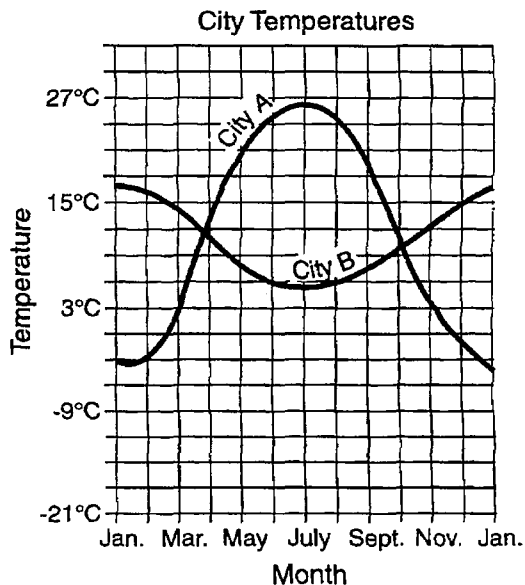
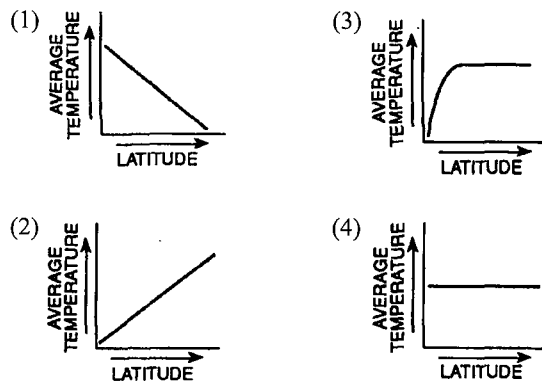


Base your answers to questions 1 and 2 on the graph below, which shows the average monthly temperature of two cities A and B.

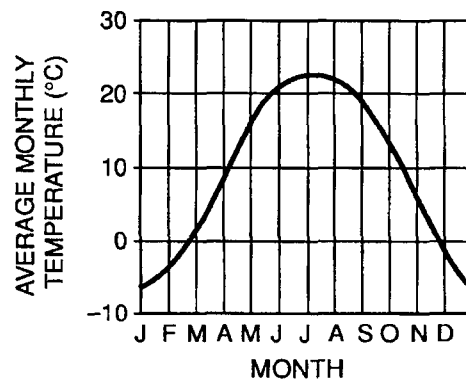


- The temperature in city B is highest in January and lowest in July because city B is located
  - on the side of a mountain
  - on an island
  - in the Southern Hemisphere
  - at the North Pole
- Both cities have an average yearly temperature of 11°C, but city A has a much greater temperature range than city B has because city A most likely
  - is closer to the Equator
  - is farther from a large body of water
  - has more rainfall
  - has stronger prevailing winds
- How does the average annual surface temperature compare from latitude to latitude?
  - As latitude increases, the average annual surface temperature decreases.
  - As latitude increases, the average annual surface temperature increases.
  - As latitude increases, the average annual surface temperature remains the same.
- Which factors have the *least* effect on the climate of a region?
  - latitude and elevation
  - longitude and population density
  - wind belts and storm tracks
  - mountain barriers and nearness to large bodies of water

5. Which graph best represents the relationship between the latitude of locations north of the Equator and the yearly average surface temperatures of these locations?



6. The graph below represents the average temperature of a city for each month of the year.

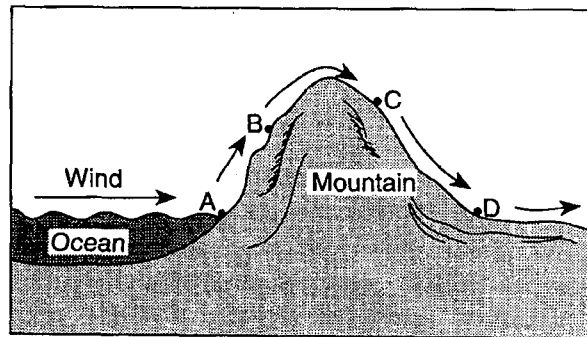


Where is this city most likely located?

- inland in the Northern Hemisphere, in a middle latitude
  - inland in the Southern Hemisphere, in a middle latitude
  - on a coast near the Equator
  - on a coast in the Antarctic
7. What is the best explanation for these two statements?
- Some mountains located near the Earth's Equator have snow-covered peaks.
  - Icecaps exist at the Earth's poles.
- High elevation and high latitude have a similar effect on climate.
  - Both mountain and polar regions have arid climates.
  - Mountain and polar regions receive more energy from the Sun than other regions do.
  - An increase in snowfall and an increase in temperature have a similar effect on climate.

