

Elemental Geosystems, 5e (Christopherson)

Chapter 6 Water Resources

1) Approximately what percentage of our bodies is comprised of water?

- A) 5 percent
- B) 25 percent
- C) 70 percent
- D) 99 percent

Answer: C

2) Which of the following are true?

- A) 80 countries face impending water shortages.
- B) One billion people lack access to safe water.
- C) 1.8 billion people lack access to adequate sanitary facilities.
- D) In the next 50 years, water availability per person is expected to drop by 74%.
- E) All of the above are true.

Answer: E

3) Precipitation normally refers to

- A) the moisture demand in the water balance.
- B) all forms of moisture including fog.
- C) rain, sleet, snow, and hail.
- D) the actual evapotranspiration amount.

Answer: C

4) In the water budget, _____ is the major receipt and _____ is the major expenditure.

- A) sunshine; radiative cooling
- B) outgassing; dissociation
- C) precipitation; evaporation and transpiration
- D) evaporation and transpiration; precipitation

Answer: C

5) The hydrologic cycle includes water

- A) at the surface of the earth and in the oceans.
- B) in the atmosphere.
- C) at a depth of up to several kilometers below the surface.
- D) all of the above
- E) at and below the surface only.

Answer: D

6) Which of the following is true regarding the hydrologic cycle?

- A) The bulk of the precipitation occurs over land.
- B) Very little moisture is advected from the sea to the land.
- C) 22 percent of Earth's precipitation falls over the oceans.
- D) 78 percent of all precipitation falls on the oceans.

Answer: D

- 7) Precipitation that reaches Earth's surface penetrates the soil surface through the process of
- A) percolation.
 - B) throughfall.
 - C) infiltration.
 - D) interception and throughfall.

Answer: C

- 8) Atmospheric water that is carried from the ocean to the land is balanced by
- A) atmospheric water carried back to the ocean from land.
 - B) surface water flow from the land to the ocean.
 - C) subsurface flow from the land to the ocean.
 - D) the combination of all of the above
 - E) None of the above no balance exists.

Answer: D

- 9) Which of the following is not considered precipitation in all climates?
- A) hail
 - B) sleet
 - C) fog
 - D) rain
 - E) snow

Answer: C

- 10) Potential evapotranspiration refers to
- A) the moisture supply.
 - B) the amount of unmet water demand in an environment.
 - C) the amount of water that would evaporate or transpire if it were available.
 - D) actual evapotranspiration under conditions of moisture deficit.

Answer: C

- 11) Which of the following is true of precipitation in North America?
- A) The highest amounts occur in the Southwest and Midwest.
 - B) The highest amounts occur in the Southeast and Northwest.
 - C) The lowest amounts are received in the Midwest.
 - D) The lowest amounts are received near Hudson's Bay.

Answer: B

- 12) Transpiration refers to
- A) the movement of free water molecules away from a wet surface.
 - B) the outward movement of water from plant leaves.
 - C) an amount of moisture loss from the surface that cannot be measured.
 - D) evaporation.

Answer: B

- 13) Which of the following would decrease the rate at which evapotranspiration occurs?
- A) increased temperatures
 - B) increased wind speed
 - C) increased humidity
 - D) increased water availability

Answer: C

- 14) Which of the following is normally true of a hot desert?
- A) Potential evapotranspiration exceeds actual evapotranspiration.
 - B) Actual evapotranspiration exceeds potential evapotranspiration.
 - C) Potential evapotranspiration equals actual evapotranspiration.
 - D) It is impossible to say what the normal relationship between potential and actual evapotranspiration would be in a desert.

Answer: A

- 15) Which of the following can measure evapotranspiration?
- A) rain gauge
 - B) anemometer
 - C) evaporation pan
 - D) weighing lysimeter

Answer: D

- 16) Which of the following is true regarding potential evapotranspiration (POTET) in the United States?
- A) The highest values are in the South and East.
 - B) The highest values are in the Southwest.
 - C) Complete measurements and a map of POTET have yet to be prepared.
 - D) It coincides with precipitation amounts.

Answer: B

- 17) If precipitation and soil moisture are inadequate to meet potential evapotranspiration demands, the moisture condition is described as
- A) actual evapotranspiration.
 - B) a surplus.
 - C) a deficit.
 - D) soil moisture utilization.

