SECTION: ATMOSPHERIC HEATING

1. Sample answer: Thermal conduction is the transfer of thermal energy as heat through a material. Radiation is the transfer of energy by electromagnetic waves. Convection is the transfer of energy by circulation in a fluid. The greenhouse effect is Earth's natural warming process. Global warming is a gradual increase in average global temperature.
2. B
3. Sample answer: Energy from the sun warms the atmosphere by radiation. The Earth reradiates energy from the sun, which warms the atmosphere. The air directly above the Earth's surface is also heated by conduction. Warm air is then circulated through the atmosphere by convection currents.
4. The greenhouse effect is the Earth's natural heating process by which gases in the atmosphere trap reradiated energy, which heats the atmosphere. Global warming is the rise in average global temperature and may be caused by an increase in the greenhouse effect.
5. The radiation balance is the balance between incoming solar energy and thermal energy that the Earth radiates into space.
6. 506.6° F ÷7 = 72.4°F
7. Convection in the atmosphere relies on radiation from the sun. If radiation from the sun stopped, air would not be warmed and convection currents would eventually stop circulating.
8. Answers may vary. Global warming occurs when the radiation balance is upset and more energy is coming in than is going out.

SECTION: GLOBAL WINDS AND LOCAL WINDS

1. Sample answer: Wind is the movement of air from areas of high pressure to areas of low pressure. The Coriolis effect is the apparent deflection of a moving object due to Earth's rotation. Jet streams are high altitude belts of strong winds. Polar easterlies are global winds that blow from the poles toward 60° north and 60° south latitude. Westerlies are global winds that blow between 30° and 60° latitude in both hemispheres. Trade winds are global winds that blow between 30° latitude and the equator in both hemispheres..
2. A
3. Pressure belts are bands of high and low pressure that are found about every 30DE degree of latitude.
4. Winds are caused by the unequal heating of the Earth's surface, which causes pressure differences.
5. The Coriolis effect causes winds to appear to be deflected to the east or west depending on the direction that the winds are traveling in each hemisphere. Because of the Coriolis effect, winds in the Northern Hemisphere appear to curve to the right, and winds in the Southern Hemisphere appear to curve to the left.
6. Both types of breezes result from pressure differences caused by unequal heating of materials.
7. Because unequal heating of the Earth's surface causes winds, there would probably not be winds near Earth's surface if Earth's surface were the same temperature everywhere.
8. 500 km/h × 5 h = 2,500 km
   (500 km/h + 250 km/h) × 2 h =1,500km
   2,500 km - 1,500 km = 1,000 km
   1,000 km ÷ 500 km/h = 2 h+
   2 h + 2 h = 4 h
9. Both winds are affected by the Coriolis effect. In the Northern Hemisphere, the westerlies travel in a northerly direction. They appear to be deflected to the northeast by the Coriolis effect. In contrast, in the Northern Hemisphere, the trade winds blow in a southerly direction, so they appear to be deflected to the southwest.
10. During the day, a sea breeze is caused by the cooler air over the water moving toward the land. Walking toward the sea breeze would lead you to the ocean.

SECTION: AIR POLLUTION

1. Acid shock
2. Acid precipitation
3. C

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4. Primary pollutants are pollutants that are put into the air directly by human or natural activity. Secondary pollutants form when primary pollutants react with other substances.
5. Answers may vary. Household cleaners, paint products, dirty air heating and air conditioning vents, furniture and carpeting, heaters, and stoves can all be sources of indoor air pollution. There are many natural sources of air pollution, including dust, ash from volcanoes, pollen, and smoke.
6. The ozone hole is a thinning of the ozone layer in polar regions, particularly the Antarctic. Levels of ozone vary seasonally, but the ozone hole is caused primarily by CFCs that were released into the atmosphere by human activity.
7. Answers may vary. Accept any of the effects of air pollution on human health mentioned in this section. There are many ways that air pollution can be reduced. Legislation, such as the Clean Air Act, gives the Environmental Protection Agency the power to control the amount of air pollutants released from most sources. In addition, new technology has helped create cars that release fewer pollutants and devices, such as scrubbers, that reduce industrial air pollution.
8. Answers may vary. Cooperation is important to reducing air pollution problems that cross national boundaries.
9. Answers may vary. Students should note that it can take a long time before the effects of air pollution on an individual's health can be observed.
10. western New York and Pennsylvania; Answers may vary. Students may suggest that the prevailing winds concentrate the pollutants that contribute to acid precipitation on the Eastern seaboard.
11. Students may note that the prevailing winds and topographic features such as the Adirondack mountains concentrate acid precipitation over Buffalo.

Chapter Review

1. Sample answer: Air pressure is the measure of the force with which air molecules are pushing on a surface. Wind is the movement of air caused by differences in air pressure.
2. Sample answer: The troposphere is the lowest layer of the Earth's atmosphere. The thermosphere is the uppermost layer of the Earth's atmosphere.
3. Sample answer: The greenhouse effect is the Earth's natural heating process, by which gases in the atmosphere absorb and reradiate thermal energy. Global warming is a rise in average global temperature.
4. Sample answer: Convection is the transfer of thermal energy by the circulation of a liquid or gas. Thermal conduction is the transfer of thermal energy through a material.
5. Sample answer: A global wind is a large-scale pattern of air circulation in the atmosphere. A local wind generally flows short distances and can blow from any direction.
6. Sample answer: The stratosphere is the atmospheric layer above the troposphere, where temperature rises with altitude. The mesosphere is between the stratosphere and thermosphere, where temperature decreases with increasing altitude.
7. C
8. C
9. B
10. C
11. A
12. B
13. D
14. A
15. B
16. D
17. As altitude increases, there are fewer gas molecules. Gravity pulls most of the atmosphere's gas molecules close to the Earth's surface, which makes the lower layers more dense than the upper layers.
18. Air rises as it is heated because it becomes less dense.

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