The Risks of Nuclear Power, Nuclear Fusion

I found this information on page _____.

Details

Complete the graphic organizer to explain how nuclear fission produces electricity.



Identify three advantages and three disadvantages of using nuclear power.

Advantages	Disadvantages
1. _____	1. _____
2. _____	2. _____
3. _____	3. _____

SYNTHESIZE IT

Compare and contrast nuclear fusion to nuclear fission.

Energy Sources

Section 3 Renewable Energy Sources

Scan the headings in Section 3 of your book. Then list six sources of energy that will be discussed in the section.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

**Review
Vocabulary**

Define radiant energy.

radiant energy

**New
Vocabulary**

Use your book to define the following key terms.

renewable resource

photovoltaic cell

hydroelectricity

geothermal energy

biomass

**Academic
Vocabulary**

Use a dictionary to define migrate.

migrate

Section 3 Renewable Energy Sources (continued)

Main Idea

Energy Options

I found this information
on page _____.

Energy from the Sun

I found this information
on page _____.

Energy from Water

I found this information
on page _____.

Details

Summarize *the need for alternative energy sources.*

Complete *the statements to make them true.*

The solar energy that falls on the United States in one day is more
than _____.

When sunlight strikes a solar cell, _____ flow
through the system.

Conversion of solar energy to electrical energy by solar cells is
only _____ percent efficient.

Another way to generate electricity from solar energy is in a
_____.

Sequence *the steps in the production of hydroelectric energy.*
The first step has been completed for you.

Water flows through tunnels near the base of a dam.



Section 3 Renewable Energy Sources (continued)

Main Idea

Details

Energy from the Tides, Harnessing the Wind, Energy from Inside Earth

I found this information on page _____.

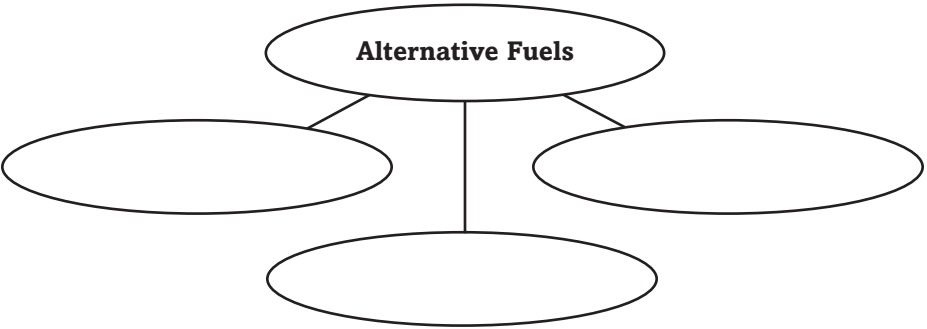
Complete *the table comparing information about tides, wind, and geothermal energy sources.*

	Tides	Wind	Geothermal
efficiency			
availability of the source		must be in areas where wind blows steadily	
effect on plants and animals	can disturb marine life		
pollution created			can release some gases

Alternative Fuels

I found this information on page _____.

Identify *three other alternative fuels.*



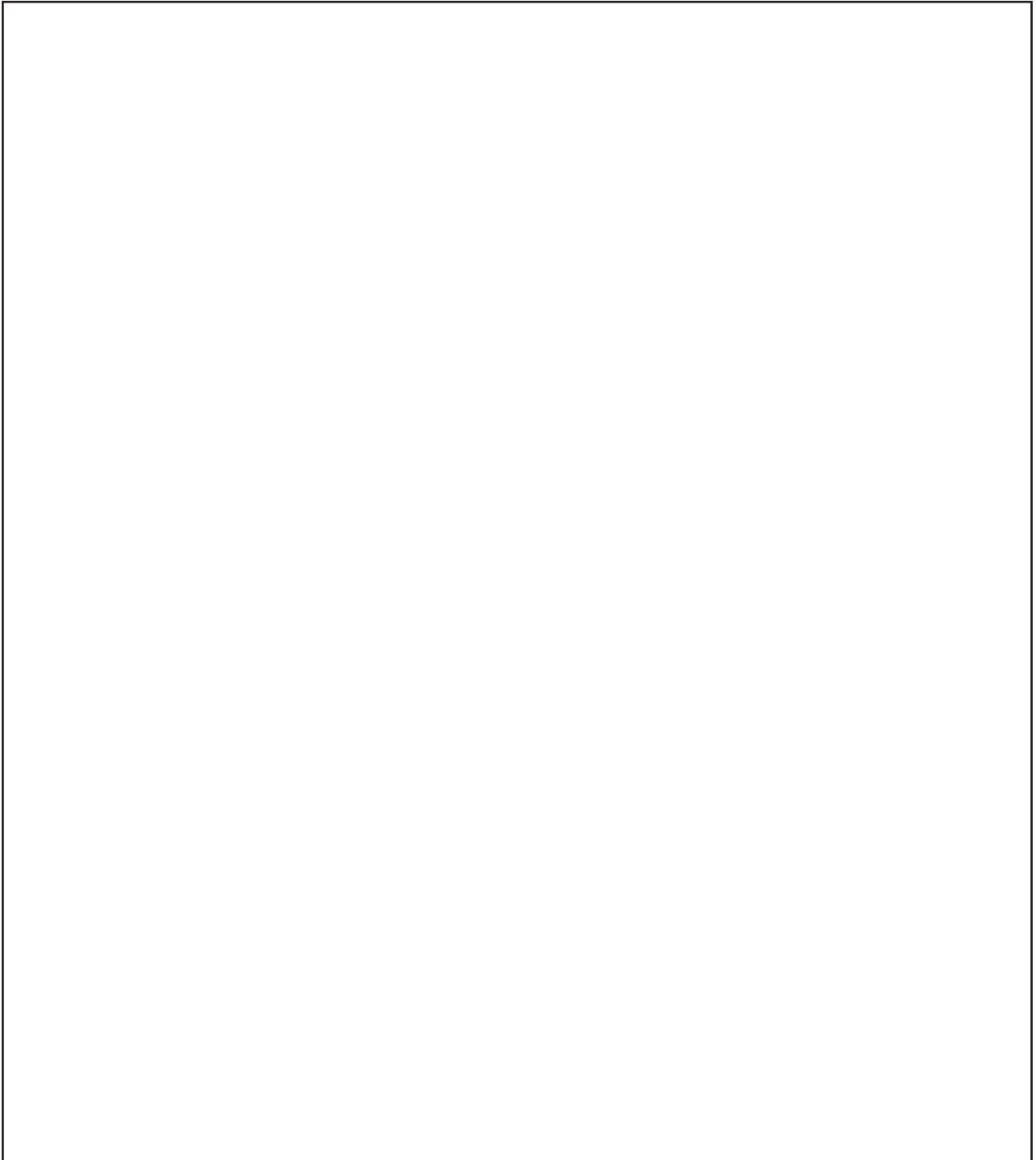
ANALYZE IT

Evaluate one renewable energy source that you think is promising for our future energy needs. Support your choice.

Tie It Together

Energy Sources

Create your own graphic organizer(s) similar to the ones you have seen in your Science Notebook to clearly summarize important information about each of the renewable energy sources in this section. Leave some of the information out, and have a friend try to complete your organizer.



Energy Sources

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Energy	After You Read
• According to the law of conservation of energy, energy cannot be created or destroyed.	
• Nonrenewable resources cannot quickly be replaced by natural processes.	
• Nuclear power plants produce about eight percent of the energy consumed in the United States.	
• Nuclear fusion releases energy when nuclei are split.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

Identify the three major types of energy sources discussed in this chapter. Then indicate one major disadvantage to using each source of energy.

Weather and Climate

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Weather and Climate
	<ul style="list-style-type: none">• The words <i>weather</i> and <i>climate</i> have basically the same meaning.
	<ul style="list-style-type: none">• Wind blows across lines of equal pressure.
	<ul style="list-style-type: none">• Oceans and mountains have an important effect on the climate of a region.
	<ul style="list-style-type: none">• Much of the northern United States was covered by glacier ice 18,000 years ago.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe some severe weather that you have observed. Hypothesize what might cause these weather events.

Weather and Climate

Section 1 Earth’s Atmosphere

Scan the headings and illustrations in Section 1. Write three questions that come to mind about Earth’s atmosphere.

1. _____

2. _____

3. _____

Review Vocabulary

Define nucleus. Then use the word in a scientific sentence.

nucleus _____

New Vocabulary

Use your book or a dictionary to define the following terms.

latent heat _____

temperature inversion _____

troposphere _____

greenhouse effect _____

Academic Vocabulary

Use a dictionary to define the term structure to reflect its scientific meaning.

structure _____

Section 1 Earth's Atmosphere (continued)

Main Idea

Atmospheric Composition

I found this information on page _____.

Atmospheric Structure

I found this information on page _____.

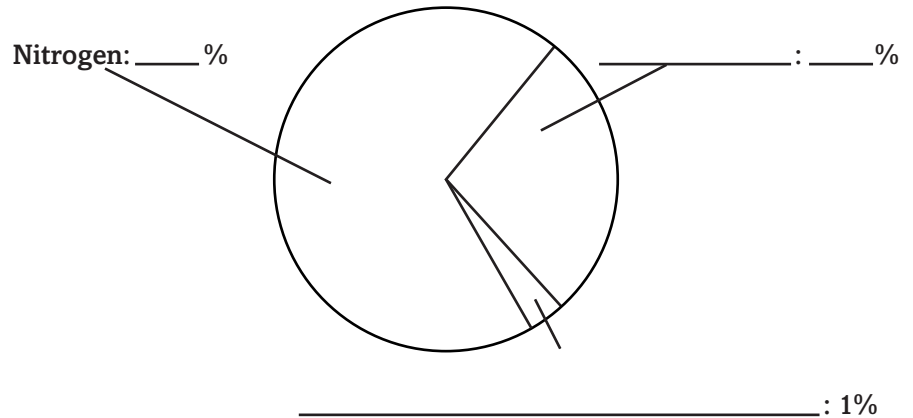
Heating the Atmosphere

I found this information on page _____.

Details

Complete the graph by identifying the main components of the atmosphere and indicating the percentage of each.

Percentage of Gases in the Atmosphere



Organize information about the layers of the atmosphere.

Stratosphere: _____

Troposphere: _____

Complete the chart by describing the factors that contribute to heating Earth's atmosphere.

Heating the Atmosphere	
Factor	Description
Solar radiation	
Ozone layer	
Earth's surface	
Trace gases	
Latent heat	

Section 1 Earth's Atmosphere (continued)

Main Idea

Details

A Varied Surface

*I found this information
on page _____.*

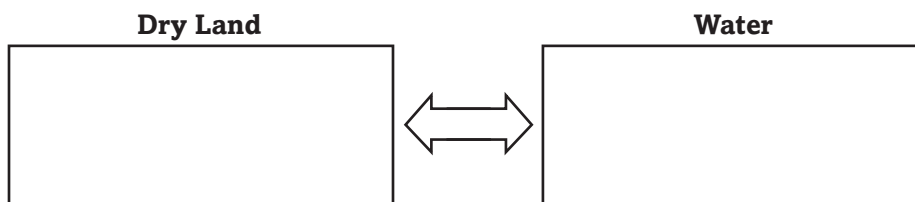
**Water in the
Atmosphere**

*I found this information
on page _____.*

**Global Water
Cycle**

*I found this information
on page _____.*

Compare *the rates at which dry land and water absorb and release heat into the atmosphere.*



Summarize *cloud formation by completing the paragraph.*

As air rises in the atmosphere, it _____ and
_____. For droplets to form, _____
_____ must cool enough for _____ to
occur. Cloud droplets are so small that _____
_____ can keep them from falling to Earth.

Model *the water cycle in the space below.*

SYNTHESIZE IT

Write a short explanation of how the Sun affects the water cycle.

Weather and Climate

Section 2 Weather

Scan the headings in Section 2 of your book. Predict three topics that will be discussed in this section.

1. _____
2. _____
3. _____

Review Vocabulary

Define gradient to show its scientific meaning.

gradient _____

New Vocabulary

Define the following terms. Use each term in a scientific sentence.

westerlies _____

jet stream _____

subtropical high _____

weather front _____

Academic Vocabulary

Use a dictionary to define the term source.

source _____

Section 2 Weather (continued)

Main Idea

Details

Atmospheric Pressure

I found this information on page _____.

I found this information on page _____.

High and Low Pressure Systems

I found this information on page _____.

Complete the statements about air pressure.

The _____ exerts pressure on objects within it.

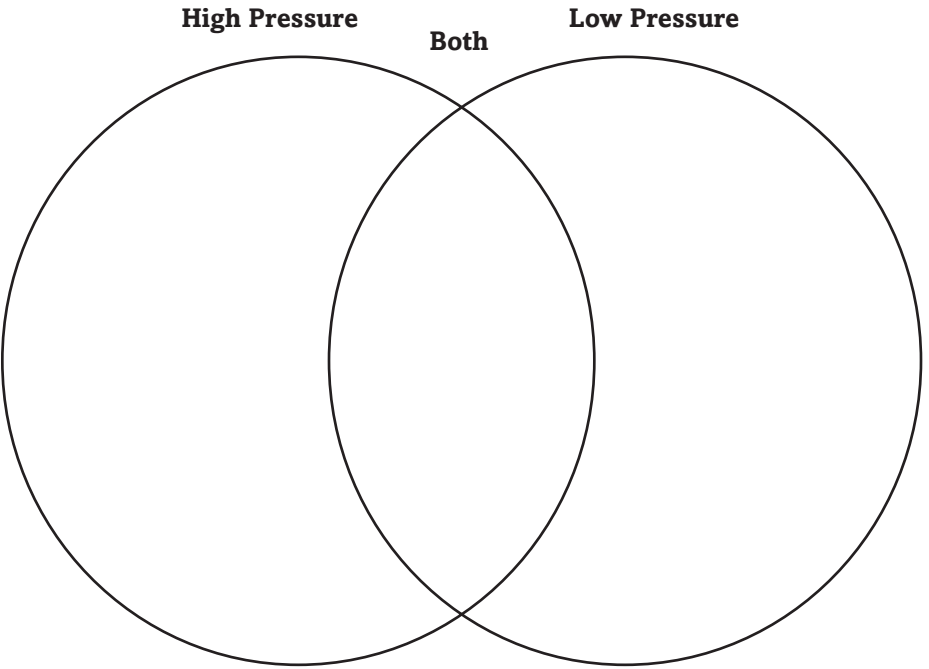
When air is heated, _____ and becomes _____.

Warm air weighs less and _____. Uneven heating of Earth's surface causes _____ in air pressure.

Summarize the causes of Earth's major wind belts by completing the graphic organizer.

Global winds are produced by

Compare and contrast high and low pressure systems by completing the Venn diagram using at least 10 different facts.



Section 2 Weather (continued)

Main Idea

Air Masses and Weather Fronts

I found this information on page _____.

Severe Weather

I found this information on page _____.

Details

List *the 4 types of weather fronts.*

- | | |
|----------|----------|
| 1. _____ | 3. _____ |
| 2. _____ | 4. _____ |

Classify *severe weather by completing the outline.*

Severe Weather

I. Thunderstorms

A. Characteristics

1. _____
2. _____

B. Hazards

1. _____
2. _____

II. Rotating windstorms

A. Characteristics of tornadoes

1. _____
2. _____

B. Characteristics of Hurricanes

1. _____
2. _____

SYNTHESIZE IT

A warm front is approaching your area and is expected to arrive in three days. Predict the weather you should expect during this three-day period.

Weather and Climate

Section 3 Climate

Scan the headings and illustrations in this section. Predict three things that you will learn about climate.

