Answer Key

Directed Reading A

SECTION: NATURAL RESOURCES

1. They are each one of Earth's resources.
2. C
3. D
4. natural resources
5. the sun
6. a natural resource that can be replaced at the same rate at which it is being used
7. Answers will vary but may include water, forests, and animals.
8. A
9. nonrenewable resource
10. Answers may vary. Sample answer: People can turn off faucets when they are not in use.
11. Answers may vary. Sample answer: Polluted lakes and rivers can affect the water we drink.
12. nonrenewable resources
13. Answers may vary. Sample answer: Biking, walking, or taking a bus instead of driving a car. Turning off lights when not in use.
14. the process of reusing materials from waste or scrap; the process of reusing some items
15. It takes less energy to recycle products than it does to make new ones.
16. Answers may vary. Sample answer: newspapers, plastic containers, and cardboard boxes

SECTION: FOSSIL FUELS

1. C
2. A
3. Answers may vary. Sample answer: petroleum, coal, and natural gas
4. Because fossil fuels are nonrenewable resources, once they are burned they are gone.
5. B
6. B
7. C
8. A
9. A
10. D
11. C
12. B
13. Answers may vary. Sample answer: People used coal to heat their homes and to power coal-burning steam locomotives.
14. When cleaner energy resources became available, people reduced their use of coal.
15. Many power plants burn coal to generate electrical energy.
16. All fossil fuels form from the buried remains of ancient organisms.
17. Microscopic sea organisms die, and their remains settle on the ocean floor. The remains are buried in sediment, are compacted, and become rock. Through physical and chemical changes over millions of years, the remains become petroleum and gas.
18. Permeable rocks are rocks through which fluids, such as petroleum and gas, can move.
19. Parts of today's sea life will become petroleum and natural gas millions of years from now.
20. B
21. C
22. A
23. D
24. Answers may vary. Sample answer: The greater the carbon content of coal, the more cleanly it burns. Anthracite coal has the highest carbon content.
25. B
26. A
27. surface mining, strip mining
28. acid precipitation
29. Answers may vary. Answer should include one of the following: it can remove soil that plants need for growth and animals need for shelter; it can destroy wildlife habitats; or it can lower water tables and pollute water supplies.
30. Answers may vary. Sample answer: Producing, transporting, and using petroleum can cause environmental problems and endanger wildlife.

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

31. smog
32. Large numbers of automobiles in the cities burn gasoline; mountains surrounding cities like Los Angeles prevent wind from blowing pollutants away.

SECTION: ALTERNATIVE RESOURCES

1. Fossil fuels are nonrenewable resources and can be used up. Obtaining and using fossil fuels has environmental consequences.
2. D
3. B
4. fission
5. Answers may vary. Sample answer: Nuclear power plants produce radioactive wastes. Nuclear plants can accidentally release radiation into the environment.
6. fusion
7. the sun
8. It produces few dangerous wastes.
9. Very high temperatures are required for fusion to take place.
10. B
11. D
12. B
13. C
14. renewable
15. They change sunlight into electrical energy.
16. Solar panels are large panels made of many solar cells wired together. They provide electrical energy to homes and buildings.
17. Solar collectors are dark-colored boxes with glass or plastic tops. They are used to heat water used to heat homes.
18. Answers may vary. Sample answer: Some climates do not have enough sunny days to benefit from solar energy. Solar cells and solar collectors are expensive to make.
19. D
20. A
21. D
22. Hydroelectric energy is renewable.
23. Huge hydroelectric dams must be built to capture enough water to generate significant amounts of electric energy.
24. They can destroy forests and wildlife habitats. They can decrease water quality. They can create soil erosion.
25. C
26. D
27. alcohol
28. gasohol
29. 40%
30. Biomass is renewable.
31. Producing biomass requires land that could be used for growing food.
32. D
33. B
34. Hot water and steam are used to heat a fluid, which is then pumped through a building.

