

Chapter Resources

Atmosphere

Includes:

Reproducible Student Pages

ASSESSMENT

- ✓ Chapter Tests
- ✓ Chapter Review

HANDS-ON ACTIVITIES

- ✓ Activity Worksheets for each Student Edition Activity
- ✓ Laboratory Activities
- ✓ Foldables—Reading and Study Skills activity sheet

MEETING INDIVIDUAL NEEDS

- ✓ Directed Reading for Content Mastery
- ✓ Directed Reading for Content Mastery in Spanish
- ✓ Reinforcement
- ✓ Enrichment
- ✓ Note-taking Worksheets

TRANSPARENCY ACTIVITY MASTERS

- ✓ Section Focus Activity
- ✓ Teaching Transparency Activity
- ✓ Assessment Transparency Activity

Teacher Support and Planning

- ✓ Content Outline for Teaching
- ✓ Spanish Resources
- ✓ Teacher Guide and Answers



**Glencoe
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Glencoe Science

Student Edition

Teacher Wraparound Edition

Interactive Teacher Edition CD-ROM

Interactive Lesson Planner CD-ROM

Lesson Plans

Content Outline for Teaching

Directed Reading for Content Mastery

Foldables: Reading and Study Skills

Assessment

Chapter Review

Chapter Tests

ExamView Pro Test Bank Software

Assessment Transparencies

Performance Assessment in the Science

Classroom

The Princeton Review Standardized Test

Practice Booklet

Directed Reading for Content Mastery in Spanish

Spanish Resources

Guided Reading Audio Program

Reinforcement

Enrichment

Activity Worksheets

Section Focus Transparencies

Teaching Transparencies

Laboratory Activities

Science Inquiry Labs

Critical Thinking/Problem Solving

Reading and Writing Skill Activities

Cultural Diversity

*Laboratory Management and Safety in the Science
Classroom*

MindJogger Videoquizzes and Teacher Guide

Interactive Explorations and Quizzes CD-ROM

Vocabulary Puzzlemaker Software

Cooperative Learning in the Science Classroom

Environmental Issues in the Science Classroom

Home and Community Involvement

Using the Internet in the Science Classroom

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Additional Assessment Resources available with Glencoe Science:

- ExamView Pro Test Bank Software
- Assessment Transparencies
- Performance Assessment in the Science Classroom
- The Princeton Review Standardized Test Practice Booklet
- MindJogger Videoquizzes
- Vocabulary Puzzlemaker Software
- Interactive Explorations and Quizzes CD-ROM with Presentation Builder
- The Glencoe Science Web site at: **science.glencoe.com**
- An interactive version of this textbook along with assessment resources are available online at: **mhl.com**

To the Teacher

This chapter-based booklet contains all of the resource materials to help you teach this chapter more effectively. Within you will find:

Reproducible pages for

- Student Assessment
- Hands-on Activities
- Meeting Individual Needs (Extension and Intervention)
- Transparency Activity Masters

A teacher support and planning section including

- Content Outline of the chapter
- Spanish Resources
- Answers and teacher notes for the worksheets

Hands-On Activities

MiniLAB and Activity Worksheets: Each of these worksheets is an expanded version of each activity and MiniLAB found in the Student Edition. The materials lists, procedures, and questions are repeated so that students do not need their texts open during the lab. Write-on rules are included for any questions. Tables/charts/graphs are often included for students to record their observations. Additional lab preparation information is provided in the *Teacher Guide and Answers* section.

Laboratory Activities: These activities do not require elaborate supplies or extensive pre-lab preparations. These student-oriented labs are designed to explore science through a stimulating yet simple and relaxed approach to each topic. Helpful comments, suggestions, and answers to all questions are provided in the *Teacher Guide and Answers* section.

Foldables: At the beginning of each chapter there is a *Foldables: Reading & Study Skills* activity written by renowned educator, Dinah Zike, that provides students with a tool that they can make themselves to organize some of the information in the chapter. Students may make an organizational study fold, a cause and effect study fold, or a compare and contrast study fold, to name a few. The accompanying *Foldables* worksheet found in this resource booklet provides an additional resource to help students demonstrate their grasp of the concepts. The worksheet may contain titles, subtitles, text, or graphics students need to complete the study fold.

Meeting Individual Needs (Extension and Intervention)

Directed Reading for Content Mastery: These worksheets are designed to provide students with learning difficulties with an aid to learning and understanding the vocabulary and major concepts of each chapter. The *Content Mastery* worksheets contain a variety of formats to engage students as they master the basics of the chapter. Answers are provided in the *Teacher Guide and Answers* section.

Directed Reading for Content Mastery (in Spanish): A Spanish version of the *Directed Reading for Content Mastery* is provided for those Spanish-speaking students who are learning English.

Reinforcement: These worksheets provide an additional resource for reviewing the concepts of the chapter. There is one worksheet for each section, or lesson, of the chapter. The *Reinforcement* worksheets are designed to focus primarily on science content and less on vocabulary, although knowledge of the section vocabulary supports understanding of the content. The worksheets are designed for the full range of students; however, they will be more challenging for your lower-ability students. Answers are provided in the *Teacher Guide and Answers* section.

Enrichment: These worksheets are directed toward above-average students and allow them to explore further the information and concepts introduced in the section. A variety of formats are used for these worksheets: readings to analyze; problems to solve; diagrams to examine and analyze; or a simple activity or lab which students can complete in the classroom or at home. Answers are provided in the *Teacher Guide and Answers* section.

Note-taking Worksheet: The *Note-taking Worksheet* mirrors the content contained in the teacher version—*Content Outline for Teaching*. They can be used to allow students to take notes during class, as an additional review of the material in the chapter, or as study notes for students who have been absent.



Assessment

Chapter Review: These worksheets prepare students for the chapter test. The *Chapter Review* worksheets cover all major vocabulary, concepts, and objectives of the chapter. The first part is a vocabulary review and the second part is a concept review. Answers and objective correlations are provided in the *Teacher Guide and Answers* section.

Chapter Test: The *Chapter Test* requires students to use process skills and understand content. Although all questions involve memory to some degree, you will find that your students will need to discover relationships among facts and concepts in some questions, and to use higher levels of critical thinking to apply concepts in other questions. Each chapter test normally consists of four parts: Testing Concepts measures recall and recognition of vocabulary and facts in the chapter; Understanding Concepts requires interpreting information and more comprehension than recognition and recall—students will interpret basic information and demonstrate their ability to determine relationships among facts, generalizations, definitions, and skills; Applying Concepts calls for the highest level of comprehension and inference; Writing Skills requires students to define or describe concepts in multiple sentence answers. Answers and objectives are provided in the *Teacher Guide and Answers* section.



Transparency Activity Masters

Section Focus Transparencies: These transparencies are designed to generate interest and focus students' attention on the topics presented in the sections and/or to assess prior knowledge. There is a transparency for each section, or lesson, in the Student Edition. The reproducible student masters are located in the *Transparency Activities* section. The teacher material, located in the *Teacher Guide and Answers* section, includes Transparency Teaching Tips, a Content Background section, and Answers for each transparency.

Teaching Transparencies: These transparencies relate to major concepts that will benefit from an extra visual learning aid. Most of these transparencies contain diagrams/photos from the Student Edition. There is one *Teaching Transparency* for each chapter. The *Teaching Transparency Activity* includes a black-and-white reproducible master of the transparency accompanied by a student worksheet that reviews the concept shown in the transparency. These masters are found in the *Transparency Activities* section. The teacher material includes Transparency Teaching Tips, a Reteaching Suggestion, Extensions, and Answers to Student Worksheet. This teacher material is located in the *Teacher Guide and Answers* section.

Assessment Transparencies: An *Assessment Transparency* extends the chapter content and gives students the opportunity to practice interpreting and analyzing data presented in charts, graphs, and tables. Test-taking tips that help prepare students for success on standardized tests and answers to questions on the transparencies are provided in the *Teacher Guide and Answers* section.

Teacher Support and Planning

Content Outline for Teaching: These pages provide a synopsis of the chapter by section, including suggested discussion questions. Also included are the terms that fill in the blanks in the students' *Note-taking Worksheets*.

Spanish Resources: A Spanish version of the following chapter features are included in this section: objectives, vocabulary words and definitions, a chapter purpose, the chapter Activities, and content overviews for each section of the chapter.

Reproducible Student Pages

Reproducible Student Pages

■ Hands-On Activities

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Hands-On Activities



Determining If Air Has Mass

Procedure

1. On a **pan balance**, find the mass of an **inflatable ball** that is completely deflated.
2. Hypothesize about the change in the mass of the ball when it is inflated.
3. Inflate the ball to its maximum recommended inflation pressure.
4. Determine the mass of the fully inflated ball.

Mass of ball when completely deflated	Predicted mass of ball when fully inflated	Actual mass of ball when fully inflated

Analysis

1. What change occurs in the mass of the ball when it is inflated?

2. Infer from your data whether air has mass.

TRY AT HOME



Model the Water Cycle

Procedure



1. Fill a clear **glass jar** with hot tap **water**.
2. Cover the jar with a **pie pan** or small **cooking pan**.
3. Add crushed **ice** to the pan.
4. Observe for 20 min.

Analysis

1. What did you observe happening on the bottom of the pan?

2. How is this similar to the water cycle?



Evaluating Sunscreens

Lab Preview

Directions: Answer these questions before you begin the Activity.

1. Why are terms like “sunblock” and “waterproof” misleading?

2. Why is it important to calculate the cost per fluid ounce of each brand of sunscreen?

Without protection, sun exposure can damage your health. Sunscreens protect your skin from ultra violet radiation. In this activity, you will draw inferences using the labels of different sunscreens.

What You'll Investigate

How effective are various brands of sunscreens?

Materials

variety of sunscreens of different brand names

Goals

- **Draw inferences** based on labels on sun-screen brands.
- **Compare** the effectiveness of different sun-screen brands for protection against the Sun.
- **Compare** the cost of several sunscreen brands.

Safety Precautions



Procedure

1. The Sun Protection Factor (SPF) tells you how long the sunscreen will protect you. For example, an SPF of 4 allows you to stay in the Sun four times longer than if you did not use sunscreen. Record the SPF of each sunscreen on the data table below.
2. **Calculate** the cost per fluid ounce of each sunscreen brand.
3. Government guidelines say terms like *sunblock* and *water proof*, are misleading because sunscreens cannot block the Sun, and they wash off in water. List the misleading terms in your the table for each brand.

Data and Observations

Brand name	SPF	Misleading terms	Cost per fluid ounce
1.			
2.			
3.			
4.			

Activity (continued)**Conclude and Apply**

1. **Explain** why you need to use sunscreen.

2. A minimum of SPF 15 is considered adequate protection for a sunscreen. Sunscreens with an SPF greater than 30 are considered by government guidelines to be misleading because sunscreens will wash or wear off. Evaluate the SPF of each brand of sunscreen.

3. Considering the cost and effectiveness of all the sunscreen brands, discuss which brand you consider to be the best buy.

Communicating Your Data

Create a poster on the proper use of sunscreens, and provide guidelines for selecting the safest product. **For more help, refer to the Science Skill Handbook.**



Design Your Own Experiment

The Heat Is On

Lab Preview

Directions: Answer these questions before you begin the Activity.

1. What does the safety symbol shaped like an oven mitt mean?

2. What two substances will you be comparing?

Sometimes, a plunge in a pool or lake on a hot summer day feels cool and refreshing. Why does the beach sand get so hot when the water remains cool? A few hours later, the water feels warmer than the land does. In this activity, you'll explore how water and land absorb heat.

Recognize the Problem

How do soil and water compare in their abilities to absorb and emit heat?

Form a Hypothesis

Form a hypothesis to explain how soil and water compare in their abilities to absorb and release heat. Write another hypothesis about how air temperatures above soil and above water differ during the day and night.

Safety

Precautions



CAUTION: Be careful when handling the hot overhead light. Do not let the light or its cord make contact with water.

Possible Materials

ring stand	clear plastic boxes (2)
soil	overhead light with reflector
metric ruler	thermometers (4)
water	colored pencils (4)
masking tape	

Goals

- **Design** an experiment to compare the rates of heat absorption and release for soil and water.
- **Observe** how these differing rates of heat absorption and release affect the air above soil and above water.

Test Your Hypothesis

Plan

1. As a group, agree upon and write your hypotheses.
2. **List** the steps that you need to take to test your hypotheses. Include in your plan how you will use your equipment to compare the rates of heat absorption and release for water and soil.
3. **Design** a data table on a separate sheet of paper for both parts of your experiment—when the light is on and energy can be absorbed and when the light is off and energy is released to the environment.

