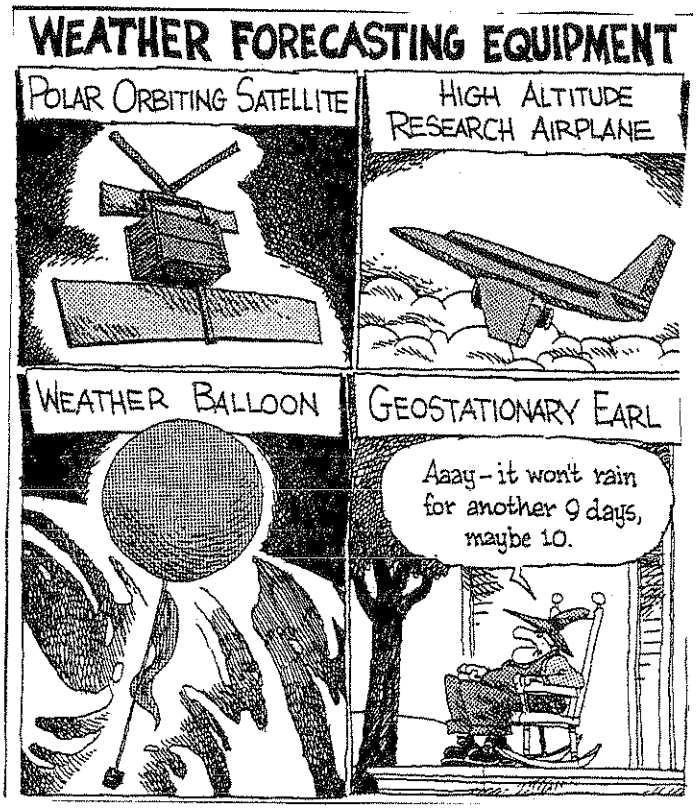
Weather Packet

Chapter 1

Review and Reinforce



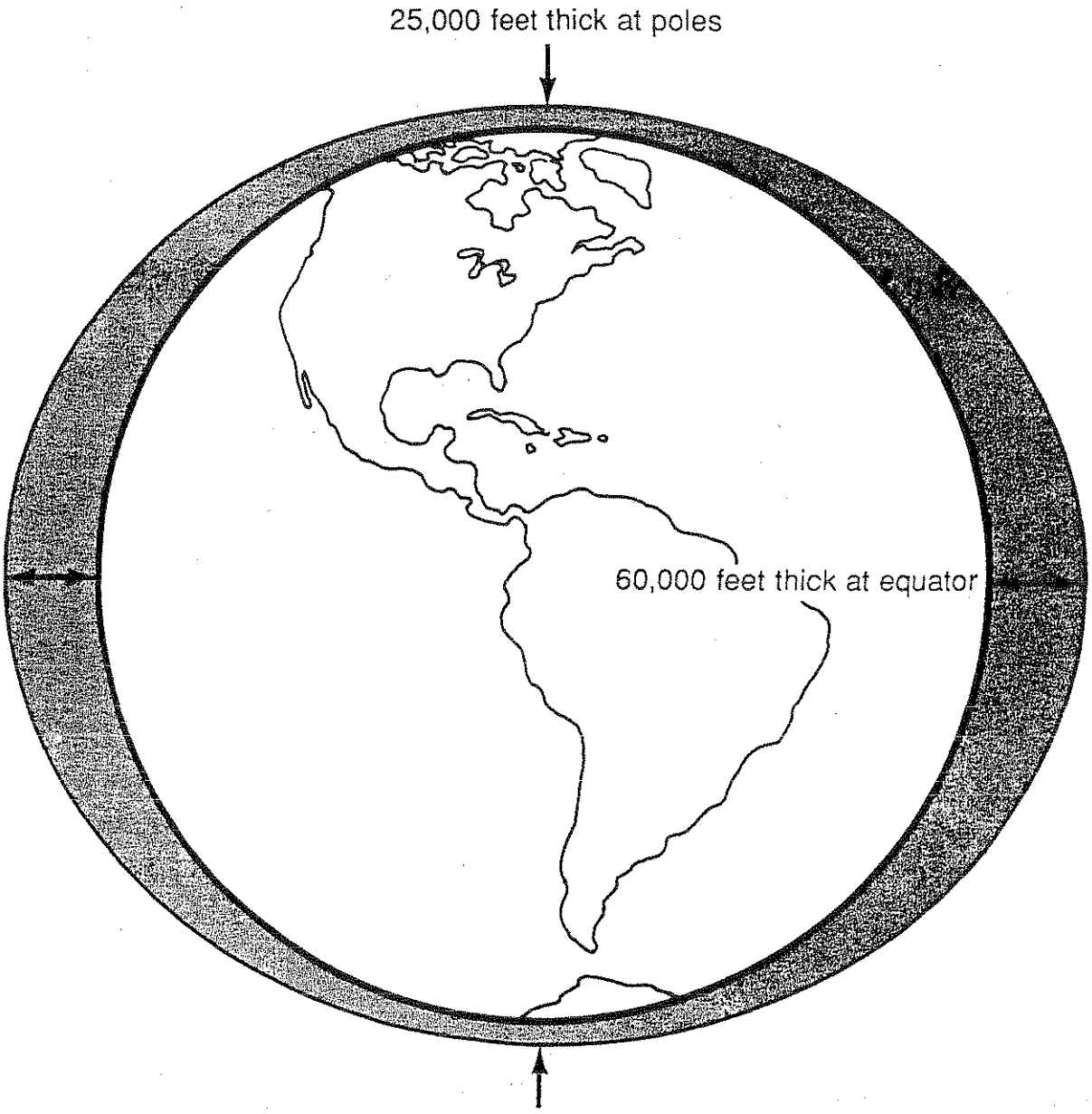
_____

Name

_____

Homeroom

THE ATMOSPHERE



The atmosphere is all of the air around the earth. This blanket of air acts as protection from harmful rays