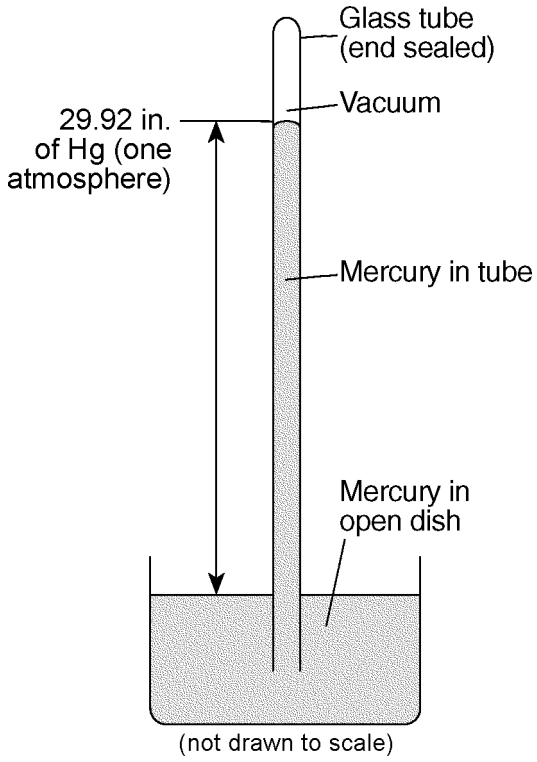
Name: _____

1) An increase in the transparency of Earth's atmosphere is often caused by
   A) a decrease in solar radiation
   B) an increase in airborne dust particles
   C) an increase in the duration of insolation
   D) a decrease in cloud cover

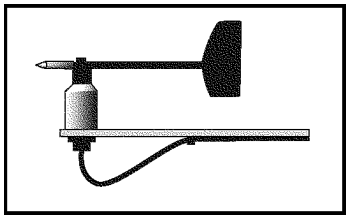
2) Which weather variable is measured by a barometer?
   A) air pressure
   B) dewpoint
   C) wind speed
   D) visibility

3) The diagram below represents a weather instrument.



Which weather variable was this instrument designed to measure?
   A) dewpoint
   B) air pressure
   C) amount of precipitation
   D) relative humidity

4) The diagram below shows a weather instrument found at most weather stations.



The main function of this instrument is to measure which weather variable?
   A) relative humidity
   B) wind speed
   C) wind direction
   D) air pressure

5) Which set of instruments is correctly paired with the weather variables that they measure?

A)

wind speed – anemometer
wind direction – barometer

C)

wind speed – anemometer
wind direction – wind vane

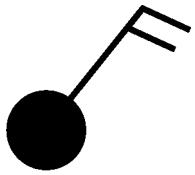
B)

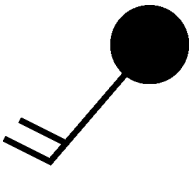
wind speed – barometer
wind direction – wind vane

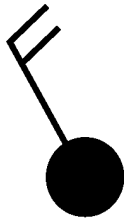
D)

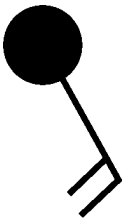
wind speed – wind vane
wind direction – barometer

6) Which station model shows a wind direction from the southeast?

A) 

C) 

B) 

D) 

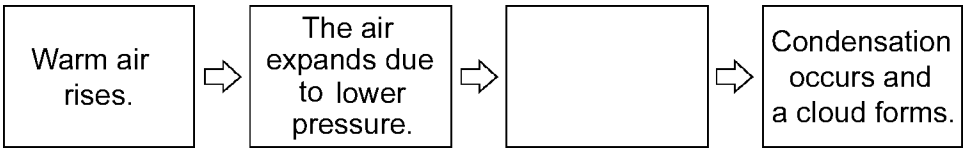
7) Which transfer of energy occurs mainly through the process of convection?

A) heated air in the lower atmosphere transferred upward by density differences
B) solar energy transferred through space to Earth's surface
C) heat from radioactive decay transferred by molecular collisions to surrounding mantle rock
D) electromagnetic energy transferred from the Sun to the Moon

8) Most of the air in the lower troposphere at the equatorial low-pressure belt is

A) cool, moist, and sinking
B) warm, moist, and rising
C) cool, dry, and sinking
D) warm, dry, and rising

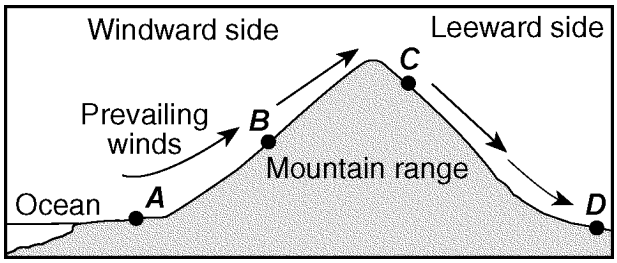
9) The incomplete flowchart below shows some of the changes that occur in warm air as it rises to form a cloud.



Which statement should be placed in the empty box to accurately complete the flowchart?

A) The air warms as it expands.
B) The air enters the thermosphere.
C) The air's relative humidity decreases to zero.
D) The air cools until it reaches the dewpoint.