Do

1. Make sure your teacher approves your plan and your data table before you start.
2. Carry out the experiment as planned.
3. During the experiment, record your observations and complete the data table.
4. Include in your measurements the temperatures of the soil and the water. Also compare the rate of release of heat for water and soil. Include the temperatures of the air immediately above both of the substances. Allow 14 min for each test.

Activity (continued)**Analyze your Data**

1. Use your colored pencils and the information in your data tables to make line graphs. Show the rate of temperature increase for soil and water. Graph the rate of temperature decrease for soil and water after you turn the light off.
2. **Analyze** your graphs. When the light was on, which heated up faster—the soil or the water?

3. **Compare** how fast the air temperatures over the water changed with how fast the temperatures over the land changed after the light was turned off.

Draw Conclusions

1. Was your hypothesis supported or not? Explain.

2. **Infer** from your graphs which lost heat faster—the water or the soil.

3. **Compare** the temperatures of the air above the water and above the soil 14 minutes after the light was turned off. How do water and soil compare in their abilities to absorb and release heat?

Communicating Your Data

Make a poster showing the steps you followed for your experiment. Include the graph of your data. **Display** your poster in the classroom. **For more help, refer to the Science Skill Handbook.**



Laboratory Activity

Air Volume and Pressure

You can't always see the air in Earth's atmosphere, but air is real. Like any other form of matter, air has definite physical properties. As you work through this activity, you will observe two of the properties of air—volume and pressure.

Strategy

You will demonstrate that air has volume (occupies space).

You will demonstrate that air exerts pressure.

Materials



water

beaker (500-ml)

bicycle pump

air mattress

meterstick

Procedure

1. Put 250 ml of water in the beaker.
2. Insert the hose of the bicycle pump so it is below the surface of the water.
3. To demonstrate that air occupies space, pump air into the water. Record your observations. Remove the pump hose.
4. To demonstrate that air exerts pressure, place the air mattress on the floor. Press the mattress flat to be sure it contains very little air. Feel the floor through the mattress.
5. Measure in centimeters the length, width, and thickness of the air mattress. Record your measurements in Table 1.
6. Inflate the mattress using the bicycle pump. Measure and record the dimensions of the mattress again.
7. Push down with your hand on one area of the inflated air mattress. Note how the dimensions of the area you are pushing on change. How does the part of the mattress surrounding your hands change?

Data and Observations

Observations:

1. Air pumped into beaker:

2. Pushing down on mattress:

Table 1

Air mattress	Before pumping	After pumping
1. Length (cm)		
2. Width (cm)		
3. Thickness (cm)		

Laboratory Activity 1 (continued)**Questions and Conclusions**

1. What happened in the beaker of water when you pumped air into it?

2. What property of air does this demonstrate?

3. Calculate the volume of air in the air mattress. Show your work below. If you need more room, use the back of this page.

4. What happened to the thickness of the air mattress in the area where you pushed on it?

5. What happened to the area of the air mattress surrounding the area you pushed? What property of air does this show?

6. Does air exert pressure? Defend your answer.

Strategy Check

_____ Can you demonstrate that air has volume?

_____ Can you demonstrate that air exerts pressure?



Laboratory Activity

Temperature of the Air

Air temperature is an important factor in the scientific study of weather. Air temperature affects air pressure and, thus, the type of weather that may occur. Differences in air temperature also cause winds. By studying the air temperature and weather at different times during the day, you may be able to predict how the air temperature will affect local weather.

Strategy

You will measure air temperature at different times during the day.

You will measure air temperature at the same location each time.

You will graph your results and compare your graph with those of your classmates.

Materials



Celsius thermometer (metal backed)

graph paper

Procedure

1. Select an outdoor site for taking air temperature readings. Make sure the site is an open shaded area.
2. Record the air temperature at this site three times each day for a week. Be careful to read the thermometer at the same times each day. Record data in Table 1.
3. Record additional weather factors, such as cloud cover, precipitation, and winds.

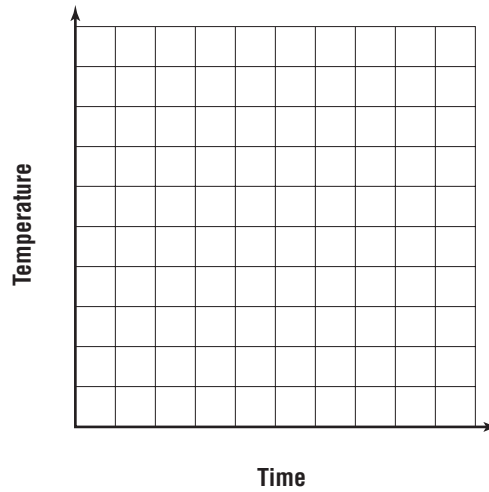
Data and Observations

Table 1

Date	Time	Temp (°C)	Other
	1.		
	2.		
	3.		
	1.		
	2.		
	3.		
	1.		
	2.		
	3.		
	1.		
	2.		
	3.		

Laboratory Activity 2 (continued)

Graph your data showing temperature and time. Graph temperature on the vertical axis and time on the horizontal axis.

**Questions and Conclusions**

1. Why did you take your air temperature readings in the shade instead of the Sun?

2. Describe any patterns in your air temperature graph.

3. Do these patterns agree with patterns observed by your classmates? Explain.

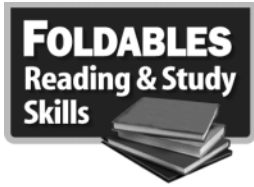
4. How can you explain the patterns in terms of solar energy absorbed by the land?

Strategy Check

_____ Can you measure air temperature?

_____ Can you collect data for a week?

_____ Can you graph your data?



Atmosphere

Directions: Use this page to label your Foldable in the *Before You Read* at the beginning of the chapter.

Earth's Atmosphere

Troposphere

Stratosphere

Mesosphere

Thermosphere

Exosphere

The lowest of Earth's layers, it's where I live.

This layer above the troposphere contains higher levels of ozone.

This layer extends from the stratosphere to about 85 km above Earth.

Within this layer lies the ionosphere, which allows radio waves to travel far distances.

You'll find the space shuttle in this highest layer.

Meeting Individual Needs



Directed Reading for
Content Mastery

Overview Atmosphere

Directions: Complete the concept map using the terms in the list below.

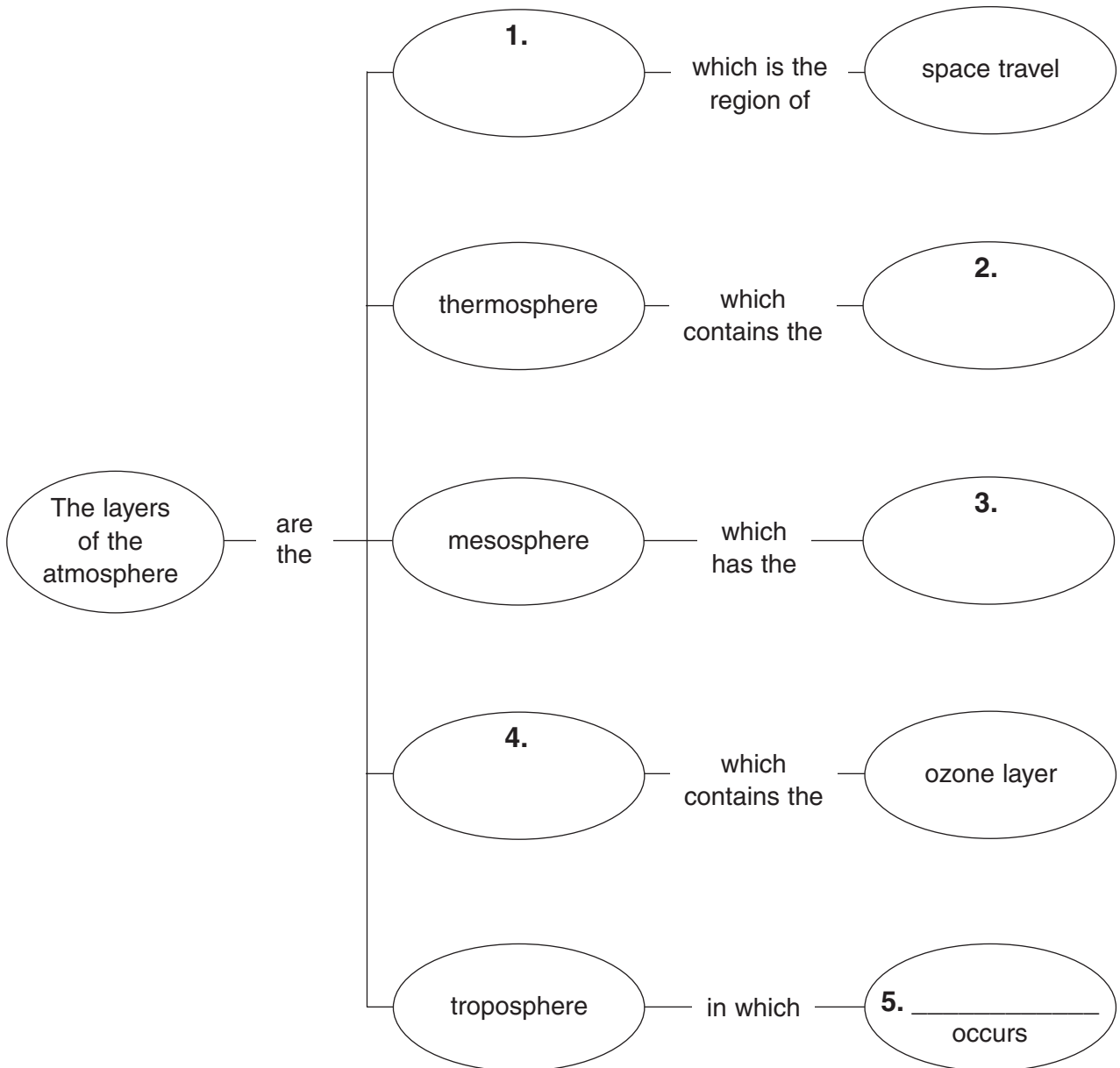
weather

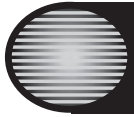
exosphere

coldest air temperature

ionosphere

stratosphere





Directed Reading for
Content Mastery

**Section 1 ■ Earth's
Atmosphere**
**Section 2 ■ Energy
Transfer in
the Atmosphere**

Directions: *Unscramble the terms in italics to complete the sentences below. Write the terms on the lines provided.*

1. The layer of atmosphere that we live in is the *oreeshroppt*.

2. The most common gas in our atmosphere is *gnoetrin*.

3. The layer of atmosphere that contains the ozone layer is the *rattsoreeph*s.

4. Harmful energy that comes from the sun is *travelutoil triadiona*.

5. Chemical compounds that pollute the atmosphere are *frochrabonlorolucos*.

6. Energy is transferred when molecules bump into one another in *notonducci*.

7. A cycle in which air is warmed, warm air rises, air is cooled, and cooled air sinks is a *nocitecnov centurr*.

8. All the water on Earth's surface is called the *dropshyere*.

9. The process of water vapor changing to a liquid is called *cannedsitnoo*.

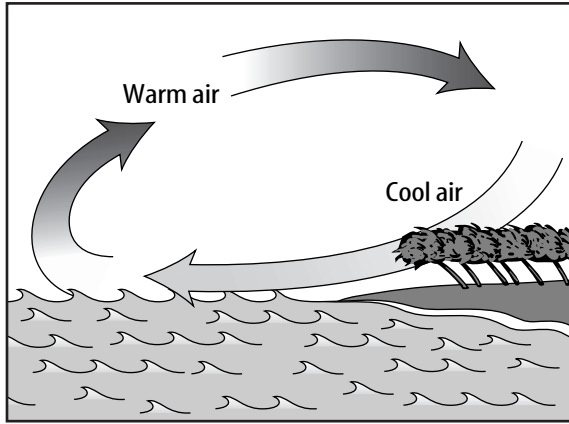
10. When water changes from a liquid to a gas, it *asprotavee*.



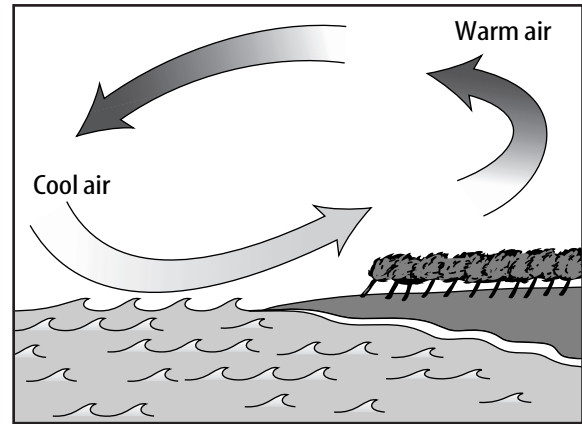
Directed Reading for Content Mastery

Section 3 ■ Air Movement

Directions: Identify the illustrations below as showing a sea breeze or land breeze.



