Fossils (pp. 240–246)

This section explains what fossils are and how they form.

Use Target Reading Skills

As you preview the section headings and visuals, write what you know about the topic in the box What You Know. *As you read the section, complete the* What You Learned *box.* Accept all logical answers.

What You Know
1. Fossils come from ancient organisms. 2. Fossils are found in hardened rock.

What You Learned
1. Molds and casts are types of fossils. 2. Organisms are also preserved in amber.

Name _____ Date _____ Class _____

Types of Fossils:
1. molds
2. casts
3. petrified
4. carbon films
5. trace
6. preserved remains

Fossils *(continued)*

Introduction (p. 240)

1. The preserved remains or traces of living things are called fossils.

2. List three things that scientists learn by studying fossils.
   a. evidence of how life has changed over time
   b. how Earth's surface has changed
   c. what past environments were like

How a Fossil Forms (pp. 240–243)

3. Is the following sentence true or false? Most fossils form when living things die and are buried by sediments. true

4. Is the following sentence true or false? Fossils are usually found in ~~igneous~~ sedimentary rock. ~~false~~ true

5. The type of rock that is made of hardened sediment is sedimentary rock.

6. Why do only the hard parts of organisms generally leave fossils?
   The soft parts often decay quickly or are eaten by animals.

7. Is the following sentence true or false? Fossils ~~can~~ cannot form when the remains of an organism decay. ~~false~~ true

8. Circle the letter of each sentence that is true about molds and casts.
   (a.) Both molds and casts copy the shape of ancient organisms.
   (b.) A mold forms when the hard part of an organism is buried in sediment.
   c. A cast is a hollow area in sediment in the shape of an organism.
   d. Molds and casts do not show details of the organism's structure.

9. Fossils in which minerals replace all or part of an organism are called petrified fossils.

10. Is the following sentence true or false? Petrified fossils can form when the minerals in water make a copy of the organism. true

11. What is a carbon film?
    A carbon film is a type of fossil that is an extremely thin coating of carbon on rock.

12. Is the following sentence true or false? A carbon film forms when ~~minerals~~ sediment preserve the delicate parts of an organism. ~~false.~~ true

13. Circle the letter of each trace fossil.
   (a.) footprints
   (b.) animal trails
   c. animal shells
   (d.) burrows

14. What can a scientist infer by looking at fossil footprints?
   Fossil footprints give clues about the animal's size and behavior, whether it walked on two legs or four legs, or if it lived alone.

15. What are three ways that the remains of organisms have been preserved?
   a. in tar
   b. in amber, or hardened by tree sap
   c. by freezing

Change Over Time (pp. 244–246)

16. Scientists who study fossils are called paleontologists.

17. Is the following sentence true or false? Paleontologists classify organisms based on the organisms' similarities and when they lived.
   true

18. All the information that paleontologists have gathered about past life is called the fossil record.

19. Circle the letter of each sentence that is true about the fossil record.
   (a.) It provides evidence for the history of life on Earth.
   (b.) It shows that organisms have changed over time.
   c. It reveals that complex organisms have given rise to simpler organisms.
   (d.) It provides evidence to support the theory of evolution.

20. Is the following sentence true or false? It is very ~~difficult~~ easy for scientists to learn about Earth's past environments by studying fossils.
   ~~false~~ true

Fossils *(continued)*

21. Circle the letter of the environment in which coal can form.
    a. warm, shallow seas
    b. cold, icy regions
    (c.) warm, swampy regions
    d. cold ocean bottoms

22. What is a scientific theory?
    A scientific theory is a well-tested concept that explains a wide range of observations.

23. The gradual change in living things over long periods of time is called evolution.

24. Is the following sentence true or false? The fossil record shows that millions of types of organisms have evolved. true

25. A type of organism that no longer exists and will never again live on Earth is extinct.

The Relative Age of Rocks (pp. 247–251)

This section explains how scientists determine whether a rock is older or younger than other rocks.

Use Target Reading Skills

Complete the first column in the chart by previewing the red headings in this section in your textbook and asking a what *or* how *question for each. As you read the section, complete the second column with the answers.* Accept all logical answers.

