

## Chapter 6

## STUDY GUIDE

Use with Text Pages 172-174

## ● Energy from the Oceans

Use the words in the box to fill in the blanks.

condense	heat engines	oxygen
thermal	efficiency	increase
radiant	tropical	electricity
mechanical	temperatures	vaporize

Because the oceans have large surface areas and great depth, they have the ability to absorb

radiant energy from the sun and store it as thermal energy. The

mechanical energy of the moving water of tides can also be used to rotate turbines to generate electricity.

In tropical or subtropical regions, there can be more than 20°C difference between the warm surface waters and cold bottom waters. Ocean thermal energy conversion (OTEC) is a process that uses heat engines to convert differences in the thermal energy of ocean water at different temperatures into mechanical energy to drive turbines. One type of OTEC engine uses heat from warm surface waters to vaporize a working fluid with a low boiling point. In some engines, ammonia vapor drives a turbine which is connected to a generator. After the ammonia vapor passes through the turbine, it transfers heat to colder ocean water causing the ammonia to condense.

One drawback to OTEC plants is that they now operate at low efficiency because they require great amounts of energy to pump large amounts of water from ocean depths. However, improved designs will likely increase their efficiency. Another concern of OTEC systems is that the pumping of large amounts of cold water to the surface may affect the dissolved oxygen and nutrient levels of the marine environment.

## Chapter 7

## STUDY GUIDE

Use with Text Pages 180-185

## ● Why We Use Machines

In each of the following statements, a term has been scrambled. Unscramble the term and write it on the line provided.

- resistance 1. The force applied by a machine to overcome gravity or friction is the *stirnecessa* force.
- effort 2. The force that is applied to the machine is the *ofrtref* force.
- work 3. When a force is applied through a distance, *know* is done.
- machine 4. A device that makes work easier is a *himcaen*.
- input 5. The work done on a machine is work *putin*.
- ideal 6. A machine in which work input is equal to work output is an *ilead* machine.
- simple 7. A device that does work with only one movement is a *plimes* machine.
- mechanical advantage 8. The number of times a machine multiplies the effort force is the *leahmcamch gavetaadna*.
- output 9. The work done by a machine is work *putut*.
- force 10. A machine makes work easier by changing the size or direction of the *ceof* exerted on it.

In the blank, write the term that correctly completes each statement about the equations given.

11. In the equation  $MA = F_r / F_e$
- $MA$  stands for mechanical advantage.
  - $F_r$  stands for resistance force.
  - $F_e$  stands for effort force.
12. In the equation  $W = F \times d$ ,
- $W$  stands for work.
  - $F$  stands for force.
  - $d$  stands for distance.
13. In the equation  $W_{in} = F_e \times d_e$
- $W_{in}$  stands for work input.
  - $d_e$  stands for the distance the effort force is exerted.
14. In the equation  $W_{out} = F_r \times d_r$
- $W_{out}$  stands for work output.
  - $d_r$  stands for the distance the resistance force moves.

Chapter 7

STUDY GUIDE

• The Simple Machines

Short crypts are lists of related words written in a simple code in which a different set of letters has been substituted for the correct letters. The title of each list will give you a hint as to the subject of the list. Remember, the same code is used for the entire list. For example, if *c* stands for *k* in one word, *c* will stand for *k* in every word on the list. Each list has its own code. One word in each list has been done for you.

Code  
A C D E F G I J K L N O R T U W X  
e r h i c l o s m v d u t g a f n

Prying into Things

1. GALAC \_\_\_\_\_ lever
2. WOGFCOK \_\_\_\_\_ fulcrum
3. AWVICR UCK \_\_\_\_\_ effort arm
4. CAJEJRUXFA UCK \_\_\_\_\_ resistance arm
5. KAFDUXEFUG UNLUXRUTA \_\_\_\_\_ mechanical advantage
6. NECAFREIX \_\_\_\_\_ direction
7. FGUJJ \_\_\_\_\_ class

Code  
A B C D E F I J L N O Q R S T U V W X Z  
i e l o s h u x a b k t w y d g c n p r

Keeping it Simple

8. XICCBS \_\_\_\_\_ pulley
9. RFBBC LWT LJCB \_\_\_\_\_ wheel and axle
10. AWVCAWBT XCLWB \_\_\_\_\_ inclined plane
11. EVNBR \_\_\_\_\_ screw
12. NCDVO LWT QLVOCB \_\_\_\_\_ block and tackle
13. UBLZ \_\_\_\_\_ gear

In the space at the left, write the term that best completes each statement. Use the terms listed below.