1. _____
2. _____
3. _____

Review Vocabulary

Define boreal to show its scientific meaning.

boreal _____

New Vocabulary

Use your book to define the following terms.

biosphere _____

continental climate _____

maritime climate _____

lee rain shadow _____

sea breeze _____

Academic Vocabulary

Use a dictionary to define environment to show its scientific meaning.

environment _____

Section 3 Climate (continued)

Main Idea

Climate and Weather

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

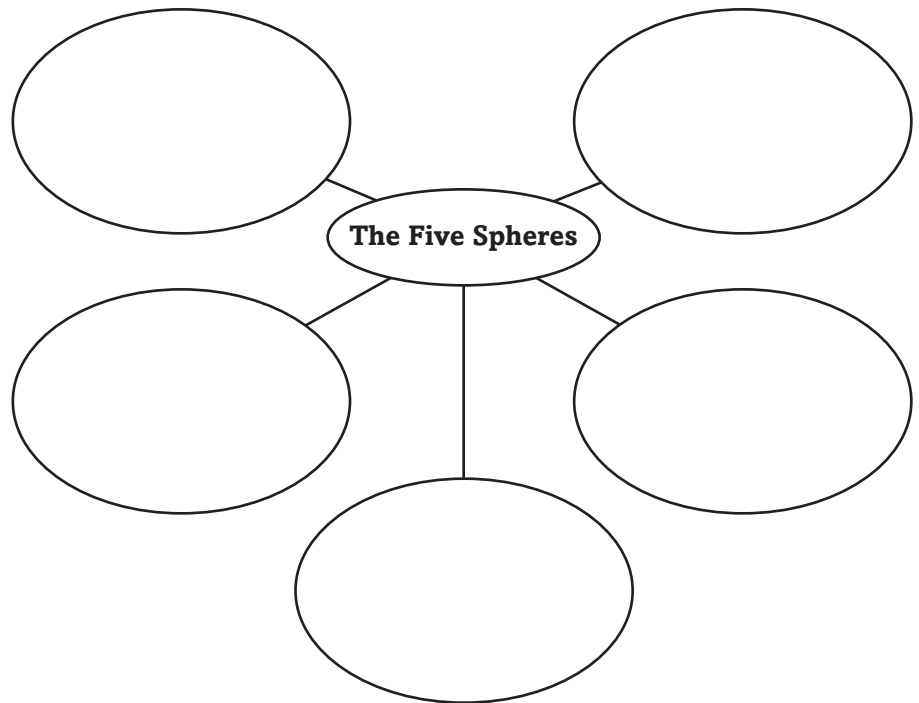
Details

Distinguish climate *and* weather by writing the correct word in front of its definition.

_____ means the day-to-day conditions of temperature, wind, precipitation, pressure, and more.

_____ means the long-term averages of weather for a region.

Identify and define each of the 5 spheres that make up the Earth system.



Summarize the interaction of the five spheres on the lines below.

Section 3 Climate (continued)

Main Idea

Details

What causes climate?

I found this information on page _____.

Summarize factors that affect large-scale climate in the concept map.

Forces that affect climate	

I found this information on page _____.

Describe how climate can vary on a small scale by completing the paragraph below.

Climates vary both _____ and _____.

Cities create a condition called the _____ effect.

This effect occurs because _____ heat _____ rapidly than land. For example, on clear, calm nights, San Francisco may be _____ warmer than surrounding areas.

SUMMARIZE IT

Summarize how climates are classified. Give a reason why it is useful to classify Earth’s climates.

Weather and Climate

Section 4 Earth's Changing Climates

Scan the headings in Section 4. Write three questions that you have about how and why climates change.

1. _____
2. _____
3. _____

Review Vocabulary

Define trace to show its scientific meaning.

trace

New Vocabulary

Use your book to define the following terms.

global warming

El Niño

La Niña

Academic Vocabulary

Use a dictionary to define the term link. Then explain how the term applies to the ocean and the atmosphere.

link

Section 4 Earth’s Changing Climates (continued)

Main Idea

Details

Seasonal Changes

I found this information on page _____.

Long-term Changes

I found this information on page _____.

The Human Factor

I found this information on page _____.

Complete the statements about seasonal changes.

Seasonal changes occur because _____.

When Earth revolves to a position in which one hemisphere is tilted toward the Sun, that hemisphere experiences _____.

Temperatures drop during winter because the intensity of _____ decreases. Seasonal changes are smallest near _____.

Summarize factors that cause climate change by completing the chart.

Factors That Cause Climate Change	
Over hundreds or thousands of years	
Over millions of years	

Summarize human factors that may affect climate by completing the diagram.

Human factors include

Section 4 Earth's Changing Climates (continued)

Main Idea

The Human Factor

I found this information on page _____.

Details

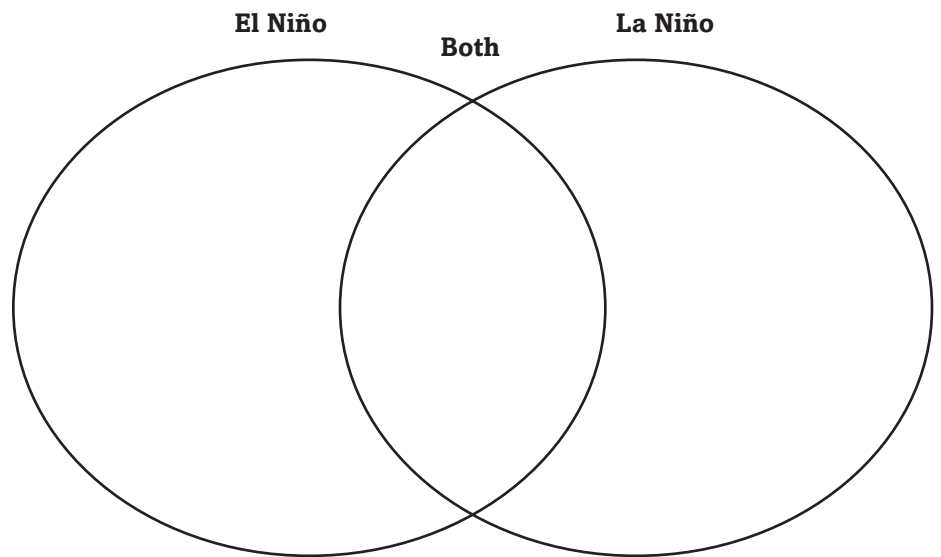
Contrast global warming *with* ozone layer depletion by completing the cause-and-effect table.

	Cause	Effect
Global warming		
Ozone layer depletion		

El Niño and La Niña

I found this information on page _____.

Compare and contrast El Niño *and* La Niña by completing the Venn diagram. Give at least seven different facts.



SYNTHESIZE IT

Explain why an understanding of the carbon cycle is important for understanding global warming.

Weather and Climate

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Weather and Climate	After You Read
• The words <i>weather</i> and <i>climate</i> have basically the same meaning.	
• Wind blows across lines of equal pressure.	
• Oceans and mountains have an important effect on the climate of a region.	
• Much of the northern United States was covered by glacier ice 18,000 years ago.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about weather and climate.

Classification of Matter

Before You Read

Before you read the chapter, use the “What I know” column to list three things you know about how different substances are classified. Then list three questions you have about matter in the “What I want to find out” column.

K What I know	W What I want to find out



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe the physical changes that take place as paint dries.

Classification of Matter

Section 1 Composition of Matter

Predict *three things that might be discussed in this section.*

1. _____
2. _____
3. _____

Review Vocabulary

property

Define *property by circling the phrase that comes closest to the meaning of the word as it is used in your book.*

- | | |
|-------------------------|------------------------|
| a piece of land | a quality or attribute |
| something that is owned | a stage prop |

New Vocabulary

Use the terms on the left to fill in the blanks.

colloid

A _____ is an _____ if all the

compound

atoms in the substance are the same. A _____ is

element

a substance in which two or more elements are combined in the same proportion.

heterogeneous mixture

A _____ contains two or more substances

homogeneous mixture

blended evenly throughout. A _____ is a mixture in which different materials can be identified easily.

solution

substance

A _____ is a homogeneous mixture of particles

suspension

too small to see with a microscope and too small to settle. A

Tyndall effect

_____ is a heterogeneous mixture containing a liquid in which you can see particles settle.

The _____ is observed when light passes through a _____.

Academic Vocabulary

Use a dictionary to define error.

error

Section 1 Composition of Matter (continued)

Main Idea

Pure Substances

*I found this information
on page _____.*

Mixtures

*I found this information
on page _____.*

Details

Classify *each substance as an element or a compound.*

calcium	chalk	graphite	sugar
carbon	hydrogen	salt	water
carbon dioxide	mercury	sodium	zinc

Elements	Compounds

Organize *information about mixtures in the outline below.*

I. Mixtures

A. Heterogeneous mixtures

1. _____
2. _____
3. _____
4. Examples: _____

B. Homogeneous mixtures

1. _____
2. _____
3. _____
4. Examples: _____

C. Colloids

1. _____
2. _____
3. _____
4. _____
5. Examples: _____

Section 1 Composition of Matter (continued)

Main Idea

Details

Mixtures

I found this information
on page _____.

I found this information
on page _____.

Sequence the types of mixtures according to particle size.

colloids solutions suspensions

Largest particles _____

↑ _____

Smallest particles _____

Compare and contrast colloids, solutions, and suspensions.
Write the characteristics of each in the table.

	colloids	solutions	suspensions
particles			
appearance			

Predict what an observer who looks directly into a light source
through a colloid will see.

SYNTHESIZE IT

Classify each substance as a solution, a colloid, or a suspension. Write each name in one of the boxes below.

herbed salad dressing
milk

paint
perfume

pulpy orange juice
smoke

tea
vinegar

colloids

suspensions

solutions

Classification of Matter

Section 2 Properties of Matter

Skim Section 2 of your book. Write three questions that come to mind from reading the headings and the illustration captions.

1. _____
2. _____
3. _____

Review Vocabulary

Use the phrase *state of matter* in a sentence.

state of matter

New Vocabulary

Read the definitions below, then write the key term for each one in the left column.

a feature or characteristic that describes an object or substance

a change in size, shape, or state of matter

change of one substance to another

characteristic of a substance that indicates whether it can undergo a certain chemical change

the process of separating substances in a mixture by evaporating a liquid and condensing its vapor

the mass of all substances that are present before a chemical change equals the mass of all substances that remain after the change

Academic Vocabulary

Define the word *identify* using a dictionary.

identify

Section 2 Properties of Matter (continued)

Main Idea

Physical Properties

I found this information on page _____.

Physical Change

I found this information on page _____.

Chemical Properties and Changes, Detecting Chemical Change

I found this information on page _____.

Details

Distinguish *between the materials listed below. Describe a unique physical property for each one that is not true for the other materials in this group.*

Material	Unique physical property
rubber	
applesauce	
marble	
mercury	

Describe *how freezing could be used to remove sugar from a mixture of sugar and water.*

Identify *four properties of a substance that will never change.*

_____, _____, _____, _____

Organize *five kinds of physical changes and five kinds of chemical changes.*

Chemical	Physical
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

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216 Classification of Matter

Section 2 Properties of Matter (continued)

Main Idea

**Weathering—
Chemical or
Physical Change?**

*I found this information
on page _____.*

**The Conservation
of Mass**

*I found this information
on page _____.*

Details

Identify *chemical and physical changes that occur as a car ages.*

Physical Changes	Chemical Changes

Describe *how the law of conservation of mass could be useful for investigating chemical changes.*

CONNECT IT

Describe some ways that industry and agriculture use physical properties to separate substances.

Classification of Matter

Chapter Wrap-Up

Review the ideas that you listed in the table at the beginning of the chapter. Cross out any incorrect information in the first column. Then complete the table by filling in the third column. How do your ideas about what you know now compare with those you provided at the beginning of the chapter?

K What I know	W What I want to find out	L What I learned

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about matter and how substances are classified.

Properties of Atoms and the Periodic Table

Before you read the chapter, respond to these statements.

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

Before You Read	Properties of Atoms and the Periodic Table
	<ul style="list-style-type: none">• An atom is the smallest unit of an element that still has all the properties of the element.
	<ul style="list-style-type: none">• An atom is made up of a positively charged nucleus and negatively charged electrons.
	<ul style="list-style-type: none">• Quarks are so tiny that they orbit the nucleus with the electrons.
	<ul style="list-style-type: none">• Isotopes of an element only differ in their number of neutrons.
	<ul style="list-style-type: none">• An element's chemical and physical properties may be predicted by its location on the periodic table.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a few sentences telling what you know about atoms.

Properties of Atoms and the Periodic Table

Section 1 Structure of the Atom

Scan Section 1. Write two things you might learn from the section.

- 1. _____
- 2. _____

Review Vocabulary

Define element to show its scientific meaning.

element

New Vocabulary

Use your book or a dictionary to define the following terms.

atom

electron

electron cloud

neutron

nucleus

proton

quark

Academic Vocabulary

Use a dictionary to define neutral.

neutral

Section 1 Structure of the Atom (continued)

Main Idea

Scientific Shorthand

I found this information on page _____.

Atomic Components

I found this information on page _____.

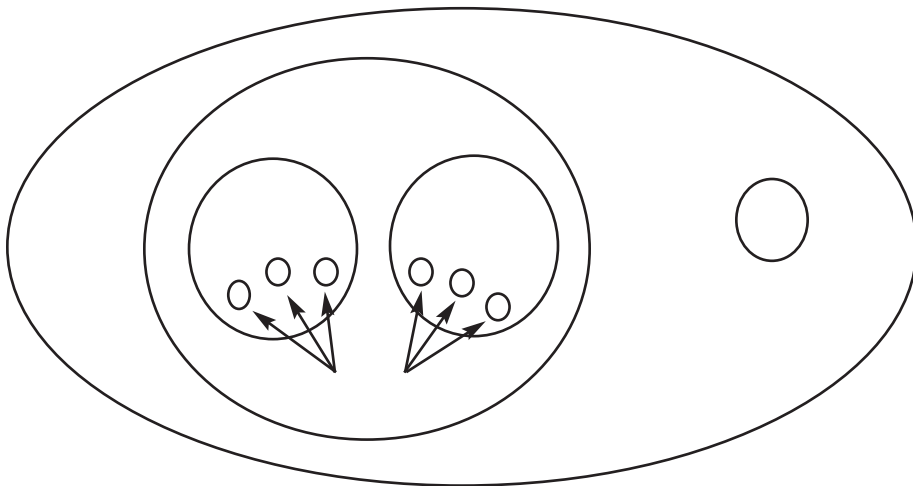
Details

Identify some of the elements and their symbols by filling in the table. Reference the Symbols of Some Elements table in your book.

Symbol	Name
Na	
	oxygen
Hg	
	hydrogen
Cl	
	calcium
K	
	nitrogen
Fe	
	gold
C	
	aluminum

Complete the diagram showing how the parts of an atom are related. Indicate the charge of each particle where applicable.

atom proton nucleus electron neutron quark



Section 1 Structure of the Atom (continued)

Main Idea

Details

Quarks: Even Smaller Particles

I found this information on page _____.

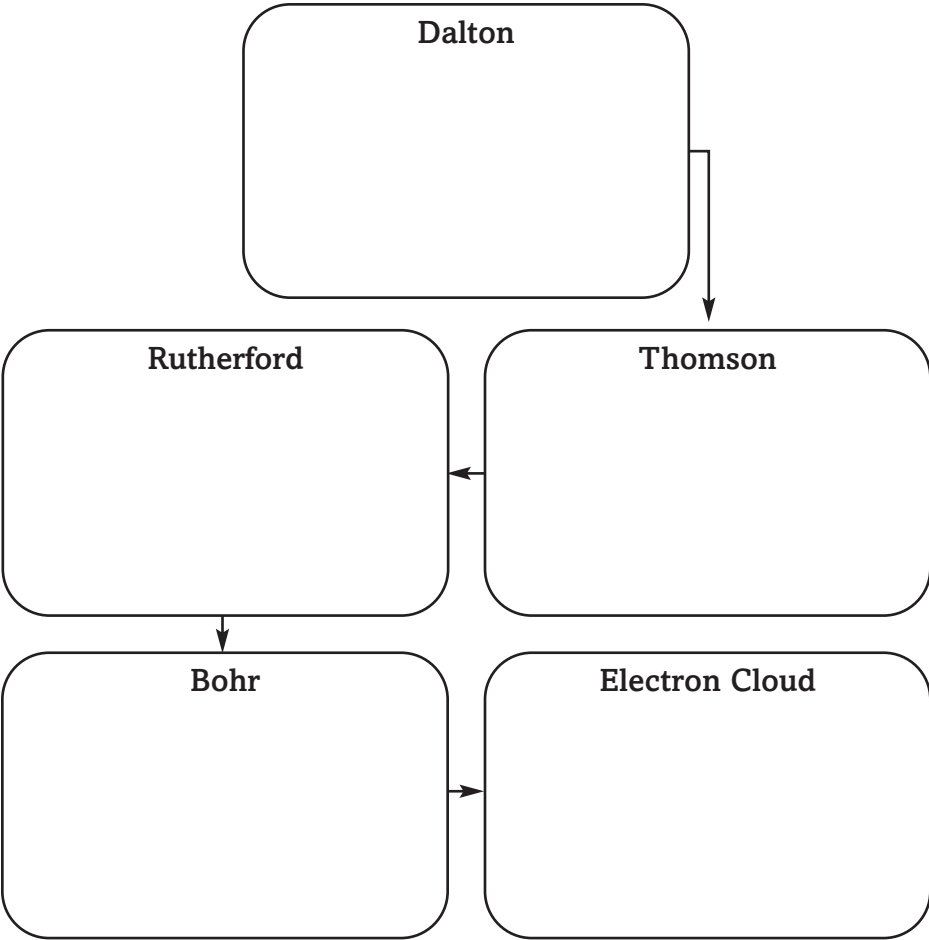
Models—Tools for Scientists

I found this information on page _____.

Summarize *key ideas about quarks.*

Theories about Quarks	Finding Quarks
Detecting Quarks	Sixth Quark

Create a time line of the changes that have occurred in modeling the atomic structure since the 1800s. Sketch and label each model.



