

Chapter 15 River Systems Answer Key

SECTION 1 THE WATER CYCLE

1. solid: snow; liquid: fog; gas: invisible water vapor in the air
2. about 7,000 km³
3. These processes are opposites.
4. rain, snow, sleet, hail
5. The amount of water falling to Earth and the amount of water evaporating from Earth's surface are the same.

Review

1. In condensation, water changes state from a gas to a liquid. In precipitation, water falls from the atmosphere to Earth's surface. The process of precipitation does not involve a change of state.
2. Precipitation may fall directly on the ocean. Water moves into the oceans from rivers.
3. Possible answer: I could take shorter showers, and ask my parents to install a low-flow shower head. I could turn the water off while brushing my teeth. I could also run the dishwasher only when there is a full load. I could also try to convince my parents not to run a sprinkler to water the lawn.
4. Factors such as temperature, wind, rainfall, and number of plants in the area all affect the local water budget. A local water budget can change with the seasons. Higher temperatures in warmer months can increase rates of evapotranspiration. Lower temperatures in cooler months can decrease evapotranspiration.
5. Most of Earth's water is in the oceans. Oceans cover more than two-thirds of Earth's surface.

SECTION 2 STREAM EROSION

1. stream load, stream discharge, and gradient
2. Suspended load is the material carried by the water. Dissolved load is actually part of the water solution.
3. The stream's gradient is probably relatively steep.
4. 780 m³/s
5. Students should label the outside of the bend "fastest-moving water" and the inside of the bend "slowest-moving water."
6. high gradient, high sediment load
7. A tributary flows into a stream.

continued

Review

1. first row, from left to right: watershed; tributaries second row: stream gradient third row, from left to right: stream load; bed load; suspended load; dissolved load fourth row, from left to right: meander; braided stream
2. A stream with a high discharge can carry a greater load. The greater the discharge, the greater the stream's ability to erode the channel. The steeper the gradient, the faster a stream flows, and the more the stream erodes its channel.

SECTION 3 STREAM DEPOSITION

1. A delta forms when the speed of a stream decreases as it empties into another body of water.
2. The floodplain is the area of land covered by the stream or river when it floods.
3. Coarse sediments are deposited closer to the channel. Finer sediments are deposited farther out onto the floodplain.
4. Floods deposit sediments. Sediments enrich the soil.

5. Possible answer: direct: building dams; indirect: conserving forests
6. Precipitation typically replaces the water that was lost through evaporation.
7. evaporation and sediment deposition

Review

1. A delta forms when a stream deposits sediment in another body of water. An alluvial fan forms when a stream deposits sediment on land.
2. People can build dams, artificial levees, and floodways.
3. Possible answer: One advantage of living in a floodplain is the easy access to the river for fishing. One disadvantage of living in a floodplain is the risk of damaged property.
4. Activities such as logging, building houses, and farming remove plants that cover the ground. Without ground cover, soils erode more easily, which can cause flooding. However, people can build structures to control flooding. They can also take action to control soils and forests to prevent excess runoff.
5. In areas with cold, snowy winters, snow builds up during the winter. During spring, the snowmelt adds to the river a large amount of water in a small amount of time. When a large amount of water enters a stream suddenly, flooding can occur.
6. Possible answer: I would want to choose a hard, solid material that water does not erode easily. However, I would not want the material to be too brittle, or the levee might break easily.

Chapter 16 Groundwater

SECTION 1 WATER BENEATH THE SURFACE

1. porosity and permeability
2. The first two have high porosity, and the last one has low porosity.
3. Yes, it can. If a material has a lot of pores in it, but the pores are not connected, it would have a high porosity but a low permeability.
4. The student should add the label “water table” to the boundary between the zone of saturation and the zone of aeration.
5. the bottom layer of the zone of aeration that pulls moisture from the zone of saturation toward itself
6. Students should circle the zone of aeration—the middle section of the diagram.
7. rise
8. The water in a recharge zone flows into an aquifer. Pollution in a recharge zone can be carried into the groundwater.
9. The well would dry up.
10. The spring would dry up.
11. The student should label the leftmost well “ordinary well” and the rightmost well “artesian well.”
12. the hot rock beneath Earth’s surface
13. It is under a lot of pressure, so its boiling point is very high.
14. The pressure decreased.

Review

1. In an artesian formation, a layer of impermeable rock lies above the aquifer.
2. porosity and permeability
3. The two zones of groundwater are the zone of aeration and the zone of saturation. Within the zone of saturation, all the pores in the aquifer are filled with water. Within the zone of aeration, the pores in the aquifer contain both water and air.
4. The water table dropped.

5. The well is an ordinary well. In an artesian well, the groundwater is under a lot of pressure. Therefore, the water flows on its own onto Earth's surface. If you have to pump the water, the well must be an ordinary well.
6. hot springs and geysers

SECTION 2 GROUNDWATER AND CHEMICAL WEATHERING

1. water that contains high levels of dissolved minerals
2. A stalactite and a stalagmite grow together.
3. The student should circle one of the icicle-like structures on the floor of the cavern.
4. To form a subsidence sinkhole, sediment slowly settles into the cracks. To form a collapse sinkhole, sediment quickly falls into a cavern.
5. Groundwater chemically weathered the rock under this highway and formed a cavern. The roof of the cavern collapsed to form a sinkhole.
6. The groundwater would be hard. It would contain a lot of minerals from the dissolved limestone.

Review

1. A cavern is an underground chamber that may be connected to other chambers. A sinkhole is a pit or depression on Earth's surface.
2. stalactites only: hang from the ceiling stalactites and stalagmites: found in caverns; form through deposition by groundwater stalagmites only: rise from the floor
3. Acid rain dissolves limestone more quickly than normal rainwater does. Many sinkholes form when limestone near or below the ground dissolves.
4. caverns and sinkholes
5. The scum is made of the minerals that were dissolved in the hard water. They were then deposited on the sides of the tub.