Relative Age

Question	Answer
What does the position of rock layers reveal?	The position of rock layers shows . . . that the oldest layers—and oldest fossils—are at the bottom.
How do geologists determine the relative age of a rock?	By applying the law of superposition
How are fossils used to date rocks?	The age of an index fossil tells the relative age of the rock layer in which it occurs.

Introduction (p. 247)

Match the term with its definition.

Term

b 1. relative age

a 2. absolute age

Definition

a. The number of years since the rock formed

b. The age of a rock compared to the ages of other rocks

The Relative Age of Rocks *(continued)*

The Position of Rock Layers (p. 248)

3. According to the law of superposition, the oldest layer is at the bottom. Each higher layer is younger than the layers below it.

4. Is the following sentence true or false? The deeper one travels into the Grand Canyon, the ~~younger~~ older the rocks become. ~~false~~ true

Determining Relative Age (pp. 249–250)

5. Complete the table below about the clues that geologists use to find the relative ages of rocks.

Clues to the Relative Ages of Rocks		
Clues	**How It Forms**	**What Clues Tell Geologists**
Extrusion	a. Lava hardens on Earth's surface.	b. Rock layers below extrusions are always older.
Intrusion	c. Magma pushes into rock, then cools and hardens.	d. An intrusion is always younger than the rock layers around and beneath it.
Fault	e. Forces inside Earth cause the rock to move on opposite sides of a fault.	f. A fault is always younger than the rock it cuts through.

g. A fault cuts through an extrusion. Which layer is the older? the extrusion

6. What is an unconformity?

An unconformity is a gap in the geologic record where new rock layers form above a much older rock surface.

7. Look carefully at the figure "Unconformity" in your textbook. Then describe how an unconformity can form.

Sedimentary rocks form in horizontal layers. Folding tilts the rock layers. The surface is eroded. New sediment is deposited, forming new rock layers. The unconformity is the boundary where the new rock layers meet the old, eroded surface.

Using Fossils to Date Rocks (pp. 250–251)

8. Geologists use index fossils to match rock layers in different locations.

9. Circle the letter of each sentence that is true about index fossils.

   (a.) Index fossils must be found in many different areas.
   b. Index fossils must represent an organism that lived for a very long time.
   c. Index fossils tell the absolute ages of the rock layers in which they occur.
   (d.) A type of ammonite that is different from other ammonites is a useful index fossil.

Fossil Fuels (pp. 278–284)

This section explains how fuels provide energy. The section also explains what fossil fuels are and compares and contrasts the different types of fossil fuels.

Use Target Reading Skills

After you read the section, reread the paragraphs that contain definitions of key terms. Use all the information you have learned to write a meaningful sentence using each key term.

Energy Transformation and Fuels (pp. 278–279)

1. A substance that provides a form of energy, such as heat, as a result of a chemical change is a(n) fuel.

2. Is the following sentence true or false? Energy can ~~false~~ true be converted from one form to another.

3. The process of burning a fuel is called combustion.

4. Is the following sentence true or false? The energy stored in fuels can be used to generate electricity. true

5. Circle the letter of each sentence that is true about the production of electric power.

   a. In most power plants, water is boiled to make steam.
   b. The mechanical energy of steam turns the shaft of a generator.
   c. Powerful magnets turn inside a wire coil.
   d. Electricity is produced by a turbine.

What Are Fossil Fuels? (pp. 280–283)