Properties of Atoms and the Periodic Table

Section 2 Masses of Atoms

Preview Section 2 of your book, using the checklist below.

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

Write three facts you learned.

1. _____
2. _____
3. _____

Review Vocabulary

Define mass to show its scientific meaning.

mass

New Vocabulary

Use your book or dictionary to define the following key terms.

atomic number

mass number

isotope

average atomic mass

Academic Vocabulary

Use a dictionary to find the scientific meaning of define.

define

Section 2 Masses of Atoms (continued)

Main Idea

Atomic Mass

I found this information
on page _____.

Details

Organize the information on atomic mass to complete the outline.

Atomic Mass

A. Nucleus of atom

- 1. _____

- 2. _____

- 3. _____

B. Atomic mass unit

- 1. _____
- 2. _____
- 3. _____

C. Protons

- 1. _____

- 2. _____

- 3. _____

- 4. _____

D. Mass number

- 1. _____

- 2. _____

Section 2 Masses of Atoms (continued)

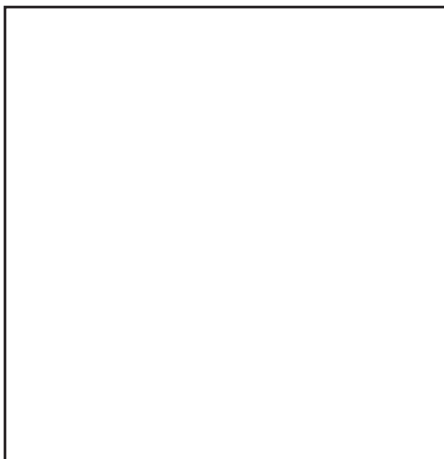
Main Idea**Isotopes**

*I found this information
on page _____.*

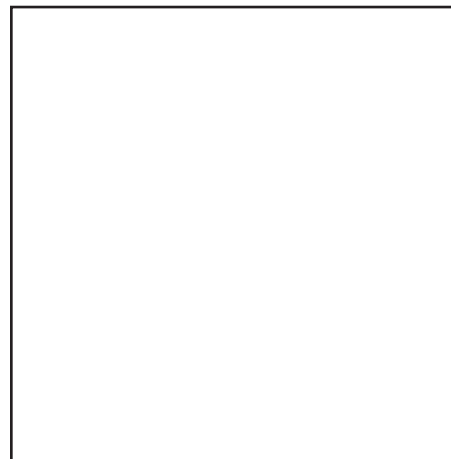
Details

Model carbon-12 *and* carbon-14 *by sketching each atom.*

- Remember that carbon's atomic number is 6.
- Label each atom's protons, neutrons, and electrons.
- Show the charges of the particles.



Carbon-12



Carbon-14

Summarize *how to calculate the average atomic mass of an element. Then perform the calculation for the element Chlorine using these data: Cl-35 makes up about $\frac{76}{100}$ of the abundance and Cl-37 makes up about $\frac{24}{100}$ of the abundance.*

CONNECT IT

While exploring on your grandfather's farm, you find a layer of charcoal that might represent a campfire built by Native Americans. Explain how you could find the age of the charcoal layer.

Properties of Atoms and the Periodic Table

Section 3 The Periodic Table

Skim Section 3 and write three questions based on your brief preview.

1. _____

2. _____

3. _____

Review Vocabulary

chemical property

Define chemical property to show its scientific meaning.

New Vocabulary

periodic table

Use your book or a dictionary to define the following terms.

group

electron dot diagram

period

Academic Vocabulary

similar

Use a dictionary to define similar to show its scientific meaning.

Section 3 The Periodic Table (continued)

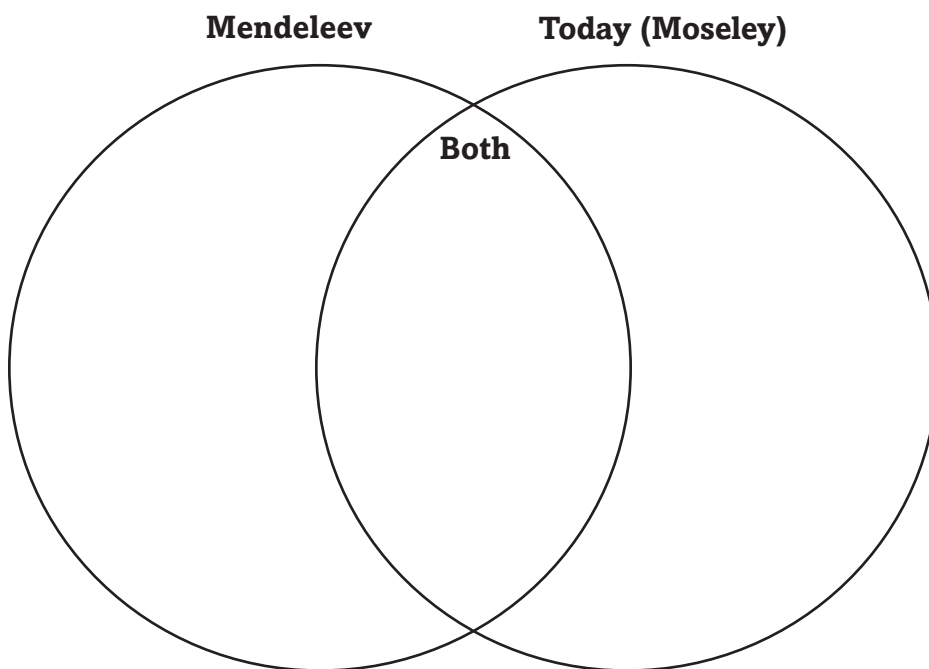
Main Idea

Organizing the Elements

I found this information on page _____.

Details

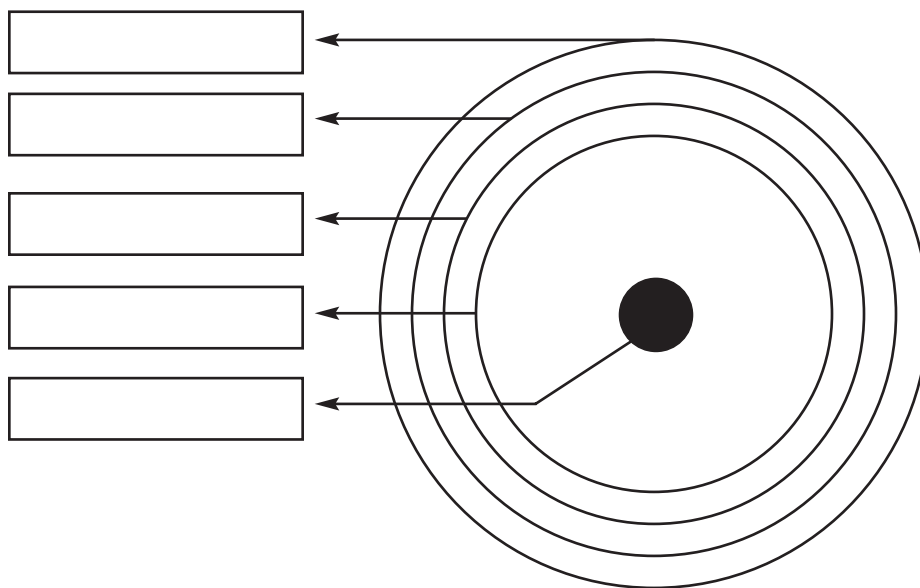
Compare *Mendeleev's early periodic table to that of today by completing the Venn diagram.*



The Atom and the Periodic Table

I found this information on page _____.

Sequence *the energy levels in the electron cloud diagram and write the maximum number of electrons that can be contained in each level.*



Tie It Together

Properties of Atoms and the Periodic Table

Since organizing the elements into a periodic table worked so well for scientists, create your own periodic table to organize another category of items. Pick a group containing many items which exhibit repeating, predictable patterns of behavior. List characteristics by which they are ordered and sorted, and organize them into columns and rows. Justify your methods for organization. Some suggestions include fashion trends or fads, types of music, beverages, or political and voting trends.

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Properties of Atoms and the Periodic Table

chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Properties of Atoms and the Periodic Table	After You Read
• An atom is the smallest unit of an element that still has all the properties of the element.	
• An atom is made up of a positively charged nucleus and negatively charged electrons.	
• Quarks are so tiny that they orbit the nucleus with the electrons.	
• Isotopes of an element only differ in their number of neutrons.	
• An element’s chemical and physical properties may be predicted by its location on the periodic table.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about the properties of atoms and the periodic table.

Earth Materials

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Earth Materials
	<ul style="list-style-type: none">• Most of Earth's crust is made of only a few elements.
	<ul style="list-style-type: none">• The composition of magma changes as minerals crystallize from it.
	<ul style="list-style-type: none">• Metamorphic rocks can form within a few years.
	<ul style="list-style-type: none">• Some Earth processes, such as weathering, destroy matter and reduce the mass of Earth.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

List ten of the most important materials you can think of and where you think they come from.

Earth Materials

Section 1 Minerals

Scan the headings and illustrations in Section 1. Write three questions you have about minerals. Look for answers to your questions as you read.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

ionic bond

Define ionic bond to show its scientific meaning.

New Vocabulary

Write the correct vocabulary word next to each definition.

- irregular break characteristic of some minerals
- naturally occurring inorganic solid with a crystalline structure that forms from magma or supersaturated solution
- measure of how easily a mineral can be scratched
- molten material found beneath Earth’s crust
- color a mineral leaves when rubbed across an unglazed porcelain plate or in powdered form
- ability of a mineral to break easily and evenly along one or more flat planes

Academic Vocabulary

bond

Use a dictionary to define bond to show its scientific meaning.

Section 1 Minerals (continued)

Main Idea

Common Elements

I found this information on page _____.

What's a mineral?

I found this information on page _____.

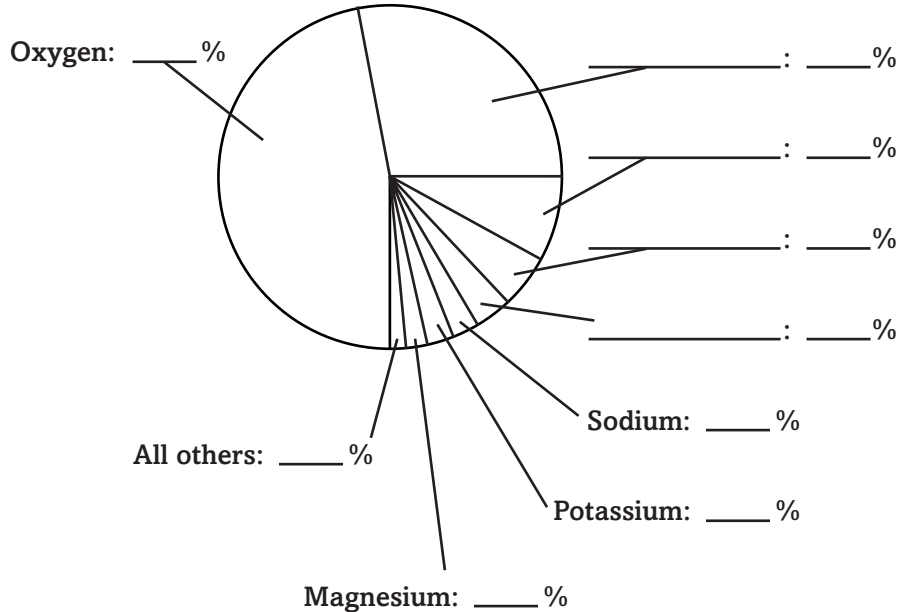
Physical Properties

I found this information on page _____.

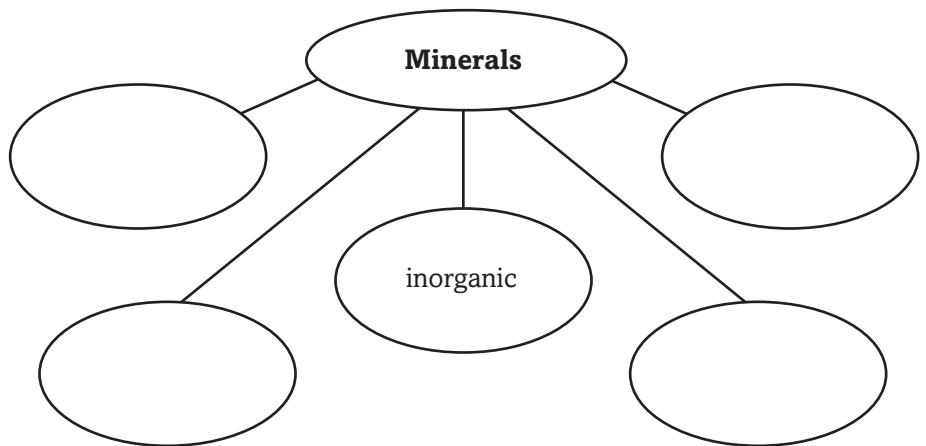
Details

Organize information about the 8 most abundant elements in Earth's crust by labeling the circle graph.

Major Elements in Earth's Crust



Complete the concept map about characteristics of minerals.



Identify six physical properties of minerals.

- | | |
|----------|----------|
| 1. _____ | 4. _____ |
| 2. _____ | 5. _____ |
| 3. _____ | 6. _____ |

Section 1 Minerals (continued)

Main Idea

Details

Mineral Formation

I found this information on page _____.

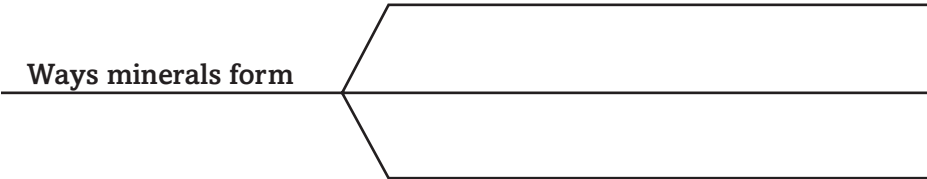
Mineral Groups

I found this information on page _____.

Mineral Uses

I found this information on page _____.

Complete the concept map about ways minerals form.



Summarize your knowledge of mineral groups by completing the paragraph.

Minerals are categorized according to their _____ and _____.

The most common group in Earth’s crust is the _____.

These minerals contain _____ and _____.

Other important groups in the crust include _____.

Organize information about the uses of minerals in the chart.

Some Uses of Minerals	
Mineral	Uses
Gold	
Hematite	
Quartz	

CONNECT IT

Describe at least 3 ways that you used minerals today.

Earth Materials

Section 2 Igneous Rocks

Scan Section 2. Identify three topics that will be discussed.

1. _____
2. _____
3. _____

Review Vocabulary

Define mixture to show its scientific meaning.

mixture

New Vocabulary

Define each vocabulary term. Then use each term in a sentence.

rock

texture

intrusive igneous rock

extrusive igneous rock

Academic Vocabulary

Use a dictionary to define intermediate.

intermediate

Section 2 Igneous Rocks (continued)

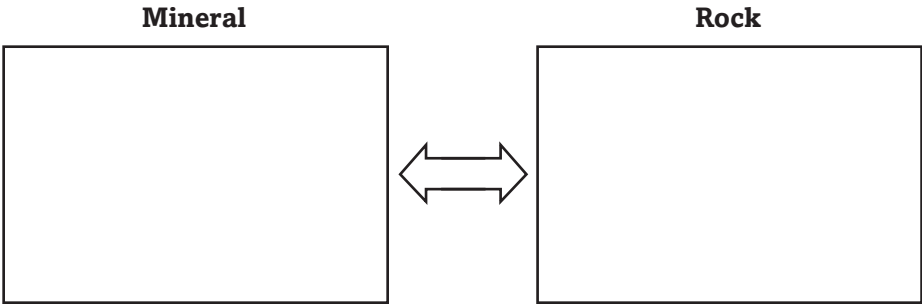
Main Idea

Details

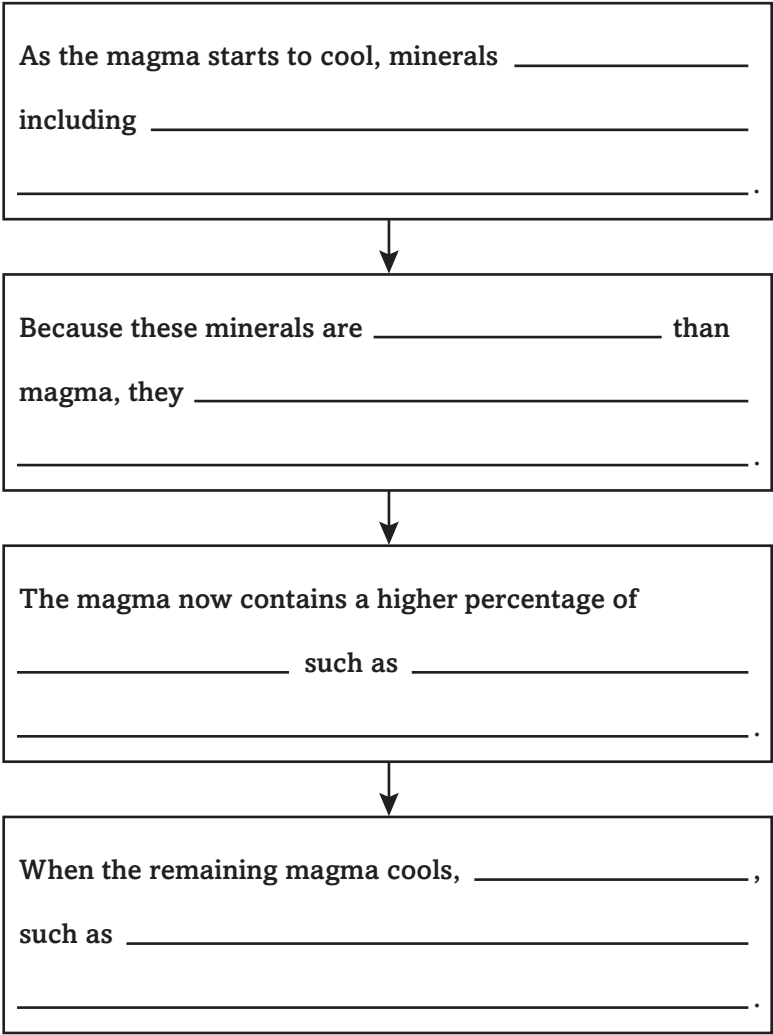
What's a rock?
I found this information on page _____.