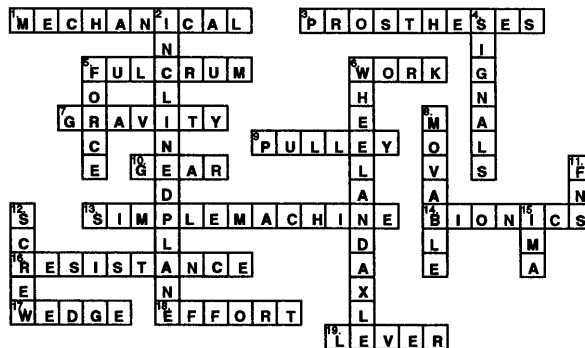
- block and tackle    screw    inclined planes    pulley    wheel and axle
- \_\_\_\_\_ screw \_\_\_\_\_ 14. An inclined plane wrapped around a cylindrical post is a \_\_\_\_\_.
- \_\_\_\_\_ wheel and axle \_\_\_\_\_ 15. A doorknob is an example of a \_\_\_\_\_.
- \_\_\_\_\_ pulley \_\_\_\_\_ 16. A grooved wheel with a rope or a chain running along the groove is a \_\_\_\_\_.
- \_\_\_\_\_ inclined planes \_\_\_\_\_ 17. Screws and wedges are types of \_\_\_\_\_.
- \_\_\_\_\_ block and tackle \_\_\_\_\_ 18. A system of pulleys is called a \_\_\_\_\_.

Chapter 7

STUDY GUIDE

• Mending with Machines

Solve the following crossword puzzle by using the clues provided.



Across

1. The number of times a machine multiplies an effort force is the \_\_\_\_\_ advantage.
3. artificial replacements for parts of the human body
5. fixed point of a lever
6. Force times distance equals this.
7. Weight is a measure of this force.
9. grooved wheel with a rope or chain running along the groove
10. wheel with teeth along its circumference
13. type of machine in which work input equals work output
14. Science of designing prostheses
16. The "r" in  $F_r$  stands for \_\_\_\_\_.
17. inclined plane with one or two sloping sides
18. The "e" in  $F_e$  stands for \_\_\_\_\_.
19. bar that is free to turn about a fixed point

Down

2. sloping surface used to raise objects (2 words)
4. In a brain-to-computer interface, electrodes are used to collect \_\_\_\_\_ from the brain.
6. simple machines made up of two wheels of different sizes that rotate together (3 words)
8. type of pulley that is attached to the object being moved
11. technique used to allow people with paralyzed legs to walk again
12. inclined plane wrapped in a spiral around a cylindrical post
15. part of formula for the mechanical advantage of a lever with no friction

Chapter 7

Use with Text Pages 198-203

STUDY GUIDE

## Using Machines

Unscramble the five terms related to machines. The hints beside each scrambled term will help you. Write each unscrambled term in the boxes below. Use only one letter in each box. Use the circled letters to find the missing term in the equation.

1. CEFRO push or pull
2. TAWT unit measuring one joule per second
3. FCYENFCIEI measure of how much work put into a machine is changed to useful work put out by the machine
4. KROW exertion of a force through a distance
5. PODNUCMO type of machine made up of two or more simple machines

1. 

F	○	R	C	E
---	---	---	---	---

2. 

W	A	T
---	---	---

3. 

E	F	F	I	C	○	N	C	Y
---	---	---	---	---	---	---	---	---

4. 

W	○	R	K
---	---	---	---

5. 

C	○	M	○	P	○	O	U	N	D
---	---	---	---	---	---	---	---	---	---

Equation: \_\_\_\_\_ **POWER** \_\_\_\_\_ = work/time

Solve the puzzle below by writing the term in the diagram that best fits each definition. You will find another term spelled vertically in the black box

6. 

C	O	M	P	O	U	N	D
---	---	---	---	---	---	---	---

7. 

R	A	D	I	U	S
---	---	---	---	---	---

8. 

F	U	L	C	R	U	M
---	---	---	---	---	---	---

9. 

M	E	C	H	A	N	I	C	A	L
---	---	---	---	---	---	---	---	---	---

10. 

D	I	R	E	C	T	I	O	N
---	---	---	---	---	---	---	---	---

11. 

F	R	I	C	T	I	O	N
---	---	---	---	---	---	---	---

12. 