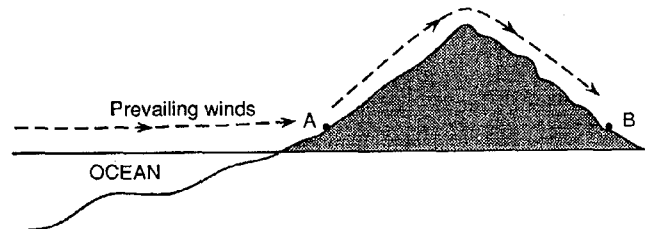
8. During the summer months, which change in location would most likely cause a decrease in the observed daytime air temperatures?
- (1) from 45° N latitude to 20° N latitude
  - (2) from sea level to 5 km above sea level
  - (3) from sea level on the windward side of a mountain to sea level on the leeward side
  - (4) from the ocean coast to an inland location
9. Which area in New York State would most likely have the *smallest* annual temperature range?
- (1) the Mohawk Valley between Syracuse and Albany
  - (2) the Adirondack peaks southwest of Plattsburgh
  - (3) the Catskills west of Kingston
  - (4) the southern shore of Long Island
10. New York City and St. Louis, Missouri, are both located at approximately the same latitude. Why does St. Louis experience a greater range of temperatures throughout the year compared to New York City?
- (1) St. Louis is closer to the Equator.
  - (2) St. Louis is at a higher altitude.
  - (3) St. Louis is farther from the ocean coast.
  - (4) St. Louis is on the windward side of mountains.
11. What effect does a large body of water usually have on the climate of a nearby landmass?
- (1) The water causes cooler summers and colder winters.
  - (2) The water causes cooler summers and warmer winters.
  - (3) The water causes hotter summers and warmer winters.
  - (4) The water causes hotter summers and colder winters.
12. What is the name of the cool ocean current that flows along the west coast of South America?
- (1) Brazil Current
  - (2) Peru Current
  - (3) South Equatorial Current
  - (4) North Pacific Current
13. Which conditions are most likely to develop over a land area adjacent to the ocean on a hot, sunny afternoon?
- (1) lower temperatures, with winds blowing in from the ocean
  - (2) lower temperatures, with winds blowing out toward the ocean
  - (3) higher temperatures, with winds blowing in from the ocean
  - (4) higher temperatures, with winds blowing out toward the ocean
14. During winter, Lake Ontario is generally warmer than adjacent land areas. The *primary* reason for this temperature difference is that
- (1) water has a higher specific heat than land has
  - (2) water reflects sunlight better than land does
  - (3) land is more dense than water is
  - (4) winds blow from land areas toward the water

15. Two coastal cities have the same latitude and elevation, but are located near different oceans. Which statement best explains why the two cities have different climates?
- (1) They are at different longitudes.
  - (2) They are near different ocean currents.
  - (3) They have different angles of insolation.
  - (4) They have different numbers of daylight hours.
16. Which current is a cool ocean current that flows completely around Earth?
- (1) West Wind Drift
  - (2) Gulf Stream
  - (3) North Equatorial Current
  - (4) California Current
17. The cross section below shows the flow of prevailing winds over a mountain ridge.



Which location is most likely to receive precipitation?

- (1) A
  - (2) B
  - (3) C
  - (4) D
18. In the diagram of a mountain below, location A and location B have the same elevation.

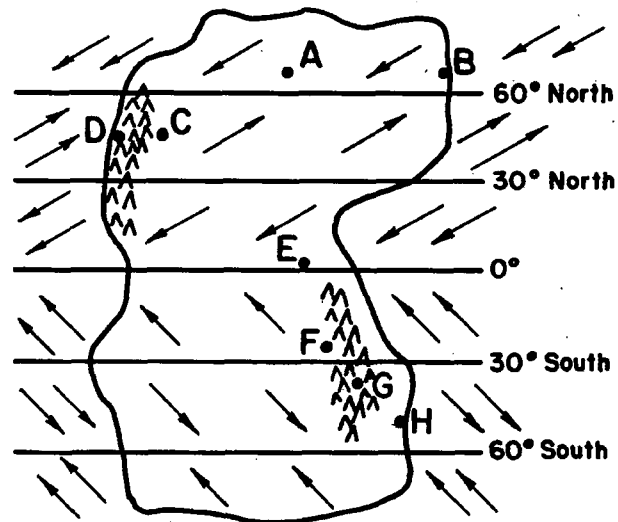


Compared to the climate at location A, the climate at location B will be

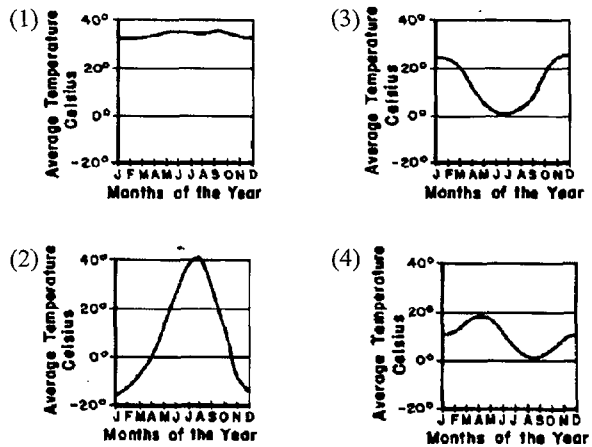
- (1) warmer and drier
  - (2) cooler and drier
  - (3) warmer and wetter
  - (4) cooler and wetter
19. According to the *Earth Science Reference Tables*, the prevailing winds at 45° S latitude are from the
- (1) southwest
  - (2) northwest
  - (3) southeast
  - (4) northeast