Intrusive Igneous Rocks
I found this information on page _____.

Contrast a rock *with* a mineral.



Sequence the process by which rocks with different compositions can form from the same original magma as it cools beneath Earth's surface.



Section 2 Igneous Rocks (continued)

Main Idea

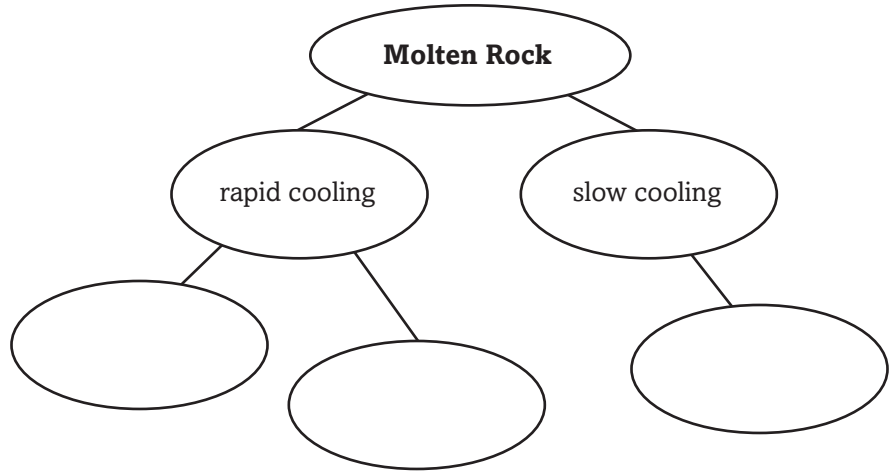
Extrusive Igneous Rocks

I found this information
on page _____.

I found this information
on page _____.

Details

Distinguish igneous textures *by completing the concept map.*



Compare intrusive and extrusive igneous rocks *by completing the chart.*

	Intrusive	Extrusive
Where formed	within crust	
Formed from		lava
Texture		
Rate of cooling		
Examples		

COMPARE IT

Two igneous rocks have exactly the same composition. One is dense and has coarse crystals. The other has low density and is full of holes. Predict how each rock formed.

Earth Materials

Section 3 Sedimentary Rocks

Scan the headings and illustrations in this section. Predict three things that you will learn about sedimentary rocks.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

Define precipitate to show its scientific meaning.

precipitate

New Vocabulary

Use each vocabulary term in a scientific sentence.

clast

porosity

cementation

Academic Vocabulary

Use a dictionary to define aggregate as a noun.

aggregate

Section 3 Sedimentary Rocks (continued)

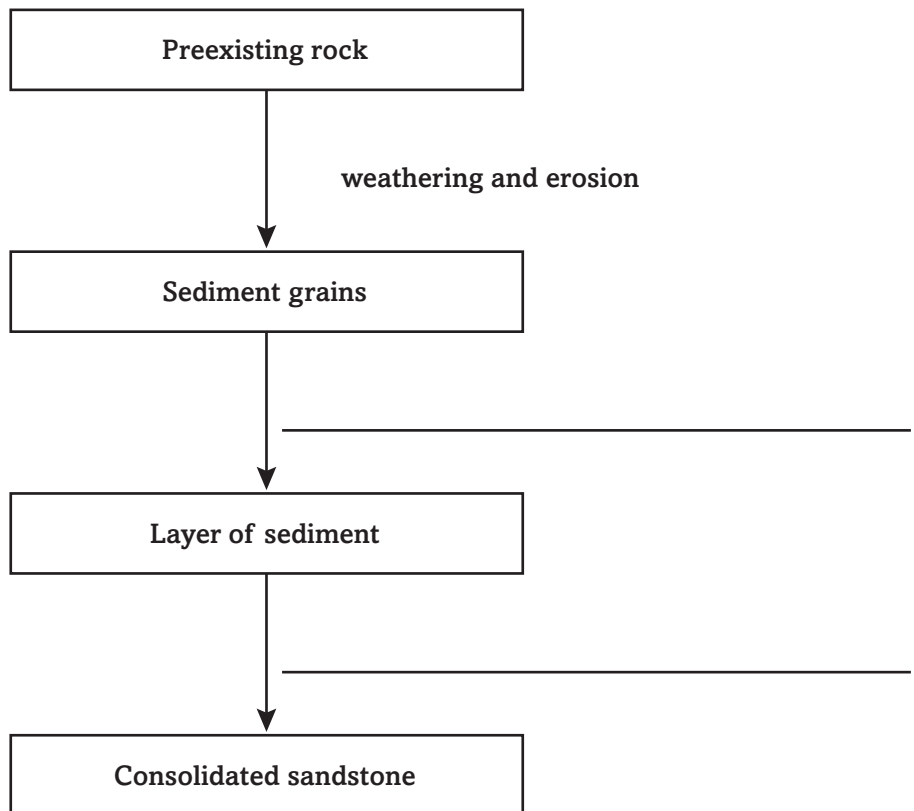
Main Idea

Rocks from Surface Materials

I found this information on page _____.

Details


Model the formation of sandstone by writing the correct processes in the concept map.



Detrital Sedimentary Rocks

I found this information on page _____.

Classify detrital sedimentary rocks by completing the table.

Detrital Sedimentary Rocks		
	Sediment	Rock
<div style="text-align: center;"> Coarsest  Finest </div>	gravel	
		shale

Section 3 Sedimentary Rocks (continued)

Main Idea

Details

Chemical
Sedimentary
Rocks

I found this information
on page _____.

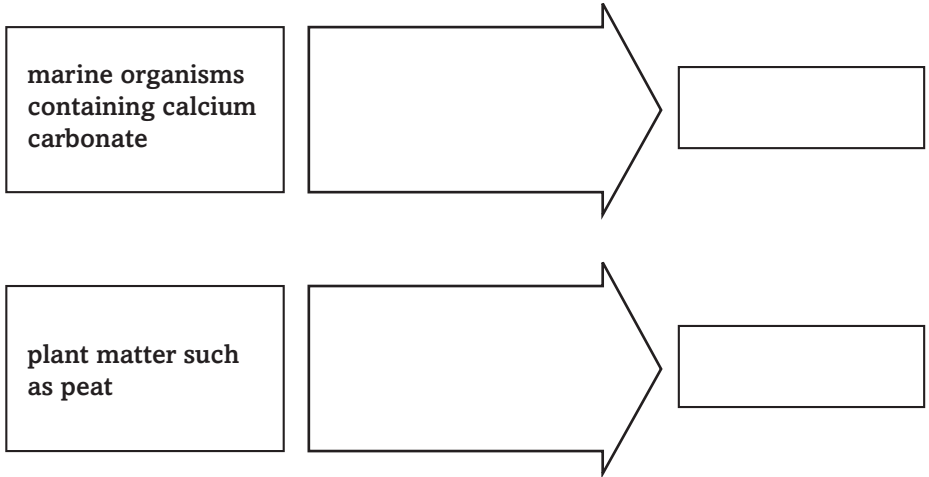
Organize *information about chemical sedimentary rocks by completing the chart.*

Formation of Chemical Sedimentary Rocks		
Process	Description	Examples
Precipitation		
Evaporation		

Biochemical
Sedimentary
Rocks

I found this information
on page _____.

Complete *the steps by which biochemical sedimentary rock is formed.*



EVALUATE IT

A sedimentary rock consists entirely of large, interlocking crystals. Classify which type of sedimentary rock it is. Support your answer with details from this chapter.

Earth Materials

Section 4 Metamorphic Rocks and the Rock Cycle

Scan the headings in Section 4. Write three questions that you have about metamorphic rocks and the rock cycle.

1. _____
2. _____
3. _____

Review Vocabulary

chemical reaction

Define chemical reaction using your book or a dictionary.

New Vocabulary

foliated

rock cycle

Define both new vocabulary terms. Then write a short paragraph to show the scientific meanings of both terms.

Academic Vocabulary

cycle

Use a dictionary to define cycle to show its scientific meaning.

Section 4 Metamorphic Rocks and the Rock Cycle (continued)

Main Idea

Details

Metamorphic Rocks and Metamorphic Rock Composition

I found this information on page _____.

Metamorphic Rock Composition

I found this information on page _____.

Metamorphic Rock Textures

I found this information on page _____.

Complete *the paragraph about how metamorphic rocks form.*

Metamorphic rocks form from preexisting _____ that might be igneous, _____, or even other _____. In order for metamorphic rocks to form, conditions of high _____, high _____, or the presence of _____ must exist. Metamorphic rocks normally require _____ of years to form.

Summarize *two environments of metamorphism by completing the chart.*

Metamorphic Rock Formation	
Type of Metamorphism	Environment
Regional	
Contact	

Model *foliated and nonfoliated rocks by drawing an example of each.*

Foliated

Nonfoliated

Section 4 Metamorphic Rocks and the Rock Cycle (continued)

Main Idea

Metamorphic Rock Classification

I found this information on page _____.

The Rock Cycle

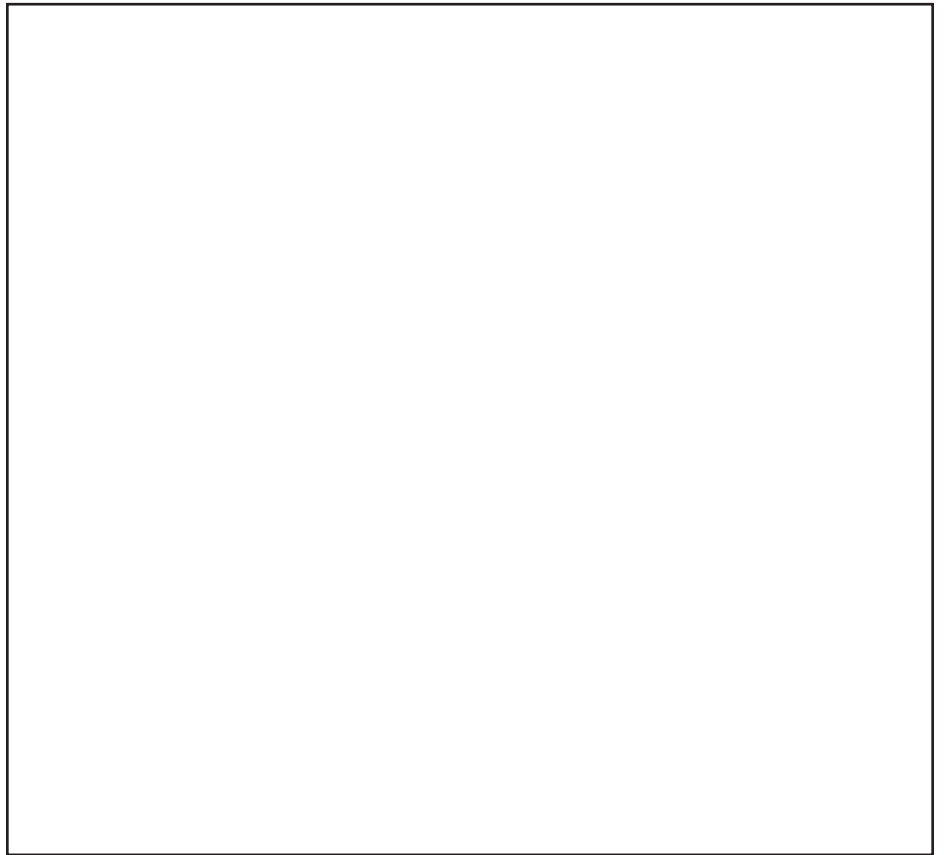
I found this information on page _____.

Details

Complete the concept map about metamorphic rock classification.

Criteria for classifying metamorphic rocks include

Model the rock cycle in the space below.



EVALUATE IT

You find a shiny, layered metamorphic rock. Predict what type of rock it may be. Support your answer with details from the chapter.

Earth Materials

chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Earth Materials	After You Read
• Most of Earth’s crust is made of only a few elements.	
• The composition of magma changes as minerals crystallize from it.	
• Metamorphic rocks can form within a few years.	
• Some Earth processes, such as weathering, destroy matter and reduce the mass of Earth.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about Earth materials.

Earth's Changing Surface

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Earth's Changing Surface
	• A region's climate can affect the soil that develops there.
	• Water in the Mississippi River comes from a region that stretches from the Appalachian Mountains to the Rocky Mountains.
	• Most of the land in deserts is covered by sand dunes.
	• Some water wells flow without pumping.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe some clues that could indicate a glacier once covered a region.

Earth’s Changing Surface

Section 1 Weathering and Soil

Scan the headings and illustrations in Section 1. Write three questions that you have about weathering and soil. Look for answers to your questions as you read.

- 1. _____
- 2. _____
- 3. _____

Review Vocabulary

Use the term sediment in a scientific sentence.

sediment

New Vocabulary

Define the following terms to show their scientific meaning.

weathering

soil

Academic Vocabulary

Use a dictionary to define expand. Then use the term in a sentence that shows its scientific meaning.

expand

Section 1 Weathering and Soil (continued)

Main Idea

Weathering

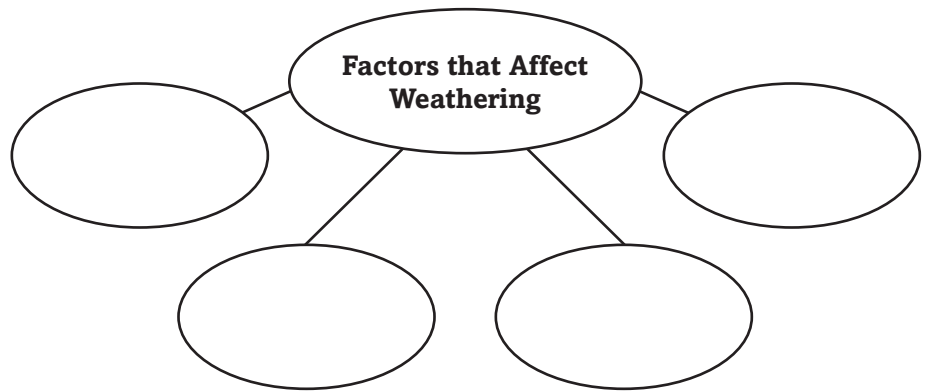
I found this information
on page _____.

Mechanical Weathering and Chemical Weathering

I found this information
on page _____.