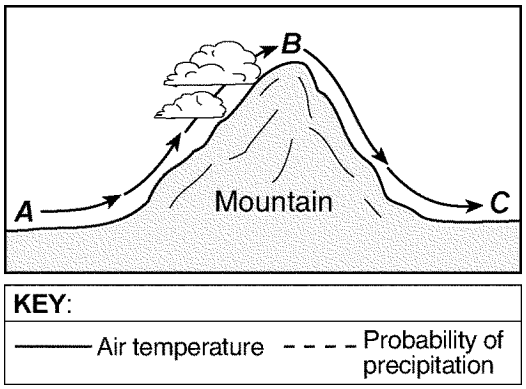
10) The cross section below represents prevailing winds moving over a coastal mountain range. Letters *A* through *D* represent locations on Earth's surface.



Which location will most likely have the *least* annual precipitation?

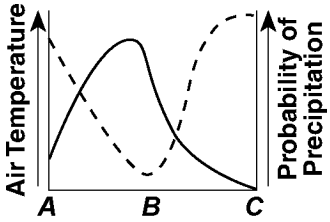
A) *A* B) *B* C) *C* D) *D*

11) The diagram below shows the flow of air over a mountain, from location *A* to *B* to *C*.

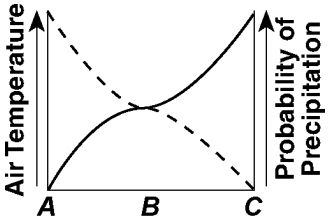


Which graph *best* shows how the air temperature and probability of precipitation change during this air movement?

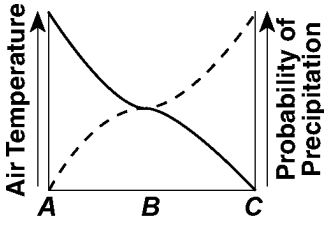
A)



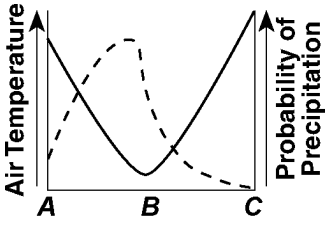
C)



B)



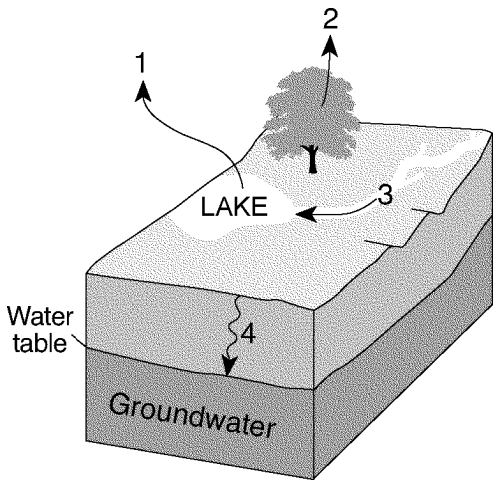
D)



12) Which processes of the water cycle return water vapor directly to the atmosphere?

A) evaporation and transpiration
B) infiltration and capillarity
C) freezing and precipitation
D) water retention and runoff

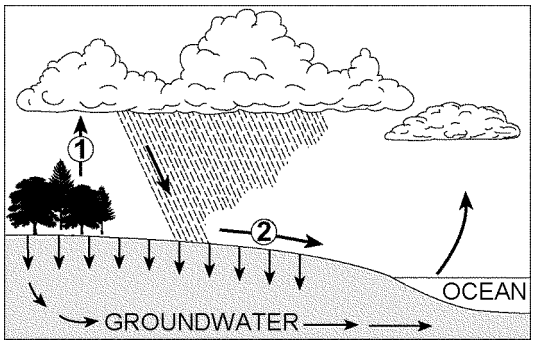
13) The arrows in the block diagram below show the movement of water after it has fallen as precipitation.



Which arrow indicates the process of transpiration?

A) 1 B) 2 C) 3 D) 4

14) The arrows in the diagram below represent processes in the water cycle.

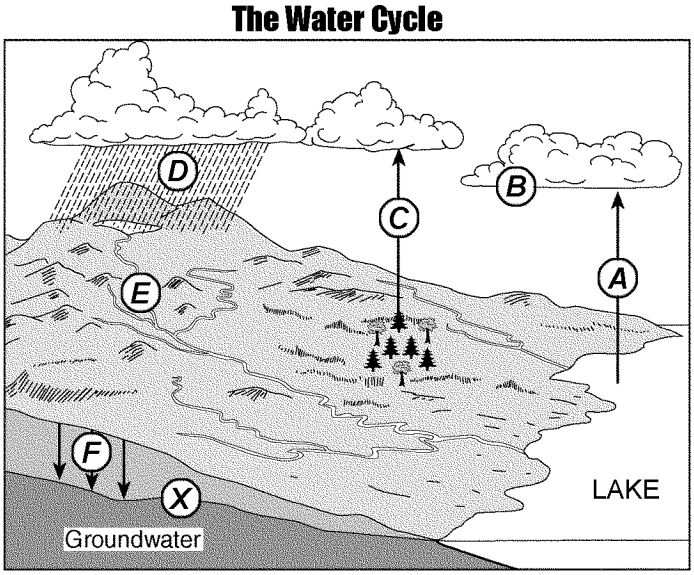


Which processes in the water cycle are identified by the numbered arrows?