Directed Reading B

SECTION: NATURAL RESOURCES

1. A
2. B
3. C
4. A
5. nonrenewable resource
6. natural gas
7. A
8. D
9. C
10. C

SECTION: FOSSIL FUELS

1. B
2. D
3. D
4. C
5. B
6. B
7. B
8. A
9. D
10. B
11. A
12. C
13. A
14. A.
15. C
16. A
17. C
18. B
19. A
20. D
21. B
22. C
23. D
24. C
25. B
26. coal
27. oil
28. smog

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

SECTION: ALTERNATIVE RESOURCES

1. B
2. nuclear energy
3. fission
4. megawatts
5. A
6. A
7. D
8. C
9. B
10. chemical energy
11. fuel cell
12. water
13. solar energy
14. solar cells
15. solar panels
16. B
17. A
18. B
19. A
20. A
21. D
22. A
23. B
24. C
25. A
26. D
27. D
28. B
29. C

Vocabulary and Section Summary

SECTION: NATURAL RESOURCES

1. natural resource: any natural material that is used by humans, such as water, petroleum, minerals, forests, and animals
2. renewable resource: a natural resource that can be replaced at the same rate at which the resource is consumed
3. nonrenewable resource: a resource that forms at a rate that is much slower than the rate at which it is consumed
4. recycling: the process of recovering valuable or useful materials from waste or scrap; the process of reusing some items

SECTION: FOSSIL FUELS

1. fossil fuel: a nonrenewable energy resource formed from the remains of organisms that lived long ago; examples include oil, coal, and natural gas
2. petroleum: a liquid mixture of complex hydrocarbon compounds; used widely as a fuel source
3. natural gas: a mixture of gaseous hydrocarbons located under the surface of the Earth; often near petroleum deposits; used as a fuel
4. coal: a fossil fuel that forms underground from partially decomposed plant material
5. acid precipitation: precipitation, such as rain, sleet, or snow, that contains a high concentration of acids, often because of the pollution of the atmosphere
6. smog: photochemical haze that forms when sunlight acts on industrial pollutants and burning fuels

SECTION: ALTERNATIVE RESOURCES

1. nuclear energy: the energy released by a fission or fusion reaction; the binding energy of the atomic nucleus
2. chemical energy: the energy released when a chemical compound reacts to produce new compounds
3. solar energy: the energy received by the Earth from the sun in the form of radiation
4. wind power: the use of a windmill to drive an electric generator
5. hydroelectric energy: electrical energy produced by falling water
6. biomass: organic matter that can be a source of energy
7. gasohol: a mixture of gasoline and alcohol that is used as a fuel
8. geothermal energy: the energy produced by heat within th e Earth

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

Section Review

SECTION: NATURAL RESOURCES

1. Sample answer: A natural resource is any natural material that is used by humans. Renewable resources can be replaced at the same rate at which they are consumed. Nonrenewable resources form at a rate much slower than the rate at which they are consumed. Recycling is the process of recovering valuable materials from waste or scrap.
2. Humans consume most natural resources by using products made from the resources.
3. B
4. Sample answer: We can conserve natural resources by using them only when necessary, by reusing them whenever possible, and by recycling them.
5. 3.3 L/h × 8.6 h = 28.38 L
6. Answers may vary. Students should note that most human activity affects Earth's resources.
7. Sample answer: aluminum cans, milk jugs, glass bottles, paper, and plastic bottles
8. Sample answer: The population is significantly larger now than it was 100 years ago, so many renewable resources are being used at a much faster rate than they were used in the past. As these resources become harder to find, people may begin to use renewable resources.