6. Energy-rich substances formed from the remains of once-living organisms are called fossil fuels.

7. List the three major fossil fuels.

   a. coal b. oil

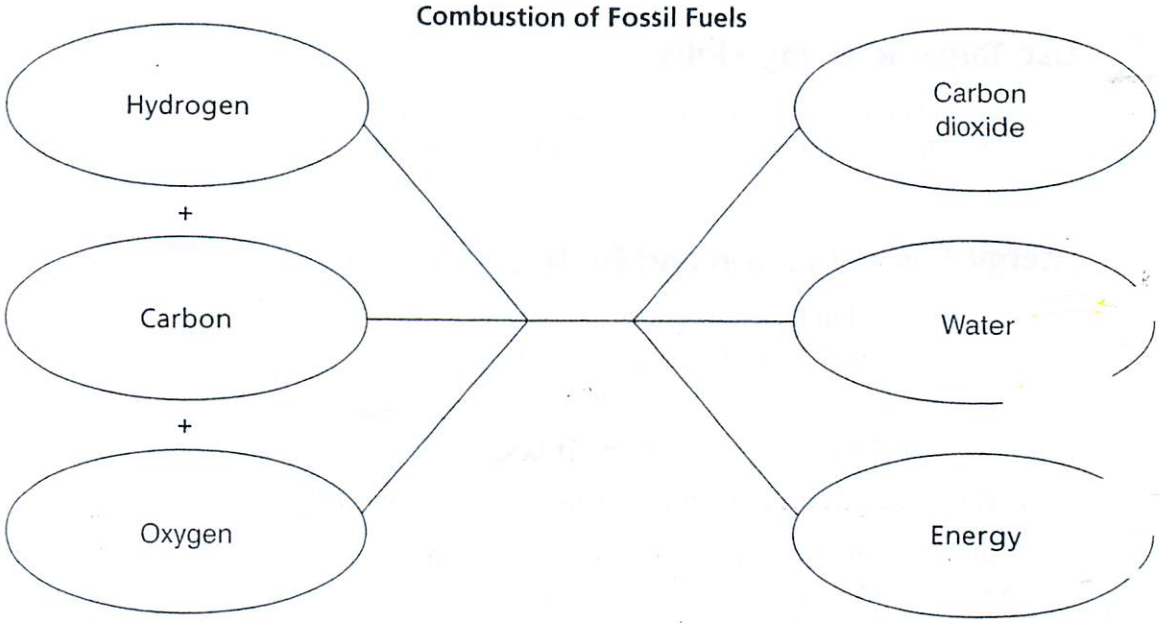
   c. natural gas

8. Energy-rich chemical compounds that contain carbon and hydrogen atoms are called hydrocarbons.

Fossil Fuels *(continued)*

9. Complete the flowchart.

Combustion of Fossil Fuels



10. A solid fossil fuel formed from plant remains is coal.

11. Is the following sentence true or false? Today, coal provides 23 percent of the energy used ~~worldwide~~ in the USA. false

12. Is the following sentence true or false? The major use of coal is to fuel ~~factories~~ electric power plants. false

13. Circle the letter of the sentence that is true about coal as an energy source.

    a. It is the least plentiful fossil fuel in the United States.
    b. It is difficult to transport.
    c. It provides a lot of energy when burned.
    d. It produces less air pollution than other fossil fuels.

14. How can coal mining harm the environment?
Coal mining can increase erosion, and runoff from mines can cause water pollution.

15. Another name for oil—the thick, black, liquid fossil fuel—is petroleum.

16. Circle the letter of each sentence that is true about petroleum.
    a. Petroleum accounts for more than half the energy produced in the world.
    (b.) Petroleum fuels most cars, airplanes, trains, and ships.
    (c.) The United States consumes a third of all the petroleum produced in the world.
    (d.) Finding oil is difficult.

17. Scientists can use sound waves to test an area for oil without drilling.

18. When oil is first pumped out of the ground, it is called crude oil.

19. A factory where crude oil is separated into fuels and other products by heating is called a(n) refinery.

20. Compounds that are made from oil are called petrochemicals.

21. Circle the letter of each sentence that is true about natural gas.
    (a.) It produces a lot of energy.
    b. It produces more air pollutants than oil.
    c. It is difficult to transport.
    (d.) It is highly flammable.

22. Is the following sentence true or false? Because natural gas is less dense than oil, it often rises above an oil deposit. true

Fossil Fuels *(continued)*

Fuel Supply and Demand (p. 284)

23. Is the following sentence true or false? Fossil fuels are considered a nonrenewable resource. ~~false~~ true

24. Circle the letter of each sentence that is true about the supply of fossil fuels.

(a.) Fossil fuels take hundreds of millions of years to form.
b. One half of Earth's known oil reserves has already been used.
c. Most nations that consume a lot of fossil fuel have large reserves of their own.
(d.) New sources of energy are needed to replace decreasing fossil fuel reserves.

Renewable Sources of Energy (pp. 285–291)

This section describes several renewable sources of energy and explains the advantages and disadvantages of each energy source.

Use Target Reading Skills

Before you read, preview Figure 7. Then write two questions that you have about the diagram in the graphic organizer below. As you read, answer your questions.