A) Process 1 is precipitation; process 2 is runoff.
B) Process 1 is evaporation; process 2 is infiltration.
C) Process 1 is transpiration; process 2 is runoff.
D) Process 1 is condensation; process 2 is infiltration.

Questions 15 through 18 refer to the following:

The diagram below shows a model of the water cycle. Letters *A* through *F* represent some processes of the water cycle. Letter *X* indicates the top of the underground zone that is saturated with water.



(not drawn to scale)

15) Which process is represented by letter *F* in the given diagram?

A) condensation
B) capillarity
C) infiltration
D) vaporization

16) What does letter *X* in the water cycle diagram represent?

A) impermeable rock
B) the water table
C) sea level
D) a floodplain

17) If the surface soil in the given diagram is saturated and precipitation increases, there will be

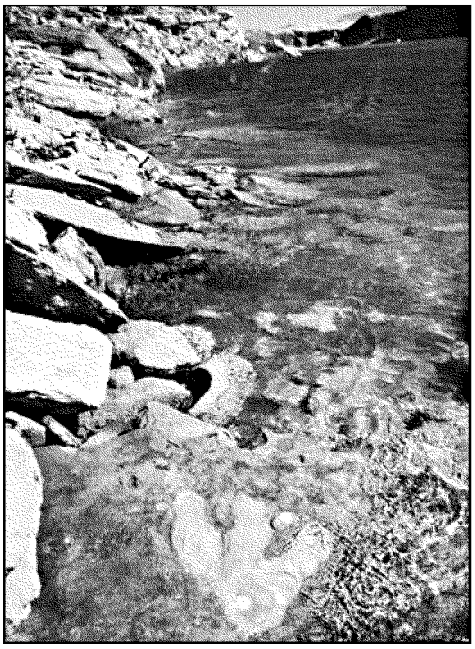
A) an increase in the rate of capillarity
B) a decrease in the amount of groundwater
C) a decrease in the surface elevation of the lake
D) an increase in the amount of runoff

18) The processes of transpiration and evaporation are represented by which letters in the water cycle diagram?

A) *B* and *E*
B) *C* and *A*
C) *D* and *F*
D) *D* and *A*

19) **DINOSAUR TRACKS REVEALED AFTER YEARS OF DRY WEATHER**.
By April 2005, the surface of Lake Powell, a human-made lake in Utah and Arizona, had fallen 145 feet below its highest level. This revealed many traces of ancient life that had not been observed since this area had been covered with water. Among these traces, discovered in sandstone bedrock, were many dinosaur tracks, ranging in age between 170 and 200 million years old.

Dinosaur Track on Shoreline of Lake Powell



SOURCE: Andre Delgalvis, *Arizona Highways*, February 2006

Which conditions before April 2005 in the Lake Powell region most likely produced the *decrease* in the water level of Lake Powell?

A) Precipitation exceeded evaporation.
B) Precipitation exceeded runoff.
C) Evaporation exceeded precipitation.
D) Runoff exceeded precipitation.

20) The *least* amount of surface water runoff will occur when soil pore spaces are
A) saturated and the slope is gentle
B) saturated and the slope is steep
C) unsaturated and the slope is gentle
D) unsaturated and the slope is steep

21) A paved blacktop parking lot was built on what was once a soil-covered field. This area will now experience increased runoff when rain occurs because the paved parking lot has
A) less capillarity
B) greater porosity
C) greater infiltration
D) less permeability

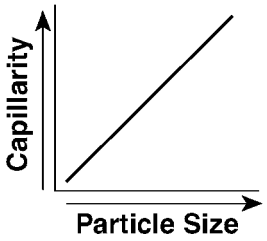
22) Sediment samples *A* through *D* below have the same volume and packing, but contain different percentages of various particle sizes.

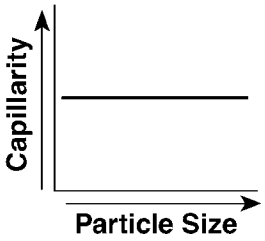
Sample *A*: 75% clay and 25% silt
Sample *B*: 25% clay and 75% sand
Sample *C*: 50% pebbles and 50% sand
Sample *D*: 50% pebbles and 50% cobbles

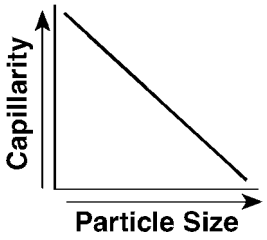
Which sample most likely has the *greatest* permeability?

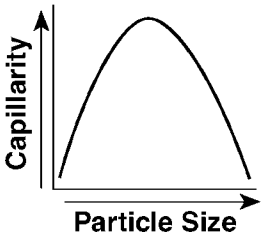
A) *A* B) *B* C) *C* D) *D*

23) Which graph shows the general relationship between soil particle size and the capillarity of the soil?

