

## CHAPTER 11 REVIEW ANSWERS

### Student Book Pages 432–433

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#### Understanding Key Concepts

1. It begins to rain when an air mass reaches its dew point temperature: When an air mass cools, thermal energy is removed from both the air and the water vapour it contains; at the dew point temperature, the cooling water vapour condenses, forms a cloud, and falls as precipitation.
2. The major biomes found in Canada include the tundra, taiga, temperate deciduous forest, and the grasslands.
3. The two most important factors in determining a region's climate are temperature and precipitation.
4. Data are usually averaged over a 30-year period in order to create climatographs that describe the climate of a region.
5. The higher a region is in elevation, the cooler its climate will be.
6. The same biome may exist in different locations, latitudes, and altitudes because it is a combination of temperature and precipitation that will ultimately determine to which biome a region belongs. Biomes are broad descriptions of the abiotic and biotic factors of an area — the specifics of the same biome in different areas of the world will differ. (The savanna of Africa and Alberta grasslands are both considered grasslands.)
7. In a tropical rain forest biome, animals must adapt to compete with a number of organisms, and be able to survive the great number of predators in addition to coping with the consistently warm temperatures and heavy rainfall. In the temperate deciduous forest biome, competition is not quite as fierce; survival in a changing climate is a more significant pressure for adaptation in this biome.

Animals and plants will be well adapted to survive in both the warm, moist summers and the cold winters by changing coat colour, hibernating, or storing food.

8. The tropical rain forest and temperate deciduous forest are quite similar, having multiple layers where organisms happily live without venturing to other layers of the ecosystem. The amount of light that penetrates to the forest floor is also comparable during the summer months, but in the temperate deciduous forest, the canopy layer will lose its leaves, allowing light to penetrate to the lower layers and thus supporting more photosynthesis at these levels.
9. A biome is considered an open system because both matter (animals, air, water, soil) and energy (solar energy and heat) may both enter and leave the biome.
10. Paleoclimatologists collect fossil, ice core, tree ring, pollen grain, glacier ice, and sediment samples in order to study past climates.
11. From the data that paleoclimatologists have collected, especially ice core and fossil data, they are able to show that the climate has changed over time.
12. By correlating carbon dioxide levels with the climates of the past, scientists can develop models that may be able to predict future temperatures that will determine rainfall and climate.
13. Continental drift might cause climate change in the following two ways: 1, Movement of the continents and opening and closing of ocean basins would affect the transfer of thermal energy on Earth's surface, changing wind and precipitation patterns, and, in the long run, climate; 2, Movement of a continent to a different latitude would affect the amount of solar radiation it receives and thermal energy transfers via wind and ocean currents, thus altering the climate of the continent.
14. An example of feedback that might occur given a drop in Earth's average temperature would be the resulting formation of sea ice, which, having a high albedo, would reflect greater amounts of solar radiation into space than would water, furthering the cooling of Earth's atmosphere and the formation of even more sea ice. This scenario is an example of a positive feedback loop.
15. A volcano could affect the climate of a region by putting large volumes of dust, ash, and smoke into the atmosphere, which would reflect solar radiation. This would not only reduce the amount of solar radiation reaching Earth's surface, but photosynthetic organisms (and thus their consumers) would "starve."
16. Natural climate change is called natural because it is not caused by any human activity such as fossil

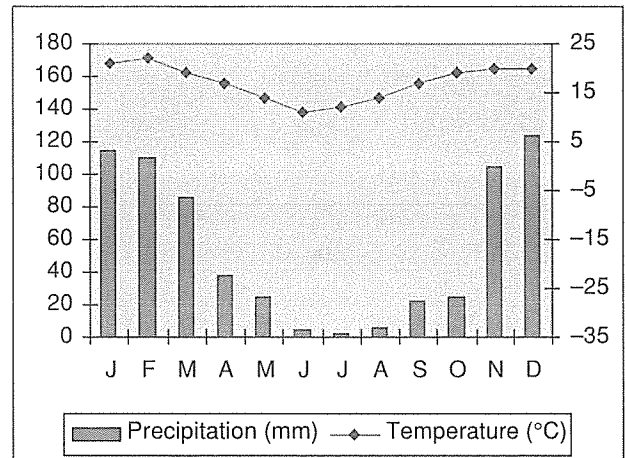
fuel burning or clearcutting of forests.

17. Mass extinction means that an event occurred which changed the conditions of a region so much that many species could not adapt and thus died out.

### Developing Skills

18.