Possible questions and answers:

Q. How does the house capture solar energy?
A. Active solar collectors on the roof, large windows on south and west sides that act as passive solar collectors
Q. What does the equipment that is on the roof and in the basement do?
A. Active solar cells on the roof generate electricity that can be stored in the basement. Water heated in an active solar collector on the roof is stored in a tank in the basement and used to heat the house.

Harnessing the Sun's Energy (pp. 286–287)

1. What is solar energy? Solar energy is energy from the sun.

2. Circle the letter of each sentence that is true about solar energy.
   - (a.) It is the source of most other renewable energy resources.
   - b. It causes pollution.
   - (c.) It will not run out for billions of years.
   - (d.) It is available only when the sun is shining.

3. How do some solar plants capture energy and use it to generate electricity?
   Rows of giant mirrors focus the sun's rays to heat a tank of water. The water boils, making steam that can be used to generate electricity.

4. Is the following sentence true or false? Solar energy can be converted directly into electricity in a solar cell. true

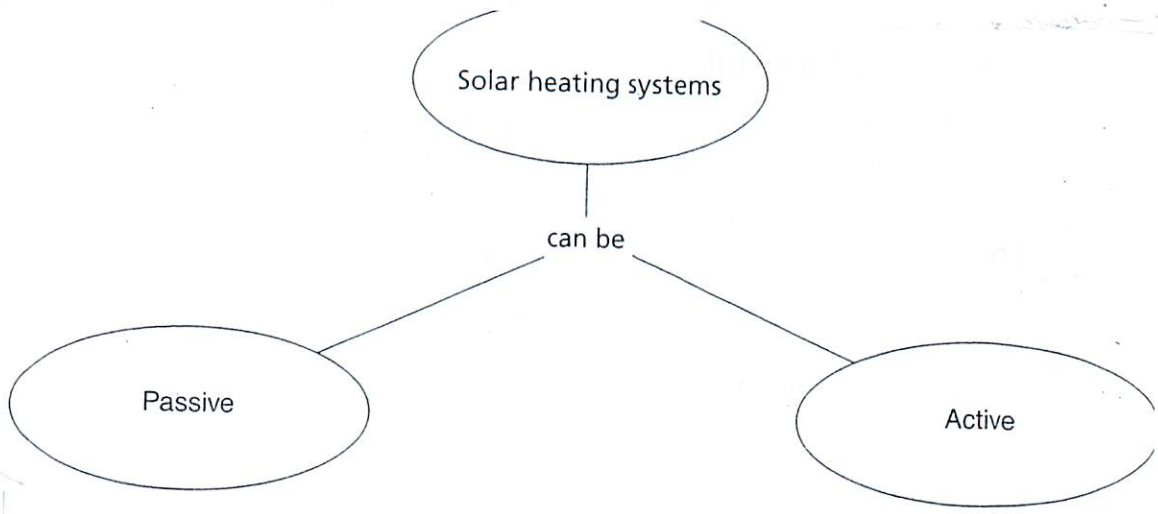
5. What are solar cells used to power?
   They are used to power calculators, lights, and other small devices.

6. Is the following sentence true or false? Solar heating systems convert sunlight into ~~mechanical energy~~. ~~false~~ true electricity in a solar cell.

Renewable Sources of Energy *(continued)*

Complete the concept map.

7.



8. How do active solar heating systems differ from passive solar heating systems?

Active solar heating systems use fans and pumps to distribute the heat.

Hydroelectric Power (p. 288)

9. List other renewable sources of energy besides the sun.

a. water b. wind

c. biomass fuels d. geothermal energy

e. hydrogen

10. Electricity produced by flowing water is called hydroelectric power. an indirect form of solar energy.

11. Is the following sentence true or false? Hydroelectric power is the ~~least~~ most widely used source of renewable energy in the world today.
~~false~~ true

12. What are two limitations on hydroelectric power in the United States?
Most of the suitable rivers have already been dammed, and dams can have negative effects on the environment.

Capturing the Wind (pp. 288–289)

13. Circle the letter of each sentence that is true about wind energy. - an indirect form of solar energy.
   a. It provides 10 percent of the world's electricity.
   (b.) It is the fastest-growing energy source.
   c. It causes pollution.
   (d.) In some places it is the major source of power.