Answer: C

- 18) Actual evapotranspiration (ACTET) is determined by
- A) $PRECIP - DEFIC.$
 - B) $PRECIP - SURPL.$
 - C) $ACTET - DEFIC.$
 - D) $POTET - DEFIC.$

Answer: D

- 19) Which of the following conditions are necessary for a surplus to exist?
- A) Water is added to the soil when actual evapotranspiration is less than potential evapotranspiration.
 - B) Water is added to the soil when potential evapotranspiration is less than actual evapotranspiration.
 - C) Water is added to the soil when actual evapotranspiration is equal to potential evapotranspiration and the soil is full of moisture.
 - D) Water is added to the soil when the deficit is very small.

Answer: C

- 20) Surplus (SURPL) does not include which of the following?
- A) water oversupply
 - B) overland flow
 - C) total runoff
 - D) soil moisture recharge

Answer: D

21) Which of the following is the most directly useful for estimating stream flow?

- A) potential evapotranspiration
- B) actual evapotranspiration
- C) runoff
- D) soil moisture storage

Answer: C

22) Soil moisture that plants are capable of accessing and using is called

- A) wilting point water.
- B) gravitational water.
- C) available water.
- D) hygroscopic water.

Answer: C

23) Which of the following types of water is accessible to plants?

- A) hygroscopic
- B) capillary
- C) deficit water
- D) transpired water

Answer: B

24) Which of the following is true when the soil is at field capacity?

- A) A surplus definitely exists.
- B) No gravity drainage has occurred.
- C) The soil is holding the maximum amount of water that it can hold against the pull of gravity.
- D) The capillary force is not acting.

Answer: C

25) The difference between the wilting point and field capacity is approximately equal to

- A) wilting point water.
- B) gravitational water.
- C) available water.
- D) hygroscopic water.

Answer: C

26) The texture and structure of the soil dictate

- A) potential evapotranspiration.
- B) available pore spaces (i.e., the soil's porosity).
- C) flow of water through soil (i.e., the soil's permeability).
- D) hygroscopic water.
- E) Both B and C are correct.

Answer: E

27) If the field capacity *increases* while wilting point *decreases*, the amount of available water

- A) increases.
- B) decreases.
- C) remains the same.

Answer: A

- 28) Clay has a _____ field capacity because _____.
- A) large; the pores between the particles are bigger
 - B) large; there are more particles (i.e., there is greater surface area) for the water to adhere to
 - C) small; the pores between the particles are bigger
 - D) small; there are fewer particles (i.e., there is less surface area) for the water to adhere to

Answer: B

- 29) Which of the following types of soil would have the most water available for plant use following a rain? (Consider all relevant factors.)
- A) sand
 - B) silt
 - C) clay

Answer: B

- 30) As transpiration occurs, water enters plant roots because _____.
- A) a neutral pressure gradient is created
 - B) the water pressure in the soil is more than the water pressure in the plant
 - C) the water pressure in the soil is less than the water pressure in the plant
 - D) gravity acts on the water in the soil

Answer: B

- 31) Which of the following soil particle sizes is usually associated with the slowest recharge rate?
- A) sand
 - B) silt
 - C) clay

Answer: C

- 32) Hurricane Camille
- A) evidently produced damage and property loss that exceeded any presumed moisture benefits.
 - B) created deficit abatement (drought-ending) precipitation that produced benefits exceeding damages.
 - C) produced floods only along the Gulf Coast.
 - D) led to restrictive zoning along the Gulf Coast so that properties were not rebuilt after the storm in the same vulnerable areas.

Answer: B

- 33) The water balance for Kingsport, Tennessee exhibits
- A) a net water surplus (SURPL) during each month of the year.
 - B) net demands for water for 10 months of the year.
 - C) water deficits in the summer months.
 - D) water deficits each month of the year.

Answer: C

- 34) Of the example stations, which of the following experiences the greatest moisture deficits?
- A) Kingsport, Tennessee
 - B) Omaha, Nebraska
 - C) Jacksonville, Florida
 - D) Phoenix, Arizona

Answer: D

- 35) Approximately what percent of the U.S. population derives a portion of its fresh water from groundwater sources?
- A) 10 percent
 - B) 30 percent
 - C) 50 percent
 - D) 90 percent

Answer: C

- 36) Which of the following accurately describes annual groundwater withdrawal in the United States?
- A) Withdrawals increased 160 percent between 1950 and 1990.
 - B) The percentage of withdrawals in the U.S. and Canada are about the same.
 - C) Groundwater pumping is presently not exceeding water recharge rates.
 - D) The amount withdrawn is equal to river discharges in the U.S.