A)


C)


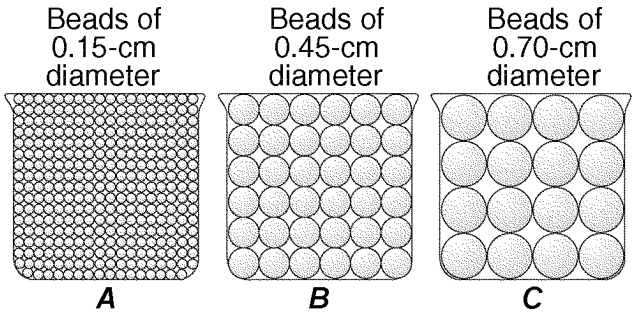
B)


D)


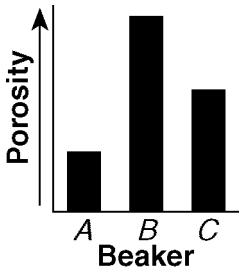
24) Which soil characteristic allows *greater* amounts of water retention?

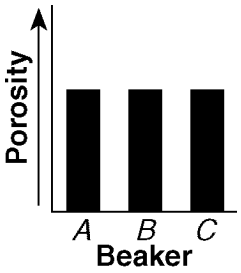
A) small-size particles
B) high-density particles
C) low-density particles
D) large-size particles

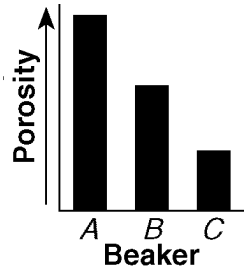
25) The diagram below represents three identical beakers filled to the same level with spherical beads.

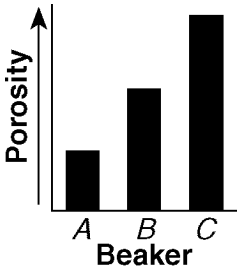


If the packing of the beads within each beaker is the same, which graph *best* represents the porosity within each beaker?

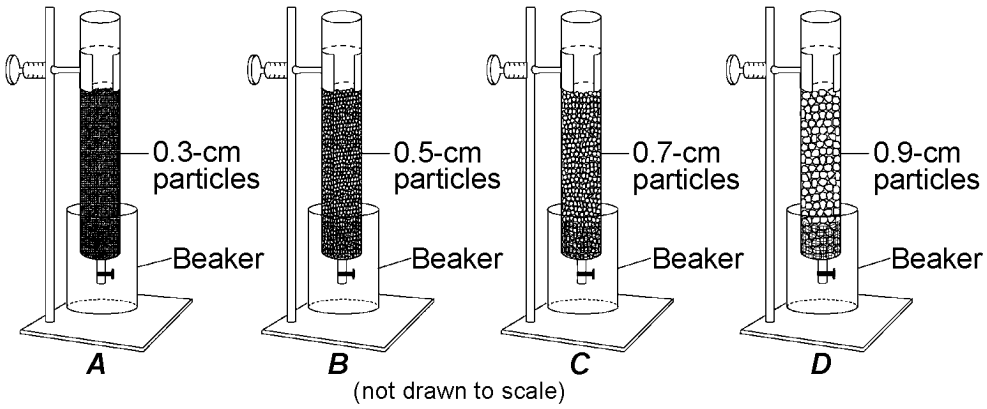
A)


C)


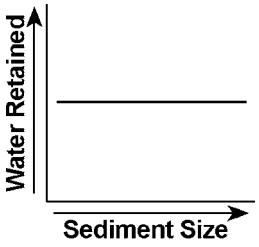
B)


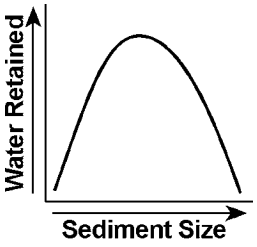
D)


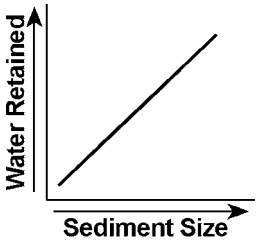
26) The diagram below represents the setup for an experiment for studying groundwater. Tubes *A*, *B*, *C*, and *D* contain equal volumes of sediments. Within each tube, the sediments are uniform in size, shape, and packing. A test for water retention was conducted by first filling each tube with water and then draining the water into beakers.

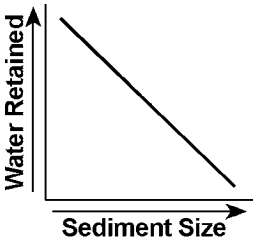


Which graph represents the general relationship between the sediment size and the amount of water retained by the sediments after the tubes had drained?

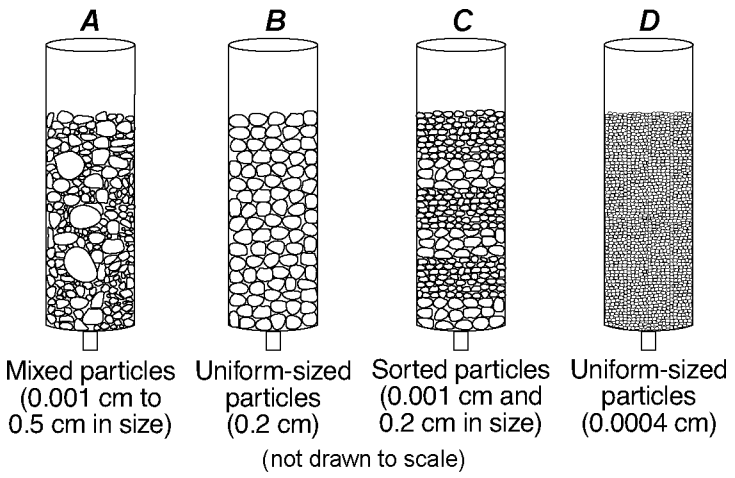
A)