14. Is the following sentence true or false? ~~Most~~ Few places have winds that blow steadily enough to be a worthwhile energy source.
~~false~~ true

Biomass Fuels (p. 289)

15. Fuels made from living things are called biomass fuels.

16. Circle the letter of each sentence that is true about biomass fuels.
   (a.) They include leaves, food wastes, and manure.
   (b.) They can be converted to other fuels.
   c. They are widely used today in the United States.
   (d.) They are renewable resources.

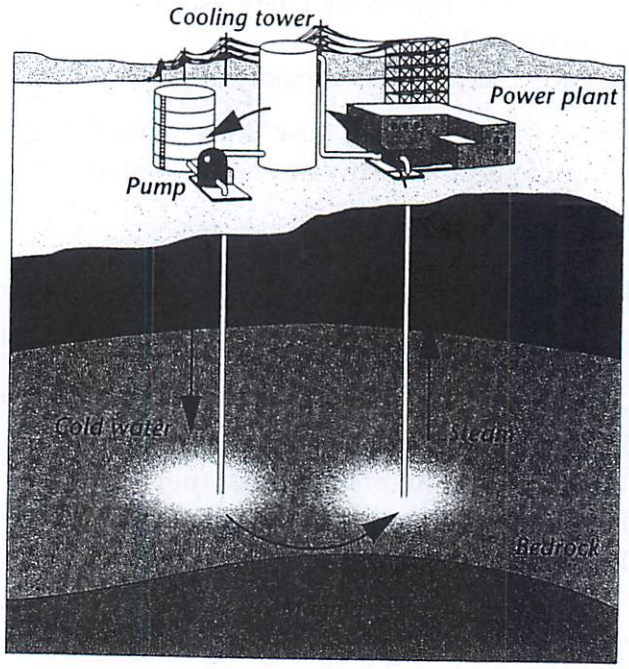
Renewable Sources of Energy *(continued)*

Tapping Earth's Energy (p. 290)

17. Intense heat from Earth's interior is called geothermal energy.

18. Is the following sentence true or false? Geothermal energy is an unlimited source of cheap energy. true

19. Add arrows to the drawing to show how water flows through a geothermal power plant.



The Promise of Hydrogen Power (p. 291)

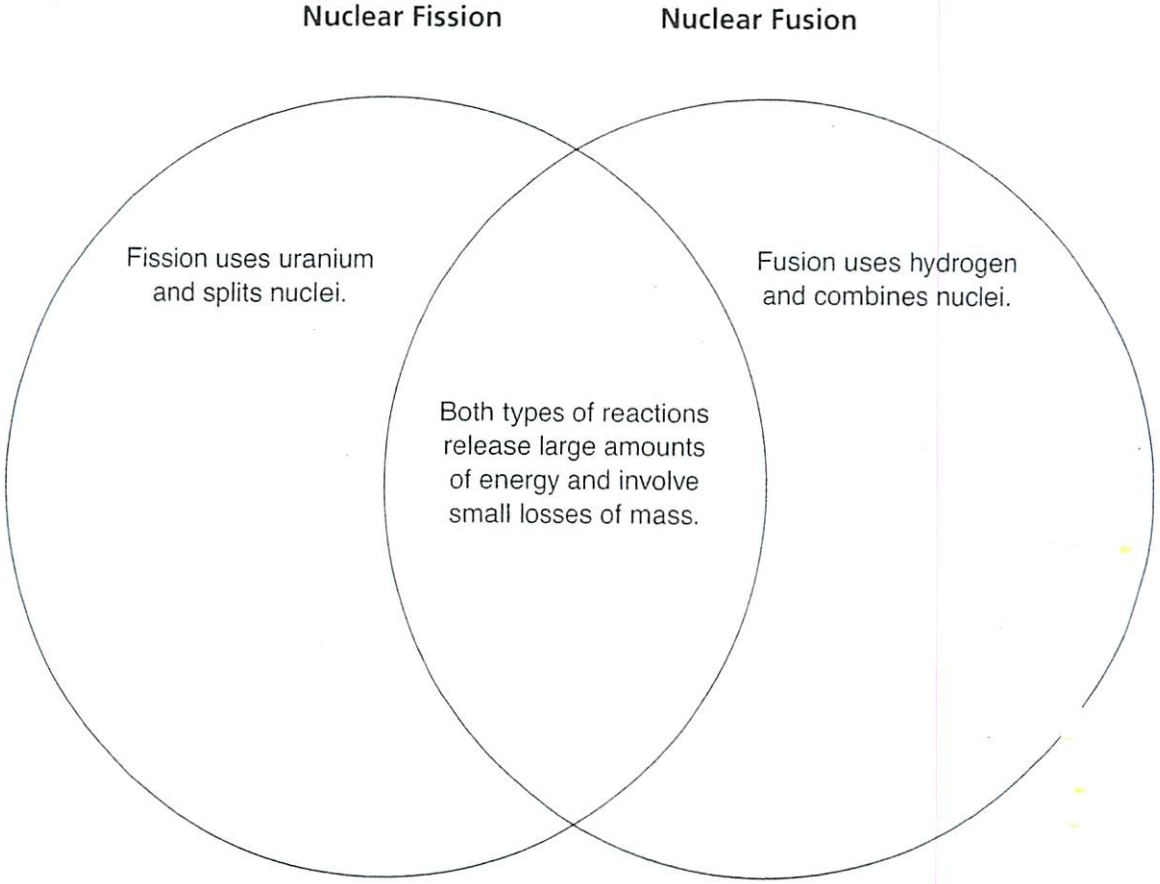
20. What is the obstacle to using hydrogen as a fuel?
It takes more energy to obtain pure hydrogen than is produced by burning the hydrogen.