20. Which planetary wind pattern is present in many areas of little rainfall?
- (1) Winds converge and air sinks.
  - (2) Winds converge and air rises.
  - (3) Winds diverge and air sinks.
  - (4) Winds diverge and air rises.
21. At which latitudes do currents of dry, sinking air cause the dry conditions of Earth's major deserts?
- (1)  $0^\circ$  and  $30^\circ$  N
  - (2)  $60^\circ$  N and  $60^\circ$  S
  - (3)  $30^\circ$  N and  $30^\circ$  S
  - (4)  $60^\circ$  S and  $90^\circ$  S
22. The planetary wind and moisture belts indicate that large amounts of rainfall occur at Earth's Equator because air is
- (1) converging and rising
  - (2) converging and sinking
  - (3) diverging and rising
  - (4) diverging and sinking
23. The prevailing southwesterlies wind belt causes most low-pressure weather systems to travel across the United States from the
- (1) southwest toward the northeast
  - (2) northwest toward the southeast
  - (3) northeast toward the southwest
  - (4) southeast toward the northwest
24. What is the general pattern of air movement on March 21 at Earth's Equator ( $0^\circ$ )?
- (1) upward, due to low temperature and high pressure
  - (2) upward, due to high temperature and low pressure
  - (3) downward, due to low temperature and high pressure
  - (4) downward, due to high temperature and low pressure

Base your answers to questions 25 through 29 on the diagram below. The diagram represents an imaginary continent on the Earth surrounded by water. The arrows indicate the direction of the prevailing winds. Two large mountain regions are also indicated. Points *A*, *B*, *E*, and *H* are located at sea level; *C*, *D*, and *F* are in the foothills of the mountains; *G* is high in the mountains.



25. Which graph best represents the average monthly temperatures that would be recorded during one year at location *E*?



26. Which physical characteristic would cause location *G* to have a colder yearly climate than any other location?
- (1) the nearness of location *G* to a large ocean
  - (2) the location of *G* with respect to the prevailing winds
  - (3) the elevation of location *G* above sea level
  - (4) the distance of location *G* from the Equator
27. Which location probably has the greatest annual rainfall?
- (1) *A*
  - (2) *F*
  - (3) *C*
  - (4) *D*

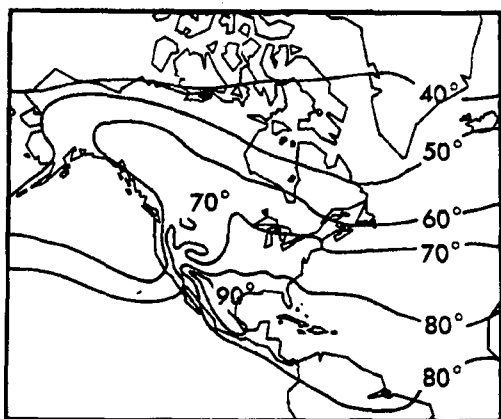
28. Which location probably has the greatest range in temperature during the year?

- (1) *A* (3) *H*  
 (2) *B* (4) *D*

29. Which location will probably record its highest potential evapotranspiration values for the year during January?

- (1) *A* (3) *C*  
 (2) *F* (4) *D*

Base your answers to questions 30 and 31 on the isotherm map of North America and part of South America below. The map shows the average daily temperature in degrees Fahrenheit during 1 month of the year.



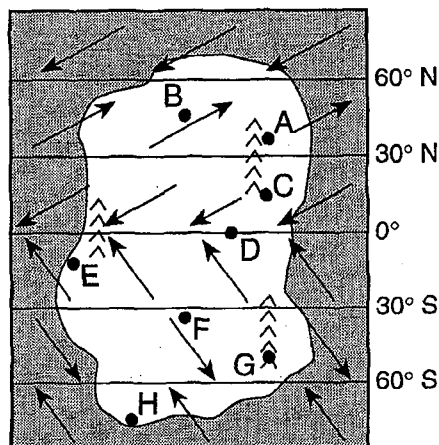
30. This map could represent the average daily temperature for the month of

- (1) November (3) March  
 (2) January (4) July

31. Why does the 60-degree isotherm bend northward in the Northern Hemisphere during the time of the year when the data was recorded?

- (1) The land is warmer than the ocean.  
 (2) Warm ocean currents are moving northward along both coasts.  
 (3) The mid-ocean ridges are heating the ocean water.  
 (4) A high-pressure air mass is centered over North America.

Base your answers to questions 32 through 36 on the *Earth Science Reference Tables* and the map below. The map represents an imaginary continent on the Earth surrounded by oceans. The locations represented by points *E* and *H* are at sea level, locations *A* and *C* are at the base of mountains, and location *G* is at the top of a mountain. The arrows indicate the direction of the prevailing winds on the Earth.



32. What is the main reason that location *A* is colder in January than in July?

- (1) It receives less insolation in January.  
 (2) The altitude of the Sun is greater in January.  
 (3) The Earth is farther from the Sun in January.  
 (4) The Earth's temperature range is greater in January.