C)


B)


D)


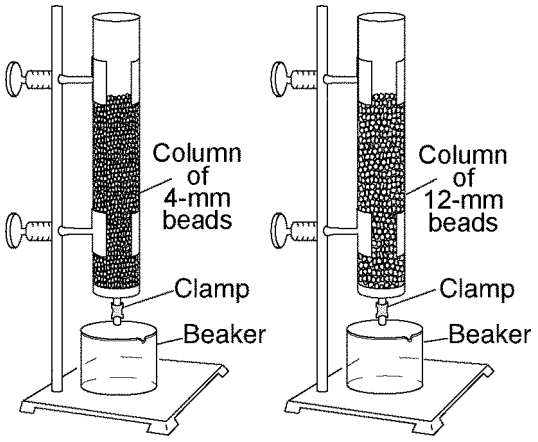
27) The diagram below shows columns *A*, *B*, *C*, and *D* that contain different sediments. Equal volumes of water were poured through each column.



Which column of sediment retained the *most* water?

A) *A* B) *B* C) *C* D) *D*

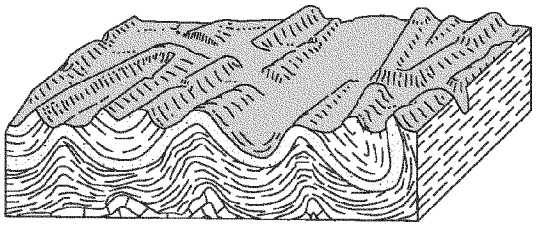
28) The diagram below shows an experimental setup to compare water retention and permeability in two columns with equal volumes of spherical plastic beads of different diameters.



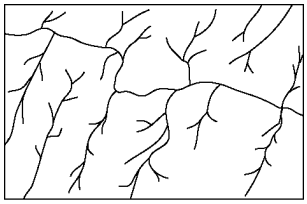
Which statement *best* describes the water retention and permeability in the two columns of beads?

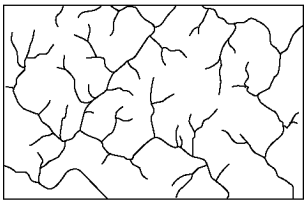
A) The column with 4-mm beads has greater water retention and the column with 12-mm beads has greater permeability.
B) The column with 12-mm beads has greater water retention and permeability.
C) The column with 4-mm beads has greater water retention and permeability.
D) The column with 12-mm beads has greater water retention and the column with 4-mm beads has greater permeability.

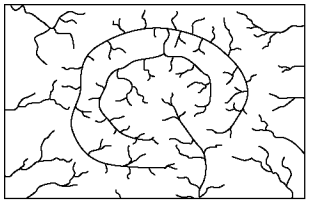
29) The block diagram below shows a portion of Earth's crust.

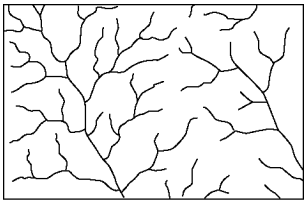


Which stream drainage pattern is most likely present on this crustal surface?

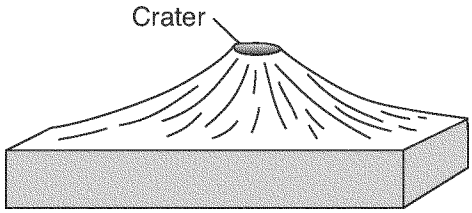
A) 

C) 

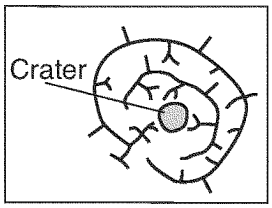
B) 

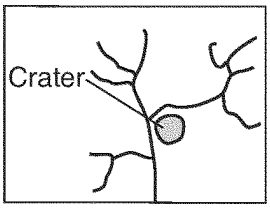
D) 

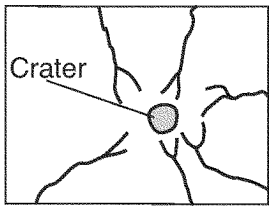
30) The block diagram below shows a volcano.

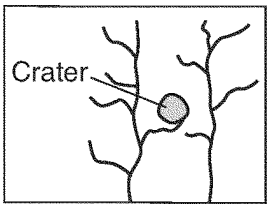


Which map shows the stream drainage pattern that most likely formed on the surface of this volcano?

A) 

C) 

B) 

D) 

31) Which air mass is associated with low relative humidity and high air temperature?

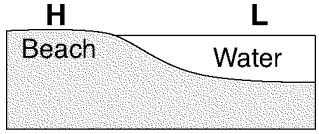
A) maritime polar
B) maritime tropical
C) continental polar
D) continental tropical

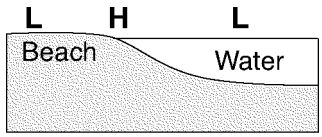
32) Which weather variable generally decreases when wind speed is increasing, clouds are thickening, and visibility drops?