Nuclear Energy (pp. 294–298)

This section explains how nuclear reactions inside atoms can produce energy. The section also describes the advantages and disadvantages of nuclear energy.

Use Target Reading Skills

As you read, compare and contrast fission and fusion reactions in the Venn diagram below. Write the similarities in the space where the circles overlap and the differences on the left and right sides.

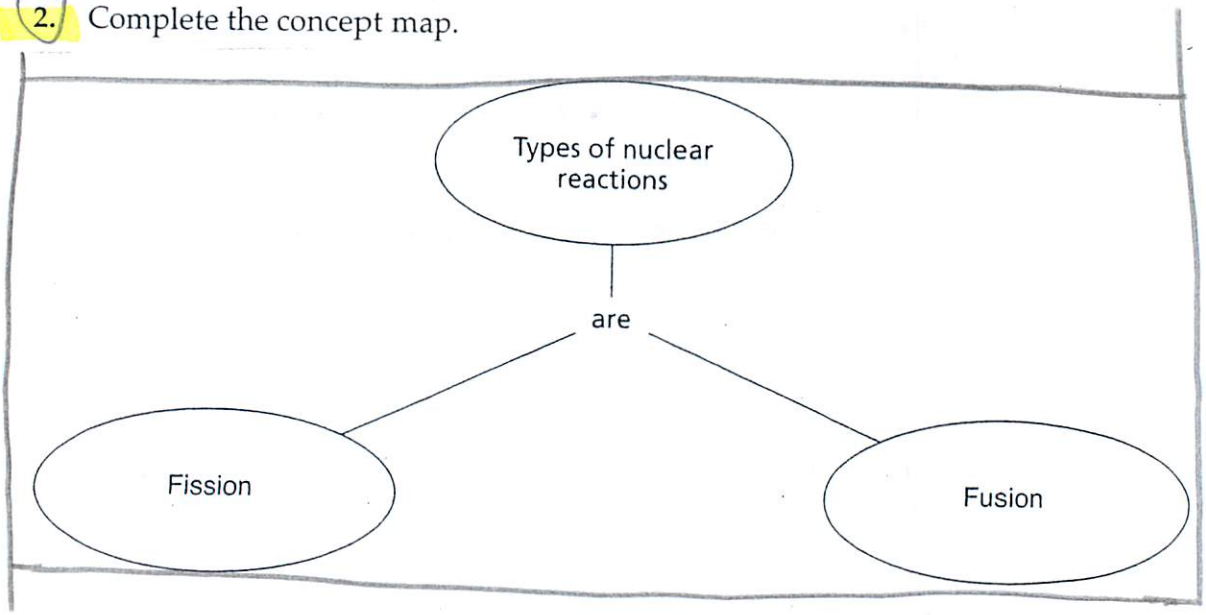


Nuclear Energy *(continued)*

Introduction (p. 294)