1. _____



2. _____

Directions: Match each cause with the correct effect. Write the letter of the effect in the blank before the cause.

Cause

- _____ 3. The equator receives more of the Sun's energy.
- _____ 4. Warm air is less dense than cold air.
- _____ 5. The poles receive less of the Sun's energy.
- _____ 6. Cold air is more dense than warm air.
- _____ 7. Warm air molecules are farther apart.
- _____ 8. Earth rotates.

Effect

- a. Cold air sinks.
- b. Air near the equator is warmer.
- c. The Coriolis effect exists.
- d. Warm air rises.
- e. Warm air is less dense.
- f. Air near the poles is colder.



Key Terms

Atmosphere

Directions: Use the terms to complete the puzzle below. The letters in the dark, vertical box will spell a familiar term.

Coriolis effect

troposphere

sea breeze

ionosphere

ozone layer

jet stream

radiation

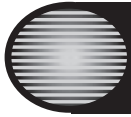
land breeze

condensation

hydrosphere

A crossword puzzle grid with 10 numbered starting points for words. The grid is 10 columns wide and 10 rows high. The starting points are: 1 (1,1), 2 (2,2), 3 (1,3), 4 (4,4), 5 (2,5), 6 (3,6), 7 (4,7), 8 (5,8), 9 (6,9), and 10 (7,10).

1. Part of atmosphere that protects Earth from harmful radiation
2. The transfer of energy that occurs when molecules bump into one another
3. Narrow belt of strong wind at high altitude
4. All the water on Earth's surface
5. The process of water vapor changing to a liquid
6. Layer of atmosphere closest to Earth's surface
7. A layer of charged particles above Earth
8. Constant movement of water between the atmosphere and Earths.
9. Changes direction of free moving fluids such as air and water
10. A convection current created during the day



Lectura dirigida para
Dominio del contenido

Sinopsis La atmósfera

Instrucciones: Completa el mapa conceptual usando los siguientes términos.

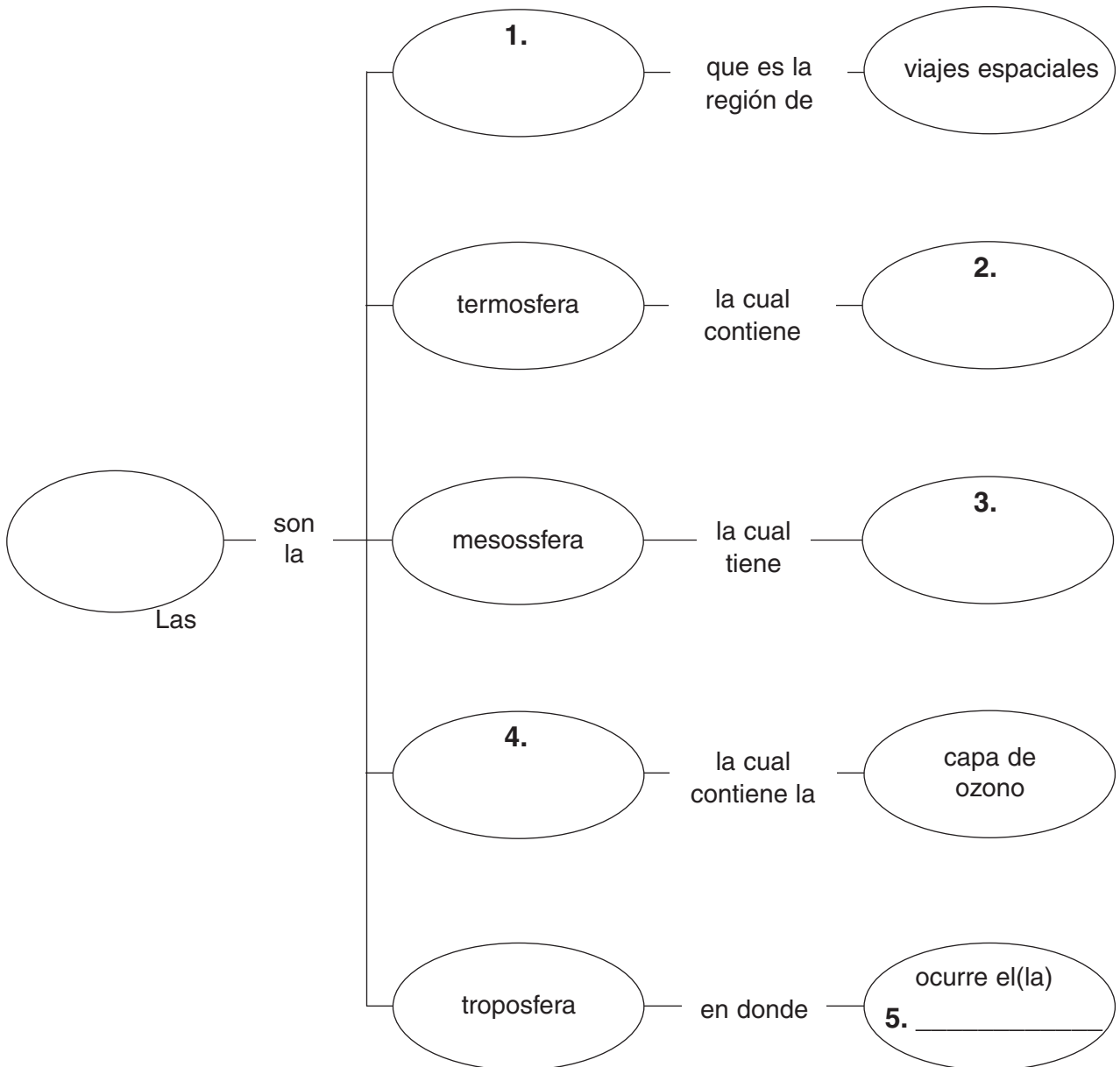
tiempo

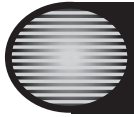
exosfera

temperatura del aire más fría

ionosfera

estratosfera





Lectura dirigida para
Dominio del contenido

Sección 1 ■ La atmósfera terrestre

Sección 2 ■ Transferencia de energía en la atmósfera

Instrucciones: Descifra las letras de los términos en bastardilla para completar las oraciones. Escribe los términos en las líneas dadas.

1. La capa de la atmósfera en donde vivimos es la *fraeoprto*.

2. El gas más común en la atmósfera es el *goinrtóen*.

3. La capa de la atmósfera que contiene la capa de ozono es la *featarseotsr*.

4. La energía dañina proveniente del Sol es el(la) *canióardi vulratoitela*.

5. Algunos de los compuestos químicos que contaminan la atmósfera son los *cursoarhordib*.

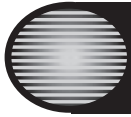
6. En la *cindónucoc*, la energía se transfiere cuando las moléculas chocan unas con otras.

7. El ciclo en el cual el aire se calienta, se eleva, luego se enfría y ya frío se hunde es un(a) *riercteno de vceccónoin*.

8. Toda el agua de la superficie de la Tierra se conoce como la *fraehodris*.

9. El proceso por el cual el vapor de agua cambia a líquido se llama *dacóisconen*.

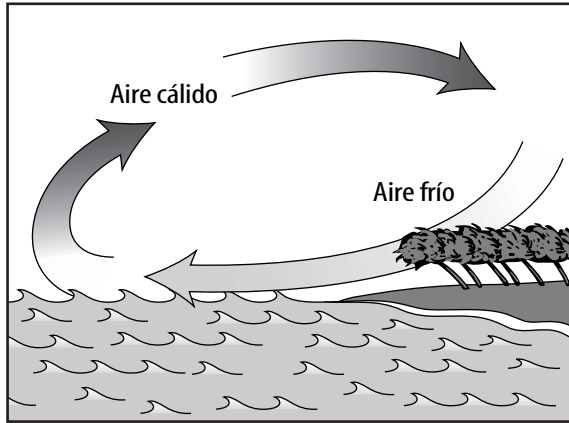
10. Cuando el agua cambia de líquido a gas, el agua se *praovea*.



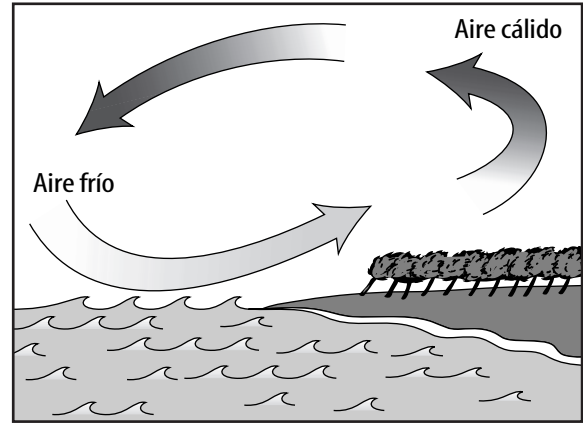
Lectura dirigida para
Dominio del contenido

Sección 3 ■ Movimiento del aire

Instrucciones: Identifica las ilustraciones que muestran la **brisa marina** o la **brisa terrestre**.



1. _____



2. _____

Instrucciones: Coordina cada causa con su efecto. Escribe la letra del efecto en el espacio en blanco.

Causa

- _____ 3. El ecuador recibe la mayor cantidad de energía solar.
- _____ 4. El aire cálido es menos denso que el aire frío.
- _____ 5. Los polos reciben la menor cantidad de energía del Sol.
- _____ 6. El aire frío es más denso que el aire cálido.
- _____ 7. Las moléculas de aire cálido están más separadas.
- _____ 8. La Tierra rota.

Efecto

- a. El aire frío se hunde.
- b. El aire cerca del ecuador es más cálido.
- c. Ocurre el efecto de Coriolis.
- d. El aire cálido asciende.
- e. El aire cálido es menos denso.
- f. El aire cerca de los polos es más frío.

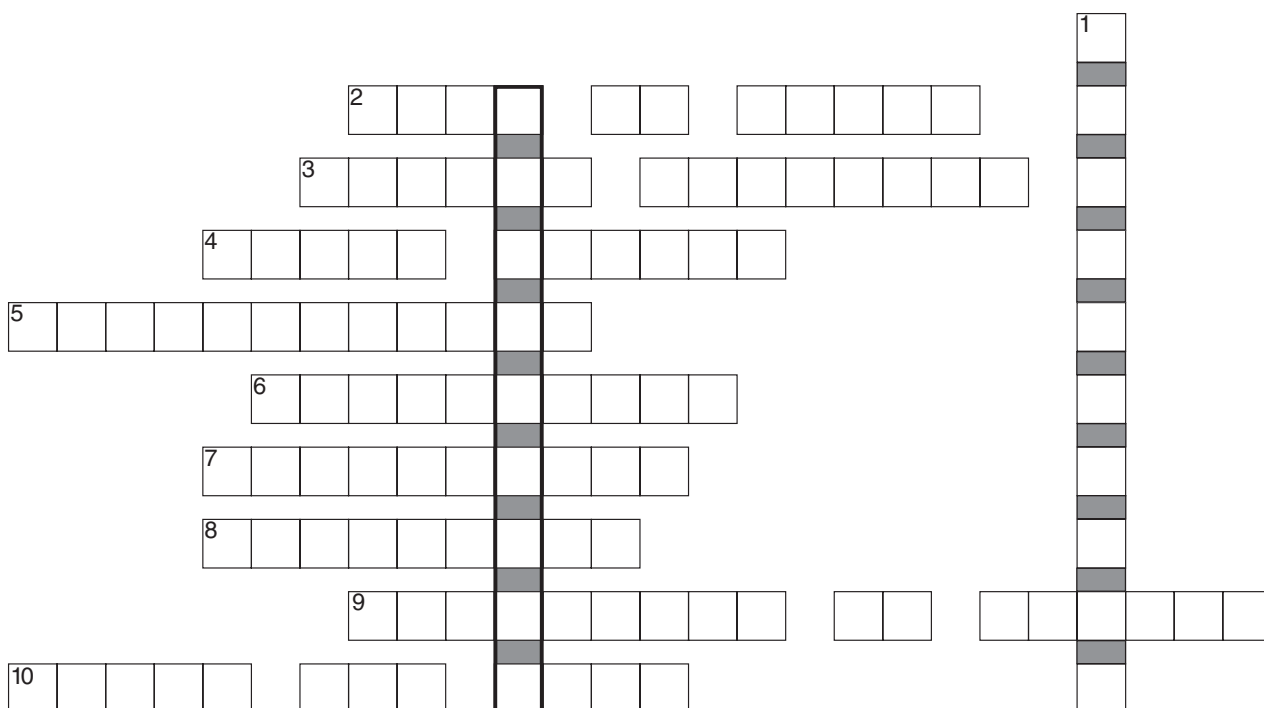


Lectura dirigida para
Dominio del contenido

Términos claves La atmósfera

Instrucciones: Usa los siguientes términos para completar el crucigrama. Las letras de la caja oscura vertical te darán un término conocido.

efecto Coriolis troposfera brisa marina
ionosfera capa de ozono corriente de chorro conduction
ciclo del agua condensacion hidrosfera



1. Transferencia de energía cuando las moléculas chocan unas con otras
2. Parte de la atmósfera que protege a la Tierra de la radiación dañina
3. Cambia la dirección de los cuerpos de movimiento libre como, el aire y el agua
4. Corriente de convección que se forma durante el día
5. Proceso por el cual el vapor de agua cambia a sólido
6. Todas las aguas de la superficie de la Tierra
7. Capa de la atmósfera que está más cerca de la superficie terrestre
8. Capa atmosférica de partículas con carga eléctrica
9. Banda estrecha de vientos fuertes a gran altitud
10. Movimiento constante del agua entre la atmósfera y la Tierra.