SECTION: FOSSIL FUELS

1. Sample answer: An energy resource is a resource that humans use to produce energy. Fossil fuels are formed from the remains of organisms that lived long ago. Petroleum is a liquid mixture of complex hydrocarbon compounds. Natural gas is a mixture of gaseous hydrocarbons. Coal is formed from partially decomposed plant material. The combination of sulfur dioxide and water vapor produces acid precipitation. Smog is a petrochemical haze that forms when sunlight acts on industrial pollutants and burning fuels.
2. B
3. Coal is a solid fossil fuel, petroleum is a liquid fossil fuel, and natural gas is a gaseous fossil fuel.
4. Sample answer: Petroleum and natural gas both form when microscopic sea organisms die, settle to the ocean floor, and decay. The remains of organisms are buried, and after millions of years of pressure and heat they become natural gas and petroleum.
5. We obtain petroleum and natural gas by drilling wells into rock formations that contain these resources.
6. Answers may vary. Students may mention oil spills, loss of soil from strip mining coal, acid rain, the production of smog due to burning fossil fuels, and increasing atmospheric CO_2.
7. Petroleum and natural gas form underwater from the decayed remains of aquatic microorganisms. Coal forms on land from partially decayed plant matter.
8. Answers may vary. Accept any well-supported answer.
9. the Middle East
10. $500,000,000,000 × 0.06 = $30,000,000,000

SECTION: ALTERNATIVE RESOURCES

1. Sample answer: The energy released by fission or fusion is nuclear energy. Solar energy is produced by the sun. Using a windmill to drive an electric generator is called wind power. Electrical energy produced by falling water is hydroelectric energy. Biomass is organic matter that can be used as a source of energy. Gasohol is a combination of alcohol and gasoline. Geothermal energy is produced by using heat within the Earth to produce hot water or steam.
2. A
3. Solar energy can be used for heating or used to produce electricity.
4. Hydroelectric energy production is practical in areas in which there are large rivers.
5. Sample answer: Burning biomass and converting plant material to alcohol that can be burned are two ways to release biomass energy.

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

6. Steam and water heated by geothermal energy can be used to generate electrical energy. Water heated by geothermal energy can also be used as a direct heat source.
7. Nuclear power plants require large volumes of water to prevent overheating and to generate steam. There is little water in the desert.
8. Answers may vary. Accept any well supported answer.
9. 16% + 38% = 54%
10. 16% + 27% + 38% = 81%

Chapter Review

1. petroleum
2. chemical energy
3. Sample answer: Solar energy is energy from the sun. Wind power uses a windmill to drive an electric generator.
4. Sample answer: Biomass is organic matter that contains stored energy. Gasohol is a fuel made from plant biomass and petroleum.
5. B
6. B
7. C
8. D
9. A
10. A
11. D
12. Air pollutants mix with moisture in the air and produce acids. These acids fall with rain or snow as acid precipitation.
13. Solar cells are relatively expensive to make.
14. Sample answer: Humans use natural resources to produce electrical energy, heat, food, and products.
15. Some fossil fuels are found underground on land, and others are found under the ocean. The type and location of fuel determine the method used to remove the fuel. Petroleum and natural gas are removed by drilling wells into rock that contains these resources. Coal is obtained either by mining deep into the Earth or by surface mining.
16. An answer to this exercise can be found at the end of the Teacher Edition.
17. Answers may vary. Accept all reasonable answers.
18. Answers may vary. We label certain resources as nonrenewable because it takes a long time for them to be replenished. Fossil fuels are renewable in the sense that they will be renewed in millions of years. But they form at a rate that is much slower than the rate at which they are used.
19. Sample answer: It is important to conserve renewable natural resources so that we don't use them up faster than they can be replenished.
20. Answers may vary. Students may discuss the amount of geothermal energy available. Geothermal energy can be exhausted in a particular location.
21. Sample answer: The sun provides energy for photosynthesis. Photosynthetic organisms use this energy to build their tissues. The tissues of dead plants and sea organisms form fossil fuels.
22. Sample answer: You can reduce the use of electrical energy and water. You can reuse products whenever possible. You can recycle things that cannot be reused.
23. Sample answer: Coal forms mainly from partly decayed plant matter. Petroleum and natural gas form from sea organisms. Therefore, coal is generally found in different locations than locations where petroleum and natural gas are found.
24. Answers may vary. Accept any well supported answer.
25. approximately 70 quadrillion British Thermal Units
26. 1998
27. Answers may vary. Students may state that population has been increasing faster in areas where fewer energy resources are available than in areas where energy resources are plentiful.