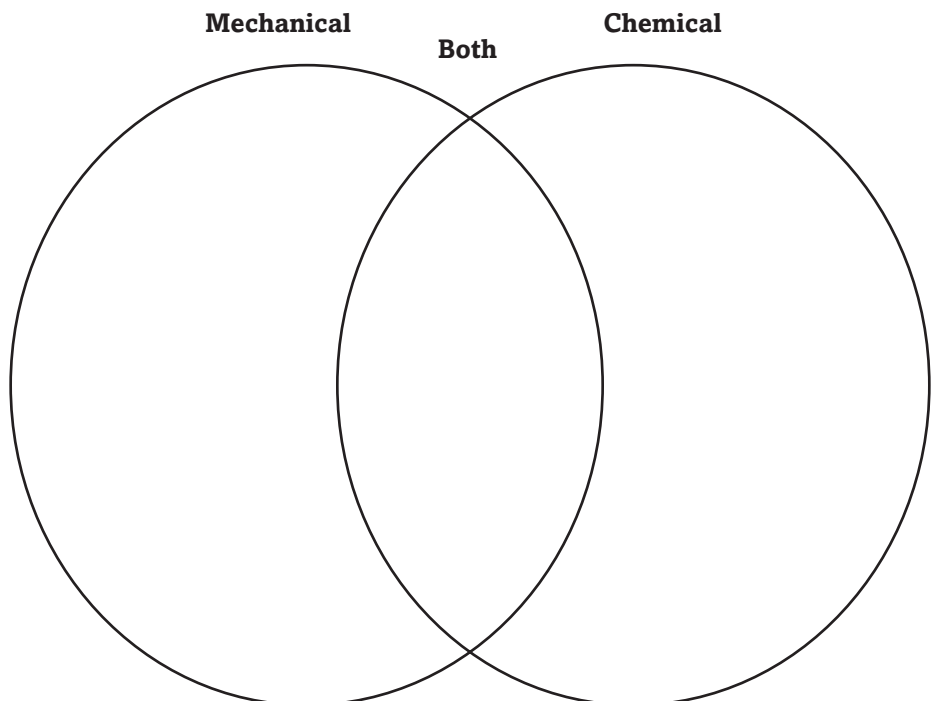
Details

Identify factors that affect the weathering of rock by completing the concept map.



Compare and contrast mechanical weathering *and* chemical weathering by completing the Venn diagram. Use the phrases listed below.

- weakens rock
- releases ions into water solution
- does not affect composition of rock
- increases surface area of rock being weathered
- forms new minerals



Section 1 Weathering and Soil (continued)

Main Idea

Details

Soil

I found this information on page _____.


Soil Conservation

I found this information on page _____.

Summarize characteristics of soil horizons below.

O Horizon
A Horizon
E Horizon
B Horizon
C Horizon
R Horizon

Complete the graphic organizer about soil conservation.

soil conservation includes 

SYNTHESIZE IT

Describe the relationship between weathering and soil.

Earth's Changing Surface

Section 2 Shaping the Landscape

Scan the headings in Section 2 of your book. Identify three topics that will be discussed in this section.

1. _____
2. _____
3. _____

Review Vocabulary

Define physical change to shows its scientific meaning.

physical change

New Vocabulary

Write a scientific sentence using each of the vocabulary terms.

erosion

sediment transport

deposition

drainage basin

longshore current

Academic Vocabulary

Use a dictionary to define the term transport to shows its scientific meaning.

transport

Section 2 Shaping the Landscape (continued)

Main Idea	Details
<div>Erosion, Transport, and Deposition</div> <div>I found this information on page _____.</div>	<div><p>Complete <i>the following paragraph about how the landscape is shaped.</i></p><p>_____ is the process by which rock, sediment, and soil are picked up and removed from an area. _____</p><p>_____ all can cause erosion.</p><p>Once the material has been picked up, it can be moved to another location. This process of moving sediment from one place to another is called _____. Eventually, the transporting agent no longer will be able to move the sediment and _____ will occur.</p></div> <div><p>Model <i>a river system in the space below. Include tributaries, a trunk stream, and a delta in your sketch. Label and describe places where you think erosion, transportation, and deposition are occurring.</i></p><div></div></div>

Section 2 Shaping the Landscape (continued)

Main Idea

Glaciers

*I found this information
on page _____.*

Wind

*I found this information
on page _____.*

Details

Classify *glacial features as erosional or depositional by writing as many features as you can in the table.*

Erosional Features	Depositional Features

Sequence *the migration of a dune. Draw a sand dune in the space below. Label the dune T_1 . Then draw the position of the dune at two times in the future (T_2 and T_3).*

Summarize *how dunes migrate.*

SYNTHESIZE IT

Mudflows are a dangerous type of mass-wasting event. Describe a mudflow. How might damage and loss of life from mudflows be prevented?

Earth’s Changing Surface

Section 3 Groundwater

Scan the illustrations in this section. Write three things that you learned about water or groundwater.

1. _____

2. _____

3. _____

Review
Vocabulary

Define pore space to show its scientific meaning.

pore space

New
Vocabulary

Use your book or a dictionary to define the following terms.

infiltration

water table

aquifer

porosity

Academic
Vocabulary

Use a dictionary to define transmit to show its scientific meaning.

transmit

Section 3 Groundwater (continued)

Main Idea

The Water Cycle

*I found this information
on page _____.*

Groundwater

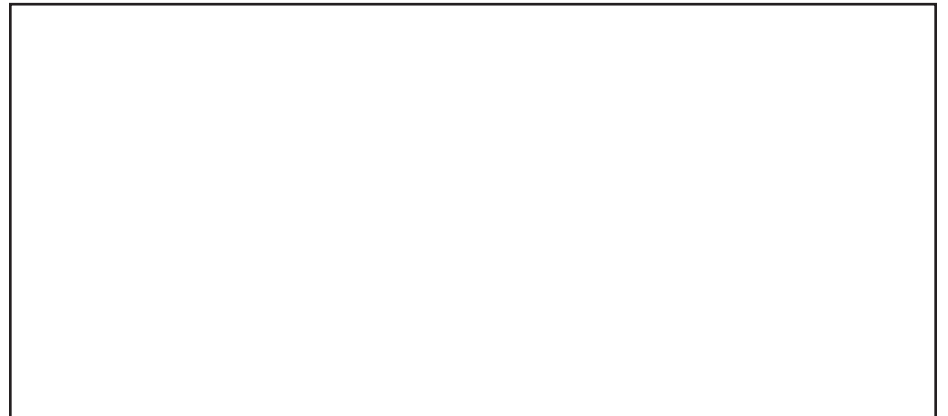
*I found this information
on page _____.*

*I found this information
on page _____.*

Details

Summarize *on the lines below how the water cycle provides water to the groundwater system.*

Create *a drawing of porous sediment in the space below. Label your drawing to show where groundwater could be held.*



Model *an aquifer in the space below. Label the land's surface, the water table, the unsaturated zone, and the saturated zone. Add arrows to your sketch to show how groundwater moves in your aquifer.*



Section 3 Groundwater (continued)

Main Idea

Water Resources

I found this information on page _____.

I found this information on page _____.

Details

Summarize how groundwater is obtained *by completing the chart.*

Sources of Groundwater	
Source	Description
springs	
wells	

Organize information about artesian wells *by sketching a cross section of one. Label the aquifer and aquitards. Then describe how water flows from an artesian well.*

EVALUATE IT

Polluted groundwater is a difficult problem. Infer why a polluted aquifer might remain polluted for a long period of time.

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Earth's Changing Surface

Section 4 Geologic Time

Scan the headings in Section 4. Write three questions that you have about geologic time.

1. _____
2. _____
3. _____

Review Vocabulary

radioactivity

Define radioactivity to shows its scientific meaning.

New Vocabulary

Write the correct vocabulary term on the blank next to each definition.

Hutton's concept that the laws of nature act today as they have in the past

gap in the rock record that represents a period of erosion or nondeposition

remains or traces of an organism in the geologic rock record

states that the oldest rocks in an undisturbed sequence of rock layers are at the bottom of the undisturbed sequence

process of dating objects or events in time order or sequence

process of assigning a precise numerical age to an organism, object, or event based on its absolute reference

Academic Vocabulary

structure

Use a dictionary to define structure to shows its scientific meaning.

Section 4 Geologic Time (continued)

Main Idea

Time

I found this information on page _____.

Principles of Relative Dating

I found this information on page _____.

Fossils

I found this information on page _____.

Details

Distinguish absolute ages and relative ages by writing three everyday examples of each type in the table below.

Everyday Examples of Relative Ages and Absolute Ages	
Relative ages	Absolute ages
1.	1.
2.	2.
3.	3.

Classify the following statements according to whether the statement reflects use of the principle of superposition, the principle of uniformitarianism, or the principle of original horizontality.

1. The principle of _____ allows me to conclude that a sandstone near the bottom of an undisturbed sequence of rock layers must be older than a limestone near the top.

2. The principle of _____ allows me to conclude that folded or tilted rock layers must have been disturbed sometime after the layers formed.

3. The principle of _____ allows me to conclude that ancient rock that is similar to volcanic rock forming today in Hawaii probably formed in the same way.

Sequence the units of geologic time from the longest type of unit to the shortest type of unit.

Longest unit ←————→ Shortest unit

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Section 4 Geologic Time (continued)

Main Idea

Absolute Dating

I found this information
on page _____.

I found this information
on page _____.

Details

Define a pattern of half-life *by completing the blanks to show how much parent isotope and daughter isotope remain. Assume that no atoms can enter or escape from the system.*

Half-lives	Amount of daughter and parent (moles)	Daughter to parent ratio
0	D: 0 P: 16	0
1	D: _____ P: _____	_____
2	D: _____ P: _____	_____
3	D: _____ P: _____	_____
4	D: _____ P: _____	_____

Summarize *how knowing the half-life of an isotope and the daughter to parent ratio of a rock sample allows scientists to determine the age of rocks.*

SYNTHESIZE IT

After oil forms, it tends to rise toward the surface. Hypothesize how folded rocks can trap oil in economic amounts. Include a description of which type of fold would be most effective at trapping oil.

Earth’s Changing Surface

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Earth’s Changing Surface	After You Read
• A region’s climate can affect the soil that develops there.	
• Water in the Mississippi River comes from a region that stretches from the Appalachian Mountains to the Rocky Mountains.	
• Most of the land in deserts is covered by sand dunes.	
• Some water wells flow without pumping.	

Review

Use this checklist to help you study.

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- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about Earth’s surface.

Chemical Bonds

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Chemical Bonds
	<ul style="list-style-type: none">• The properties of a chemical compound are the same as the properties of each element it contains.
	<ul style="list-style-type: none">• An ion forms when an atom gains or loses electrons in its outer shell.
	<ul style="list-style-type: none">• Covalent bonds form when atoms share electrons.
	<ul style="list-style-type: none">• The oxidation number is the number of oxygen atoms in a molecule.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe how glue is similar to chemical bonds.

Chemical Bonds

Section 1 Stability in Bonding

Predict four topics that might be discussed after reviewing the objectives of Section 1.

1. _____
2. _____
3. _____
4. _____

Review Vocabulary

compound

Define compound.

New Vocabulary

chemical formula

Define the following vocabulary terms.

ion

Academic Vocabulary

unique

Use a dictionary to define unique. **Then use the word in a sentence that demonstrates its scientific meaning.**

Section 1 Stability in Bonding (continued)

Main Idea

Combined Elements

I found this information on page _____.

Formulas

I found this information on page _____.

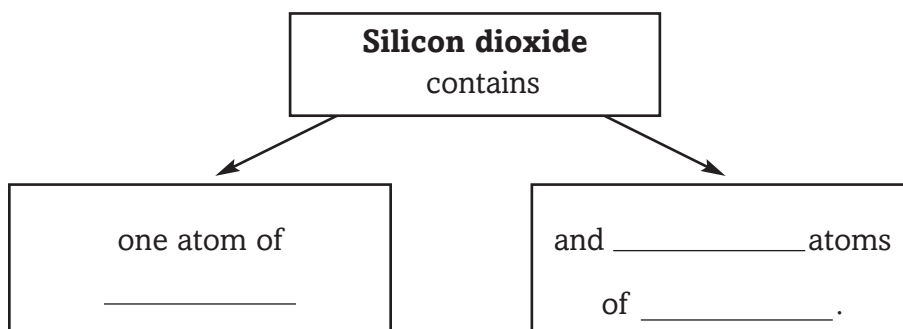
Atomic Stability

I found this information on page _____.

Details

Evaluate *why sodium chloride is not like the elements that form it.*

Complete *the graphic organizer. Use the table in your book for information.*



Summarize *what can be learned about an element from its electron dot diagram. Then draw an electron dot diagram of lithium below your answer. Use the examples of electron dot diagrams shown in your book for help.*

Section 1 Stability in Bonding (continued)

Main Idea**Atomic Stability**

I found this information
on page _____.

I found this information
on page _____.

Details

Create your own electron dot diagrams for sodium and chlorine.
Explain how both atoms could become more stable.



Complete the statements about ions.

To become more _____, atoms _____ and _____
electrons. An atom that has gained or lost an electron is called an
_____. An ion is a _____ particle that has _____
or _____ electrons than protons. An ion does not have a
_____ charge. _____ between ions can hold
compounds together.

CONNECT IT

Make an analogy between the sharing of electrons and the
completion of a jigsaw puzzle.

Chemical Bonds

Section 2 Types of Bonds

Skim through Section 2 of the book. Write three questions that come to mind from reading the headings and the illustration captions.

1. _____
2. _____
3. _____

Review Vocabulary

atom

Define atom using your book or a dictionary.

New Vocabulary

Read the definitions below. Then write the vocabulary word that matches each definition in the left column.

the force that holds atoms together in a compound

the force of attraction between a positive ion and a negative ion in an ionic compound

the force of attraction between two atoms that share electrons

the neutral particle that forms when atoms share electrons

a molecule that has a slightly positive end and a slightly negative end, but the molecule itself is neutral

a molecule where the electrons are shared equally in the bond

Academic Vocabulary

neutral

Use a dictionary to define neutral.

Section 2 Types of Bonds (continued)

Main Idea

Gain or Loss of Electrons

I found this information on page _____.

The Ionic Bond and Sharing Electrons

I found this information on page _____.

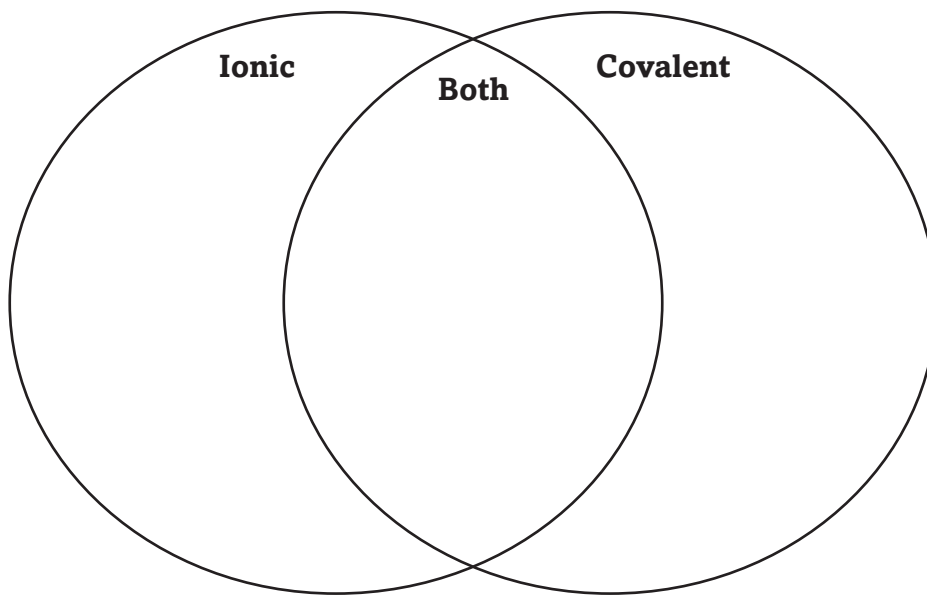
I found this information on page _____.

Details

Complete *the steps in the formation of a potassium ion.*

1. An atom of potassium has _____ electron in its _____.
2. A potassium atom _____ one electron in its outer level when it combines with an _____.
3. The potassium atom is now a _____.
4. The potassium ion has a _____ charge.
5. The symbol for a positive potassium ion is _____.

Compare *ionic and covalent bonds in the Venn diagram below with at least eight facts.*



Analyze *and discuss why it is much easier for Group 14 elements to become stable by sharing instead of transferring electrons.*

Section 2 Types of Bonds (continued)

Main Idea

Details

SUMMARIZE IT

Write two key facts in each of the boxes below.

Covalent Bonds

1.

2.

Polar Covalent Bonds

1.

2.

Sharing Electrons

1. Sharing requires less energy.

2. A covalent bond is formed.

Unequal Sharing

1.

2.

Nonpolar Covalent Bonds

1.

2.

Chemical Bonds

Section 3 Writing Formulas and Naming Compounds

Scan Section 3 of your book, using the checklist below.

- ☐ Read all section titles.
- ☐ Read all bold words.
- ☐ Read all charts and graphs.
- ☐ Look at all the pictures and read their captions.
- ☐ Think about what you already know about chemical formulas and compounds.

Formulate two questions about what you would like to learn.

1. _____

2. _____

Review Vocabulary

anion

Define anion using your book or a dictionary.

New Vocabulary

Define the following vocabulary words. Use your book for help.

binary compound

oxidation number

polyatomic ion

hydrate

Academic Vocabulary

negate

Use a dictionary to define negate.