SECTION 1

Reinforcement

Earth's Atmosphere

Directions: Answer the following questions on the lines provided.

1. Which atmosphere layer contains electrically charged particles that reflect radio waves?

2. In which atmosphere layer(s) does the temperature increase as altitude increases?

3. In which atmosphere layer(s) does the temperature decrease as altitude increases?

Directions: Use the chart to answer questions 4–7.

Gas	Percent by volume	Gas	Percent by volume
A	78.09	Helium	trace
B	20.95	Methane	trace
Argon	0.93	Krypton	trace
Carbon dioxide	0.03	Xeron	trace
C	0.0 to 4.0	Hydrogen	trace
Neon	trace	Ozone	trace

4. What information does the chart show? _____

5. A, B, and C represent three different gases. What is A? _____

How do you know? _____

6. What is B? _____

How do you know? _____

7. What is C? _____

How do you know? _____

SECTION**2****Reinforcement****Energy Transfer in the Atmosphere**

Directions: Answer the following questions on the lines provided using information from the graph.

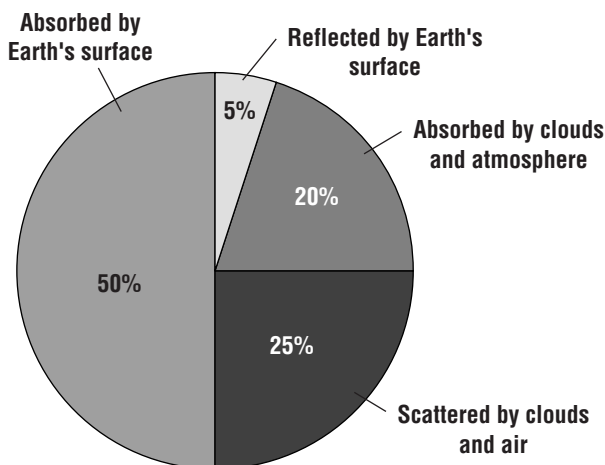
1. Why doesn't all radiation directed at Earth reach the surface?

2. What percent of radiation is lost before reaching Earth's surface?

3. What percent of radiation is lost after reaching Earth's surface?

4. What factors in the atmosphere seem to have the greatest effect on the amount of radiation received from the Sun?

What happens to radiation coming to Earth from the sun?



Directions: Complete the chart using the correct terms and phrases from the chapter. Then answer the following questions on the lines provided.

Types of heat transfer	How they are produced
5. Radiation	produced by _____
6. Conduction	produced by _____
7. Convection	produced by _____

8. If you put a frying pan on a burner on a stove and turn the burner on, the bottom of the frying pan gets hot. What type of heat transfer has occurred?

9. When you get in a closed car on a sunny day and the temperature inside is much warmer than outside, what type of heat transfer has taken place?

10. In some home heating systems, warm air is blown by a furnace fan into one side of a room. On the other side of the room cold air sinks to the floor. What type of heat transfer is this?

SECTION
3**Reinforcement****Air Movement**

Directions: Write the term that matches each description below in the spaces provided. Unscramble the letters in the boxes to write a phrase related to the lesson. Use your textbook as a reference.

1. Caused by the uneven heating of Earth and its atmosphere

____ ____

2. Imaginary line around the middle of Earth

3. Windless zone at the equator which sailing vessels try to avoid

_____ ____

4. Winds generally responsible for the movement of weather across the United States and Canada

_____ _____

5. Winds that provide a dependable route for trade

____ _____

6. Cool breezes during the day caused by differences in heating and cooling rates of land and water

_____ _____

7. Narrow belts of strong winds at high altitudes which blow near the top of the troposphere

_____ ____

8. Cool breezes at night caused by differences in heating and cooling rates of land and water

_____ _____

9. Heat from the Sun

_____ ____

10. The deflection of air masses resulting from Earth's eastward rotation

_____ _____

11. Winds that blow from the North and South Poles

____ _____

12. The phrase is: _____

SECTION
1**Enrichment**

Observing the Effects of Air Pressure

Temperature affects the density of air. The following experiment demonstrates the power of air pressure.

Materials

glass bottle

sheet of paper

long match or paper drinking straw and match

hard-boiled egg, peeled

Procedure

1. Be sure that the opening at the top of the glass bottle is slightly smaller than the diameter of the egg.
2. Crumple the sheet of paper into a ball and drop it into the bottle.
3. Light the end of the paper drinking straw or the long match. Use to ignite the paper in the bottle. Be careful!
4. Immediately after the paper burns out, set the peeled hard-boiled egg over the opening at the top of the bottle with the pointed end of the egg down.

Analyze

1. What happened to the egg?

2. What caused the egg to do this?

Conclude and Apply

3. How can you get the egg out?

SECTION
2**Enrichment****Determining Temperature Change****Materials**

small, dark-colored block of wood
thermometer
water
electric teapot or teapot and hot plate

coffee mug
ice cubes
room heater or register
clock or watch

Procedure

1. Place the wooden block in direct sunlight and record its surface temperature.
2. Measure and record the temperature of the block after two hours in the sun.
3. Heat water in the teapot and pour it into the mug. Record the temperature of the water.
4. Place two ice cubes in the water. After 10 minutes, measure and record the temperature of the water.
5. Record the temperature of the air as shown on the thermostat.
6. Ask an adult to turn up the thermostat.
7. Stand near the room heater or register, then stand near the cold-air return. Record your observations.
8. After 20 minutes, again record the temperature shown on the thermostat.

Analyze and Conclude

1. What happened to the wood block?

2. What type of heat transfer caused what you noticed?

3. What happened to the temperature of the water when ice cubes were added?

4. Explain the method of heat transfer demonstrated by the ice in the water.

5. Explain what happened in the room when the thermostat was turned up.

6. Which method of heat transfer is demonstrated by the heating of the room?

SECTION 3

Enrichment

Thermals

Convection is responsible not only for major wind systems that affect the entire Earth but also for small-scale air movements that affect only a small part of Earth's surface. Land and sea breezes are an example of small-scale air movements, or local winds. These small-scale movements are the result of differences in temperature over land and sea.

Small Scale Movement

Thermals are another type of small-scale movement. Thermals develop over only a few hundred square meters of land and last less than an hour. The formation of thermals is illustrated in the pictures below.

Figure 1 shows the thermal beginning as a rising column of air at Earth's surface.

In Figure 2, a cap develops at the top. Eventually, the cap breaks off and increases in size as it continues to be forced upward (Figures 3 and 4). At higher altitudes, the thermal develops a "donut shape" before it dissipates in the cooler air (Figure 5).

Thermals may develop where Earth's surface is warm and the overlying air is cool. This may occur anywhere on Earth. The amount of heating at the surface varies, depending upon the amount of solar radiation absorbed by that part of Earth's surface.

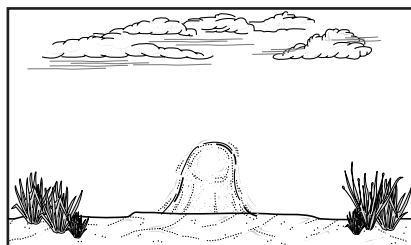


Figure 1

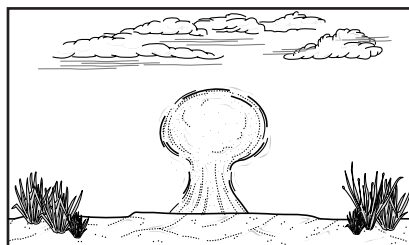


Figure 2

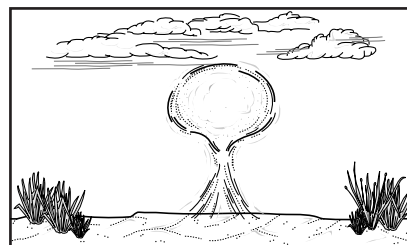


Figure 3

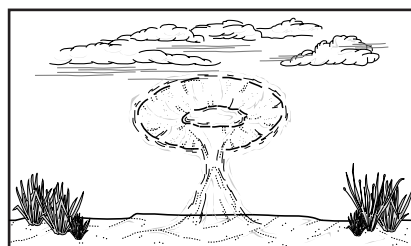


Figure 4

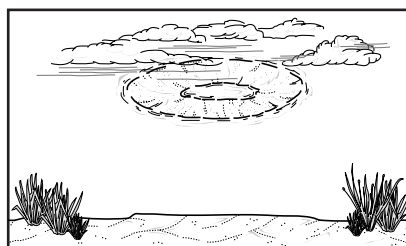
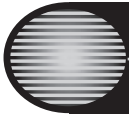


Figure 5

1. Thermals occur as a result of hot and cold air movements: _____ air rises and _____ air sinks.
2. What eventually causes a thermal to dissipate? _____

3. Vultures and hawks sometimes "glide the thermals." What do you think this means? Why do you think they do it? _____

**Note-taking
Worksheet**

Atmosphere

Section 1 Earth's Atmosphere

- A. _____—thin layer of air that protects the Earth's surface from extreme temperatures and harmful Sun rays
- B. Atmospheric makeup—mixture of gases, _____, and liquids
1. Early atmosphere was much different than today.
 - a. Volcanoes produced nitrogen and carbon dioxide, but little _____.
 - b. More than 2 billion years ago _____ began producing oxygen.
 - c. Eventually oxygen formed an _____ layer that protected Earth from harmful rays.
 - d. _____ plants and diverse life forms developed.
 2. Atmospheric _____ include nitrogen (78%), oxygen (21%), carbon dioxide, water vapor, and argon.
 - a. Atmosphere is changing with the introduction of pollutants: increasing human energy use is increasing the amount of _____.
 - b. Pollutants mix with oxygen and other chemicals to form _____.
 3. _____ include dust, salt, and pollen.
 4. _____ include water droplets and droplets from volcanoes.
- C. _____ main layers of the atmosphere
1. _____ levels
 - a. Lowest layer, where humans live, is the _____, which extends about 10 km up, and contains most of the water vapor and gases.
 - b. Extending from 10 km to 50 km above Earth, the _____ contains higher levels of ozone.
 2. _____ levels
 - a. _____ extends from 50 km to 85 km and is the layer in which shooting stars are visible.
 - b. Thickest part of atmosphere is from 85 km to 500 km and is called the _____ for its high temperatures.
 - c. Within the thermosphere is a layer of charged particles called the _____ that can help carry radio waves.
 - d. _____—outer layer of atmosphere in which the space shuttle flies has very few molecules
- D. _____—molecules closer to the surface are more densely packed (at higher pressure) together than those higher in the atmosphere because of the mass of gases pressing down on them from higher in the atmosphere.

Note-taking Worksheet (continued)

- E. _____ in atmospheric layers
1. The troposphere is warmed primarily by the Earth's surface; temperature _____ as altitude increases in this layer.
 2. Temperatures _____ as altitude increases in the stratosphere, particularly the upper portion because ozone absorbs energy from the Sun.
 3. Temperatures _____ with altitude in the mesosphere.
 4. Thermosphere and exosphere are the first to receive the Sun's rays, so they are very _____
- F. _____—about 19 km to 48 km above Earth in the stratosphere, this layer of 3-atom molecules protects the Earth from the Sun's harmful **ultraviolet radiation**
1. Life on Earth, as we know it, _____ on it.
 2. Pollutants called _____ (CFCs) are destroying the ozone layer.
 - a. CFCs are used in _____, air conditioners, aerosol sprays, and foam packaging.
 - b. If these products develop a leak, CFCs can enter the _____.
 3. The ozone layer has a large hole over _____ and a smaller one over the North Pole.

