8. Australia has summer during December, January, February, and March. This is because Australia is in the Earth's Southern Hemisphere, and the Southern Hemisphere is tilted away from the sun during these months.
9. dry
10. Accept all reasonable answers. If the prevailing winds blew from the Atlantic Ocean, the area would have a wet climate with plenty of precipitation.

SECTION: THE TROPICS

1. Sample answer: The tropical zone is the climate region that surrounds the equator and that extends from about 23.5° north latitude to 23.5° south latitude.
2. B
3. thin and nutrient poor
4. Some savanna plant species need fire to break open their seeds' outer skin in order to grow. Also, for other plant species, the heat from the fire triggers the plant to drop its seeds into the newly enriched soil.
5. 27°C + 28°C + 29°C + 29°C = 113°C 113°C ÷4 = 28.25°C
6. Sample answer: Tropical biomes differ in the amount of precipitation they receive, the average temperature range, soil characteristics, vegetation, and kinds of animals.
7. Sample answer: A plant in a tropical rain forest would have to adapt to an environment that received a large amount of rain that would leach nutrients from the soil. A plant in a tropical desert would have to adapt to a very hot, dry environment.
8. tropical desert

SECTION: TEMPERATE AND POLAR ZONES

1. Sample answer: A microclimate is the climate of a small area.
2. polar zone
3. temperate zone
4. D
5. The temperate zone has lower temperatures than the Tropics because it is located at a higher latitude.
6. Because the polar zone is at a higher latitude than the other climate zones, it receives less direct solar energy and therefore has lower temperatures.
7. The Earth is tilted so that during the summer, high latitudes are pointed toward the sun. Therefore, polar regions receive 24 hours of daylight each day. In the winter, the Earth is tilted so that high latitudes are pointed away from the sun. Therefore, polar regions experience 24 hours of night each day.
8. The needles of conifers are acidic. When the needles fall to the ground, they make the soil acidic, which makes it difficult for many plants to grow.
9. 700,000 $km^2 \times 0.20 = 140{,}000$ km^2
10. Sample answer: Temperate forests would be better for growing crops than the taiga because the soil in the forest is very fertile and organically rich. The taiga would be a difficult place to grow crops because the soil is acidic from the conifer needles.
11. Students should choose plants and animals that are adapted to very cold climates in the mountains. Sample answer: mountain goat, snow leopard, moss

SECTION: CHANGES IN CLIMATE

1. Sample answer: Milankovitch theorized that ice ages were caused by changes in the Earth's orbit and changes in the tilt of the Earth's axis.
2. Sample answer: Global warming is the gradual increase in the average global temperature that is due to a higher concentration of greenhouse gases in the atmosphere. The greenhouse effect is the warming of the surface and lower atmosphere of the Earth that occurs when carbon dioxide, water vapor, and other gases in the air absorb and trap thermal energy.
3. Ice ages could be caused by changes in the Earth's orbit, in the tilt of the Earth's axis, by plate tectonics, volcanic eruptions, or asteroid impacts.
4. A

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5. The Earth has experienced periods of cold and warm temperatures called glacial and interglacial periods.
6. The Earth's climate may have changed because of the change in the Earth's orbit, a change in the tilt of the Earth's axis, volcanic eruptions, impact from a large asteroid, the sun's cycle, and global warming.
7. We are in an interglacial period. Ice sheets are melting instead of advancing.
8. The greenhouse effect occurs when gases in the atmosphere trap thermal energy and warm the Earth.
9. 30°C - 18°C = 12°C
10. Sample answer: Global warming might improve farming at higher latitudes. Closer to the equator, an increase in evaporation and less rainfall might make growing crops difficult.
11. Answers may vary. Sample answer: Trees store carbon, so deforestation could cause carbon dioxide levels in the air to increase, which might increase global warming.

Chapter Review

1. Sample answer: A biome is one large region characterized by a specific type of climate, and the tropical zone is an even larger region, consisting of several biomes.
2. Sample answer: Weather is the condition of the atmosphere at a particular time, and climate is the average weather condition of an area.
3. Sample answer: The temperate zone is between the Tropics and the polar zone. The polar zone includes the North and South poles and their surrounding areas.
4. global warming
5. microclimate
6. D
7. A
8. B
9. C
10. C
11. B
12. Higher latitudes receive less solar radiation because the sun's rays strike the Earth's surface at a less direct angle. This spreads the same amount of solar energy over a larger area, resulting in lower temperatures.
13. The amount of precipitation an area receives can depend on whether the region's prevailing winds form from a warm air mass or from a cold air mass. If the winds form from a warm air mass, they will probably carry moisture. If the winds form from a cold air mass, they will probably be dry. Precipitation is more likely to occur when the prevailing winds are warm and moist.
14. Answers may vary. Sample answer: Alpine biomes on tropical mountains are examples of a microclimate. Less dense air at higher elevations retains less thermal energy and less precipitation than air at lower elevations.
15. The tundras and deserts receive very little precipitation.
16. Carbon dioxide is a greenhouse gas. Deforestation decreases the amount of trees, which naturally recycle carbon dioxide in the atmosphere. If the trees are burned, carbon dioxide will be released into the atmosphere, and global warming will increase.
17. An answer to this exercise can be found at the end of the Teacher Edition.
18. Sample answer: Warm surface currents heat the surrounding air. A warm surface current might bring warmer temperatures to an area of land at a higher latitude that might normally be colder.
19. Sample answer: Due to the Earth's tilt, higher latitudes in the Northern Hemisphere receive more solar energy in June, July, and August, causing summer during that period. Because the Southern Hemisphere is tilted away from the sun during these months, higher latitudes in that hemisphere receive less direct solar energy, which causes winter.

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