**Climatograph, Unknown Location**



- (a) This biome is most likely from a tropical rain forest. Over 600 mm of rain each year plus relatively mild temperatures all year are indicative of a tropical rain forest.
  - (b) This city is likely located in the southern hemisphere.
  - (c) This location receives over 600 mm of rain each year. High annual rainfall, combined with relatively mild average temperatures, is indicative of a tropical rain forest. The inference that this location is likely in southern hemisphere is based on the cooler temperatures in May, June, July, and August.
19. In order to survive the dry conditions of the grasslands, grasses must have deep root systems to reach water, be able to survive periods of drought, and resist transpiration.
  20. Kangaroo rats probably forage at night to avoid the extreme heat of the day. Their physiology would be adapted to conserve water. Their kidneys are able to produce extremely concentrated urine.
  21. The effect of volcanic eruption on climate includes the following events:  
volcanic eruption → dust and ash in the air → decreased solar radiation reaching Earth → decreased temperature, decreased photosynthesis → more carbon dioxide in the atmosphere → enhanced greenhouse effect → increased temperature

**Problem Solving/Applying**

22. Alberta is currently experiencing an increase in forest fires, likely due to the currently drier conditions in western Canada. Some areas of Canada are experiencing wetter conditions, which should reduce the incidence of forest fires.
23. See Terrestrial Biomes-Background biome summaries in TR Section 11.2, for a complete discussion of biomes and adaptations.
24. If you find fossils of tropical plants in a desert, it can be inferred that this region was once a tropical rain forest.
25. As you climb to higher elevations, the air cools. In a desert, this effect will be even more noticeable since there is little moisture in the air to moderate temperature changes.
26. Since classifying a region into a biome depends primarily on temperature and precipitation data, a climatograph, which provides both of these data, would be instrumental in determining the biome classification.
27. (a) This climatograph is from the taiga biome.  
(b) The climate could be described as having a very cold and long winter, with average temperatures well below 0°C for over five months. The growing season is just over five months long. The area's precipitation, slightly over 600 mm annually, is mainly in the form of rain.

**Critical Thinking**

28. A variety of answers will be acceptable for this question. Answers might include some of the following points:
  - People adapt to living in biomes by dressing according to the weather and building shelters appropriate for the climate. In cold biomes, people must wear winter clothes, while in hot biomes, they will wear loose white clothing to stay cool. If the weather is cold, houses will have thick walls and be well insulated. In a consistently warm climate, the houses will have a cooling mechanism, or at least be able to take advantage of breezes.
  - They also adapt to different biomes by cultivating crops that grow in these areas and constructing their diet based on what they can grow. In dry areas, grasslands and desert (near desert) areas, drought-resistant crops are grown and irrigation systems are constructed. In the tropical rain forest, inhabitants may live off the fruits of the rain forest. Crops that require a long growing season and significant rainfall are grown in the temperate deciduous forest biome. In the tundra, the Inuit diet is based largely on meat since there are few plants that could be cultivated and there is such a short growing season.
  - Humans adapt to living in particular biomes by constructing their work and leisure time around the climate. In climates where the midday is extremely warm, work shuts down for a siesta time, a time of rest to minimize exertion and even further overheating. In the grasslands, where many people are involved in agriculture, farmers work from sunrise to sundown during the growing season, taking their leisure time during the non-growing season.
29. This topic may prove to be an interesting starting point for a class discussion. Answers will vary, but might include the following: Climate has influenced civilization in many ways. The areas with the most extreme climates are lightly populated, while the inviting biomes that provide many opportunities for agriculture are heavily populated. Diets, housing, clothing, work, and leisure activities are all influenced by climate.
30. Deserts are generally found between 15° and 35° North and South latitude due to the convection currents in the three-cell model. The air that is descending at these latitudes originated from the warm moist air of the equator, which as it rose, cooled and led to significant precipitation at the equator. The now dry cool air warms as it descends, increasing its dew point and providing little precipitation to these latitudes.
31. The taiga biome was important to the early exploration and development of Canada because it provided an economic reason for its exploration — the fur trade.
32. A desert rabbit or hare would have to conserve water, producing highly concentrated urine and perspiring little if any. Its large ears would be designed to dissipate heat effectively. Its fur would likely be brown to blend in better with its surroundings. A hare in the tundra would likely be white to blend in with its surroundings. It would have a thick coat to maintain its body heat, and would likely have small ears that would reduce heat loss.

**Pause & Reflect**

Have students answer the Focussing questions at the beginning of the chapter without looking at their previous answers. How much have they learned from this unit? Have students comment on what they have learned and what they would still like to know.