Section 2 Energy Transfer in the Atmosphere

- A. Some energy from the Sun is reflected back into _____, some is absorbed by the _____, and some is absorbed by _____ and water on Earth's surface.
- B. _____—energy that flows from an object with a higher temperature to one with a lower temperature
1. _____—energy transferred in rays or waves
 2. _____—transfer of energy when molecules bump into each other through contact
 3. _____—transfer of heat by the flow of a material
 - a. Molecules move closer together, making the air more dense, and air _____ rises.
 - b. Cold air _____, pushing up warm air, which then cools and sinks, pushing up more warm air.
- C. The _____ cycle—water moves back and forth between Earth's atmosphere and surface
1. Energy from the Sun causes water to _____ from the **hydrosphere**, and rise as vapor.

Note-taking Worksheet (continued)

2. Water vapor in the atmosphere can cool and return to liquid form through _____.
 - a. When water vapor condenses, clouds of tiny water _____ may form.
 - b. Water droplets collide to form larger _____.
 3. Water drops fall back to Earth as _____.
- D. Earth's atmosphere is unique—it holds just the right amount of the Sun's _____ to support life.

Section 3 Air Movement

- A. _____—forms when air in an area of high pressure moves to an area of lower pressure
1. Different areas of Earth receive different amounts of the Sun's _____.
 - a. The equator's warm air, being less dense, is pushed upward by denser, _____ air.
 - b. The pole's cold air, being more _____, sinks and moves along Earth's surface.
 2. The _____—rotation of the Earth causes moving air and water to change direction to the right north of the equator and left south of the equator
- B. Global winds—wind patterns, caused by convection currents combined with the Coriolis effect, of Earth that affect the world's _____
1. Near the equator, very little wind and daily rain patterns called the _____
 2. Surface winds
 - a. Between the equator and 30° latitude (north and south) are steady _____.
 - b. Between 30° and 60° latitude (north and south) the _____ blow in the opposite direction from the trade winds.
 - c. _____ blow from northeast to southwest near the north pole and from southeast to northwest near the south pole.
 3. Upper troposphere—narrow belts of strong winds called _____
 - a. Jet stream moves _____ in the winter.
 - b. Helps _____ develop and move across the country
- C. Local wind systems—affect _____ weather
1. _____—a convection current blows wind from the cooler sea toward warmer land during the day
 2. _____—at night, air moves toward the water as the land cools more rapidly than the water

Assessment



Chapter Review

Atmosphere

Part A. Vocabulary Review

Directions: Complete the following sentences using the correct terms.

1. The lowest layer of the atmosphere is the _____; it contains clouds and smog.
2. An oxygen form present in the _____ filters ultraviolet radiation from the sun.
3. Heat transfer that occurs when molecules come in contact with one another is _____.
4. Winds blowing from the northeast to the southwest near the North Pole are known as _____.
5. Air masses moving in the northern hemisphere are turned westward from their original paths in the _____.
6. A windless zone at Earth's equator where air rises almost straight up is called the _____.
7. Ions and free electrons are formed in the _____ when atmospheric particles are bombarded by energy from space.
8. Cool, dense air near the sea moves inland toward warm, dense areas during the day and sets up _____.
9. At 30° north or south of the equator, air descending to Earth's surface creates steady _____.
10. The transfer of energy in the form of rays or waves is known as _____.
11. The _____ blow from southwest to northeast at 30° to 60° latitude in the northern hemisphere.
12. Cool, dense air moves during the night from the land toward water as _____.
13. Skin cancer can be caused by too much exposure to _____.
14. Each hemisphere has two narrow belts of fast-moving winds called _____.
15. Some chemicals that are being blamed for the destruction of the ozone layer are _____.

Chapter Review (continued)**Part B. Concept Review**

Directions: *Describe each of the following concepts on the lines provided.*

1. three things that can happen to the energy Earth receives from the Sun

2. the danger of ultraviolet radiation

3. the relationship of radiation, conduction, and convection

4. the destruction of ozone by chlorofluorocarbons

5. the cause of the difference in temperature between the equator and the poles

6. the two most abundant gases in our atmosphere

7. the factors that affect air pressure

8. the Coriolis effect on wind patterns

9. sea breezes during the day and land breezes at night



Chapter Test

Atmosphere

I. Testing Concepts

Directions: In the blank to the left, write the letter of the term or phrase that correctly completes each statement.

- _____ 1. The _____ is the layer of the atmosphere nearest to Earth's surface.
a. mesosphere b. troposphere c. stratosphere d. ionosphere
- _____ 2. The _____ are windless zones near the equator.
a. doldrums c. polar easterlies
b. prevailing westerlies d. trade winds
- _____ 3. In the water cycle, evaporated water _____.
a. precipitates as rain or snow c. becomes groundwater
b. runs into lakes, streams, and oceans d. condenses into clouds
- _____ 4. _____ is the transfer of energy by electromagnetic waves.
a. Conduction b. Convection c. Radiation d. Condensation
- _____ 5. Electrically-charged particles are found primarily in the _____.
a. troposphere b. exosphere c. ionosphere d. stratosphere
- _____ 6. The _____ are responsible for the movement of much of the weather across the United States.
a. prevailing westerlies c. trade winds
b. polar easterlies d. doldrums
- _____ 7. The _____ merges into outer space.
a. troposphere b. stratosphere c. mesosphere d. exosphere
- _____ 8. Too much exposure to _____ can cause skin cancer.
a. water vapor c. ultraviolet radiation
b. air pressure d. ozone
- _____ 9. Air in the _____ is warmed by heat from Earth's surface.
a. troposphere b. exosphere c. stratosphere d. thermosphere
- _____ 10. _____ is the transfer of heat by the flow of a heated material.
a. Radiation b. Conduction c. Convection d. Absorption
- _____ 11. The _____ is caused by Earth's rotation.
a. jet stream b. Coriolis effect c. doldrums d. trade winds
- _____ 12. Air above the _____ is heated more than at any other place on Earth.
a. north pole b. south pole c. equator d. United States
- _____ 13. Chlorofluorocarbons may be destroying the ozone layer by _____.
a. adding more ozone molecules c. destroying ozone molecules
b. blocking ultraviolet radiation d. increasing nitrogen levels

Chapter Test (continued)

- _____ 14. Steady winds between the equator and 30° latitude north or south are known as _____.
 a. doldrums b. jet streams c. easterlies d. trade winds
- _____ 15. Air currents that blow near the north and south poles are the _____.
 a. polar easterlies b. trade winds c. polar westerlies d. jet streams
- _____ 16. Reflection and absorption by the atmosphere prevent some _____ from reaching Earth's surface.
 a. ozone b. radiation c. nitrogen d. oxygen
- _____ 17. Sea and land breezes happen because _____.
 a. the land heats and cools more slowly than the water
 b. the land heats and cools more quickly than the water
 c. air moves more easily over water than over land
 d. air moves more easily over land than over water
- _____ 18. The distinct wind patterns on Earth's surface are created by _____ and by the Coriolis effect.
 a. differences in heating c. magnetic fields
 b. the ozone layer d. the jet streams
- _____ 19. Temperatures in the thermosphere are _____.
 a. hot and cold c. very cold
 b. constantly changing d. very warm
- _____ 20. _____ is the only substance that exists as a solid, liquid, and gas in Earth's atmosphere.
 a. Nitrogen b. Ozone c. Water d. Radiation

Directions: *In the blank at the left, write the letter of the term that matches each description.*

- _____ 21. transfer of energy through space a. conduction
- _____ 22. transfer of energy through contact b. convection
- _____ 23. transfer of heat causing differences in air density c. radiation
- _____ 24. transfer of energy from land and water to air by direct contact
- _____ 25. transfer of energy from the Sun to Earth's surface

Directions: *Match the terms in the left column with the phrases in the right column. Write the letter of the correct phrase in the blank at the left.*

- _____ 26. nitrogen a. 21 percent of the atmosphere
- _____ 27. smog b. zero to four percent of air
- _____ 28. water vapor c. most common gas in air
- _____ 29. oxygen d. normally found in the upper atmosphere
- _____ 30. ozone e. caused when pollutants mix with oxygen and other chemicals in the presence of sunlight

Chapter Test (continued)

II. Understanding Concepts

Skill: Comparing and Contrasting

Directions: Use the chart to answer the questions.

Thermometer	Original temperature reading	Temperature after heat applied for 15 minutes	Temperature after heat turned off for 15 minutes
Above sand	25°C	33°C	26°C
Above water	25°C	28°C	27°C

1. Over which material did the air heat faster?

2. Over which material did the air cool faster?

3. How can the temperatures of sand and water affect the climate of the area?

4. How does this information explain the difference between land and sea breezes?

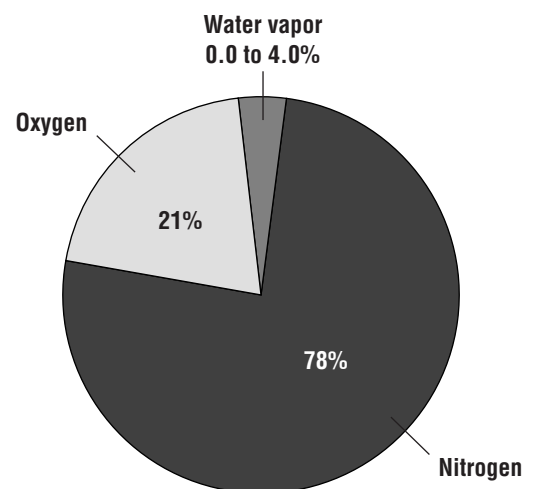
Skill: Using a Graph

Directions: Use the circle graph to answer the following questions.

5. Which gas makes up about one-fifth of Earth's atmosphere?

6. About what percent of Earth's atmosphere does water vapor make up?

7. How could you express the amount of nitrogen in Earth's atmosphere as a fraction?



Chapter Test (continued)**Skill: Concept Mapping**

Directions: *The following sentences appear in an events-chain concept map that shows how CFCs destroy the ozone layer. Number the sentences in the order in which they would appear on the map.*

- _____ 8. A regular two-atom O_2 molecule is formed.
- _____ 9. A chlorine atom from a chlorofluorocarbon molecule comes near a molecule of ozone.
- _____ 10. The ozone molecule breaks apart.

III. Applying Concepts**Writing Skills**

Directions: *Answer the following questions in complete sentences on the lines provided.*

1. You can't see, touch, or smell the ozone layer. Why is it important to you?

2. Many cities are trying to reduce their smog levels. Why?

3. Where is the air pressure the greatest, at sea level or on a mountaintop? Explain.

4. If you were standing at the equator, which way would the cold air coming from the South Pole appear to be moving?

5. Three things can happen to the radiation that Earth receives from the Sun. What are they?

Transparency Activities

SECTION**1****Section Focus****Transparency Activity**

Cosmic Impact

You might think you have to live on the Moon to find a large impact crater such as the one in this photo. Not so. This impact crater in Australia is one of the world's largest. However, unlike the Moon where impact craters are quite common, impact craters on Earth are pretty rare.



1. What does a meteor shower look like? What do you think is happening in a meteor shower?
2. Why is the surface of the Moon struck by objects from space so much more frequently than the surface of Earth?
3. What affect do you think the impact of the meteorite shown above had on the atmosphere?

SECTION
2**Section Focus**
Transparency Activity**Full of Hot Air**

Ready for a hot air balloon ride? First, the hot air balloon must be spread out on the ground. Second, the pilot must fill it with hot air. Then, the hot air balloon will rise. Finally, it's up, up, and away!



1. Why does a balloon filled with hot air rise?
2. How do you think a pilot controls the altitude of a hot air balloon?
3. What atmosphere conditions might affect the flight of a hot air balloon?

SECTION

3

Section Focus
Transparency Activity

The Growth of a Mountain

Did you know that Mount Everest, the world's highest point, is two meters higher than previously thought? Researchers on a 1999 expedition sponsored by the National Geographic Society used sophisticated satellite equipment to measure the peak's height. They found the elevation to be 8,850 m (29,035 feet), instead of 8,848 m (29,028 feet)—a measurement that had been accepted since 1954.



1. In general, what do you think conditions are like at the top of Mount Everest compared to the base?
2. What causes the plume coming off the summit of Mount Everest?
3. How do winds affect air travel?

SECTION

2

Teaching Transparency
Activity

Heat Transfer



Teaching Transparency Activity (continued)

1. In what ways is heat transferred within Earth's atmosphere?

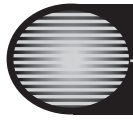
2. What is the transfer of heat by electromagnetic waves called?