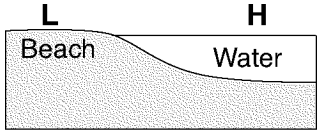
A) dewpoint
B) air pressure
C) relative humidity
D) precipitation

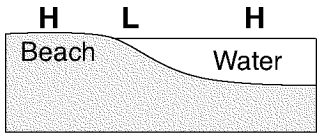
33) Which cross section below *best* shows the locations of high air pressure and low air pressure near a beach on a hot, sunny, summer afternoon?

KEY:
H High air pressure
L Low air pressure

A)


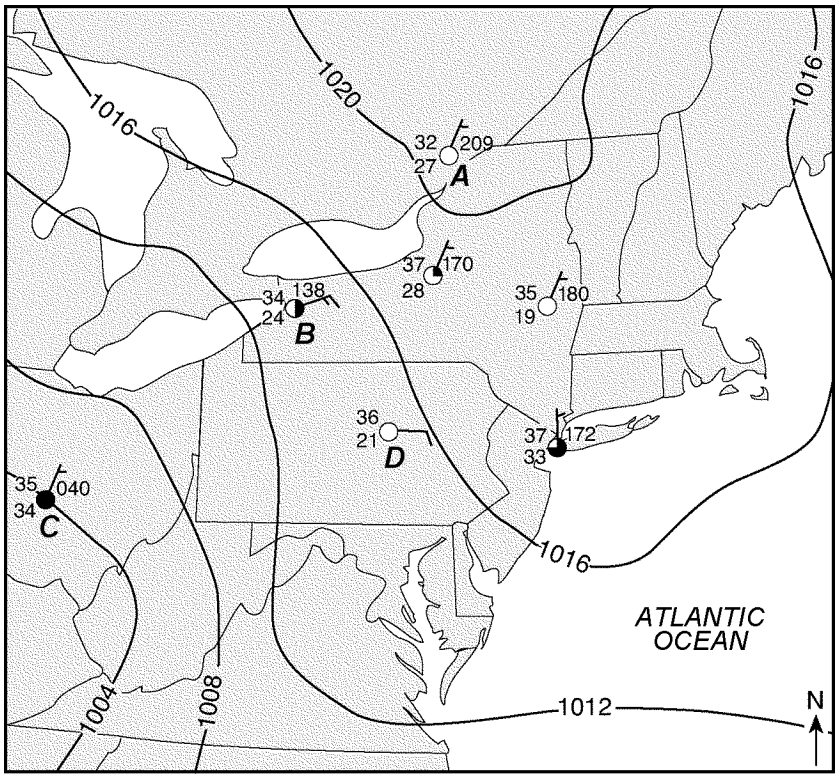
B)


C)


D)


Questions 34 through 37 refer to the following:

The weather map below shows isobars and seven weather station models. Four of the weather stations are identified by letters *A*, *B*, *C*, and *D*.



34) Which New York State weather station on the given weather map had clear skies?

A) Albany
B) Syracuse
C) Buffalo
D) New York City

35) Which of the weather stations on the given weather map had the *highest* relative humidity?

A) *A* B) *B* C) *C* D) *D*

36) What was the probable air pressure, in millibars, at station *D* on the given weather map?

A) 1036.0 mb
B) 1017.0 mb
C) 1015.0 mb
D) 1021.0 mb

37) Which weather information shown at station *B* on the given weather map was measured with an anemometer and weather vane?

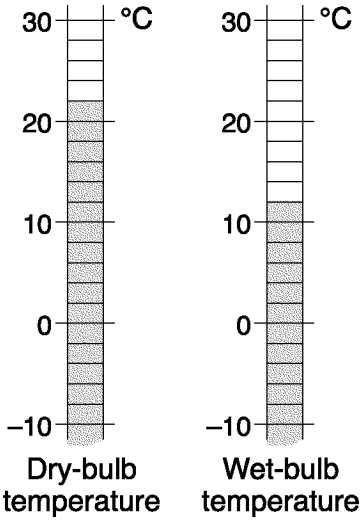
A) 34
C) 138

B) 
D) 

38) What is the dewpoint when the dry-bulb temperature is 8DC and the wet-bulb temperature is 2DC?

A) -9DC B) 3DC C) 28DC D) 6DC

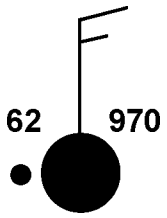
39) The diagram below shows dry-bulb and wet-bulb temperature readings for a parcel of air.



What is the dewpoint of the air?

A) 10DC B) 3DC C) 27DC D) -5DC

40) The station model below shows several weather variables recorded at a particular location.



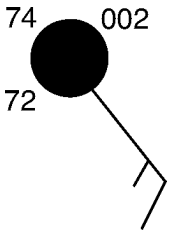
What was the most likely dewpoint at this location?

A) 32DF B) 70DF C) 40DF D) 61DF

41) What is the dewpoint when the air temperature is 26DC and the relative humidity is 77%?