of the sun and regulates the Earth's temperatures. Celestial bodies without atmospheres, such as the moon, are unprotected, so their days are extremely hot and their nights are extremely cold.

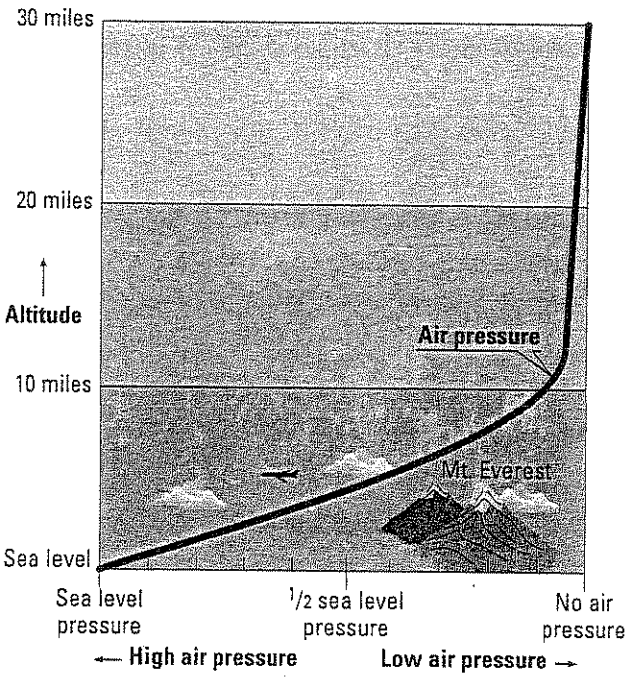


Figure 4-4: Air pressure changes quickly with height.