3. What is the transfer of heat by the flow of a heated material called?

4. What is the transfer of heat involving contact (molecules bumping into one another) called?

5. What kind of heat transfer do you have when you are out on a sunny day and your face feels warm?

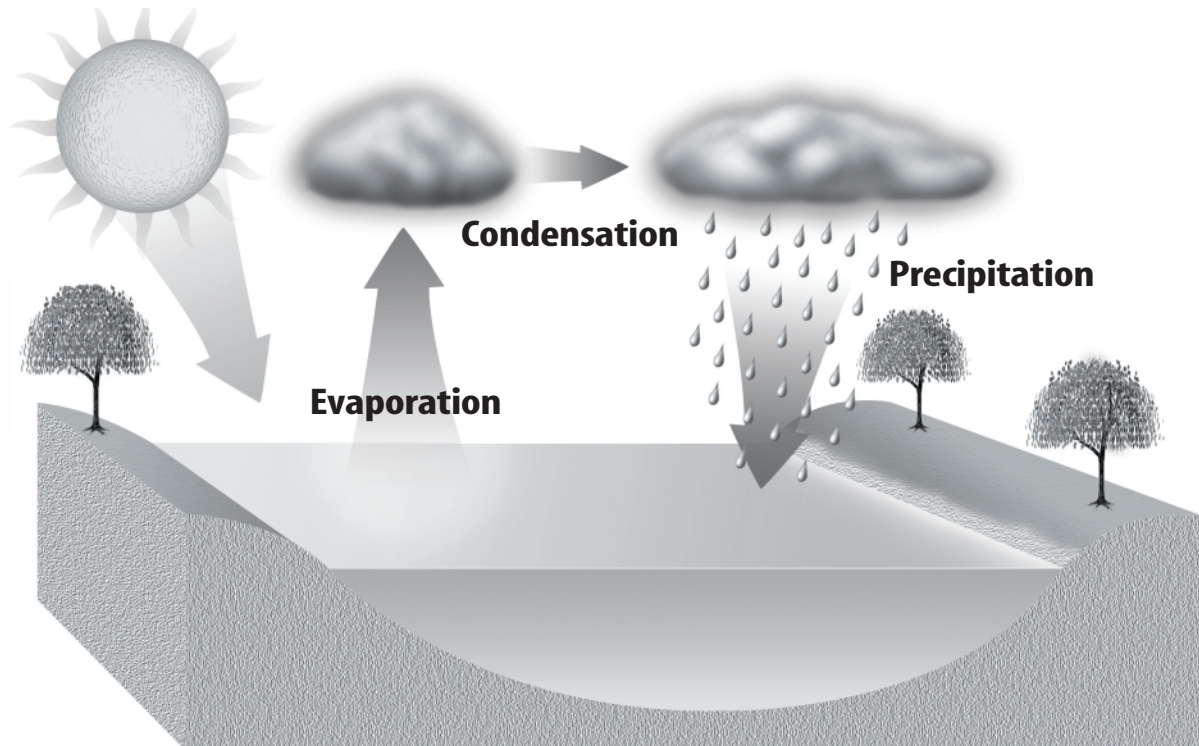
6. If a cold object is in contact with a warm object, in which direction is heat transferred?



Assessment Transparency Activity

Atmosphere

Directions: Carefully review the diagram and answer the following questions.

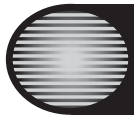


1. The water in the lake evaporated in response to ____.
A the Sun
B the wind
C the clouds
D precipitation
2. Which of these facts best explains why water vapor condenses back into water drops?
F Sunlight heats the water, causing it to turn into vapor.
G Water vapor rises into the air and then cools again, forming clouds.
H Rain falls back onto the ground from the clouds.
J The water cycle needs the Sun.
3. Many types of chemicals are dumped into lakes and rivers from large factories. This practice could affect the environment by ____.
A decreasing the amount of rain
B decreasing the water level in lakes
C increasing the temperature of the air
D increasing the amount of pollution in rain

Teacher Support and Planning

Teacher Support and Planning

Content Outline for Teaching	T2
Spanish Resources	T5
Teacher Guide and Answers	T9



Section 1 Earth's Atmosphere

Underlined words and phrases are to be filled in by students on the Note-taking Worksheet.

- A. Atmosphere—thin layer of air that protects the Earth's surface from extreme temperatures and harmful Sun rays
- B. Atmospheric makeup—mixture of gases, solids, and liquids
 1. Early atmosphere was much different than today.
 - a. Volcanoes produced nitrogen and carbon dioxide, but little oxygen.
 - b. More than 2 billion years ago simple organisms began producing oxygen.
 - c. Eventually oxygen formed an ozone layer that protected Earth from harmful rays.
 - d. Green plants and diverse life forms developed.
 2. Atmospheric gases include nitrogen (78%), oxygen (21%), carbon dioxide, water vapor, and argon.
 - a. Atmosphere is changing with the introduction of pollutants: increasing human energy use is increasing the amount of carbon dioxide.
 - b. Pollutants mix with oxygen and other chemicals to form smog.
 3. Solids include dust, salt, and pollen.
 4. Liquids include water droplets and droplets from volcanoes.
- C. Five main layers of the atmosphere
 1. Lower levels
 - a. Lowest layer, where humans live, is the troposphere, which extends about 10 km up, and contains most of the water vapor and gases.
 - b. Extending from 10 km to 50 km above Earth, the stratosphere contains higher levels of ozone.
 2. Upper levels
 - a. Mesosphere extends from 50 km to 85 km and is the layer in which shooting stars are visible.
 - b. Thickest part of atmosphere is from 85 km to 500 km and is called the thermosphere for its high temperatures.
 - c. Within the thermosphere is a layer of charged particles called the ionosphere that can help carry radio waves.
 - d. Exosphere—outer layer of atmosphere in which the space shuttle flies has very few molecules
- D. Atmospheric pressure—molecules closer to the surface are more densely packed (at higher pressure) together than those higher in the atmosphere because of the mass of gases pressing down on them from higher in the atmosphere.

Content Outline for Teaching (continued)

E. Temperature in atmospheric layers

1. The troposphere is warmed primarily by the Earth's surface; temperature decreases as altitude increases in this layer.
2. Temperatures increase as altitude increases in the stratosphere, particularly the upper portion because ozone absorbs energy from the Sun.
3. Temperatures decrease with altitude in the mesosphere.
4. Thermosphere and exosphere are the first to receive the Sun's rays, so they are very warm.

F. **Ozone layer**—about 19 km to 48 km above Earth in the stratosphere, this layer of 3-atom molecules protects the Earth from the Sun's harmful **ultraviolet radiation**

1. Life on Earth, as we know it, depends on it.
2. Pollutants called **chlorofluorocarbons** (CFCs) are destroying the ozone layer.
 - a. CFCs are used in refrigerators, air conditioners, aerosol sprays, and foam packaging.
 - b. If these products develop a leak, CFCs can enter the atmosphere.
3. The ozone layer has a large hole over Antarctica and a smaller one over the north pole.

DISCUSSION QUESTION:

What is the ionosphere? *A layer of charged particles located in the thermosphere*

Section 2 Energy Transfer in the Atmosphere

- A. Some energy from the Sun is reflected back into space, some is absorbed by the atmosphere, and some is absorbed by land and water on Earth's surface.
- B. **Heat**—energy that flows from an object with a higher temperature to one with a lower temperature
 1. **Radiation**—energy transferred in rays or waves
 2. **Conduction**—transfer of energy when molecules bump into each other through contact
 3. **Convection**—transfer of heat by the flow of a material
 - a. Molecules move closer together, making the air more dense, and air pressure rises.
 - b. Cold air sinks, pushing up warm air, which then cools and sinks, pushing up more warm air.
- C. The water cycle—water moves back and forth between Earth's atmosphere and surface
 1. Energy from the Sun causes water to evaporate from the **hydrosphere**, and rise as vapor.
 2. Water vapor in the atmosphere can cool and return to liquid form through **condensation**.
 - a. When water vapor condenses, clouds of tiny water droplets may form.
 - b. Water droplets collide to form larger precipitation.

Content Outline for Teaching (continued)

3. Water drops fall back to Earth as precipitation.

D. Earth's atmosphere is unique—it holds just the right amount of the Sun's energy to support life

DISCUSSION QUESTION:

What are three ways that heat energy is transferred through the atmosphere? *Radiation, conduction, convection*

Section 3 Air Movement

A. Wind—forms when air in an area of high pressure moves to an area of lower pressure

1. Different areas of Earth receive different amounts of the Sun's radiation.
 - a. The equator's warm air, being less dense, is pushed upward by denser, colder air.
 - b. The pole's cold air, being more dense, sinks and moves along Earth's surface.
2. The Coriolis effect—rotation of the Earth causes moving air and water to change direction to the right north of the equator and left south of the equator

B. Global winds—wind patterns, caused by convection currents combined with the Coriolis effect, of Earth that affect the world's weather

1. Near the equator, very little wind and daily rain patterns called the doldrums
2. Surface winds
 - a. Between the equator and 30° latitude (north and south) are steady trade winds
 - b. Between 30° and 60° latitude (north and south) the prevailing westerlies blow in the opposite direction from the trade winds
 - c. Polar easterlies blow from northeast to southwest near the north pole and from southeast to northwest near the south pole
3. Upper troposphere—narrow belts of strong winds called jet streams
 - a. Jet stream moves faster in the winter.
 - b. Helps storms develop and move across the country

C. Local wind systems—affect local weather

1. Sea breezes—a convection current blows wind from the cooler sea toward warmer land during the day
2. Land breezes—at night, air moves toward the water as the land cools more rapidly than the water

DISCUSSION QUESTION:

What is the Coriolis effect? *Rotation of the Earth makes air and water appear to turn right north of the equator and left south of the equator*



La atmósfera terrestre

Lo que aprenderás

- A identificar los gases de la Tierra.
- A describir la estructura de la atmósfera terrestre.
- A explicar qué causa la presión del aire.

Vocabulario

atmosphere / atmósfera: el aire de la Tierra, el cual está compuesto por una capa tenue de gases, sólidos y líquidos; forma una capa protectora alrededor del planeta y está dividida en cinco capas distintivas.

troposphere / troposfera: capa de la atmósfera terrestre más próxima a la tierra, contiene un 99 por ciento de vapor de agua y un 75 por ciento de los gases atmosféricos; es la región donde se forman las nubes y ocurre el estado del tiempo.

ionosphere / ionosfera: capa de partículas cargadas eléctricamente en la termosfera que absorbe las ondas radiales AM durante el día y las vuelve a reflejar durante la noche.

ozone layer / capa de ozono: capa de la estratosfera con una alta concentración de ozono; absorbe la mayor parte de la radiación ultravioleta dañina proveniente del Sol.

ultraviolet radiation / radiación ultravioleta: tipo de energía que llega a la Tierra proveniente del Sol; puede causar daños a la piel y ocasionar cáncer; gran parte de esta radiación es absorbida por la capa de ozono.

chlorofluorocarbons (CFCs / clorofluorocarbonos): compuestos químicos que se usan en refrigeradores, acondicionadores de aire, empaques de espuma y rociadores de aerosol; estos compuestos químicos pueden penetrar en la atmósfera y destruir el ozono.

Por qué es importante

La presencia de la atmósfera en la Tierra permite la existencia de vida en el planeta.



Evalúa bloqueadores solares

Si no usas protector solar, la excesiva exposición al Sol puede dañar tu piel. Los bloqueadores solares protegen tu piel de la radiación ultravioleta. En esta actividad obtendrás inferencias a partir de los datos incluidos en las etiquetas de varios protectores.

Lo que investigarás

¿Qué tan efectivos son los bloqueadores solares?

Materiales

bloqueadores solares de varias marcas

Metas

- Hacer inferencias a partir de la información y las etiquetas de los bloqueadores solares.
- Comparar la eficacia de los diferentes bloqueadores solares para proteger contra los daños causados por el Sol.
- Comparar el costo de los diferentes bloqueadores solares.

Medidas de seguridad

Procedimiento

1. Haz una tabla de datos en tu Diario de ciencias y anota los siguientes rubros: *marca, SPF, términos engañosos y costo por onza de fluido*.
2. El factor de protección de solar SPF, indica la cantidad de tiempo que puedes permanecer bajo el Sol. Por ejemplo, un protector con SPF de 4, te permitirás estar bajo el Sol cuatro veces más tiempo que si no usaras protector. Anota en la tabla el SPF de los diferentes protectores.
3. Calcula el costo por onza fluida de protector, para cada marca.
4. De acuerdo con las pautas gubernamentales, términos como "bloqueador solar" o "a prueba de agua" son engañosos porque los protectores no pueden bloquear el Sol y, además, son deslavados por el agua. Anota en la tabla una lista con los términos engañosos incluidos en la etiqueta de cada marca.