Section 3 Writing Formulas and Naming Compounds (continued)

Main Idea**Binary Ionic Compounds**

*I found this information
on page _____.*

*I found this information
on page _____.*

Details

Complete *the table below for sodium and chlorine. Use the periodic table in your book.*

Element	Oxidation Number	Positive or Negative Charge?
Sodium		
Chlorine		

Define *what an oxidation number of 1+ means.*

Summarize *the three steps in writing a formula for an ionic compound by completing the graphic organizer below.*

1. _____

2. _____

3. _____

Section 3 Writing Formulas and Naming Compounds (continued)

Main Idea**Compounds with Polyatomic Ions**

I found this information on page _____.

Compounds with Added Water

I found this information on page _____.

Details

Organize the steps for finding the formula for ammonium sulfate by completing the questions and answers below. Look at the *Polyatomic Ions* table in your book for help.

Question: What is the positive ion and its charge?

Answer: _____

Question: What is the negative ion and its charge?

Answer: _____

Question: Balance the charges to make the compound neutral.

Answer: _____

The formula is: _____

Summarize the information about hydrates by filling in the blanks below.

Some ionic compounds have _____ as part of their structure. A _____ has water _____ and written into its _____.

The _____ can be removed from the hydrate crystals by _____ them. The form of the compound without water is described as _____. The formula $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ is named _____, whose common name is gypsum.

The _____ form (without water), _____ is the common powder known as plaster of paris.

Section 3 Writing Formulas and Naming Compounds (continued)

Main Idea**Naming Binary Covalent Bonds**

I found this information
on page _____.

Details

Analyze *eight different binary covalent compounds of your choice. Write the formula for each compound in the left column. Write out the name in the right column. Use the Prefixes for Covalent Compounds table in your book for help.*

Formula	Name

CONNECT IT

Think of three common chemical compounds people use every day. Based on the rules listed throughout this section, write out the chemical formulas and chemical names of each one.

Chemical Bonds chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Chemical Bonds	After You Read
• The properties of a chemical compound are the same as the properties of each element it contains.	
• An ion forms when an atom gains or loses electrons in its outer shell.	
• Covalent bonds form when atoms share electrons.	
• The oxidation number is the number of oxygen atoms in a molecule.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you learned about chemical bonds.

Chemical Reactions

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Chemical Reactions
	<ul style="list-style-type: none">• There is no gain or loss of matter in a chemical reaction.
	<ul style="list-style-type: none">• In synthesis reactions, one element replaces another in a compound.
	<ul style="list-style-type: none">• Energy is required to initiate a chemical reaction.
	<ul style="list-style-type: none">• A catalyst is used to slow down a chemical reaction.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Describe several cause-and-effect types of events that might happen in your refrigerator. Decide which of the events are chemical reactions.

Chemical Reactions

Section 1 Chemical Changes

Predict Review the objectives of Section 1. Predict three topics that might be discussed.

1. _____
2. _____
3. _____

Review Vocabulary

chemical change

Define chemical change. Give an example of chemical change you might see in your everyday life.

New Vocabulary

chemical reaction

Use your book to define the following key terms.

reactant

product

chemical equation

Academic Vocabulary

component

Use a dictionary to define component. Then give an example of a component.

Section 1 Chemical Changes (continued)

Main Idea

Describing Chemical Reactions

I found this information on page _____.

Conservation of Mass

I found this information on page _____.

Writing Equations

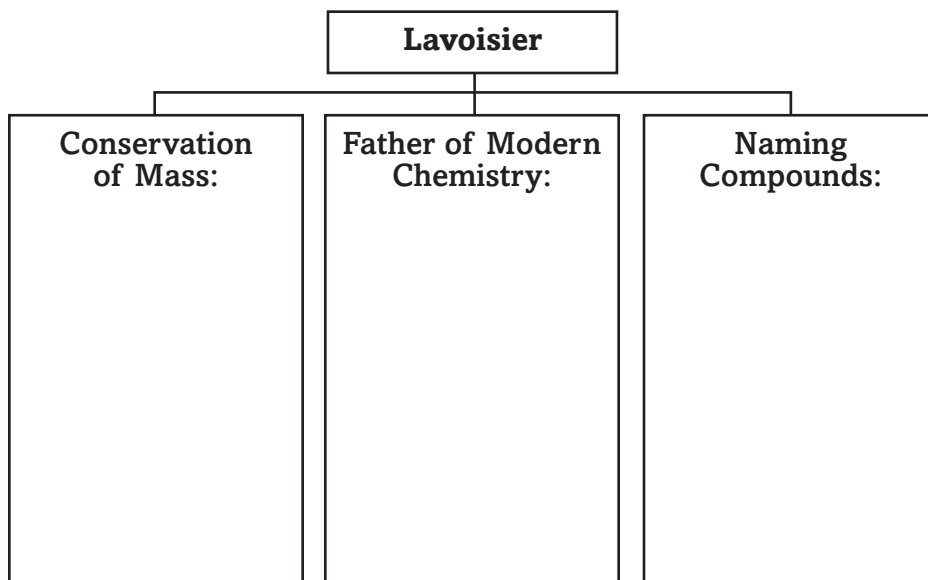
I found this information on page _____.

Details

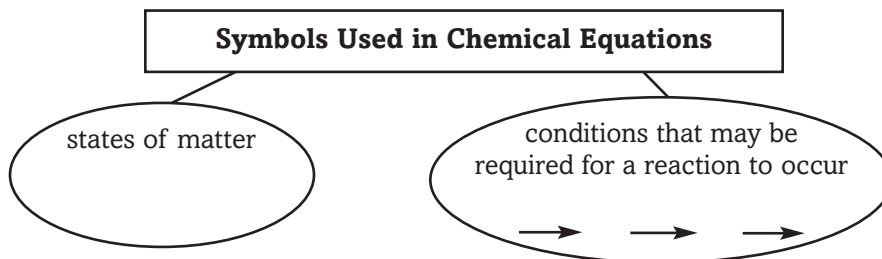
Identify the reactants and the products in the following chemical equations.

Chemical Equation	Reactants	Products
$\text{Zn} + \text{S} \rightarrow \text{ZnS}$		
$\text{AgNO}_3 + \text{NaCl} \rightarrow \text{AgCl} + \text{NaNO}_3$		
$\text{C}_{12}\text{H}_{22}\text{O}_{11} \rightarrow 12\text{C} + 11\text{H}_2\text{O}$		
$\text{Fe} + \text{CuSO}_4 \rightarrow \text{FeSO}_4 + \text{Cu}$		
$\text{CaCO}_3 + 2\text{HCl} \rightarrow \text{H}_2\text{O} + \text{CO}_2 + \text{CaCl}_2$		

Summarize the contributions of Lavoisier by filling out the organizer. Include information on his experiments, observations, and theories.



Complete the graphic organizer about symbols used in chemical equations.



Section 1 Chemical Changes (continued)

Main Idea**Writing Equations**

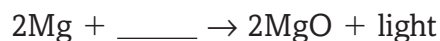
I found this information
on page _____.

Unit Managers

I found this information
on page _____.

Details

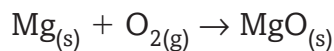
Complete the following chemical formula and its translation.



Magnesium _____ oxygen _____ magnesium
oxide and _____.

Analyze the role of coefficients as unit managers in writing
chemical equations.

Evaluate how students balanced the equation.



Student Name	Student's Answer	Evaluation: Would the equation balance? What does the student's answer mean?
Melinda	put a 2 in front of the Mg and a 2 in front of MgO	
Barni	put a 2 in front of the MgO	
Ali		This would mathematically balance the equation, but you cannot really cut the molecule in half and then combine it.

COMPARE IT

Use what you have learned about chemical reactions to contrast the processes of cooking a hard-boiled egg and cutting paper to make confetti.

Chemical Reactions

Section 2 Chemical Equations

Scan Section 2 of your book, using the checklist below.

- ☐ Read all section titles.
- ☐ Read all bold words.
- ☐ Read all charts and graphs.
- ☐ Look at all the pictures and read their captions.
- ☐ Think about what you already know about chemical equations.

Write two questions about what you would like to learn.

1. _____
2. _____

Review Vocabulary

subscript

Define subscript. *Write a chemical formula that has a subscript and draw an arrow pointing to the subscript.*

New Vocabulary

balanced chemical equation

Use your book or a dictionary to define balanced chemical equation.

Academic Vocabulary

formula

Use a dictionary to define formula. *Then use the word in a sentence that shows its scientific meaning.*

Section 2 Chemical Equations (continued)

Main Idea**Balanced Equations**

*I found this information
on page _____.*

Details

Summarize information about balancing equations by completing the prompts.

Balancing an equation means _____

_____.

Coefficients are the numbers that show _____

_____.

Subscripts are numbers that show there is _____

_____.

Identify each number 3 below as a coefficient (C) or a subscript (S).

_____ 2 FeSO₃ _____ 3 Na _____ 4 Al₂O₃

_____ 3 HCl _____ 6 AlH₃ _____ 3 H₂

Complete the right side of the equation. The first one has been started for you.

Atoms	BaCl ₂	+	H ₂ SO ₄	→	BaSO ₄	+	HCl
Ba	1						
Cl	2						
H							
S							
O							

Evaluate whether the equation above is balanced. Give the total number of atoms on the left side and the total number on the right side.

Identify the coefficient for HCl that would balance the equation above.

Section 2 Chemical Equations (continued)

Main Idea**Balanced Equations**

I found this information
on page _____.

I found this information
on page _____.

Details

Sequence and describe the 4 steps involved in balancing a chemical equation. In the right column, write an example for each step.

1. Write equation. Check that symbols and formulas for reactants and products are correct.	
2.	
3.	
4.	

Identify coefficients that balance each equation.

1. $\text{P}_{(s)} + \text{O}_{2(g)} \rightarrow \text{P}_4\text{O}_{10(s)}$
2. $\text{KClO}_{3(s)} \rightarrow \text{KCl}_{(s)} + \text{O}_{2(g)}$
3. $\text{H}_2\text{O}_{(l)} \rightarrow \text{H}_{2(s)} + \text{O}_{2(g)}$
4. $\text{CH}_{4(s)} + \text{O}_{2(g)} \rightarrow \text{CO}_{2(g)} + \text{H}_2\text{O}_{(g)}$
5. $\text{Al}_2\text{O}_{3(s)} \rightarrow \text{Al}_{(s)} + \text{O}_{2(g)}$
6. $\text{MgSO}_{4(aq)} + \text{KCl}_{(aq)} \rightarrow \text{MgCl}_{2(s)} + \text{K}_2\text{SO}_{4(aq)}$

CONNECT IT

Analyze how chemical equations and mathematical equations are similar. Provide an example to illustrate your point.

Chemical Reactions

Section 3 Classifying Chemical Reactions

Skim Section 3. Write two statements about what you plan to learn from the reading.

1. _____

2. _____

Review Vocabulary

states of matter

Define states of matter to show its scientific meaning.

New Vocabulary

Read the definitions below. Then write the key term for each one in the left column.

a reaction in which a substance reacts with oxygen to produce heat and light

a reaction in which two or more substances combine to form another substance

a reaction in which one substance breaks down, or decomposes, into two or more substances

a reaction in which one element replaces another element in a compound

a reaction in which the positive ion of one compound replaces the positive ion of the other compound to form two new compounds

Academic Vocabulary

accumulate

Use a dictionary to define accumulate. Then use the term in a scientific sentence.

Section 3 Classifying Chemical Reactions (continued)

Main Idea**Types of Reactions**

*I found this information
on page _____.*

Details

Describe each type of chemical reaction *in words*. Give the general form if it exists and an example for each.

I. Combustion Reaction

Description: _____

Example: _____

II. Synthesis Reaction

Description: _____

General form: _____

Example: _____

III. Decomposition Reaction

Description: _____

General form: _____

Example: _____

IV. Single-Displacement Reaction

Description: _____

General form: _____

Example: _____

V. Double-Displacement Reaction

Description: _____

General form: _____

Example: _____

VI. Oxidation-Reduction Reaction

Description: _____

Example: _____

Section 3 Classifying Chemical Reactions (continued)

Main Idea**Type of Reactions**

I found this information
on page _____.

I found this information
on page _____.

Details

Analyze the activity series chart in your book to decide which metal will replace the other in a displacement reaction.

1. calcium
lead

2. tin
zinc

3. copper
aluminum

Classify each chemical reaction by writing the reaction type in the blank to the left.

- decomposition
- double displacement

- single displacement
- synthesis



Model the reaction setup for the decomposition of water. Use the figure in your book to help you.

- Label the test tubes, beaker, and battery.
- Show the electrodes that conduct the electricity to the water to make the reaction happen.
- Show the amounts of hydrogen and oxygen that are produced.

**CONNECT IT**

Select an example of a chemical reaction that you have observed in real life. Describe the reaction and try to write an equation for it.

Chemical Reactions

Section 4 Reaction Rates and Energy

Preview Section 4 of this chapter. Read the headings and the illustration captions. Write three questions that come to mind.

1. _____
2. _____
3. _____

Review Vocabulary

Define chemical bond to show its scientific meaning.

chemical bond

New Vocabulary

Use your book or a dictionary to define the following key terms.

activation energy

endothermic reaction

exothermic reaction

rate of reaction

catalyst

inhibitor

Academic Vocabulary

Use a dictionary to define release to show its scientific meaning.

release

Section 4 Reaction Rates and Energy (continued)

Main Idea

Chemical Reactions and Energy

I found this information on page _____.

Endergonic and Exergonic Reactions

I found this information on page _____.

Details

Identify *three facts about chemical reations and energy.*

1. _____

2. _____

3. _____

Complete *the following paragraphs about energy reactions.*

All exothermic reactions are _____, but not all exergonic reactions are _____. _____ reactions give off heat energy, while _____ reactions give off any sort of energy.

All _____ reactions are endergonic, but not all _____ reactions are endothermic. _____ reactions absorb heat energy, while _____ reactions absorb any sort of energy.

Classify *each reaction as endergonic or exergonic.*

- combustion of fossil fuels
- dissolving salt in water
- dynamite explosions
- electroplating
- fireflies' light

- glow sticks
- photosynthesis
- rusting iron
- separating aluminum metal from its ore

Exergonic

Endergonic

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282 Chemical Reactions

Section 4 Reaction Rates and Energy (continued)

Main Idea

Chemical Reaction Rates

I found this information on page _____.

I found this information on page _____.

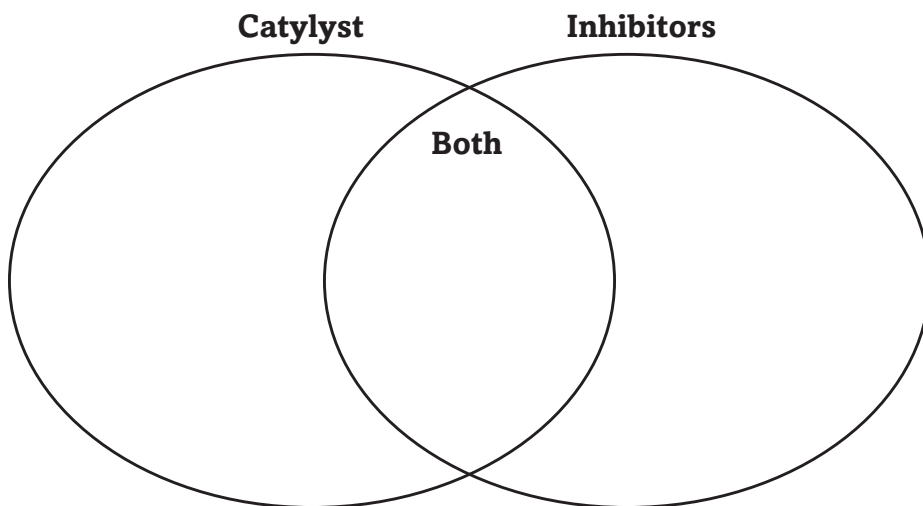
Details

Match the condition that controls reaction rates to its clue by placing the correct letter on the line.

- | | |
|----------------------|--|
| ___ 1. temperature | a. stirring helps reactants collide more often |
| ___ 2. concentration | b. increasing this reduces the amount of space atoms have to move in |
| ___ 3. surface area | c. raising this makes atoms and molecules move faster |
| ___ 4. agitation | d. this increases when a substance is split into pieces |
| ___ 5. pressure | e. the closer atoms are to one another, the more likely they are to collide |

Compare and contrast the roles of catalysts and inhibitors in reactions. Fill in the Venn diagram with the phrases below.

- | | |
|---|-------------------------|
| • does not enter into the reaction itself | • temperature change |
| • enzymes in body | • used in auto industry |
| • food preservatives | • used to make polymers |



CONNECT IT

Use what you have learned in this section to explain why a match will not light if you do not strike it hard enough.

Chemical Reactions Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Chemical Reactions	After You Read
• There is no gain or loss of matter in a chemical reaction.	
• In synthesis reactions, one element replaces another in a compound.	
• Energy is required to initiate a chemical reaction.	
• A catalyst is used to slow down a chemical reaction.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about chemical reactions.