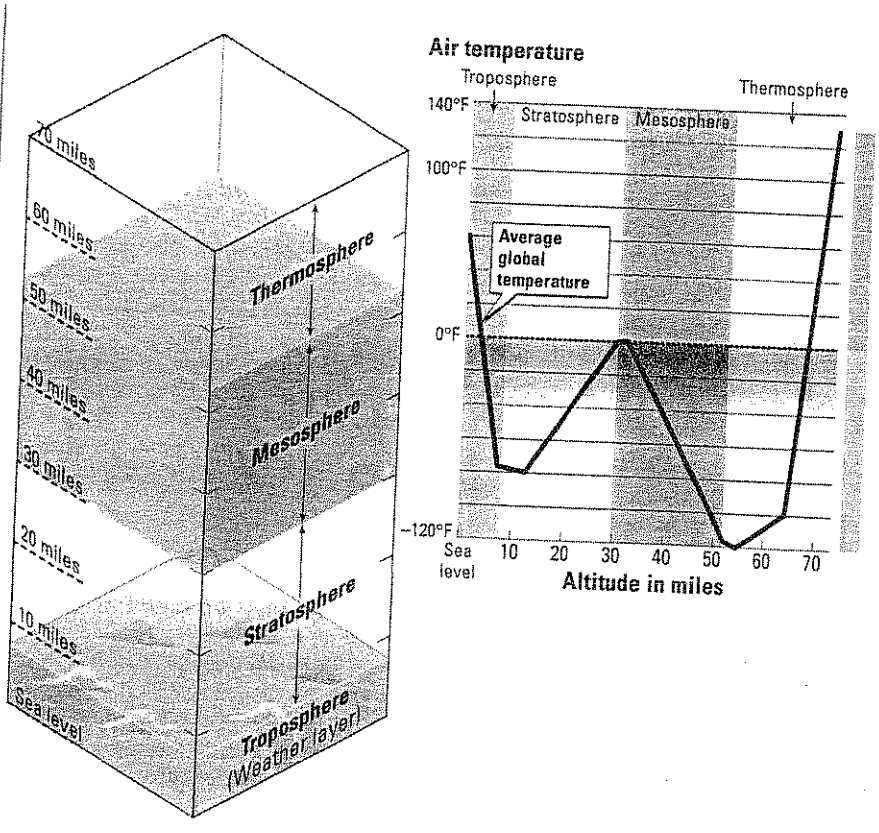


Figure 2-9: Here is a map of the atmosphere's different layers.

Name _____ Date _____ Class _____

SECTION 1-1 REVIEW AND REINFORCE

The Air Around You

◆ Understanding Main Ideas

Fill in the blanks in the table below.

Gases in Dry Air	Percent by Volume
Argon	**1.** _____
2. _____	0.036
Nitrogen	**3.** _____
4. _____	21

Answer the following questions on a separate sheet of paper.

5. Besides the gases shown in the table, what else is found in Earth's atmosphere?

6. What are two sources of carbon dioxide in air?

7. Why is nitrogen important for living things?

8. How does the atmosphere make conditions on Earth suitable for living things?

9. What are two processes that use oxygen?

10. Where is the amount of water vapor in the air likely to be highest, above a desert or a tropical rain forest?

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

_____ **11.** weather

_____ **12.** atmosphere

_____ **13.** ozone

_____ **14.** water vapor

_____ **15.** oxygen

a. the layer of gases that surrounds Earth

b. a form of oxygen with three atoms instead of two

c. water in the form of a gas

d. the condition of Earth's atmosphere at a particular time and place

e. gas used by living things to turn food into energy

Name _____ Date _____ Class _____

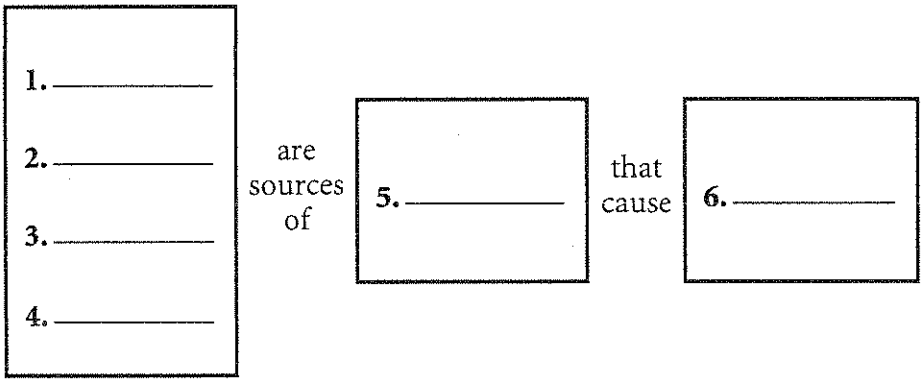
SECTION 1-2 REVIEW AND REINFORCE

Air Quality

◆ Understanding Main Ideas

Fill in the blanks in the flow chart with the words listed below.

burning fossil fuels, air pollution, dust storms, farming, forest fires, pollutants



If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

_____ **7.** Almost half the air pollution from human activities comes from factories.

_____ **8.** The average number of pollen grains in a cubic meter of air is called the pollen rate.

_____ **9.** Soot refers to particles that give smoke its dark color.

_____ **10.** Photochemical smog is most likely to occur where it is rainy.

◆ Building Vocabulary

Fill in the blank to complete each statement.