33. Which location most likely has the lowest average yearly temperature?

- (1) *A* (3) *F*  
 (2) *D* (4) *G*

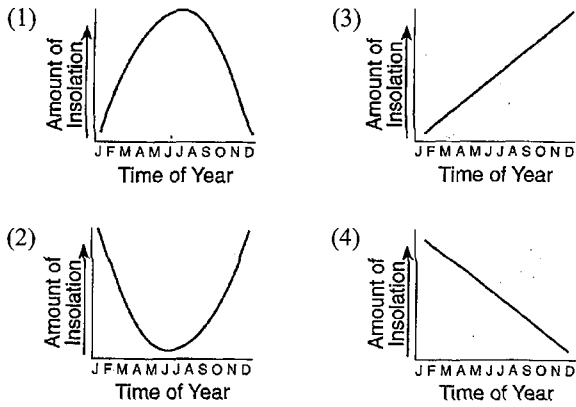
34. At 0° latitude, the primary factor that causes rising air currents, adiabatic cooling, and cloud formation is the process of

- (1) precipitation (3) convection  
 (2) radiation (4) conduction

35. Which location most likely has the most arid (dry) climate?

- (1) *H* (3) *C*  
 (2) *F* (4) *D*

36. Which graph best represents the relationship between time of year and amount of insolation at location *F*?



37. Assuming a constant land slope, the greatest infiltration of water into the Earth will occur when the surface is

- (1) permeable and saturated
- (2) permeable and unsaturated
- (3) impermeable and saturated
- (4) impermeable and unsaturated

38. Which type of soil would water infiltrate most slowly?

- (1) silt
- (2) pebbles
- (3) fine sand
- (4) fine clay

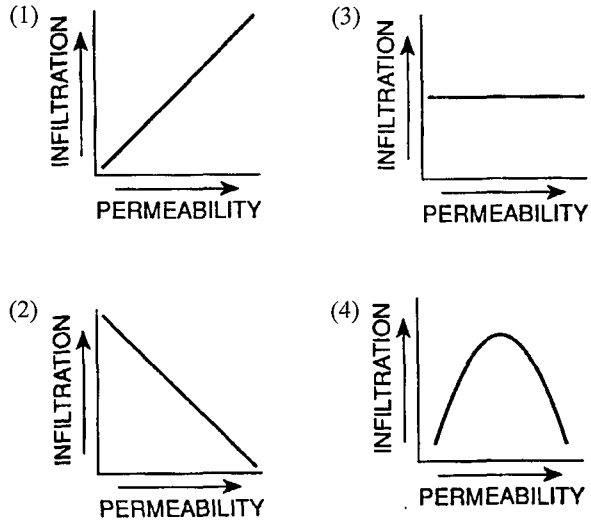
39. When rain falls on an area of sandy soil, infiltration will usually be greater than surface runoff if the

- (1) soil surface has a steep slope
- (2) soil is saturated
- (3) rate of precipitation is low
- (4) surface is impermeable

40. Flash flooding often occurs in city areas because

- (1) runoff decreases during precipitation
- (2) ground water storage is usually very large
- (3) roads, pavements, and buildings reduce the infiltration of water into the ground
- (4) the heat generated by city areas decreases actual evapotranspiration

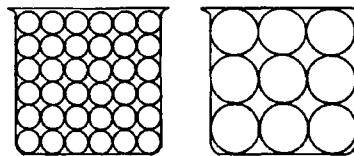
41. Which graph best represents the relationship between soil permeability rate and infiltration when all other conditions are the same?



42. Through which of the following loose soil materials does water infiltrate fastest?

- (1) clay
- (2) silt
- (3) sand
- (4) pebbles

43. The diagrams below represent two identical containers filled with nonporous uniform particles. The containers represent models of two different sizes of soil particles.



Compared to the model containing larger particles, the model containing smaller particles has

- (1) less permeability and greater porosity
- (2) greater porosity and greater capillarity
- (3) less permeability and greater capillarity
- (4) greater permeability and greater porosity

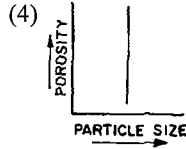
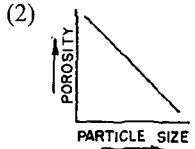
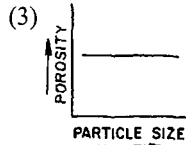
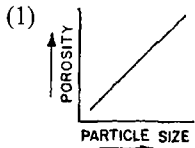
44. Immediately after a moderate rainfall, the stream discharge is greater from a stream that drains a clay soil area than from a stream that drains a sand-and-gravel soil area. This discharge differs because the clay soil is

- (1) less porous, and allows less runoff
- (2) more porous, and allows more runoff
- (3) less permeable, and allows more runoff
- (4) more permeable, and allows less runoff

45. Which is most important in determining the amount of ground water that can be stored within a rock?

- (1) the rock's geologic age
- (2) the rock's hardness
- (3) the rock's porosity
- (4) the rock's color

46. Which graph best represents the relationship between porosity and particle size for soil samples of uniform size, shape, and packing?