W	E	D	G	E
---	---	---	---	---

13. 

S	C	R	E	W
---	---	---	---	---

Definitions

6. An automobile is this kind of machine.
7. distance from center of circle to its edge
8. fixed point on which a lever rotates
9. A measure of the amount a machine multiplies a force is its \_\_\_\_\_ advantage.
10. A fixed pulley changes the \_\_\_\_\_ of a force.
11. a force that opposes motion
12. simple machines made up of two inclined planes
13. inclined plane wrapped around a cylindrical post

Chapter 8

Use with Text Pages 214-221

STUDY GUIDE

## Matter and Temperature

Match the definition in Column II with the term in Column I. Write the letter of the correct definition in the blank on the left.

- |   |  |
|---|--|
| <p>Column I</p> <p><u>h</u> 1. kinetic theory of matter</p> <p><u>j</u> 2. plasma</p> <p><u>i</u> 3. crystals</p> <p><u>f</u> 4. solid</p> <p><u>c</u> 5. amorphous material</p> <p><u>a</u> 6. steam</p> <p><u>e</u> 7. thermal expansion</p> <p><u>b</u> 8. liquid</p> <p><u>d</u> 9. gas</p> <p><u>g</u> 10. ice</p> | <p>Column II</p> <p>a. water vapor</p> <p>b. state of matter with no definite shape but with definite volume</p> <p>c. solid which is not made of crystals</p> <p>d. state of matter that has no definite shape and no definite volume</p> <p>e. Matter expands when it gets hotter and contracts when it cools.</p> <p>f. state of matter with definite shape and definite volume</p> <p>g. water in the solid state</p> <p>h. Tiny particles in motion make up all matter.</p> <p>i. particles arranged in repeating geometric patterns</p> <p>j. gaslike mixture of charged particles</p> |
|---|--|

Use the words in the box to fill in the blanks.

shape	vibrate	plasma	energy
spread	volume	contracts	crystals
heated	position	flow	separate

In solids, particles move back and forth, but do not change \_\_\_\_\_ **position** \_\_\_\_\_.

Different kinds of solids have \_\_\_\_\_ **crystals** \_\_\_\_\_ of different shapes. Particles in a liquid have more energy than do solid particles. Liquid particles can \_\_\_\_\_ **vibrate** \_\_\_\_\_ over and around each other. Because of this kind of particle motion, liquids are able to \_\_\_\_\_ **flow** \_\_\_\_\_.

Because particles of a liquid are very close to one another, a liquid has a definite \_\_\_\_\_ **volume** \_\_\_\_\_. The particles in a gas have more \_\_\_\_\_ **energy** \_\_\_\_\_ than do liquid particles. Gas particles can completely \_\_\_\_\_ **separate** \_\_\_\_\_ from one another. A gas does not have a definite \_\_\_\_\_ **shape** \_\_\_\_\_ or volume. The most common form of matter in the universe is \_\_\_\_\_ **plasma** \_\_\_\_\_.

Matter expands when it is \_\_\_\_\_ **heated** \_\_\_\_\_. Matter expands because particles \_\_\_\_\_ **spread** \_\_\_\_\_ apart in all directions. Matter \_\_\_\_\_ **contracts** \_\_\_\_\_ when it is cooled.

NAME \_\_\_\_\_

DATE \_\_\_\_\_

CLASS \_\_\_\_\_

## Chapter 8

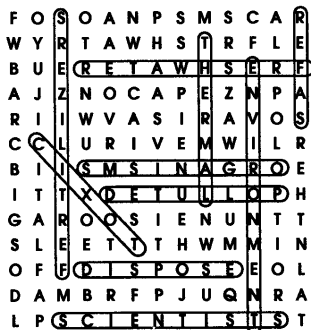
## STUDY GUIDE

## Fresh Water: Will There Be Enough?

Use with Text Pages 222–223

Complete the following sentences using words from pages 222–223 in your textbook. Then look for these words in the word search.

- fresh water 1. For living things, the most important liquid on Earth is \_\_\_\_\_. (2 words)
- Polluted 2. \_\_\_\_\_ water refers to water that contains such high levels of unwanted materials that it is unacceptable for use.
- Toxic 3. \_\_\_\_\_ chemicals from home use may end up in our water supply if they are not disposed of properly.
- Fertilizers 4. \_\_\_\_\_, herbicides, and pesticides used on farms may enter the groundwater.
- thermal 5. The excess heat in water is called \_\_\_\_\_ pollution.
- organisms 6. If water temperature is changed too much, some \_\_\_\_\_ that live in the water will die.
- safer environment 7. One way to reduce water pollution is to use products that are \_\_\_\_\_ for the \_\_\_\_\_.
- Scientists dispose 8. \_\_\_\_\_ are trying to develop better ways to contain and \_\_\_\_\_ of industrial wastes.