11. Harmful substances in air, water, or soil are called _____.

12. _____ is a brown haze caused by the action of sunlight on chemicals.

13. Rain that contains more acid than normal is known as _____.

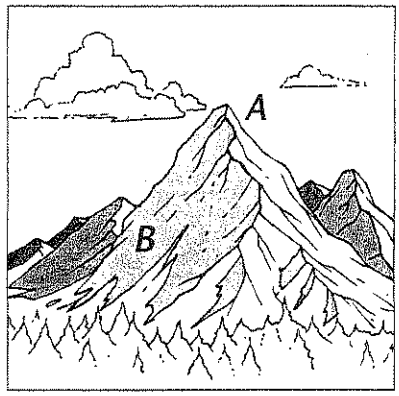
Name _____ Date _____ Class _____

SECTION 1-3 REVIEW AND REINFORCE

Air Pressure

◆ Understanding Main Ideas

Study the figure below, and then complete the following statements.



1. Altitude is greater at point _____.

2. Air pressure is greater at point _____.

3. Density of the air is greater at point _____.

4. A cubic meter of air has less mass at point _____.

5. The percentage of oxygen in the air at point A is _____ percent.

Answer the following questions on a separate sheet of paper.

6. State three properties of air.

7. Why doesn't air pressure crush objects such as your desk?

8. What two units of air pressure are used in weather reports?

◆ Building Vocabulary

Match each term with its definition by writing the letter of the correct definition on the line beside the term.

_____ **9.** air pressure

_____ **10.** altitude

_____ **11.** aneroid barometer

_____ **12.** barometer

_____ **13.** density

_____ **14.** mercury barometer

_____ **15.** pressure

a. the amount of mass in a unit volume of a substance

b. force per unit area

c. the result of the weight of a column of air pushing down on an area

d. any instrument that measures changes in air pressure

e. instrument that measures changes in air pressure using liquid mercury

f. the distance above sea level

g. instrument that measures changes in air pressure without using a liquid

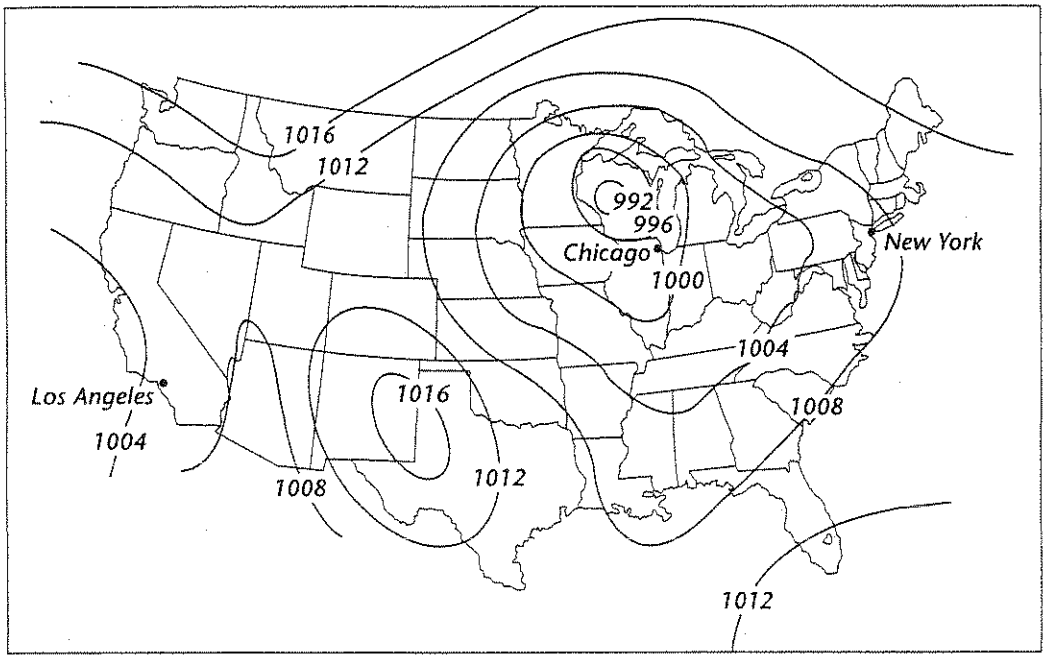
5

Name _____ Date _____ Class _____

SECTION 1-3 **ENRICH**

Isobars and Air Pressure

Air pressure is an important factor affecting weather. Changes in air pressure help weather forecasters predict how the weather will change. Air pressure readings from barometers are shown on weather maps, like the one below, with lines called isobars. Isobars are drawn to connect areas that have the same air pressure.