47. If a rock is compressed and its volume decreases, how will the rock's density and porosity be affected?

- (1) Density and porosity will both decrease.
- (2) Density and porosity will both increase.
- (3) Density will decrease and porosity will increase.
- (4) Density will increase and porosity will decrease.

48. Soil with the *lowest* porosity is composed of particles that are all

- (1) different sizes and shapes
- (2) large and angular
- (3) small and rounded
- (4) large and rounded

49. In which sediments is the capillary action of water greatest?

- (1) silt and sand
- (2) sand and pebbles
- (3) pebbles and cobbles
- (4) cobbles and boulders

50. The upward movement of water through tiny spaces in soil or rock is called

- (1) water retention
- (2) capillary action
- (3) porosity
- (4) permeability

51. Surface runoff will generally be greatest when the

- (1) rainfall is light and the ground is permeable
- (2) infiltration rate is greater than the rainfall rate
- (3) slope of the land is too great to permit infiltration
- (4) ground is permeable and unsaturated

52. Surface runoff is most likely to occur when

- (1) the soil is unsaturated
- (2) the land is flat
- (3) rainfall exceeds the permeability rate
- (4) little capillary action occurs

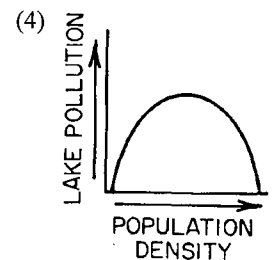
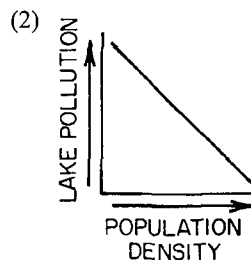
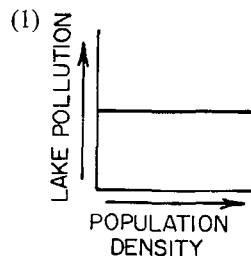
53. When the soil is saturated in a gently sloping area, any additional rainfall in the area will most likely

- (1) become ground water
- (2) become surface runoff
- (3) cause a moisture deficit
- (4) cause a higher potential evapotranspiration

54. What is the main reason that a high concentration of aerobic bacteria is harmful to a lake?

- (1) The bacteria release large amounts of oxygen.
- (2) The bacteria use up large amounts of oxygen.
- (3) The bacteria cause excessive cooling of the water.
- (4) The bacteria provide food for predators.

55. Which graph best illustrates the relationship between lake water pollution and human population density near the lake?



56. A landfill is most likely to directly pollute

- (1) water vapor over the landfill
- (2) precipitation about to fall on the landfill
- (3) surface streams flowing to the landfill
- (4) ground water under the landfill

57. The main source of moisture for the local water budget is

- (1) potential evapotranspiration
- (2) actual evapotranspiration
- (3) ground water storage
- (4) precipitation

58. As both the duration and the angle of insolation increase, the potential evapotranspiration will generally

- (1) decrease
- (2) increase
- (3) remain the same

59. During which month of the year do most locations in New York State have the greatest potential evapotranspiration?

- (1) January
- (2) April
- (3) July
- (4) October

60. Which factor may cause the potential evapotranspiration ( $E_p$ ) values of a region to be relatively high during the month of June?

- (1) many warm days with sunshine
- (2) an unusually large amount of precipitation
- (3) ground water storage that has reached a maximum
- (4) the absence of vegetation in the area

61. An area with a high potential for evapotranspiration has little actual evapotranspiration and precipitation. The climate of this area is best described as

- (1) hot and arid
- (2) hot and humid
- (3) cold and arid
- (4) cold and humid

62. The greatest source of moisture entering the atmosphere is evaporation from the surface of

- (1) the oceans
- (2) the land
- (3) lakes and streams
- (4) ice sheets and glaciers

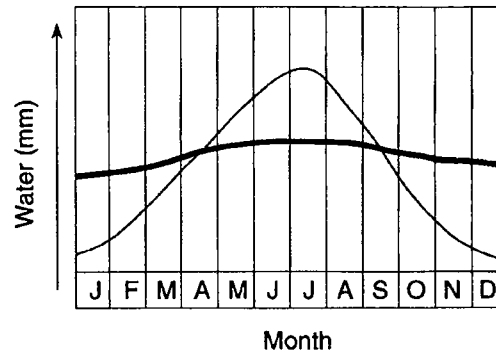
63. Which condition most likely exists when precipitation is greater than potential evapotranspiration and soil water storage is at the maximum?

- (1) usage
- (2) runoff
- (3) recharge
- (4) drought

64. When does a moisture deficit occur in a local water budget?

- (1) when precipitation is less than potential evapotranspiration and the soil storage is zero
- (2) when precipitation plus surplus is greater than potential evapotranspiration
- (3) when precipitation is greater than potential evapotranspiration and the soil is saturated
- (4) when precipitation is less than potential evapotranspiration

65. According to the water budget graph below, during which month will the soil moisture most likely be depleted at this location?