Solutions, Acids, and Bases

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Solutions, Acids, and Bases
	• A solution is a mixture that has the same composition, color, density, and taste throughout.
	• The solubility of a compound cannot be measured.
	• pH measures how acidic a solution is.
	• Bases are commonly found in household cleaners.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

*Write an answer to this question: Are all liquids solutions, and are all solutions liquids?
Check your answer later and revise it if you've learned differently.*

Solutions, Acids, and Bases

Section 1 How Solutions Form

Scan the headings, charts, graphs, and illustrations of Section 1. List 3 solutions not mentioned in your book that you might find in your house.

1. _____
2. _____
3. _____

Review Vocabulary

Define homogeneous mixture.

homogeneous mixture

New Vocabulary

Use your book or a dictionary to define the following key terms.

solution

solute

solvent

aqueous solution

Academic Vocabulary

Use a dictionary to define process. Then use the word in a sentence that demonstrates you know its scientific meaning.

process

Section 1 How Solutions Form (continued)

Main Idea

**What is a solution?
Solutes and Solvents**

*I found this information
on page _____.*

How Substances Dissolve

*I found this information
on page _____.*

Details

Create an example of a gas, liquid, and solid phase of a solution in the boxes below. Label the solute and solvent in each box. Use the figures in your book for help.

Gas Phase	Liquid Phase	Solid Phase

Sequence a three-step process of dissolving a polar solid in a polar liquid.

Step 1.



Step 2.



Step 3.

Solutions, Acids, and Bases

Section 2 Solubility and Concentration

Skim the objectives of Section 2 in your book. Write three topics you expect to be covered in the reading.

1. _____
2. _____
3. _____

Review Vocabulary

substance

Define substance to reflect its scientific meaning.

New Vocabulary

Read the definitions below. Then write the key term for each one in the left column.

the greatest amount of solute that can dissolve in a specific amount of solvent at a given temperature

how much solute is in a solution compared to how much solvent

a mixture that contains all the solute it can hold at a given temperature

a mixture that can dissolve more solute at a given temperature

a mixture that has more solute than a saturated solution at the same temperature

Academic Vocabulary

precise

Use a dictionary to define precise.

Section 2 Solubility and Concentration (continued)

Main Idea

Types of Solutions

I found this information on page _____.

Solubility of Gases

I found this information on page _____.

Details

Analyze *the Temperature Effects on Solubility graph in your book. Then list the four substances from least soluble to most soluble at 70°C.*

1. _____
2. _____
3. _____
4. _____

Complete *the graphic organizer about the solubility of gases.*

Increasing the pressure of a gas over a liquid

increases →

Cooling the liquid

increases →

Evaluate *why many people prefer to store carbonated beverages in the refrigerator.*

CONNECT IT

Relate how a household sponge and water can be used to model the concept of an unsaturated solution, a saturated solution, and a supersaturated solution.

Solutions, Acids, and Bases

Section 3 Acids, Bases, and Salts

Skim Section 3. Look at the headings, photos, illustrations, and captions. Write three questions you have about the information you think may be covered in this section. Try to answer your questions as you read.

Question: _____?

Answer: _____

Question: _____?

Answer: _____

Question: _____?

Answer: _____

Review Vocabulary

electrolyte

Define electrolyte to show its scientific meaning.

New Vocabulary

Read the definitions below. Then write the key term for each one in the left column.

a substance that produces hydrogen ions, H^+ , in a water solution

an organic compound that changes color in an acid or a base

any substance that forms hydroxide ions, OH^- in a water solution, or a substance that accepts H^+ ions from acids

Academic Vocabulary

predict

Use a dictionary to define predict to show its scientific meaning.

Section 3 Acids, Bases, and Salts (continued)

Main Idea

Details

Acids

*I found this information
on page _____.*

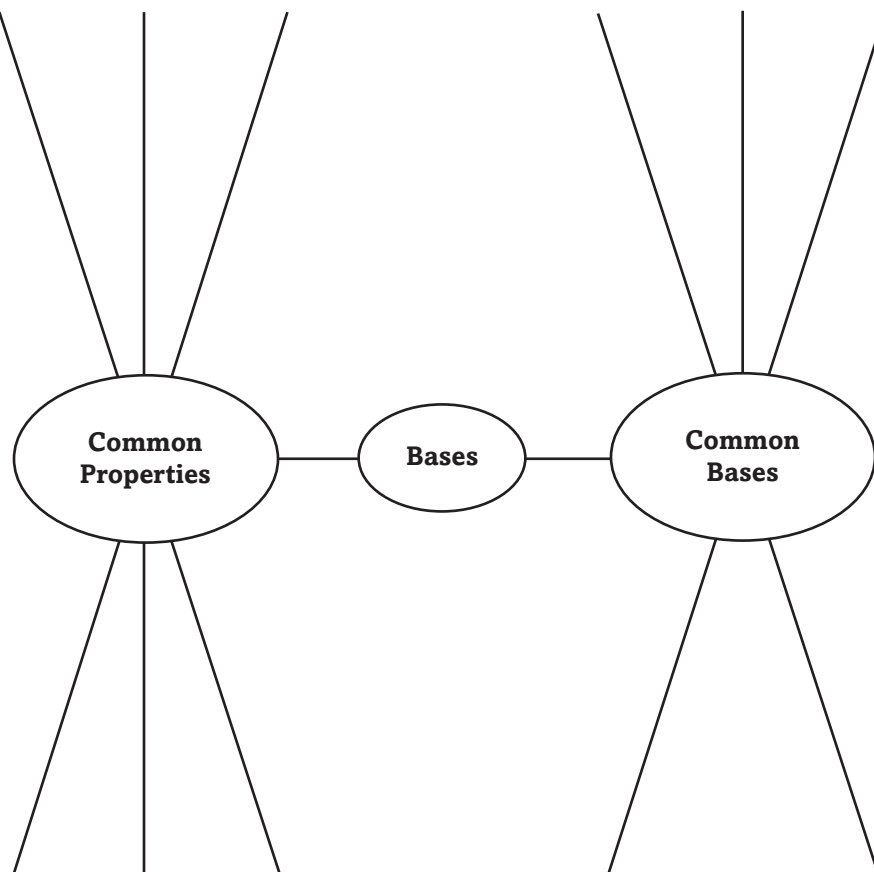
Organize *information about acids using the table below.*

Acids	
Definition:	Four Common Properties:
Four Common Acids:	Four Uses of Acids:

Bases

*I found this information
on page _____.*

Identify *a fact or example about bases on each line.*



Section 3 Acids, Bases, and Salts (continued)

Main Idea

Solutions of Acids and Bases

I found this information on page _____.

I found this information on page _____.

Details

Create one review question dealing with the dissociation of acids and one review question dealing with the dissociation of bases. Give answers to your two questions.

Question: _____?

Answer: _____

Question: _____?

Answer: _____

Model an ammonia molecule and a water molecule. Show what happens during dissociation.

Analyze how ammonia can be a base even though it does not contain OH .

CONNECT IT

The smell of fish is caused by a base. Hypothesize why lemon juice can be used to neutralize the smell of fish.

Solutions, Acids, and Bases

Section 4 Strength of Acids and Bases

Predict Look at the headings in Section 4. Write two predictions about what you will learn in this section.

1. _____

2. _____

Review Vocabulary

acid strength

Define acid strength in a sentence to show its scientific meaning.

New Vocabulary

Read the definitions below. Then write the key term for each one in the blank in the left column.

an acid in which almost all the acid molecules dissociate in water

a base that dissociates completely in solution

a measure of the concentration of H^+ ions in a solution

an acid in which only a small number of the acid molecules dissociate in water

a base that does not dissociate completely in solution

Academic Vocabulary

conduct

Use a dictionary to define conduct as a verb in science.

Section 4 Strength of Acids and Bases (continued)

Main Idea

Strong and Weak Acids and Bases

I found this information on page _____.

I found this information on page _____.

I found this information on page _____.

Details

Evaluate *why acids are able to conduct electricity. Then describe which types of acids are better conductors and why.*

Analyze *information about strong and weak acids and bases.*

	Equation for Dissociation	Arrow Directions Demonstrate
Weak acid		
Weak base		
Strong acid		
Strong base		

Contrast *the terms weak and dilute as they describe acids and bases.*

Weak	Dilute

Describe *what the particles of an acid or base would look like with each combination of characteristics listed below.*

	Concentrate	Diluted
Weak	There are many particles, but not all are dissociated ions.	
Strong		

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Section 4 Strength of Acids and Bases (continued)

Main Idea

Solution pH

*I found this information
on page _____.*

*I found this information
on page _____.*

Details

Model a pH scale from 0 to 14. Then complete the following:

- Circle and label a neutral pH.
- Use arrows to show which direction indicates more acidic and which direction indicates more basic.
- Circle and label the pH level with the highest concentration of H^+ ions and the pH level with the lowest concentration of H^+ ions.

Analyze how buffers allow you to eat acidic and basic foods without changing your blood pH.

CONNECT IT

People with fish tanks test the water regularly to check its pH. Predict what the fish owner would do if the water were too acidic or too basic. Predict how these conditions might affect the fish.

Solutions, Acids, and Bases

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Solutions, Acids, and Bases	After You Read
• A solution is a mixture that has the same composition, color, density, and taste throughout.	
• The solubility of a compound cannot be measured.	
• pH measures how acidic a solution is.	
• Bases are commonly found in household cleaners.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about solutions, acids, and bases.

Nuclear Changes

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Nuclear Changes
	<ul style="list-style-type: none">• An atom's nucleus takes up most of the space occupied by the atom.
	<ul style="list-style-type: none">• An atom's nucleus contains nearly all the mass of the atom.
	<ul style="list-style-type: none">• The strong force holds large nuclei together more effectively than small nuclei.
	<ul style="list-style-type: none">• Radioactive dating uses radioactive isotopes and their half-lives.
	<ul style="list-style-type: none">• Mass and energy are interchangeable according to Einstein's theory of relativity.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a paragraph describing your impressions of the Sun.

Nuclear Changes

Section 1 Radioactivity

Scan Section 1 and write down three topics that might be covered in this section.

1. _____

2. _____

3. _____

Review Vocabulary

Define long-range force.

long-range force

New Vocabulary

Use your book or a dictionary to define the following key terms.

strong force

radioactivity

Academic Vocabulary

Use a dictionary to define stable as it might be used in this section.

stable

Section 1 Radioactivity (continued)

Main Idea	Details												
<p>The Nucleus</p> <p><i>I found this information on page _____.</i></p>	<p>Describe <i>the nucleus. Discuss its size and what it contains.</i></p> <p>_____</p> <p>_____</p> <p>_____</p>												
<p>The Strong Force</p> <p><i>I found this information on page _____.</i></p>	<p>Compare and contrast <i>the strong force and the electrical force in the nuclei of atoms. Describe each force for a small and a large nucleus.</i></p> <table><thead><tr><th>Nucleus Size</th><th>Strong Force</th><th>Electrical Force</th><th>Comparison: Total Effect</th></tr></thead><tbody><tr><td>small</td><td>between holds nucleus tightly together because</td><td>relatively weak;</td><td></td></tr><tr><td>large</td><td></td><td></td><td></td></tr></tbody></table>	Nucleus Size	Strong Force	Electrical Force	Comparison: Total Effect	small	between holds nucleus tightly together because	relatively weak;		large			
Nucleus Size	Strong Force	Electrical Force	Comparison: Total Effect										
small	between holds nucleus tightly together because	relatively weak;											
large													

Section 1 Radioactivity (continued)

Main Idea

Radioactivity

I found this information on page _____.

Details

Organize important information about radioactivity in the boxes below.

Isotopes

Nuclear Decay

Radioactivity

Discovery

Element Symbols

CONNECT IT

Describe how “finding a needle in a haystack” is similar to finding the nucleus in an atom.

Nuclear Changes

Section 2 Nuclear Decay

Preview *the section and list three possible effects of radiation exposure.*

1. _____
2. _____
3. _____

Review Vocabulary

Define electromagnetic wave.

electromagnetic wave

New Vocabulary

Use your book or a dictionary to define the key terms.

alpha particle

transmutation

beta particle

gamma rays

half-life

Academic Vocabulary

Use a dictionary to define nuclear.

nuclear

Section 2 Nuclear Decay (continued)

Main Idea

Details

**Nuclear
Radiation;
Alpha Particles;
Beta Particles;
Gamma Rays**

*I found this information
on page _____.*

Compare and contrast *the properties of alpha, beta, and gamma radiation. For mass, speed, and penetration, write words that compare the three types.*

Nuclear Radiation			
	Alpha	Beta	Gamma
Symbol			γ
Form			
Cause		weak force causes a neutron to decay into a proton plus beta radiation	
Charge			none
Mass			
Speed		faster than alpha	
Penetration			
Example of a material that can stop it	sheet of paper		
Effect on cells			

Section 2 Nuclear Decay (continued)

Main Idea

**Alpha Particles;
Beta Particles**

*I found this information
on page _____.*

**Radioactive
Half-Life,
Radioactive
Dating**

*I found this information
on page _____.*

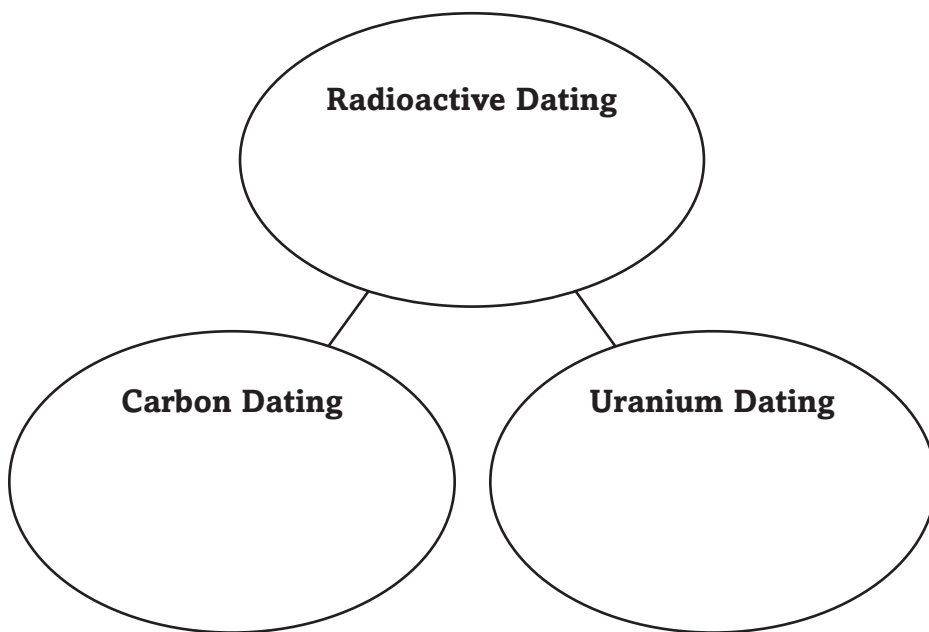
Details

Compare *the transmutation that occurs in alpha radiation and the transmutation that occurs in beta radiation.*

In both alpha and beta transmutation, a nucleus becomes a _____. In alpha radiation, a nucleus emits _____ and _____, so its atomic number _____ by 2 and the mass number decreases by _____.

In beta radiation, _____ decays into a proton, emitting _____. The atomic number _____, but the mass number _____.

Summarize *information about radioactive dating.*



CONNECT IT

Hypothesize how a museum might validate the age of an ancient art masterpiece.

Nuclear Changes

Section 3 Detecting Radioactivity

Scan Section 3 of your book, using the checklist below.

- ☐ Read all section titles.
- ☐ Read all bold words.
- ☐ Read all charts and graphs.
- ☐ Look at all the pictures and read their captions.
- ☐ Think about what you already know about detecting radioactivity.

Write three questions that come to mind after scanning this section.

1. _____
2. _____
3. _____

Review
Vocabulary

ion

Define ion to show its scientific meaning.

New
Vocabulary

Use your book or a dictionary to define the following key terms.

cloud chamber

bubble chamber

Geiger counter

Academic
Vocabulary

Use a dictionary to define expose as it might be used in this section. Then use it in a sentence that reflects this definition.

expose

Section 3 Detecting Radioactivity (continued)

Main Idea

Radiation Detectors; Measuring Radiation

I found this information on page _____.

Details

Describe *how each instrument works to detect or measure radiation.*

Cloud Chamber: _____

Bubble Chamber: _____

Electroscope: _____

Geiger Counter: _____

Background Radiation

I found this information on page _____.

Sequence *the sources of background radiation that occur in nature. Order them from greatest percentage to least percentage.*

Background Radiation	
Source	Percent of Total Radiation
	11%
Rocks and soil	

Nuclear Changes

Section 4 Nuclear Reactions

Skim Section 4. Write three uses for nuclear reactions.