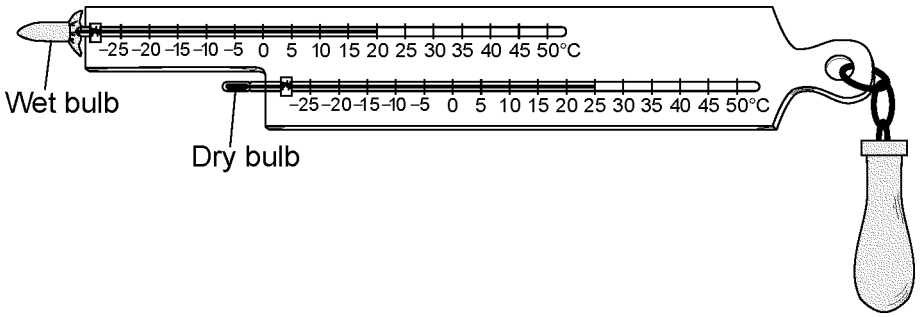
A) 23DC B) 3DC C) 22DC D) 20DC

42) What are the dewpoint and wind direction shown on the station model below?



A) 72DF and wind from the southeast
B) 72DF and wind from the northeast
C) 74DF and wind from the southwest
D) 74DF and wind from the northwest

43) The diagram below represents the wet-bulb and dry-bulb temperatures on a sling psychrometer.



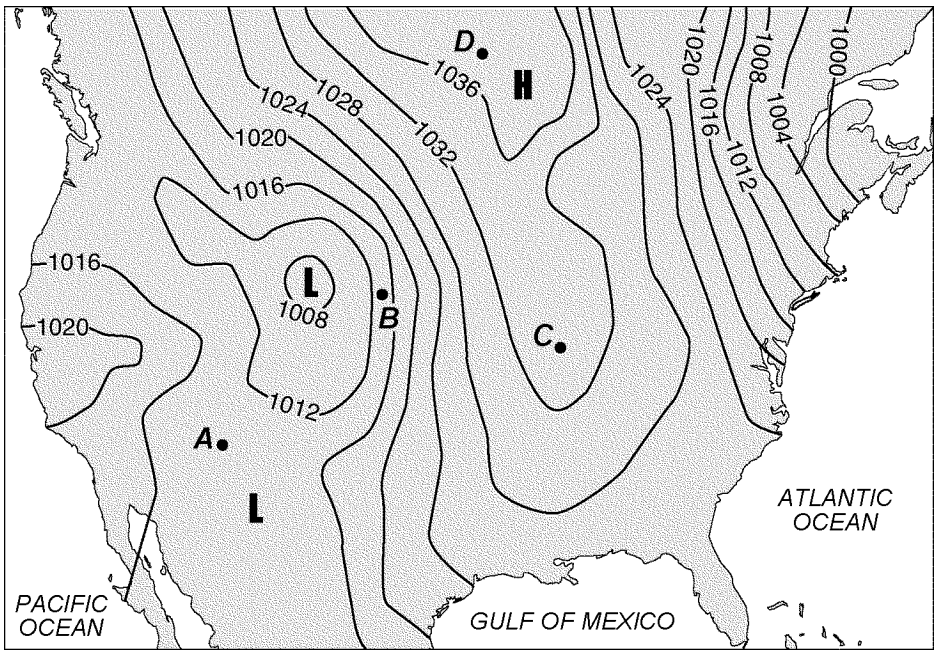
What was the relative humidity of the air when these temperatures were recorded?

A) 17% B) 63% C) 20% D) 5%

44) The *highest* surface wind speeds occur when there is a

A) 20-millibar air-pressure difference between two nearby locations
B) 4-millibar air-pressure difference between two distant locations
C) 4-millibar air-pressure difference between two nearby locations
D) 20-millibar air-pressure difference between two distant locations

45) The weather map below shows isobars labeled in millibars. Points *A*, *B*, C, and *D* are locations on Earth's surface.



Which location was probably experiencing the *highest* wind speed?

A) *A* B) *B* C) *C* D) *D*

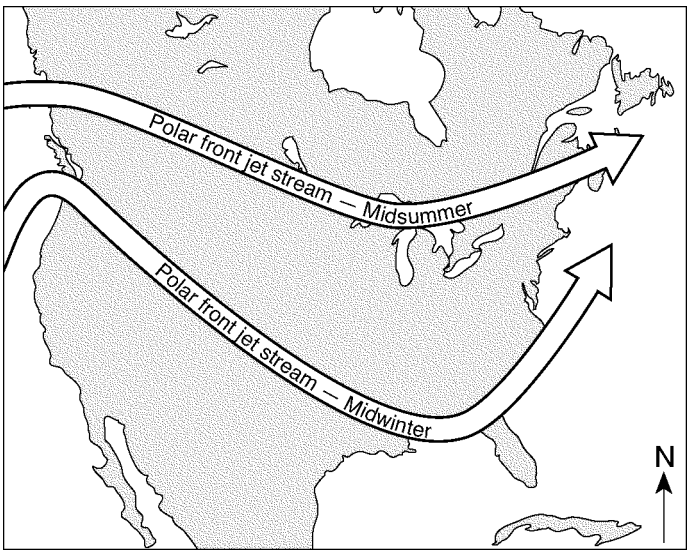
46) In which layer of the atmosphere is the jet stream located?