KEY

- Precipitation
- Potential evapotranspiration

- (1) February
- (2) April
- (3) August
- (4) October

66. What most likely will happen to soil moisture when precipitation is greater than potential evapotranspiration?

- (1) Soil-moisture storage may decrease.
- (2) Soil-moisture deficit may increase.
- (3) Soil moisture may be recharged.
- (4) Soil moisture may be used.

67. For a given soil region, the total precipitation is greater than the total potential evapotranspiration, and water storage is at its maximum. Under these conditions, the local water budget is in a state of

- (1) moisture usage
- (2) moisture recharge
- (3) moisture surplus
- (4) moisture deficit

68. Why do many streams continue to flow during long periods when there is no precipitation?

- (1) Soil moisture storage is recharged by vegetation along the streams.
- (2) Ground water continues to move into the stream channels.
- (3) An increase in potential evapotranspiration increases the stream runoff.
- (4) The porosity beneath the stream channels becomes higher than normal.

69. Stream discharge would normally be highest during a period of

- (1) recharge
- (2) deficit
- (3) usage
- (4) surplus

70. As surface runoff in a region increases, stream discharge in that region will usually

- (1) decrease
- (2) increase
- (3) remain the same

71. The type of climate for a location can be determined by comparing the yearly amounts of

- (1) precipitation and potential evaporation
- (2) soil storage and potential evapotranspiration
- (3) precipitation and infiltration
- (4) change in soil storage and stream discharge

72. A region with an arid climate has an annual precipitation that is

- (1) less than the annual potential evapotranspiration
- (2) greater than the annual potential evapotranspiration
- (3) equal to the annual potential evapotranspiration

73. Two locations, one in northern Canada and one in the southwestern United States, receive the same amount of precipitation each year. The location in Canada is classified as a humid climate. Why would the location in the United States be classified as an arid climate?

- (1) The yearly distribution of precipitation is different.
- (2) The soil-moisture storage in the southwestern United States is more than that in northern Canada.
- (3) The potential evapotranspiration is greater in the southwestern United States than in northern Canada.
- (4) The vegetation of the southwestern United States is different from that of northern Canada.

74. Which climate conditions are typical of regions near the North Pole and the South Pole?

- (1) low temperature and low precipitation
- (2) low temperature and high precipitation
- (3) high temperature and low precipitation
- (4) high temperature and high precipitation

75. The table below shows the relationship between total yearly precipitation ( $P$ ) and potential evapotranspiration ( $E_p$ ) for different types of climates.

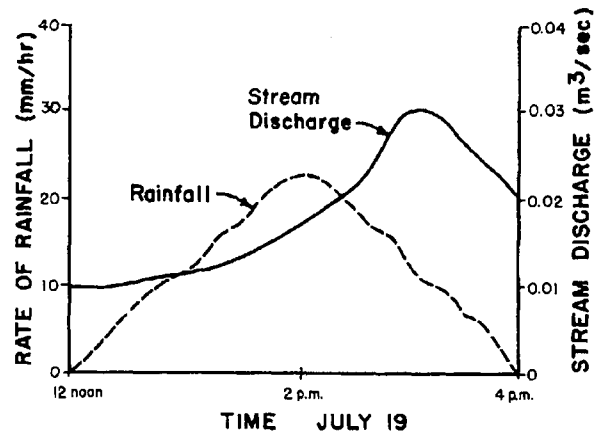
**Climate Classification**

Climate Type	Total Yearly $P/E_p$ Ratio
Humid	Greater than 1.2
Subhumid	0.8 to 1.2
Semiarid	0.4 to 0.8
Arid	Less than 0.4

The total yearly precipitation ( $P$ ) for a city in Texas is 218 millimeters. The total yearly potential evapotranspiration ( $E_p$ ) is 951 millimeters. Which type of climate does this city have?

- (1) humid
- (2) subhumid
- (3) semiarid
- (4) arid

Base your answers to questions 76 through 80 on your knowledge of Earth science and the graph below. The graph shows the rate of rainfall during a storm and the stream discharge of a nearby stream on July 19.



76. The rainstorm lasted for a total of

- (1) 5 hours
- (2) 2 hours
- (3) 3 hours
- (4) 4 hours

77. The maximum rate of rainfall was approximately

- (1) 10 mm/hr
- (2) 19 mm/hr
- (3) 23 mm/hr
- (4) 33 mm/hr

78. Which statement best explains the sharp increase in stream discharge at the time that rainfall decreased?

- (1) Rainwater fell directly into the stream.
- (2) The temperature of the stream water decreased.
- (3) Great amounts of runoff water evaporated.
- (4) Surface runoff reached the stream.

79. Why does stream discharge usually not become zero even during extended dry periods?

- (1) Ground water continues to flow into the stream.
- (2) Surface runoff increases.
- (3) The potential evapotranspiration increases.
- (4) The porosity beneath the stream becomes higher than usual.

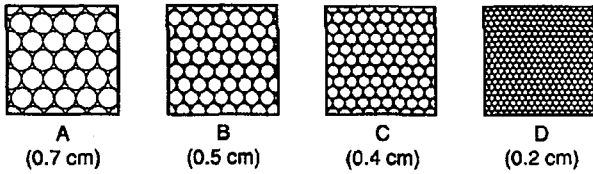
80. Note that this question only has three answers.