Reinforcement

WHAT ARE MY RESOURCES?

1. R
2. N
3. R
4. R
5. N

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

IF IT'S A FOSSIL, HOW IS IT A FUEL?

1. solid
2. decayed swamp plants
3. bituminous coal
4. anthracite
5. liquid
6. decayed sea life
7. petroleum
8. kerosene
9. gas
10. decayed sea life
11. natural gas
12. butane

Critical Thinking

1. Answers may vary. Sample answer: Near-pure sources of carbon, such as coal, could be used.
2. Answers may vary. Sample answer: STAR*FUEL is a nonrenewable energy resource because it is made using pure carbon, such as coal, which cannot be replaced at the same rate at which it is used.
3. a. Both methods use the sun's energy, and both can be used to heat water.
   b. Solar energy is used to make electricity, while STAR*FUEL is used as fuel.
4. Answers may vary. Sample answer: The production of fuel would depend on the amount of sunlight received in one small area. There might be fuel shortages because the amount of sunlight received varies with the weather.
5. Answers may vary. Sample answer: They might have wanted to find out the cost of producing STAR*FUEL compared with the cost of producing gasoline.

Section Quizzes

SECTION: NATURAL RESOURCES

1. B
2. C
3. D
4. A
5. A

SECTION: FOSSIL FUELS

1. D
2. A
3. F
4. E
5. C
6. B
7. C
8. B

SECTION: ALTERNATIVE RESOURCES

1. F
2. H
3. B
4. A
5. J
6. E
7. D
8. C
9. G
10. I

Chapter Test A

1. D
2. A
3. C
4. B
5. A
6. D
7. D
8. B
9. A
10. B
11. C
12. D
13. F
14. H
15. B
16. A
17. D
18. C
19. G
20. E
21. A
22. I
23. B
24. H
25. F

Chapter Test B

1. chemical energy
2. nuclear energy
3. petroleum
4. coal
5. renewable
6. A
7. B
8. D
9. A
10. C
11. When sulfur-bearing fuels like low-grade coals are burned, sulfur dioxide is released. Sulfur dioxide and moisture in the air combine to form sulfuric acid. Sulfuric acid dissolves in raindrops and falls to the ground in precipitation.
12. Geothermal energy is found in areas where steam rises through natural vents or wells drilled into Earth. The steam is produced when ground water is heated by magma, or melted rock, within the Earth.

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

13. Answers may vary. Sample answer: Humans can conserve resources by taking only what is needed, for example, by turning off the faucet when not using water. They can take care of natural resources by keeping water sources free from pollution. They can also recycle or reuse items, for example, by taking plastics to the local recycling center.
14. Answers may vary. Sample answer: Because the island is near the equator, where Earth receives a lot of sunlight, I would develop a solar power system. This would be a good choice because solar power produces little pollution and its energy is renewable.
15. Answers may vary. If the student chooses the pro side of the argument, the reasons may include that hydroelectric energy is inexpensive, it causes little pollution, and it is a renewable resource. If the student chooses the con side of the argument, the reasons may include that animal habitats would be destroyed to build the dam, damming can cause erosion, and the power plant would be very expensive to build.
16. Answers may vary. Sample answer: I would suggest that she use geothermal energy to heat her home and place solar panels on the rooftop to collect energy to produce electricity.
17. a. swamp plants
    b. lignite
    c. bituminous coal
    d. sediment
    e. petroleum
    f. natural gas

Chapter Test C

1. C
2. D
3. C
4. C
5. B
6. D
7. D
8. A
9. D
10. B
11. A
12. C
13. D
14. C
15. A
16. B
17. petroleum
18. coal
19. natural gas
20. smog

Standardized Test Preparation

READING

Passage 1

1. B
2. F
3. C

Passage 2

1. D
2. F
3. C

INTERPRETING GRAPHICS

1. A
2. G
3. B

MATH

1. B
2. H
3. A
4. G

Vocabulary Activity

1. gasoHol
2. smoG
3. recycLing
4. Coal
5. Solar energy
6. reneWable resOurces
7. chemical energY
8. acid prEcipitaTion
9. nonrenewAble resources
10. hydroelectric eNergy
11. Wind power
12. bIomass
13. fosSil fuels
14. natUral gas
15. nuclEar Energy
16. natural rEsource
17. peTroleum
18. gEothermal eneRgy

Together we can use wisely!