Answer: A

- 37) Excess surface water percolates through the zone of _____ to reach the zone of _____ and the water table.
- A) hydration; infiltration
 - B) porosity; permeability
 - C) water table; water deposit
 - D) aeration; saturation

Answer: D

- 38) The line of contact between the zone of aeration and the zone of saturation is known as the
- A) water table.
 - B) saturation contact.
 - C) influent line.
 - D) aquiclude.

Answer: A

- 39) A water-bearing rock stratum is called a/an
- A) water table.
 - B) aquiclude.
 - C) zone of aeration.
 - D) aquifer.

Answer: D

- 40) Which of the following would make the best aquifer?
- A) uncemented, loosely compacted clay
 - B) cemented sand that was highly compacted
 - C) uncemented sand that is loosely compacted
 - D) cemented gravel that was loosely compacted at the time of cementation

Answer: C

- 41) Silt and clay make _____ aquifers because they are _____.
- A) poor; permeable
 - B) poor; impermeable
 - C) good; permeable
 - D) good; impermeable

Answer: D

- 42) The water in a confined aquifer is under pressure of its own weight, creating a pressure level called the
- A) artesian water level.
 - B) aquifer recharge force.
 - C) potentiometric surface.
 - D) water table.

Answer: C

- 43) The term "ground water mining" refers to
- A) the removal of overlying rock to reach ground water.
 - B) the excavation of tunnels to reach ground water.
 - C) the use of ground water to mine minerals.
 - D) the removal of ground water at a rate faster than that at which it can be replaced.

Answer: D

- 44) The term "cone of depression" refers to
- A) a change in the level of the soil water zone.
 - B) a depression in the water table formed by rapid ground water withdrawal.
 - C) a depression in the earth's surface formed by ground water withdrawal.
 - D) a graphical representation of the decline in the rate of ground water flow as an aquifer dries out.

Answer: B

- 45) In order to protect aquifers from pollution, the bottoms of waste dumps should be lined with
- A) gravel.
 - B) sand.
 - C) clay.
 - D) soil.

Answer: C

- 46) Which of the following is a potential source of ground water pollution?
- A) septic tanks
 - B) pesticides and fertilizers
 - C) dumps
 - D) all of these

Answer: D

- 47) Which of the following is a potential consequence of ground water mining?
- A) land subsidence and cracked building foundations
 - B) compression of the aquifer, resulting in a permanent loss of water storage capacity
 - C) salt water intrusion
 - D) all of the above
 - E) A and B only

Answer: D

- 48) Which of the following is true regarding groundwater?
- A) It is unlimited when compared with the amount of surface water supplies.
 - B) When polluted, it is actually easier to clean up than is surface water.
 - C) The total amount of groundwater has been reduced by the mining of water.
 - D) In terms of total amount, it is second to streams in the United States.

Answer: C

49) The largest practical potential source of fresh water in North America is

- A) groundwater.
- B) ice sheets and glaciers.
- C) stream discharge.
- D) soil moisture.

Answer: A

50) A stream's flow rate is called its

- A) water flow.
- B) runoff.
- C) discharge.
- D) rate of flow.

Answer: C

51) The Nile and Colorado rivers are examples of

- A) exotic streams.
- B) streams with increases in downstream flows.
- C) two of Earth's greatest rivers in terms of discharge.
- D) internal drainage systems.

Answer: A

52) Of the average precipitation over the lower 48 states, what percentage evaporates and transpires on the average per day?

- A) 29 percent
- B) 51 percent
- C) 71 percent
- D) 49 percent

Answer: C

53) Which of the following water withdrawal habits do developing nations exhibit?

- A) They withdraw equal proportions for domestic, agricultural, and industrial use.
- B) They withdraw the greatest amounts for the industrial sector.
- C) They withdraw the greatest amounts for agriculture.
- D) Their pattern of water usage is very similar to that of the United States.

Answer: C

54) Which of the following is false?

- A) The average American diet requires 5600 liters (1320 gallons) a day to produce.
- B) World water supplies per person have shrunk by 1/3 since 1970.
- C) Canada is facing water shortages.
- D) 60 percent of the world's desalinization plants are in the Middle East.