Another rainstorm with the same characteristics as the rainstorm shown on the graph starts at 4 p.m. on July 19. As a result of this storm, the maximum stream discharge later that day would probably be

- (1) less than  $0.03 \text{ m}^3/\text{sec}$
- (2) greater than  $0.03 \text{ m}^3/\text{sec}$
- (3) equal to  $0.03 \text{ m}^3/\text{sec}$



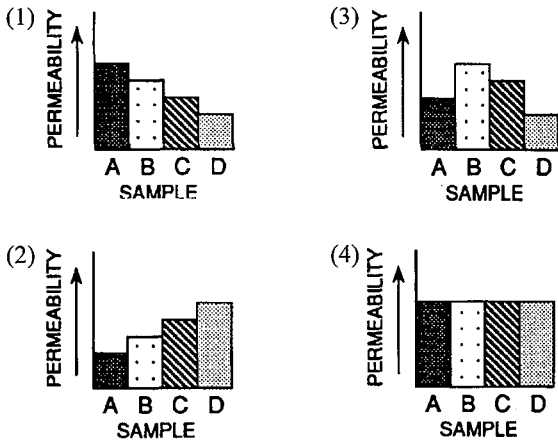
Base your answers to questions 81 through 85 on the *Earth Science Reference Tables* and the diagrams below. The diagrams represent cross sections of four samples of loosely packed, uniformly sorted soil particles. The diameter of the particles is given below each diagram. All soil samples consist of solid spherical particles.



81. Sample *D* will have the greatest capillarity because it

- (1) has the smallest surface area
- (2) has the smallest particles
- (3) is the most loosely packed
- (4) is weathering the most rapidly

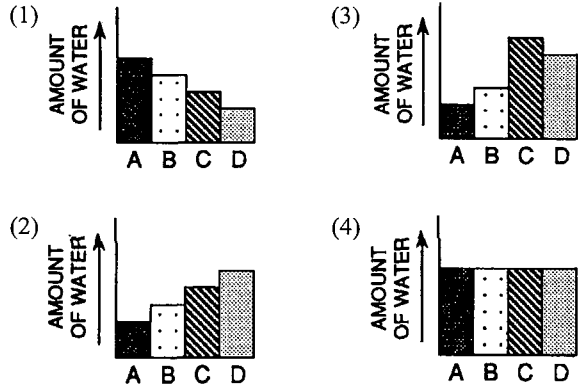
82. Which graph best represents the permeabilities of the soil samples?



83. If equal amounts of 0.2-centimeter soil particles are mixed into each sample, which sample's porosity will *not* be affected?

- (1) *A*
- (2) *B*
- (3) *C*
- (4) *D*

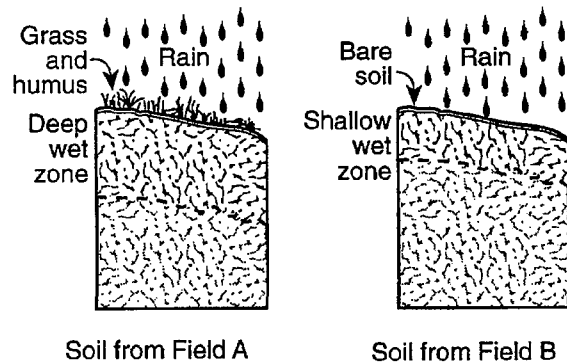
84. Equal volumes of each soil sample were saturated with water. Which graph best represents the amount of water required to fill the pore spaces of each soil sample?



85. Some particles from sample *D* are mixed with particles from sample *A*. Compared to the original permeability of sample *A*, the permeability of the resulting mixture will be

- (1) less
- (2) greater
- (3) the same

Base your answers to questions 86 through 90 on the *Earth Science Reference Tables* and the diagrams below. The diagrams show two soil cross sections from adjacent fields in New York State. Both soils are the same except that human activities have removed the vegetation from the surface of field *B*. Each field has been receiving rain for several hours.



86. These New York State soils are most likely composed of rock particles that have been

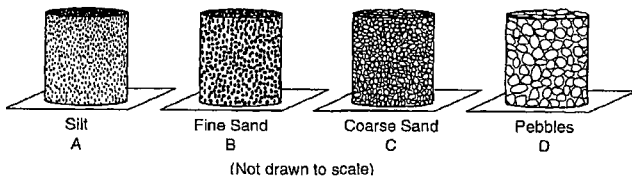
- (1) weathered from the underlying bedrock
- (2) weathered from the bedrock of northern Pennsylvania
- (3) transported by glaciers or water
- (4) transported by wind

87. The soils in field *B* would have a higher rate of permeability if the soils

- (1) had lower porosity
- (2) had a steeper surface slope
- (3) were composed of larger rock particles
- (4) were compacted by machinery traveling over the field