Spanish Resources (continued)

Evaluación de bloqueadores solares			
Marca			
SPF			
Términos engañosos			
Costo por onza fluida			

Concluye y aplica

1. Explica por qué necesitas usar bloqueador solar.
2. Se considera que un SPF de 15 es la protección mínima que debe ofrecer un bloqueador solar. Los bloqueadores solares que ofrecen SPF mayores de 30 son engañosos porque los protectores son deslavados de la piel. Analiza el SPF de cada una de las marcas.
3. Tomando en cuenta el costo y la efectividad de las diferentes marcas de bloqueadores solares, discutan acerca de cuál marca representa la mejor compra.

SECCIÓN 2 Transferencia de energía en la atmósfera

Lo que aprenderás

- A describir lo que ocurre con la energía que la Tierra recibe del Sol.
- A comparar y contrastar entre radiación, conducción y convección.
- A explicar el ciclo del agua

Vocabulario

radiation / radiación: energía que transmiten las ondas o los rayos.

conduction / conducción: transferencia de energía que ocurre cuando las moléculas chocan entre sí.

convection / convección: transferencia de calor a través del flujo de un material.

hydrosphere / hidrosfera: toda el agua de la superficie terrestre.

condensation / condensación: cambio de la materia del estado gaseoso al estado líquido, por ejemplo, cuando el agua se convierte en líquido.

Por qué es importante

El Sol provee de energía a la atmósfera terrestre, permitiendo la existencia de vida.



SECCIÓN 3 Movimiento del aire

Lo que aprenderás

- A explicar por qué la cantidad de energía que recibe la Tierra cambia con la latitud.
- A describir el efecto de Coriolis.
- A localizar las zonas de calmas ecuatoriales, los vientos alisios, los vientos ponientes prevalecientes, vientos polares del este y la corriente de chorro.

Vocabulario

Coriolis effect / efecto de Coriolis: es la causa de que el aire y el agua en movimiento giren a la izquierda en el hemisferio sur y a la derecha en el hemisferio norte, debido a la rotación de la Tierra.

jet stream / corriente de chorro: franja estrecha de vientos fuertes que sopla cerca de la troposfera.

sea breeze / brisa marina: movimiento de aire diurno desde el mar hacia la tierra; se forma cuando el aire más frío sobre el agua se mueve hacia el interior forzando el ascenso del aire calentado y menos denso sobre la tierra.

land breeze / brisa terrestre: movimiento de aire nocturno desde la tierra hacia el mar y que se forma cuando el aire más frío y denso proveniente de la tierra fuerza el aire más cálido a ascender sobre el mar.

Por qué es importante

Los sistemas de vientos determinan los patrones del tiempo más importantes del planeta.



Diseña tu propio experimento **Siente el calor**

A veces, es muy refrescante darse un chapuzón en una piscina o en un lago durante un caluroso día de verano. ¿Por qué se calienta tanto la arena de la playa, mientras que el agua permanece fresca? Sin embargo, horas después, el agua se siente mas tibia que la arena de la playa. Durante esta actividad explorarás la manera en que el agua y la tierra absorben calor.

Identifica el problema

Se trata de comparar las capacidades de absorción y emisión de calor del suelo y el agua

Formula una hipótesis

Elabora una hipótesis que compare la diferentes capacidades de absorción y emisión de calor del suelo y el agua. Elabora otra hipótesis acerca de cómo difieren las temperaturas del aire sobre el suelo y el sobre el agua, durante el día y la noche.

Medidas de seguridad

PRECAUCIÓN: *Ten cuidado cuando manipules la lámpara de pie. No permitas que la bombilla o el cable entren en contacto en el agua.*

Posibles materiales

soporte
suelo
regla de medir
agua
cinta pegante blanca
cajas transparentes de plástico
lámpara de pie con reflector
termómetros (4)
lápices de colores (4)

Metas

- Diseñar un experimento para comparar las tasas de absorción y emisión de calor de agua y suelo.
- Observar el efecto de las diferencias en las tasas de absorción y emisión de calor, sobre la tierra y sobre el agua.

Usa métodos científicos

Prueba tu hipótesis

Planifica

1. Ponte de acuerdo con tu grupo y escribe tu hipótesis.
2. Enumera los pasos que debes seguir para probar tu hipótesis. Incluye en tu plan cómo usarás tu equipo para comparar las tasas de absorción y liberación de calor del agua y del suelo.
3. Diseña una tabla de datos en tu Diario de ciencias para ambas partes de tu experimento: cuando la luz esté encendida y se absorba energía y cuando la luz esté apagada y se libere energía al ambiente.

Realiza

1. Asegúrate de que tu maestro(a) apruebe tu plan y tu tabla de datos antes de comenzar.
2. Realiza tu experimento según lo planificado.
3. Durante el experimento, anota tus observaciones y completa la tabla de datos en tu Diario de ciencias.
4. En tus medidas incluye la temperatura de la tierra y del agua. Compara también la tasa de liberación de calor para el agua y la tierra. Incluye las temperaturas del aire justo sobre ambas sustancias. Permite 15 minutos para cada prueba.

Analiza tus datos

1. Usa los lápices de colores y la información en las tablas de datos para construir gráficas lineales. Muestra la tasa de aumento de temperatura para la tierra y para el agua. Grafica la tasa de disminución de temperatura para la tierra y el agua después de apagar la luz.
2. Analiza tus gráficas. Cuando la luz estaba encendida, ¿cuál se calentó más rápido, la tierra o el agua?
3. Compara la rapidez del cambio de temperatura sobre el agua con la de la tierra, después de apagar la luz.

Spanish Resources (continued)

Saca conclusiones

1. ¿Pudiste corroborar tu hipótesis? Explica.
2. Infiere de las gráficas cuál perdió calor más rápido: la tierra o el agua.
3. Compara las temperaturas del aire sobre el agua y sobre la tierra 14 minutos después de apagar la luz. ¿Qué comparación hay entre la capacidad de la tierra y la del agua de absorber y liberar calor?

Guía de estudio

Repasa las ideas principales

Sección 1 La atmósfera terrestre

1. La atmósfera terrestre está formada principalmente por gases, aunque también contiene algunas partículas sólidas suspendidas y líquidos. Las características particulares de la atmósfera permiten la existencia de vida.
2. La atmósfera se divide en cinco capas con características propias.
3. La capa de ozono protege a la Tierra contra los rayos ultravioletas. El exceso de este tipo de radiación puede ser dañino. *¿Cómo destruyen la capa de ozono las moléculas de clorofluorocarbonos?*

Sección 2 Transferencia de energía en la atmósfera

1. La Tierra recibe energía solar. Parte de esta energía es absorbida y parte es reflejada hacia el espacio.
2. El calor absorbido es distribuido en la atmósfera terrestre por radiación, conducción y convección.

3. La energía solar proporciona la energía que pone en acción el ciclo del agua entre la atmósfera y la superficie terrestre. *¿En cuál etapa del ciclo del agua se forman las nubes?*
4. A diferencia de las atmósferas de Marte y Venus, la atmósfera terrestre mantiene un balance entre la energía que recibe y la energía que pierde, manteniendo temperaturas más o menos templadas. Este delicado balance permite la existencia de vida en la Tierra.

Sección 3 Movimiento del aire

1. Debido a la curvatura de la superficie terrestre, no todas las regiones del planeta reciben la misma cantidad de radiación solar. El calentamiento no uniforme de la atmósfera produce diferencias de temperatura en la superficie terrestre.
2. Las corrientes de convección, modificadas por el efecto de Coriolis, producen los vientos globales del planeta.
3. La corriente de chorro polar está formada por vientos muy fuertes que se desplazan en la parte alta de la troposfera. Estas corrientes se forman en la frontera entre el aire frío polar y el aire tropical cálido.
4. Las brisas terrestres y las brisas marinas ocurren cerca de los océanos. *¿Por qué cambia la dirección de la brisa entre el día y la noche?*



Hands-On Activities

MiniLab (page 3)

1. The mass increases
2. Air has mass.

MiniLab: Try at Home (page 4)

1. Condensation formed on the underside of the pie pan as the steam hit the cold surface, and drops of water rained down from the pan.
2. The hot water represents warm ocean water. The pan represents clouds, and the ice cubes represent cold air. As ocean water evaporates, it condenses to form clouds when it reaches the cold air higher in the atmosphere. The condensed water droplets then merge to form rain.

Activity (page 5)

Lab Preview

1. Sunscreens can't block the sun, and they wash off in water.
2. Knowing the price per ounce will help you decide which brand is most cost-effective.

Conclude and Apply

1. Sunscreen blocks harmful UV radiation from the Sun.
2. Answers will vary depending on SPF of brands chosen.
3. Sunscreens that cost the least per fluid ounce and provide adequate protection without misleading claims on the label should be considered the best buys.

Activity: Design Your Own Experiment (page 7)

Lab Preview

1. Be careful when handling objects that can burn, such as an overhead light.
2. soil and water

Analyze Your Data

1. Graphs should show that energy absorption and release by soil is faster.
2. soil
3. Air above the land heated faster.

Draw Conclusions

1. Answers will vary depending on results.
2. soil
3. When the light was first turned off, the temperature above the soil was higher. After several minutes, the temperature above the water was higher. Soil absorbs and releases heat more quickly than water.

Laboratory Activity 1 (page 9)

Data and Observations

1. Bubbles rise through the water.
2. Pressure against hands; part of mattress surrounding hands rises.

Table 1—Answers will vary depending on the air mattress used.

Questions and Conclusions

1. Bubbles of air rose to the surface.
2. Air occupies space, and air is less dense than the water.
3. Volume of the mattress is determined by multiplying length \times width \times height.
4. It decreased.
5. It rose. This shows that air exerts pressure.
6. Yes; Air forced into a tire or balloon will exert pressure on the inside, causing the tire or balloon to expand. When the air mattress was depressed and released, air pressure returned it to its original shape.

Lab Note: You may have students list other examples of air pressure applications, such as airplane cabins, pneumatic drills, hair dryers, divers' suits, space suits.

Laboratory Activity 2 (page 11)

Questions and Conclusions

1. The direct rays of the Sun hitting the thermometer will cause the thermometer to become warmer than the air.
2. Students' answers will depend on their graphs.
3. Answers probably will agree. Students should observe lower temperatures in the morning and on cloudy days.
4. Air temperatures near the land depend on the amount of solar energy absorbed by the land surface. The lowest temperature of the day usually will be just before sunrise. Cloud cover also will prevent some of the solar energy from reaching the surface.

Meeting Individual Needs

Directed Reading for Content Mastery (page 15)

Overview

1. exosphere
2. ionosphere
3. coldest air temperature
4. stratosphere
5. weather

Teacher Guide & Answers (continued)

Sections 1 and 2

1. troposphere
2. nitrogen
3. stratosphere
4. ultraviolet radiation
5. chlorofluorocarbons
6. conduction
7. convection current
8. hydrosphere
9. condensation
10. evaporates

Section 3

1. land breeze
2. sea breeze
3. b
4. d
5. f
6. a
7. e
8. c

Key Terms

1. ozone layer
2. conduction
3. jet stream
4. hydrosphere
5. condensation
6. troposphere
7. ionosphere
8. water cycle
9. Coriolis effect
10. sea breeze
familiar term: atmosphere

Lectura dirigida para Dominio del contenido (pág. 19)

Sinopsis

1. exosfera
2. ionosfera
3. temperatura del aire más fría
4. estratosfera
5. tiempo

Secciones 1 y 2

1. troposfera
2. nitrógeno
3. estratosfera
4. radiación ultravioleta
5. clorofluorocarbonos
6. conducción
7. corriente de convección
8. hidrosfera
9. condensation
10. se evapora

Sección 3

1. brisa terrestre
2. brisa marina
3. b
4. d
5. f

6. a
7. e
8. c

Términos claves

1. capa de ozono
2. conducción
3. corriente de chorro
4. hidrosfera
5. condensación
6. troposfera
7. ionosfera
8. ciclo del agua
9. efecto de Coriolis
10. brisa marina

Reinforcement (page 23)

Section 1

1. ionosphere
2. thermosphere, ionosphere, stratosphere
3. mesosphere, troposphere
4. the names and percentages of the gases found in the atmosphere
5. Nitrogen; it is the most abundant gas in air.
6. Oxygen; it is the second most abundant gas in air.
7. Water vapor; water vapor amount in air can vary between 0.0 and 4.0%.

Section 2

1. Some of the energy is absorbed, scattered, and/or reflected.
2. 45%
3. 5%
4. clouds and atmospheric gases
5. electromagnetic waves
6. contact of molecules
7. the flow of heated materials
8. conduction
9. radiation
10. convection

Section 3

1. wind
2. equator
3. doldrums
4. prevailing westerlies
5. trade winds
6. sea breezes
7. jet streams
8. land breezes
9. solar radiation
10. Coriolis effect
11. polar easterlies
12. air movement

Enrichment (page 26)

Section 1

1. It was sucked into the bottle.
2. The heat from the burning paper made the molecules in the air move farther apart, or become less

dense. The air pressure inside the bottle became lower than the air pressure outside the bottle. The outside air pressure pushed the egg into the bottle.