Answer: C

55) Which of the following is an example of the consumptive use of water?

- A) water that evaporates from an irrigated field
- B) hydroelectric power production
- C) using water for a bath
- D) river navigation
- E) all of the above

Answer: A

56) The High Plains aquifer

- A) averages about 30 inches of rain per year.
- B) was not heavily mined until the 1960s.
- C) is not Earth's largest aquifer.
- D) received much of its water from melting glaciers in the past.

Answer: D

57) This region of the High Plains aquifer is suffering the least from groundwater mining

- A) south-central Nebraska.
- B) northern Texas.
- C) Oklahoma.
- D) Kansas.

Answer: A

58) This activity uses the least amount of withdrawn water in the United States

- A) irrigation-livestock.
- B) industry-mining.
- C) domestic-commercial.
- D) steam-electric power.

Answer: B

59) Of the following regions, which is most vulnerable to water scarcity?

- A) South America
- B) United States
- C) India
- D) China

Answer: C

60) Rain is measured at more than 100,000 stations worldwide.

Answer: True False

61) On a hot day, a tree can transpire hundreds of liters of water.

Answer: True False

62) Potential evapotranspiration (POTET), when reduced by the deficit (DEFIC), yields the actual evapotranspiration value for a given time period.

Answer: True False

63) Precipitation normally includes rain, sleet, snow, dew, clouds, and fog.

Answer: True False

64) Thornthwaite devised a method for estimating potential evapotranspiration that utilized mean air temperature and daylength.

Answer: True False

65) When actual evapotranspiration is less than potential evapotranspiration, a soil moisture surplus exists.

Answer: True False

66) Soil moisture deficits are frequently overcome by irrigation in the arid and semi-arid agricultural regions of the world.

Answer: True False

- 67) At wilting point, no water remains in the soil.
Answer: True False
- 68) Hygroscopic water is readily accessible to plants.
Answer: True False
- 69) All plant species have the same amount of water available to them under the same soil moisture conditions.
Answer: True False
- 70) Although more water can be held in a clay soil, less is actually available for plant use than in a silt soil.
Answer: True False
- 71) Water drains more easily from a sandy soil than from a clay soil.
Answer: True False
- 72) Gravitational water is associated with soil moisture deficits.
Answer: True False
- 73) The water available to a plant is a function of soil texture and the effective rooting depth of the plant itself.
Answer: True False
- 74) The upper limit of water that collects in the zone of saturation is the water table.
Answer: True False
- 75) Water could be pumped faster from a geologic unit composed of sand than from one composed of clay.
Answer: True False
- 76) An aquifer pumped beyond its recharge rate is over utilized and becomes a product of groundwater mining.
Answer: True False
- 77) If the potentiometric surface reaches the surface of the ground, a spring will develop.
Answer: True False
- 78) Ground water pollution that our generation creates will not be a problem in the future (decades to centuries) because it is easy to clean an aquifer once it is polluted.
Answer: True False
- 79) The ten largest rivers in the world combined, in terms of discharge, exceed the total groundwater resource.
Answer: True False
- 80) Abnormally high cancer rates have occurred in the New Orleans area because of the contamination of the Mississippi River.
Answer: True False
- 81) The term for water that is caught on the surface of vegetation during a rain shower is _____. Some of this water will subsequently run down the branches and trunk of the tree to reach the ground surface by _____. Once on the ground, water will enter the soil in a process known as _____, and will then move downward through the soil as a result of the force of gravity. This movement of soil water under the influence of gravity is called _____.
Answer: interception; stemflow; infiltration; percolation

82) An _____ is a rock layer that is permeable to groundwater flow in significant amounts, whereas an _____ is a body of rock that does not conduct water in usable amounts. Technically, the zone of saturation is an _____, a water-bearing stratum that is not confined by an impermeable overburden. The upper limit of the water that collects in the zone of saturation is called the _____.

Answer: aquifer; aquiclude; aquifer; water table

83) If POTET is satisfied and soil moisture is full, then additional water input becomes _____, or water oversupply. This excess water may sit on the surface in puddles, a situation known as _____, or flow through the soil to groundwater storage. Surplus water that flows across the surface toward stream channels is termed _____, which, together with other precipitation and subsurface flows into river channels, is the _____ from the area.

Answer: surplus; water detention; overland flow; total runoff