Refer to the map to complete the following statements.

1. Each isobar differs from the next isobar by _____ millibars.
2. The lowest air pressure reading on the map is _____ millibars.
3. Where this low pressure occurs, the weather is likely to be _____.
4. The highest air pressure reading on the map is _____ millibars.
5. This high-pressure area is likely to be experiencing _____ weather.
6. An area of _____ air pressure is centered northwest of Chicago.
7. The air pressure in Chicago is about _____ millibars.
8. The air pressure in Los Angeles is about _____ millibars.
9. The air pressure in New York City is about _____ millibars.
10. Most of Florida has a barometric pressure between about 1008 millibars and _____ millibars.

6

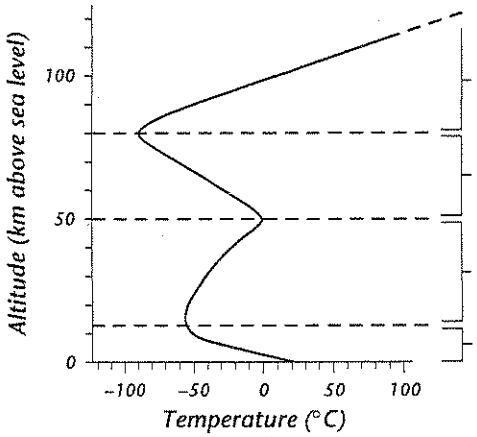
Name _____ Date _____ Class _____

SECTION 1-4 REVIEW AND REINFORCE

Layers of the Atmosphere

◆ Understanding Main Ideas

The graph below shows altitudes and temperatures for the four main layers of the atmosphere. Label the four layers and then complete the statements that follow.



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

5. The coldest temperatures in the atmosphere occur at an altitude of about _____.

6. The hottest temperatures in the atmosphere occur in the _____.

7. Temperatures increase in the _____ and _____ layers of the atmosphere.

8. As you move up through the mesosphere, the temperature _____.

◆ Building Vocabulary

If the statement is true, write true. If it is false, change the underlined word or words to make the statement true.

_____ 9. The layer of the atmosphere where weather occurs is the thermosphere.

_____ 10. The mesosphere is the layer of the atmosphere that contains ozone.

_____ 11. The exosphere is the outer layer of the thermosphere.

_____ 12. Most meteoroids burn up in the stratosphere.

_____ 13. The troposphere is divided into two layers.

_____ 14. The ionosphere lies between the mesosphere and exosphere.

(7)

Name _____ Date _____ Class _____

SECTION 1-4 **ENRICH**

Air Pressure in the Troposphere

Earth's weather occurs in the troposphere, and air pressure is an important factor in weather. Use the data on air pressure in the table to make a graph showing how air pressure changes as you move upward in the troposphere.

Altitude (m above sea level)	Average Air Pressure (millibars)
0 (sea level)	1013.2
500	954.6
1,000	898.8
1,500	845.6
2,000	795.0
2,500	746.9
3,000	701.2
3,500	657.8
4,000	616.6
4,500	577.5
5,000	540.5
5,500	505.4
6,000	472.2
6,500	440.8
7,000	411.0
7,500	383.0
8,000	356.5
8,500	331.5
9,000	308.0
9,500	285.8
10,000	265.0

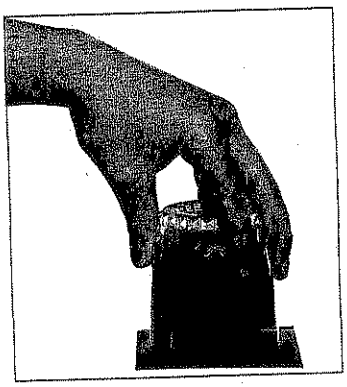
Answer the following items on a separate sheet of paper.

1. Describe the relationship between altitude and air pressure shown in the graph.
2. Estimate the average air pressure in a hole 500 meters below sea level.
3. If you were flying in a plane at an altitude of 1,500 meters, what would the air pressure outside the plane be? When you fly that high, why might your ears "pop"?