NAME \_\_\_\_\_

DATE \_\_\_\_\_

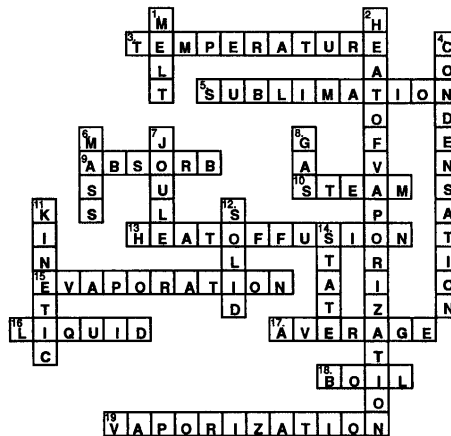
CLASS \_\_\_\_\_

## Chapter 8

## STUDY GUIDE

Use with Text Pages 224–227

## Changes in State



## Across

- The state of a material depends on this.
- change of a solid directly to a gas
- When ice melts, the particles of solid water \_\_\_\_\_ energy.
- gaseous water
- energy needed to change a material from solid to liquid (3 words)
- change of a liquid to gas below the boiling point
- has definite volume but no definite shape
- the kinetic energy of a substance is the \_\_\_\_\_ kinetic energy of its particles.
- to change from a liquid to a gas at temperatures above those normal to the liquid state
- process that occurs during boiling

## Down

- to change from solid to liquid
- energy needed to change a material from liquid to gas (3 words)
- occurs when a gas cools and changes to a liquid
- Liquids have a definite volume and \_\_\_\_\_.
- a unit of heat
- no definite shape, no definite volume
- theory used to explain changes of state
- has a definite volume and shape
- determined by motion and spacing of particles

## Chapter 8

Use with Text Pages 228–233

## STUDY GUIDE

## ● Behavior of Gases

Use the words in the box to fill in the blanks.

force	constantly	size	absolute	liquids
increase	volume	boiling	decrease	pressure
kinetic	particles	kilopascals	larger	decrease
pressure	Charles's	Boyle's	temperature	increased

Gases in Earth's atmosphere exert pressure on everything. According to the kinetic theory, the particles of a gas are constantly moving. Every time gas particles hit something and bounce off, they exert a tiny force. Pressure is this amount of force exerted per unit of area. Air pressure at sea level is 101.3 kilopascals.

The amount of force exerted by a gas depends on the size of its container. Boyle's law states that if a sample of gas is kept at constant temperature, decreasing the volume will increase the pressure the gas exerts. If you increase the volume, the pressure will decrease. According to the kinetic theory, if you do not change the amount of gas or its temperature but decrease the size of the container, the particles will strike the walls more often and the pressure will rise. When the size of the container is larger, the pressure is smaller because the particles hit the walls less often.

According to Charles's law, if a sample of gas is kept at constant pressure, the volume increases if the temperature is increased.

Charles's measurements suggested that the volume of a gas would become zero at a temperature of  $-273^{\circ}\text{C}$ . The temperature  $-273^{\circ}\text{C}$  is called absolute zero. All gases become liquids when cooled to their boiling points.

## Chapter 8

Use with Text Pages 234–239

## STUDY GUIDE

## ● Uses of Fluids

Match the definitions in Column II with the terms in Column I. Write the letter of the correct definition in the blank on the left.

## Column I

## Column II

- |                                   |   |
|-----------------------------------|---|
| <u>b</u> 1. fluid                 | a. the ability of a fluid to exert an upward force on an object immersed in it                            |
| <u>e</u> 2. Archimedes' principle | b. a gas or a liquid  |
| <u>d</u> 3. pressure              | c. Pressure applied to a fluid is transmitted unchanged throughout the fluid.                             |
| <u>f</u> 4. hydraulic lift        | d. force per unit area  |
| <u>g</u> 5. Bernoulli's principle | e. The buoyant force on an object in a fluid is equal to the weight of the fluid displaced by the object. |
| <u>a</u> 6. buoyancy              | f. operates on Pascal's principle   |
| <u>c</u> 7. Pascal's principle    | g. As the velocity of a fluid increases, the pressure exerted by the fluid decreases.                     |

Use the words in the list to fill in the blanks.