3. Increase the air pressure inside the bottle. Hold the bottle upside-down at an angle with the egg's small end over the opening. Blow hard into the bottle. This should increase the air pressure. Quickly turn the bottle completely upside-down with the egg over the opening. If you have increased the air pressure enough, the egg should be pushed out.

Section 2

1. It warmed up after being in direct sunlight.
2. Heat transfer was by radiation from the Sun to the wooden block.
3. The temperature decreased.
4. Heat transfer was by conduction. Heat was transferred from the fast-moving molecules of the hot water to the slow-moving molecules of the ice. The molecules try to reach the same speed in both the water and the ice.
5. Hot air came out of the register and cooler air was pulled into the cold-air return. The circulation of air set up a current of rising hot air that cooled and sank toward the cold-air return.
6. convection

Section 3

1. warm, cold
2. contact with cool air
3. It means they use the hot air currents to move instead of moving their wings. They do it to save energy.

Note-taking Worksheet (page 29)

Refer to Teacher Outline, student answers are underlined.

Assessment

Chapter Review (page 33)

Part A. Vocabulary Review

1. troposphere (2/1)
2. ozone layer (2/1)
3. conduction (5/2)
4. polar easterlies (9/3)
5. Coriolis effect (8/3)
6. doldrums (9/3)
7. ionosphere (2/1)
8. sea breezes (9/3)
9. trade winds (9/3)
10. radiation (5/2)
11. prevailing westerlies (9/3)
12. land breezes (9/3)
13. ultraviolet radiation (2/1)
14. jet streams (9/3)
15. chlorofluorocarbons (2/1)

Part B. Concept Review

1. Some of the energy escapes back into space, some is absorbed by the atmosphere, and some is absorbed by the land, plant, and water surfaces. (4/2)
2. Too much ultraviolet radiation can cause skin cancer. (2/1)
3. They are three methods of heat transfer. Radiation is the transfer of heat by electromagnetic waves. Conduction is the transfer of heat by direct contact of molecules. Convection is the transfer of heat by the flow of a heated material. (5/2)
4. The chlorine atoms in CFCs can break up ozone molecules and destroy ozone's ability to absorb UV radiation. (2/2)
5. Because Earth's surface is curved, not all areas receive the same amount of radiation from the Sun. The equator receives more direct radiation, so its temperatures are higher. The poles receive less direct radiation, so their temperatures are lower. (7/3)
6. nitrogen and oxygen (1/1)
7. density and temperature (3/1)
8. Winds moving toward the equator are turned westward in the northern hemisphere due to Earth's eastward rotation. (8/3)
9. Land absorbs and releases heat faster than water. This unequal heating causes local air circulation by convection currents. Cool, dense air pushes warm air. Thus the cooler land at night causes land breezes, and cooler sea air in the daytime causes sea breezes. (9/3)

Chapter Test (page 35)

I. Testing Concepts

1. b (2/1)
2. a (9/3)
3. d (6/2)
4. c (5/2)
5. c (2/1)
6. a (9/3)
7. d (2/1)
8. c (4, 5/2)
9. a (4/2)
10. c (5/2)
11. b (8/3)
12. c (7/3)
13. c (2/1)
14. d (9/3)
15. a (9/3)
16. b (4/2)
17. b (9/3)
18. a (8/3)
19. d (2/1)
20. c (1/1)
21. c (5/2)
22. a (5/2)
23. b (5/2)
24. a (5/2)

Teacher Guide & Answers (continued)

25. c (5/2)
26. c (1/1)
27. e (1/1)
28. b (1/1)
29. a (1/1)
30. d (1/1)

II. Understanding Concepts

1. sand (9/3)
2. sand (9/3)
3. The differences in the heating and cooling of land and water affect the movement of cool and warm air in the area. (9/3)
4. Land warms more easily than water. During the day, the cooler, denser air from over water flows over the land and forces up the warm air; this is a sea breeze. Land cools more quickly than water. At night, the air above land cools, sinks, and moves out over water, forcing up the warmer air over the water. This is a land breeze. (9/3)
5. oxygen (1/1)
6. 0 to 4% (1/1)
7. nearly four-fifths or more than three-fourths (1/1)
8. 3 (1/1)
9. 1 (1/1)
10. 2 (1/1)

III. Applying Concepts

Writing Skills

1. It's a layer in the stratosphere that absorbs most of the ultraviolet radiation from the Sun. Holes in the ozone layer expose us to too much UV radiation, which causes skin cancer and other health problems. (2/1)
2. Smog is a form of pollution that contains pollutants including ozone, which can harm plants and damage our lungs. (1/1)
3. Air pressure is greatest at sea level because there are more air molecules pushing down from above. (3/1)
4. Because of Earth's rotation and the air's location in the southern hemisphere, the northbound air would appear to be turning to the west as Earth turns east. (8/3)
5. The radiation can escape back into space, be absorbed by the atmosphere, or be absorbed by land and water surfaces. (4/2)

Transparency Activities

Section Focus Transparency 1 (page 40)

Cosmic Impact

Transparency Teaching Tips

- This is an introduction to Earth's atmosphere. Point out that Earth's atmosphere is comprised of five layers. The troposphere extends from the

surface to about 10 km (six miles). The stratosphere extends from there to about 50 km (30 miles). Then comes the mesosphere, to 85 km (53 miles). From the mesosphere to 500 km (300 miles) is the thermosphere, which contains a layer of electrically charged particles, the ionosphere. The last layer is the exosphere, which stretches to the edges of space. These divisions are based primarily on temperature variations.

- The different layers of atmosphere protect Earth from asteroids, meteorites, and comets. Most objects entering the atmosphere burn up in the atmosphere and never reach Earth's surface.
- Some meteorites are so large, however, that they only partially burn up, and do impact Earth. Wolf Creek crater, shown on the transparency, is in western Australia. It has a diameter of 853 m and a depth of 46 m. The rim is 25 meters above ground level. It struck Earth approximately one to two million years ago. Weighing several thousand tons, the meteorite came almost straight down, exploding against the surface with the force of an atomic bomb.
- Ask the students to compare Earth's surface to that of the Moon and discuss why the surfaces are so different.

Content Background

- Earth's atmosphere is about 78 percent nitrogen, 21 percent oxygen, and one percent trace gases, such as neon, helium, and krypton.
- It is estimated that despite having a protective atmosphere, Earth has experienced, in the last billion years, about 130,000 meteorite impacts equal to or greater than the Wolf Creek impact. There has been a drastic decrease in impacts during the last million years.
- When a meteorite strikes Earth, the impact site is vaporized, crushed, fragmented, and melted. Shock waves fan out, transferring tremendous amounts of energy to the surrounding rock layers. A cloud of dust, smoke, and fragmented rock is thrown up into the air. It has been conjectured that an enormous meteorite striking Earth near Mexico in the Gulf of Mexico may have been responsible for the last and major extinction of dinosaurs.
- Meteoroids are pieces of rock moving through space. If a meteoroid enters Earth's atmosphere and burns up before hitting the surface, it is called a meteor. If the object strikes Earth's surface, it is called meteorite.

Answers to Student Worksheet

1. Meteor showers look like little streaks of light across the sky. These streaks are sometimes called falling stars. They are rocks from space burning up in Earth's atmosphere.
2. The Moon has no atmosphere to burn up falling objects.

- The impact would have thrown up a cloud of dust, smoke, and fragments back into the atmosphere. It would have made breathing and seeing difficult and blocked out a high percentage of the Sun's rays.

Section Focus Transparency 2 (page 41)

Full of Hot Air

Transparency Teaching Tips

- This transparency introduces energy transfer in the atmosphere. Explain that heat is transferred from warmer to cooler objects in three ways—radiation, conduction, and convection. Radiation transfers heat in the form of rays (waves). Conduction transfers heat through contact. In convection, heat is transferred through the flow of materials, warmer portions rising, while the colder, denser positions sink.
- Ask the students which process transfers energy within a hot air balloon (convection).
- Explain that the propane burner in a hot air balloon heats the air directly about it increasing the energy of the molecules. These molecules move farther apart than the molecules of the cooler air; this means the warmer air is less dense, and it rises. The more dense, cooler air sinks toward the burner, where it, too, is heated. This cycle of rising and falling is a convection current. As the air within the balloon becomes less dense than the outside air, the balloon ascends.

Content Background

- In order to lift itself and two passengers, the bag of a balloon must have a volume of at least 1,700 cubic meters (60,000 cubic feet).
- A balloon's altitude can be altered by opening the burner to provide lift or opening a cooling vent to allow heated air to escape.
- The Montgolfier brothers, two Frenchmen of the late 18th century, were the first to make use of the hot air balloon, launching an unpiloted version in 1783. They later launched a sheep, rooster, and a duck in their balloons. Two other Frenchmen, de Rozier and Laurent, using a Montgolfier balloon, completed the first piloted flight in November of 1783. They burned straw and wool to stay aloft, reaching a height of 90 meters (300 feet) over the city of Paris.

Answers to Student Worksheet

- The burner heats the air, causing it to become less dense than the air around it, allowing it to rise.
- The pilot controls it by using the propane burner and the cooling vent.
- The wind, weather, and the temperature will affect the balloon.

Section Focus Transparency 3 (page 42)

The Growth of a Mountain

Transparency Teaching Tips

- This is an introduction to wind and its effects. On a personal level, wind affects how we experience temperature. Our bodies are constantly generating heat, which is transferred to the air through our skin. When we are still and there is no air movement, our skin is surrounded by a thin layer of warmth (due to constant heat transference). Wind penetrates that layer, increasing the rate at which energy is transferred. As the temperatures drop or the wind increases, the body becomes unable to replace the heat as fast as it's being transferred. The outer layers of skin begin to cool, which inhibits blood flow. Further heat loss can cause shivering and loss of feeling. The skin may even swell and turn blue. So, the harder the wind blows, the harder it is to stay warm.
- Ask the students why the winds add greatly to the difficulty in climbing Mount Everest.
- Ask students to describe how wind affects the weather. Explain how winds can cause storms by bringing cold, dry air into contact with warm, damp air. Wind also moves weather fronts from one place to another. Of course, certain storms such as hurricanes, tornadoes, and cyclones involve winds of exceptional speed.
- Ask students to list ways in which wind is detrimental. Then ask the students to describe wind's beneficial effects. Strong winds can destroy property, cause soil erosion, and affect the weather. Wind, however, is also a source of energy, disperses air pollution, and circulates the air in the Earth's atmosphere.

Content Background

- Mount Everest was first scaled in 1953 by Sir Edmund Hilary and Tenzing Norgay.
- Temperatures on the summit of Everest can reach -60°C (-76°F) and winds have been registered at 80km/h (50 mph). That produces a windchill factor of more than -101°C (-150°F).

Answers to Student Worksheet

- Answers will vary. Students will probably indicate that it is colder, windier, and harder to breathe.
- The plume is composed of snow being whipped off the summit by high winds.
- Wind patterns can lengthen or shorten travel times. High winds can also cause the postponement of flights.

Teacher Guide & Answers (continued)

Teaching Transparency (page 43)

Heat Transfer

Section 2

Transparency Teaching Tips

- Have students recall what they know about the changes that take place when matter changes temperature. (When matter is heated, particles move more quickly and take up more space. As matter cools, particles move more slowly and take up less space.)
- Discuss the terms on the transparency—*radiation*, *convection* and *conduction*. Have the students tell what they know about each term.

Reteaching Suggestions

- Review the transfer of heat through radiation, conduction, and convection.

Extensions

- **Challenge:** Have students find pictures that represent the three types of heat transfer. Have students label the pictures and make a scrapbook of the pictures.
- **Research:** In pairs, have the students find material on one of the types of heat transfer. Have each group compile the information and make an oral presentation.

Answers to Student Worksheet

1. radiation, conduction, and convection
2. radiation
3. convection
4. conduction
5. radiation
6. Heat is always transferred from the warmer object to the cooler one.

Assessment Transparency (page 45)

Atmosphere

Section 3

Answers

1. **A.** In this question, students must observe the causes and effects in a cycle.
Choice A: Yes, the sun rays are heating the water, causing it to evaporate.
Choice B: No, there is no apparent representation of the wind in the graphic.
Choice C: No, clouds form as a result of the Sun causing water to evaporate.
Choice D: No, precipitation is a result of condensation.
2. **G.** Students need to use the information in this graphic to answer the question. Since the water vapor is shown rising from the lake to the sky, it can be inferred that the water cools.
3. **D.** Students need to understand the cycle from the graphic and infer how chemicals in lakes can end up in the dumped rain.

Test-Taking Tip

If the answer choices to a question require the student to infer from the graphic, encourage them to read all the answers before trying to answer the question on their own.