8

Air pressure

When you swim underwater, you may feel the pressure of water on your body increasing the deeper you go. The air too has pressure, although you cannot feel it. Indeed, the pressure of the atmosphere at ground level is enormous and would crush you if it were not for the fact that the fluids inside your body exert as much pressure as the air pressure outside. Scientists once thought atmospheric pressure was simply the weight of hundreds of kilometers of air pushing down on the Earth. In fact, air pressure pushes in all directions — up, down, and sideways — and it is really constant bombardment by moving air molecules (p. 24). Air pressure gradually decreases as you go higher in the atmosphere — so evenly that aircraft altitude meters work simply by measuring the air pressure. Jet airliners must have pressurized cabins because the pressure drop at high altitudes would make it impossible to breathe — the greater pressure inside your body would prevent it taking in air.



Pushing power
You can prove that air pressure pushes upward as well as down this way. Fill a tumbler to the brim with water, and slide a postcard over the top. Keeping your hand pressed on the card, turn the tumbler upside down over the sink. Take your hand away, and the card will stay in place, held up by air pressure!

EXPERIMENT

Air lift

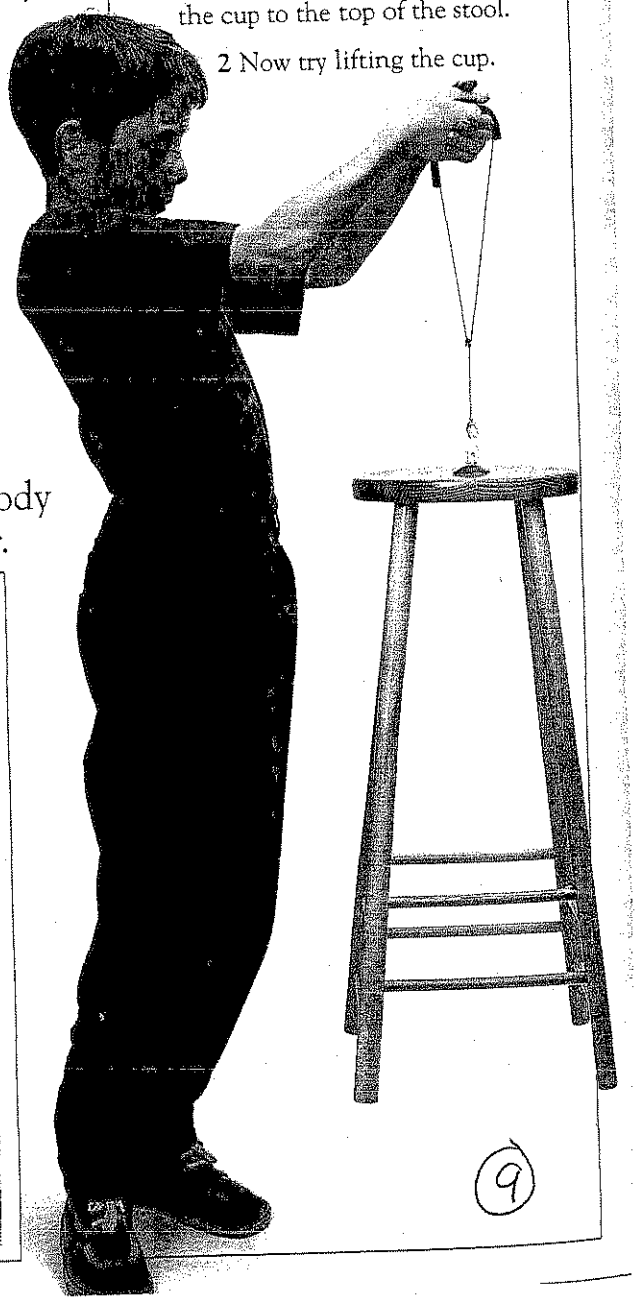
Rubber suction cups work because of air pressure. When pressed against a flat surface, air is forced out, reducing the pressure inside. Because the pressure outside is now much greater, the suction cup is pushed firmly down. This experiment shows that the pressure is enough to hold a stool in the air.