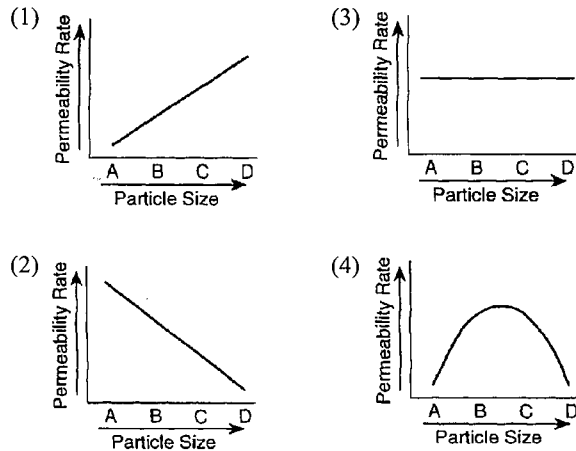
88. Which change would most likely result from replanting vegetation in field *B*?
- (1) Transpiration would decrease.
  - (2) Runoff would increase.
  - (3) Erosion would increase.
  - (4) Water infiltration would increase.
89. In which field is soil most likely developing faster?
- (1) field *A*, because plants are adding organic material to the ground
  - (2) field *A*, because less rainwater sinks into the ground
  - (3) field *B*, because more rainwater sinks into the ground
  - (4) field *B*, because less weathering occurs at the surface of the ground
90. If the skies remain clear for the week following this rain, the water in the wet zone in field *B* will
- (1) mostly become surface runoff
  - (2) partially evaporate into the air
  - (3) all remain as stored water along the surface
  - (4) mostly transpire into the ground

Base your answers to questions 91 through 95 on the *Earth Science Reference Tables* and on the diagrams below. The diagrams represent 500-milliliter containers that are open at the top and the bottom and filled with well-sorted, loosely packed particles of uniform size. A piece of screening placed at the bottom of each container prevents the particles from falling out.

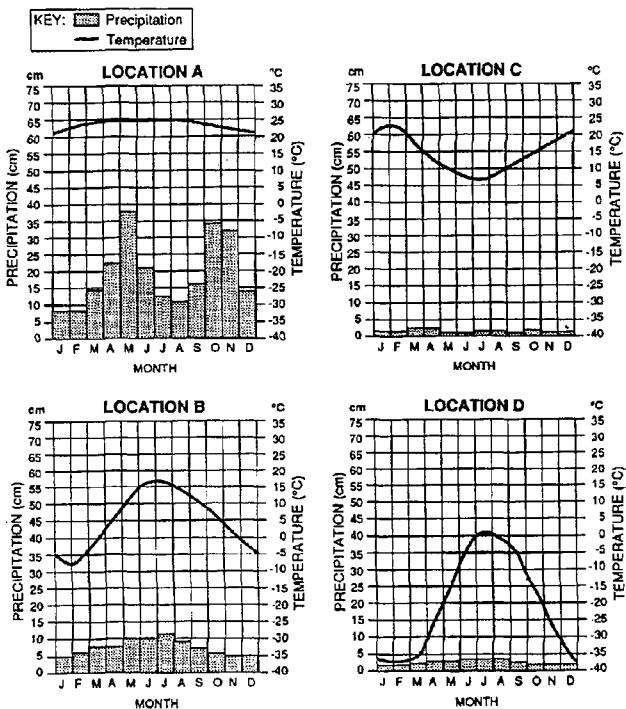


91. Container *A* is filled with particles that could have a diameter of
- (1) 0.0001 cm
  - (2) 0.001 cm
  - (3) 0.01 cm
  - (4) 0.1 cm
92. The sample in which container would have the greatest capillarity when placed in water?
- (1) *A*
  - (2) *B*
  - (3) *C*
  - (4) *D*
93. Assume that the samples in each container were taken from surface soil in different locations. Which location would produce the *least* amount of runoff during a heavy rainfall?
- (1) *A*
  - (2) *B*
  - (3) *C*
  - (4) *D*

94. The sample in which container would retain the most water on the particles after 500 milliliters of water is poured through the sample?
- (1) *A*
  - (2) *B*
  - (3) *C*
  - (4) *D*
95. Which graph best represents the rate of permeability of the samples?



Base your answers to questions 96 through 100 on the climate graphs below. Each climate graph shows the average monthly temperature and the average monthly precipitation for a particular location. Precipitation amounts are shown by the shaded bars and are read from the scale at the left of the graph. Temperatures are shown by the solid line and are read from the scale at the right of the graph.



96. Which location shows the greatest amount of change in average monthly precipitation?
- (1) *A* (2) *B* (3) *C* (4) *D*
97. Which location would most likely have the highest average potential evapotranspiration ( $E_p$ ) value for the month of July?
- (1) *A* (2) *B* (3) *C* (4) *D*
98. Which location is in the Southern Hemisphere?
- (1) *A* (2) *B* (3) *C* (4) *D*
99. Which location has a climate typical of a region near the North Pole?
- (1) *A* (2) *B* (3) *C* (4) *D*

100. Which statement best explains the small temperature range at location *A*?

- (1) Location *A* is far from any large body of water.  
 (2) Location *A* is close to the Equator.  
 (3) Location *A* has a very high elevation.  
 (4) Location *A* is located in a high-pressure wind belt.