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

SciLinks Activity

1. a. Answers may vary but should be in the 40–50 year range.
   b. Answers may vary but should be in the 50–75 year range.
   c. Answers may vary but should be in the 200–250 year range.
2. Answers may vary. Sample answer: Fossil fuels are nonrenewable resources, so when we run out, they will be gone forever. We will have to find alternate resources to generate the energy we need.
3. Answers may vary. Sample answer: Wind energy.
4. Answers may vary. Sample answer: Wind-driven turbine generators can be used to produce electricity. The wind causes the turbine to turn. The turbine is connected to an alternator which produces electricity.
5. Answers may vary. Sample answer: One disadvantage is that wind turbines are only useful where there are strong winds year-round

Performance-Based Assessment

PROCEDURE

1. Answers may vary. The pH should be in the range of 1.5 to 2. A typical measurement is 1.8.
2. Answers may vary. The pH should be in the range of 1.5 to 2. A typical measurement is 1.8.
3. Answers may vary. The pH should be less than 7. A typical measurement is 5.0.

ANALYZE THE RESULTS

4. The acid and the granite did not chemically react, so the pH of the solution was unchanged. However, the acid did react with the limestone, which raised its pH.
5. Acid precipitation is rain, sleet, or snow that contains a high level of acid. The pH of acid precipitation is below 7.
6. Answers may vary. The chemicals usually come from industrial emissions.
7. Yes. The contents of both the beaker without rock and the beaker with granite could kill plants and fish. They each have a pH below 3.
8. Answers may vary. Sample answer: One possible solution would be to conduct more research on the development of cleaner manufacturing processes. We could also put stricter legal limits on the amounts of emissions that factories are allowed to produce.

Make a Water Wheel

13. The coin rises.
14. The coin rises faster when there is more clay on the skewer.
15. If the clay is shaped so that the thread has to wrap around a bulge, the coin will rise faster. If the clay is shaped so that the thread has to wrap around a
16. Fewer fins cause the wheel to turn and the coin to rise more slowly. More narrow part, the coin will rise slower.
17. Generally, fins that catch more water will cause the wheel to turn faster and the coin to rise faster fins cause the wheel to turn faster and the coin to rise faster.

ANALYZE THE RESULTS

1. The shape and amount of clay and the number and shape of the fins influence how quickly the wheel lifts the coin

DRAW CONCLUSIONS

2. Answers may vary. Recommendations could include the following: using more fins, designing fins that catch more water, and wrapping the rope or cable around a wheel that has a larger diameter.

Rock Sponge

SAFETY INFORMATION

4. Answers may vary. The rock sample that has the highest proportion of interconnected pore space should soak up the oil the fastest. Most reservoir rock is limestone, which has many connected pores
5. Oil and gas move easily through reservoir rock that has a high proportion of interconnected pore space. This space allows for the easy removal of liquid fossil fuels.

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.

Power of the Sun

ANALYZE THE RESULTS

2. Answers may vary. Ask students to show their calculations.
3. 15,000,000,000,000 cm = $1.5 \times 10^{?}$ cm
   15,000,000,000,000 cm × 1.5×10^{13} cm

DRAW CONCLUSIONS

4. Answers may vary. If students performed the lab correctly, their numbers should be close to 3.7×10^{26} W.

Original content Copyright © by Holt, Rinehart and Winston. Additions and changes to the original content are the responsibility of the instructor.