YOU WILL NEED

- *smooth-topped stool*
- *suction cup*

1 Tie string to the suction cup. Press the cup to the top of the stool.

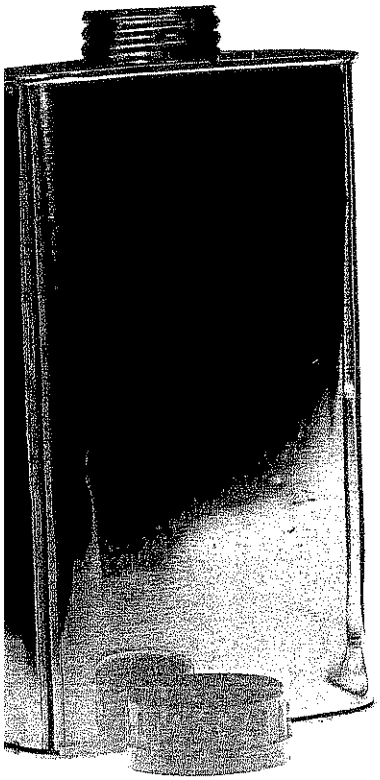
2 Now try lifting the cup.



■ DISCOVERY ■

The Magdeburg experiment

IN 1664, THE MAYOR of the German town of Magdeburg, Otto von Guericke, devised an experiment to demonstrate the strength of atmospheric pressure. He used two metal hemispheres, fitted together with an airtight joint, to make a hollow sphere. Once air had been sucked from the inside with a vacuum pump, it took 16 horses to pull the hemispheres apart. This 17th-century engraving shows the Magdeburg experiment demonstrated in the presence of Emperor Ferdinand III.



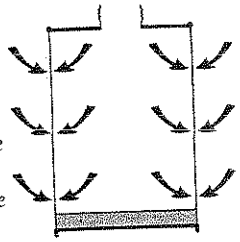
DEMONSTRATION

The collapsing can

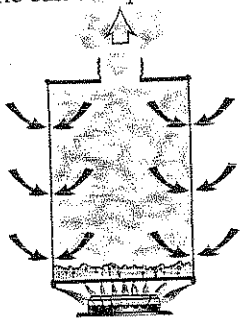
Air pushes on each and every square inch (6.5 square cm) of your body with a force equal to nearly three bags of sugar – about 14 lbs (6.4 kg). We are normally unaware of the intensity of air pressure because we are supported by equal air pressure on all sides.

Just how strongly air can push is illustrated by this collapsing can demonstration. Air pressure pressing on the outside of a metal can is strong enough to crush the can. Normally, the air inside the can pushes back against this, so the can does not collapse. But if the can is filled with steam, the situation is very different. The steam condenses to water, creating a partial vacuum inside the can. This means that there is very little air to push against the air pressure outside the can, so the can collapses.

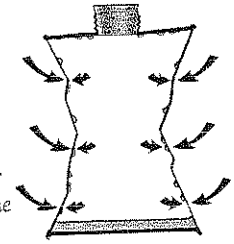
ow it works
ie can retains its ape in normal mospheric conditions cause the air pressure side the can is the me as the air pressure utside the can.



Creating steam
by boiling water inside the can pushes much of the air out of the can. The pressure of the steam, however, still equals that of the air outside the can.



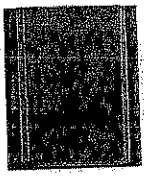
Replacing the cap
allows the steam to cool and condense, creating a partial vacuum. Pressure outside is now greater than that inside, so the can is crushed.



EXPERIMENT

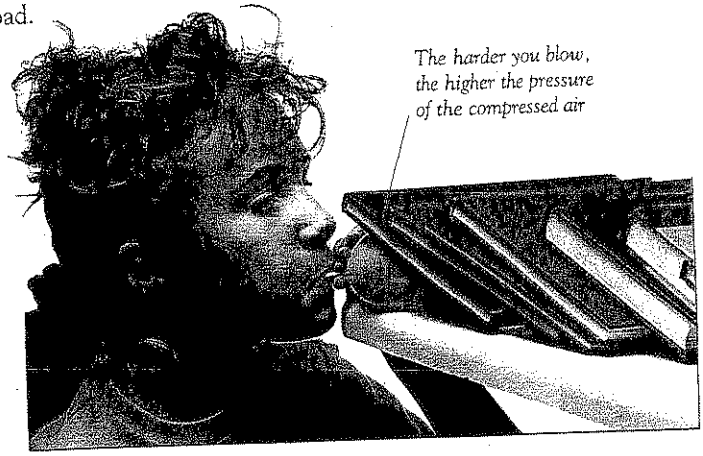
Blowing books away

You Will Need
- *stack of books*
- *balloon*



When you compress (squash) air, the air pushes back. This force can be useful. Hovercrafts, or example, use a cushion of high-pressure air to lift them out of the water. This reduces riction, which means that the vehicles can travel easily and quickly. This experiment shows ıow compressed air can be used to lift a load.