1. The central core of an atom that contains the protons and neutrons is called the nucleus.

2. Complete the concept map.



Nuclear Fission (pp. 294–295)

3. Is the following sentence true or false? Nuclear reactions convert matter into energy. true

4. What formula, developed by Albert Einstein, describes the relationship between energy and matter? $E=mc^2$

5. The splitting of an atom's nucleus into two smaller nuclei is called nuclear fission.

6. Is the following sentence true or false? In a controlled nuclear chain reaction, the energy released as heat can be used to generate electricity. true

Nuclear Power Plants (pp. 296–297)

7. How is electricity produced in a nuclear power plant?
The heat released from the reactions is used to change water into steam. The steam then turns the blades of a turbine to generate electricity. nuclear fission

Match the part of a nuclear reactor with its function.

	Part of Reactor	Function
b	8. reactor vessel	a. It contains the uranium.
a	9. fuel rod	b. It is where nuclear fission occurs.
c	10. control rod	c. It controls the reactions.
d	11. heat exchanger	d. It changes hot water to steam.

12. When fuel rods in a nuclear power plant generate so much heat that they start to melt, the condition is called a(n) meltdown.

13. Why is it difficult to dispose of radioactive wastes produced by power plants?
It is difficult because they remain dangerous for thousands of years.

The Quest to Control Fusion (p. 298)

14. The combining of two atomic nuclei to produce a single larger nucleus is called nuclear fusion.

15. Circle the letter of each sentence that is true about nuclear fusion.

a. It produces less energy per atom than nuclear fission.
(b.) The fuel it needs is readily available.
(c.) It should produce less radioactive waste than nuclear fission.
d. It is widely used today to produce electricity.

Energy Conservation (pp. 299–302)

This section describes several ways that energy use can be reduced to make available fuels last as long as possible.

Use Target Reading Skills

Before you read, write what you know about energy efficiency and conservation in the graphic organizer below. As you read, write what you learn.

Possible answers

What You Know
1. I turn off lights to conserve energy. 2. I walk instead of ride in a car when possible. 3.

What You Learned
1. One way to preserve our current energy resources is to increase efficiency. 2. One method of increasing efficiency of heating and cooling systems is to use insulation. 3. Compact fluorescent bulbs use about one fourth as much energy as incandescent light bulbs.

Introduction (p. 299)

1. What are two ways to preserve our current energy sources?
One way is to increase the efficiency of our energy use. Another way is to conserve energy whenever possible.

Energy Efficiency (pp. 300–301)

2. The percentage of energy from a fuel that is actually used to perform work is its efficiency.

3 What happens to the energy from a fuel that is not used to perform work?
Most of the rest of the energy is "lost" to the surroundings, usually as heat.

4. A layer of material that helps block the transfer of heat between the air inside and the air outside a building is called insulation.

5. How does insulation work?
Insulation traps air, and this layer of trapped air helps keep the building from losing or gaining heat from the outside.

6. Circle the letter of the choice that is the best material for insulation.
   a. fiberglass
   b. brick
   c. stone
   d. glass

7. Why do new windows have two panes of glass with space between them?
The air between the panes of glass acts as insulation to help prevent heat loss through the windows.

fluorescent light bulbs.

Energy Conservation *(continued)*

8. Is the following sentence true or false? Incandescent light bulbs waste ~~less~~ more energy than compact fluorescent bulbs. ~~false~~ true

9. How have engineers improved the energy efficiency of cars?
Engineers have designed better engines and tires.

10. What are some ways to reduce the number of cars on the road?
Communities can maintain public transit systems that provide an alternative to driving. They can also encourage carpooling, for example, by setting aside lanes for cars containing two or more people.

11. Reducing energy use is called energy conservation.

Energy Conservation (p. 302)

12. Circle the letter of each sentence that describes a way you can reduce your personal energy use.

a. Use air conditioners instead of fans.
b. Use electric lights whenever possible.
c. Walk or ride a bike for short trips.
d. Recycle.