1. _____
2. _____
3. _____

Review Vocabulary

Define kinetic energy using your book or a dictionary.

kinetic energy

New Vocabulary

Use your book or a dictionary to define the key terms.

nuclear fission

chain reaction

critical mass

nuclear fusion

tracer

Academic Vocabulary

Use a dictionary to define target.

target

Section 4 Nuclear Reactions (continued)

Main Idea

Nuclear Fission

I found this information
on page _____.

I found this information
on page _____.

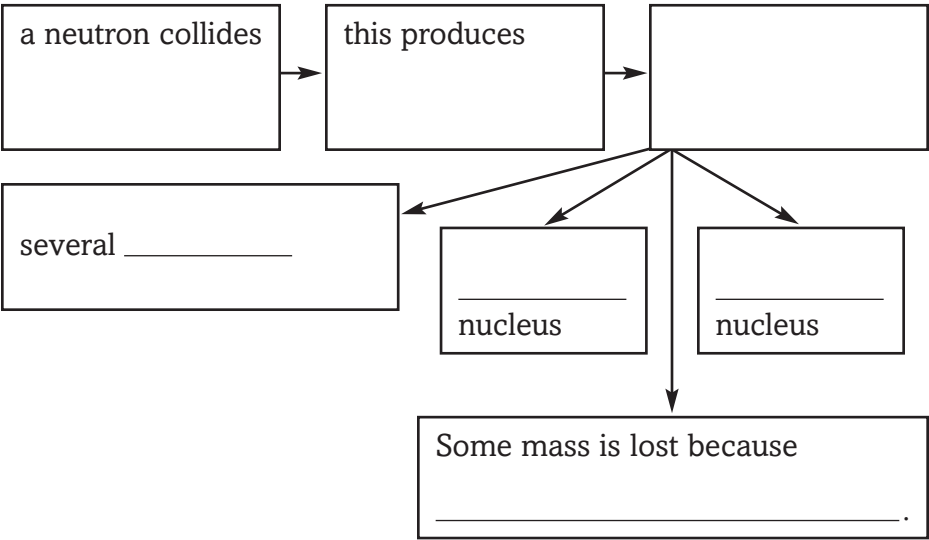
I found this information
on page _____.

Details

Complete the table listing nuclear scientists and their contributions to the theories of nuclear fission.

Year	Scientist	Contribution
1930s	Enrico Fermi	
1938		Found that when a neutron hits a uranium-235 nucleus, the nucleus splits apart into smaller nuclei.
1939	Lise Meitner	

Summarize the process of nuclear fission of uranium.



Define Einstein’s mass-energy equation in words and then write the formula.

Words:

_____ (joules) = _____ (kg) × [_____ (m/s)]

Formula: _____

Section 4 Nuclear Reactions (continued)

Main Idea

Nuclear Fusion

*I found this information
on page _____.*

**Using Nuclear
Reactions in
Medicine**

*I found this information
on page _____.*

Details

Summarize *the energy requirements of nuclear fusion.*

what must be overcome: _____

this is in order to: _____

type of energy that can do it: _____

this type of energy increases with: _____

common places to find enough energy: _____

Describe *two ways nuclear reactions are used in medicine.*

Tracers	Cancer Treatment

SYNTHESIZE IT

Using Einstein's mass-energy equation, explain in your own words why a tremendous amount of energy is produced by a small amount of mass.

Nuclear Changes

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Nuclear Changes	After You Read
• An atom’s nucleus takes up most of the space occupied by the atom.	
• An atom’s nucleus contains nearly all the mass of the atom.	
• The strong force holds large nuclei together more effectively than small nuclei.	
• Radioactive dating uses radioactive isotopes and their half-lives.	
• Mass and energy are interchangeable according to Einstein’s theory of relativity.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about radioactivity and nuclear reactions.

Stars and Galaxies

Before You Read

Before you read the chapter, respond to these statements.

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

Before You Read	Stars and Galaxies
	<ul style="list-style-type: none">• The constellations that are visible in the night sky change throughout the year.
	<ul style="list-style-type: none">• The Sun's interior contains a core, radiation layer, and a convection layer.
	<ul style="list-style-type: none">• Stars outside the Milky Way galaxy can be seen from Earth.
	<ul style="list-style-type: none">• Much of the matter in the universe cannot be seen.



Construct the Foldable as directed at the beginning of this chapter.

Science Journal

Write a paragraph about what you know about the Sun as a star.

Stars and Galaxies

Section 1 Observing the Universe

Scan the headings and illustrations in Section 1. Write three questions you have about constellations or telescopes. Look for answers to your questions as you read.

1. _____

2. _____

3. _____

Review Vocabulary

electromagnetic spectrum

Define electromagnetic spectrum *using your book or a dictionary.*

New Vocabulary

Read the definitions below. Use your book to fill in the correct vocabulary term.

optical instrument that uses a concave mirror to collect light and a lens to magnify an image

distance that light travels in one year, about 9.5 trillion km

star pattern that appears to form an image and often is named for a mythological figure

telescope that collects and amplifies radiowaves coming from objects in space

instrument that disperses light into its component wavelengths using a prism or diffraction grating

optical instrument that uses double convex lenses to collect light and magnify an image

Academic Vocabulary

image

Use a dictionary to define the term image. Then use the term in a sentence that shows its scientific meaning.

Section 1 Observing the Universe (continued)

Main Idea

Constellations

I found this information
on page _____.

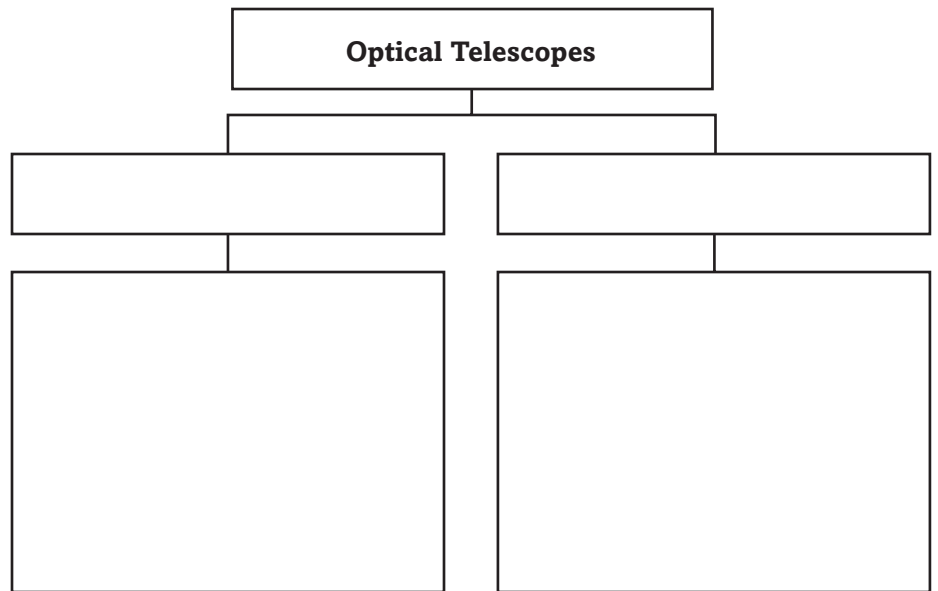
I found this information
on page _____.

I found this information
on page _____.

Details

Summarize the origin of the names of constellations.

Identify the 2 types of optical telescopes. Then state three facts about each kind of telescope.



Complete the paragraph below about radio telescopes.

Radio waves are a form of _____.

Radio waves can be detected during both _____

and travel through Earth's _____ on both clear

days and _____. A _____

collects and amplifies _____. These instruments

usually are built with a very _____, similar to a

large dish antenna, to collect and amplify the radio waves.

Section 1 Observing the Universe (continued)

Main Idea

Spectroscopes

I found this information
on page _____.

I found this information
on page _____.

Details

Summarize four kinds of information a scientist can learn about a star by using a spectroscope.

- 1. _____
- 2. _____
- 3. _____
- 4. _____

Create a concept map to help identify and sequence the colors of the spectrum.

Evaluate how a star’s spectrum can be used to determine its surface temperature. Provide an example to support your reasoning.

COMPARE IT

Compare optical telescopes on Earth with the *Hubble Space Telescope*. Describe advantages and disadvantages of each.

Stars and Galaxies

Section 2 Evolution of Stars

Scan the headings in Section 2 of your book. Identify three topics that will be discussed in this section.

1. _____
2. _____
3. _____

Review Vocabulary

absolute magnitude

Define absolute magnitude *to show its scientific meaning.*

New Vocabulary

Read the definitions below. Use your book to fill in the correct vocabulary term.

section from the upper left to the lower right of an H-R diagram that contains 90 percent of all stars

late stage in a star's life cycle that occurs when its hydrogen fuel is depleted, its core contracts, and its outer layers expand and cool

giant star that has lost its outer layers, leaving behind a hot, dense core that continues to contract under gravity

surface layer of the Sun that gives off light

cool, darker areas of the Sun's photosphere

Academic Vocabulary

evolve

Use a dictionary to define the term evolve to show its scientific meaning.

Section 2 Evolution of Stars (continued)

Main Idea

Details

How do stars form?

I found this information on page _____.

Write the 5 steps of star formation.

Formation of a Star
1.
2.
3.
4.
5.

How do stars change?

I found this information on page _____.

Complete the statement about stellar equilibrium in a main sequence star. Then complete the table to summarize how stars change based on their total mass once they move off the main sequence.

Stellar equilibrium exists when _____

Mass	Initial Stage	Middle Stage	Final Stage
1 to 8 solar masses			
8 to 25 solar masses			
25 or more solar masses			

Section 2 Evolution of Stars (continued)

Main Idea

The Sun—A Main Sequence Star

I found this information on page _____.

I found this information on page _____.

Details

Sketch a diagram of the Sun below. Label your diagram with these terms.

- radiation zone
- corona
- core
- photosphere
- convection zone

Compare prominences, flares, and CMEs in the table.

Feature	Description
Flare	
CME	
Prominence	

EVALUATE IT

A star in the sky suddenly brightens to many times its original brightness and then fades gradually over the next several years. Hypothesize what happened in terms of a star's life cycle.

Stars and Galaxies

Section 3 Galaxies and the Milky Way

Scan the bold headings in this section. List three things you might learn about galaxies or the Milky Way.

1. _____

2. _____

3. _____

Review Vocabulary

ellipse

Define ellipse to show its scientific meaning.

New Vocabulary

galaxy

Use your book to define the following key terms.

Milky Way

Local Group

Academic Vocabulary

core

Use a dictionary to define core. Then write a scientific sentence that includes the word.

Section 3 Galaxies and the Milky Way (continued)

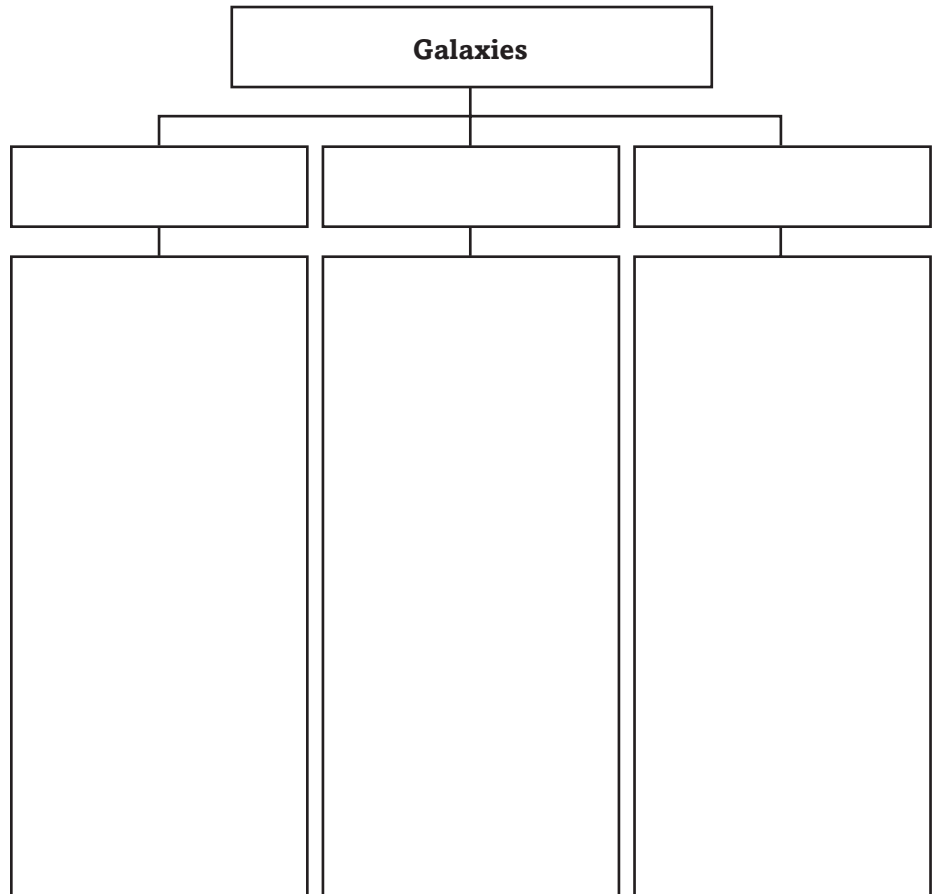
Main Idea

Galaxies

*I found this information
on page _____.*

Details

Classify galaxies into the 3 types and identify three facts about each. Record your information in the graphic organizer below.



**How do
galaxies form?**

*I found this information
on page _____.*

Summarize how galaxies might have formed and grown.

Section 3 Galaxies and the Milky Way (continued)

Main Idea

Details

The Milky Way

I found this information
on page _____.

Choose the correct number from the box below to complete each sentence.

28,000	2	10,000	225	400	1,000	100,000	220
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1. The Sun is about _____ light-years from the center of the Milky Way.
2. It takes the Sun _____ million years traveling at _____ km/s to orbit the Milky Way.
3. In the center of the Milky Way is a bulge that measures _____ light-years in diameter.
4. The Milky Way has been gobbling up the Sagittarius dwarf galaxy for about _____ billion years.
5. The Milky Way’s disk is about _____ light-years thick.
6. The Milky Way contains about _____ billion stars.
7. The Milky Way measures nearly _____ light-years across.

CONNECT IT

We live in the Milky Way galaxy. Yet the Milky Way is not the most common type of galaxy. Identify three ways the Milky Way differs from the most common type of galaxy in the universe.

Stars and Galaxies

Section 4 Cosmology

Scan the headings in Section 4. List three questions you have about cosmology.

1. _____

2. _____

3. _____

Review Vocabulary

universe

Define universe to show its scientific meaning.

New Vocabulary

Write the correct vocabulary term on the blank next to each definition.

study of how the universe began, what it is made of, and how it continues to evolve

unseen mass that adds to the gravity of a galaxy, but cannot be detected or seen

energy that might be causing accelerated expansion of the universe

the theory that the universe started with a big bang, or explosion, and has been expanding ever since

Academic Vocabulary

expansion

Use a dictionary to define the term expansion to show its scientific meaning.

Section 4 Cosmology (continued)

Main Idea

Details

How did it begin?

I found this information
on page _____.

Explain *how to model the expansion of the universe by inflating a balloon.*

The Big Bang Theory

I found this information
on page _____.

Summarize *the microwave background radiation and two scientific findings about the universe in the graphic organizer below.*

Microwave Background Radiation

Wilkinson Microwave Anisotropy Probe
1.
2.

Section 4 Cosmology (continued)

Main Idea

Expansion of the Universe

I found this information on page _____.

What is the universe made of?

I found this information on page _____.

Details

Complete *the following paragraph about the Doppler shift.*

The _____ is a change in the wavelength of _____ waves or _____ waves that occurs when the waves are _____ or _____. When a galaxy is moving toward the Milky Way, its light waves are _____, causing a _____. Light waves from a galaxy moving away from the Milky Way are _____, causing a _____.

Organize *information about dark matter and dark energy.*

Dark Matter	Dark Energy
1.	1.
2.	2.
3.	3.

SYNTHESIZE IT

Analyze why dark matter and dark energy are referred to as dark.

Stars and Galaxies

Chapter Wrap-Up

Now that you have read the chapter, think about what you have learned and complete the table below. Compare your previous answers to these.

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

Stars and Galaxies	After You Read
• The constellations that are visible in the night sky change throughout the year.	
• The Sun’s interior contains a core, radiation layer, and a convection layer.	
• Stars outside the Milky Way galaxy can be seen from Earth.	
• Much of the matter in the universe cannot be seen.	

Review

Use this checklist to help you study.

- ☐ Review the information you included in your Foldable.
- ☐ Study your *Science Notebook* on this chapter.
- ☐ Study the definitions of vocabulary words.
- ☐ Review daily homework assignments.
- ☐ Re-read the chapter and review the charts, graphs, and illustrations.
- ☐ Review the Self Check at the end of each section.
- ☐ Look over the Chapter Review at the end of the chapter.

SUMMARIZE IT

After reading this chapter, identify three things you have learned about stars and galaxies.