1 Place the balloon on the edge of a table, so that the neck hangs over ıe edge. Place the books on the alloon. Begin to blow into the balloon.



2 Continue to blow air into the balloon. The pressure of the air inflates the balloon and lifts the book off the table. Can you make the books topple?

10

Science Name _____

Weather Chapter 1-Vocabulary Date_____

Match the letter of the word with the correct definition.

a. pollutant

b. photochemical smog

c. acid rain

d. density

e. pressure

f. air pressure

g. barometer

h. mercury barometer

i. aneroid barometer

j. altitude

k. troposphere

l. stratosphere

m. mesosphere

n. thermosphere

o. ionosphere

p. aurora borealis

q. exosphere

r. weather

s. atmosphere

t. ozone

u. water vapor

_____ 1. Rain that contains more acid than normal.

_____ 2. A force that is the result of weight of a column of air pushing down on an area.

_____ 3. Elevation above sea level.

_____ 4. Instrument used to measure changes in air pressure without using a liquid.

_____ 5. Layer of gases that surrounds Earth.

_____ 6. Colorful, glowing display in the sky caused when particles from the sun strike oxygen and nitrogen atoms in the ionosphere.

_____ 7. Instrument used to measure changes in air pressure.

_____ 8. The amount of mass of a substance to a given volume.

_____ 9. The outer layer of the thermosphere, extending outward into space.

_____ 10. The lower part of the thermosphere, where electrically charged particles called ions are found.

_____ 11. Instrument used to measure changes in air pressure using liquid mercury.

_____ 12. The middle layer of Earth's atmosphere; layer where most meteoroids burn up.

_____ 13. A form of oxygen that has three oxygen atoms in each molecule instead of the usual two.

_____ 14. A brownish haze that is a mixture of ozone and other chemicals.

_____ 15. Harmful substances in the air, water or soil.

_____ 16. The force pushing on an area or surface.

_____ 17. The second-lowest layer of Earth's atmosphere.

_____ 18. The outermost layer of Earth's atmosphere.

_____ 19. The lowest layer of Earth's atmosphere, where weather occurs.

_____ 20. Water in the form of gas.

_____ 21. The condition of Earth's atmosphere at a particular time and place.

Science Explorer: Weather and Climate
Chapter 1 Self-Test
Your First Name Only:

Click on the button next to the response that best answers the question.

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1. Which human activity is responsible for half of all air pollution?
   - farming
   - manufacturing
   - building
   - driving cars and other motor vehicles

---

2. Ozone is primarily found in the
   - thermosphere.
   - mesosphere.
   - stratosphere.
   - troposphere.

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3. The ionosphere is the layer in which
   - communications satellites orbit.
   - the aurora borealis occurs.
   - meteoroids burn up.
   - ultraviolet radiation is absorbed.

---

4. The atmospheric gas from which ozone is formed is
   - oxygen.
   - carbon dioxide.
   - nitrogen.
   - hydrogen.

. The biggest single cause of air pollution is
- acid rain.
- forest fires.
- the burning of fossil fuels.
- volcanic ash and dust.

. Which of the following sets off chemical reactions
hat form photochemical smog?
- sunlight
- hydrocarbons
- nitrogen oxide
- ozone

'. The most abundant gas in Earth's atmosphere is
- oxygen.
- carbon dioxide.
- nitrogen.
- hydrogen.

---

3. Density is calculated by
- dividing volume by mass.
- dividing mass by volume.
- multiplying mass by volume.
- dividing pressure by mass.

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9. As altitude increases,
- air pressure and density increase.
- air pressure and density decrease.
- air pressure increases and density decreases.
- air pressure decreases and density increases.

9/19/05 8:00 PM

Science Explorer: Weather and Climate Self-Test

10. Earth's weather occurs in the
- thermosphere.
- mesosphere.
- stratosphere.
- troposphere.

SUBMIT