Bernoulli's	Archimedes'	less	faster	farther	floats
hydraulic	piston	buoyant force	pressure	areas	
sinks	liquid	connected	Pascal's	upward	

The amount of buoyant force determines whether an object will sink or float in a fluid. If the buoyant force is less than an object's weight, the object sinks. If the buoyant force equals an object's weight, the object floats. Archimedes' principle can be used to explain the buoyant force on an object submerged in a fluid.

Machines such as hydraulic lifts that multiply forces use Pascal's principle. In a hydraulic lift, a liquid is placed in two connected cylinders. Each cylinder has a piston that can move up and down. Also, the cylinders have different cross sectional areas. In this device, the pressure on each piston will be the same. However, the force will be greater on the piston with larger area. Bernoulli's principle explains why a pitched baseball curves and how airplanes fly. Air travels farther over the top of the wing than over the bottom. Thus, the air travels faster over the top of the wing than over the bottom. Pressure above the wing is less than pressure below it. There is net upward force on the wing.

NAME \_\_\_\_\_

DATE \_\_\_\_\_

CLASS \_\_\_\_\_

## Chapter 9

## STUDY GUIDE

Use with Text Pages 246-251

## ● Composition of Matter

One key term has been scrambled in each of the following statements. Unscramble the term. On the lines provided, rewrite the entire statement with the unscrambled term. Then find each unscrambled key term in the hidden word puzzle.

1. A(n) *ethgnesuoeroe* mixture has different materials that are spread out unevenly.

A heterogeneous mixture has different materials that are spread out unevenly.

2. A(n) *oildclo* is a heterogeneous mixture whose particles never settle and are large enough to scatter light. A colloid is a heterogeneous mixture whose particles never settle and are large enough to scatter light.

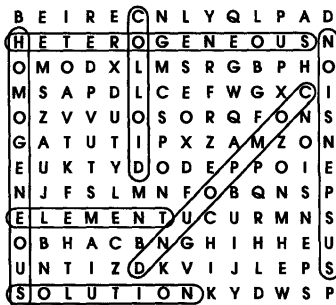
3. A homogeneous mixture in which particles are so small that they cannot be seen without a microscope is a(n) *tuolsion*. A homogeneous mixture in which particles are so small that they cannot be seen without a microscope is a solution.

4. A(n) *ssimnapue* is a liquid heterogeneous mixture in which visible particles settle. A suspension is a liquid heterogeneous mixture in which visible particles settle.

5. A(n) *ooudnmpc* is a material made from atoms of two or more combined elements. A compound is a material made from atoms of two or more combined elements.

6. If all the atoms in a sample of matter are alike, that kind of matter is a(n) *neemtl*. If all the atoms in a sample of matter are alike, that kind of matter is a(n) element.

7. A(n) *oogosuenehm* mixture has substances that are uniformly spread out. A homogeneous mixture has substances that are uniformly spread out.



NAME \_\_\_\_\_

DATE \_\_\_\_\_

CLASS \_\_\_\_\_

## Chapter 9

## STUDY GUIDE

Use with Text Pages 252-253

## ● The Colloid Connection

Use the following words and phrases to write a paragraph explaining how colloids are used to purify water.

alum	aluminum hydroxide	chlorine	clays	colloid
gel	lime	oxygen	sand	suspended materials

Answers may vary. Some municipal water-treatment plants first take water from a river and quickly filter it. The water is then allowed to settle to remove some of the clays and other suspended materials. Measured amounts of lime and alum are added to the water to produce a colloid of the compound, aluminum hydroxide, which forms a gel-like appearance and traps small dispersed particles because some of them stick to the gel. The gel is removed from the water by filtering it through a bed of fine sand. The water then may be sprayed into the air to add oxygen and be treated with chlorine for further purification.

Use the following words and phrases to write a paragraph explaining how soot is removed from smokestack exhaust.

carbon	coal fragments	negatively charged
coagulation	high voltage	soot

Answers may vary. Soot, a colloid made of carbon and uncombusted coal fragments, is vented into a chamber where it becomes negatively charged by high voltage. The charged soot particles attract uncharged soot particles. These particles then are attracted to a positive part of the chamber where the colloid structure is destroyed, which is called coagulation. The accumulated soot is then removed.