A) thermosphere
B) stratosphere
C) mesosphere
D) troposphere

47) Jet stream winds over the United States generally move from

A) east to west
B) west to east
C) south to north
D) north to south

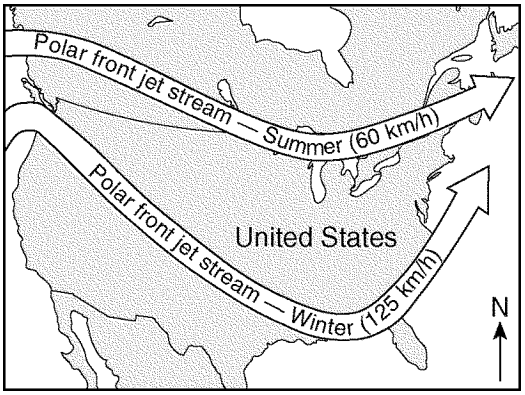
48) The map below shows two seasonal positions of the polar front jet stream over North America.



Which statement *best* explains why the position of the polar front jet stream varies with the seasons?

A) Water heats and cools more rapidly than land in winter.
B) Rising air compresses and cools in winter.
C) The vertical rays of the Sun shift north of the equator in summer.
D) Prevailing winds reverse direction in summer.

49) The map below shows a typical position and average velocity of the polar front jet stream during two different seasons.



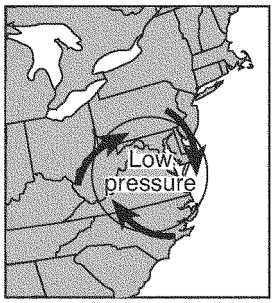
For the eastern United States, the change of the polar front jet stream from this summer position to this winter position causes

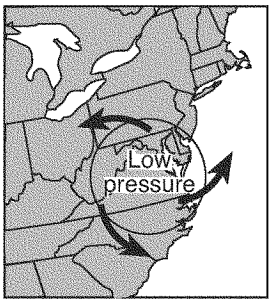
A) warmer temperatures farther north and causes storms to move more slowly
B) warmer temperatures farther north and causes storms to move more rapidly
C) cooler temperatures farther south and causes storms to move more slowly
D) cooler temperatures farther south and causes storms to move more rapidly

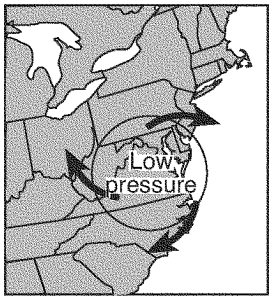
50) What is the usual surface wind pattern within a Northern Hemisphere low-pressure system?

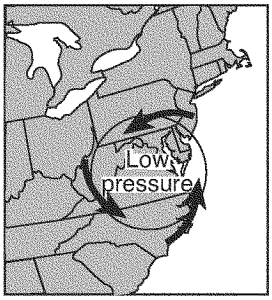
A) clockwise and inward
B) counterclockwise and inward
C) counterclockwise and outward
D) clockwise and outward

51) Which map *best* shows the general surface wind pattern in a low-pressure system located over the eastern United States?

A)


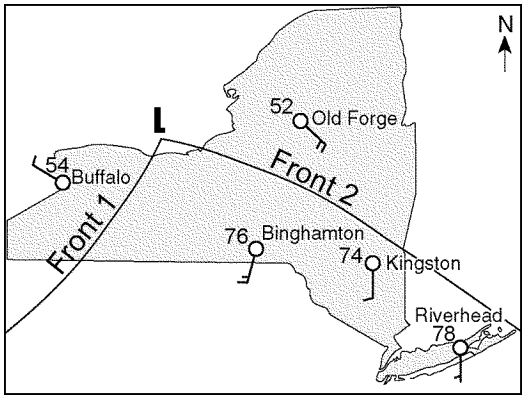
C)


B)


D)


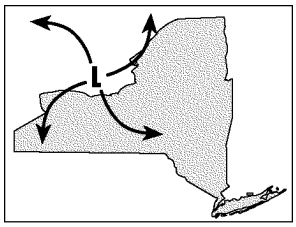
Questions 52 and 53 refer to the following:

The weather map below represents a low-pressure system over New York State. The **L** on the map represents the center of the low-pressure system. Two fronts extend from the center of the low, and are labeled front 1 and front 2. Cloud cover has been omitted from the station models.

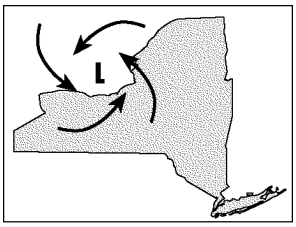


52) The arrows on which map *best* represent the surface wind pattern around the low-pressure center shown?

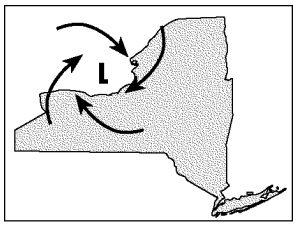
A)



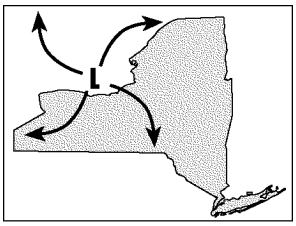
C)



B)

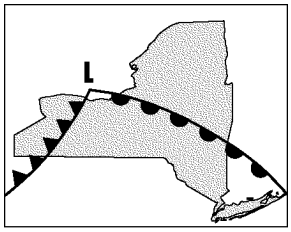


D)

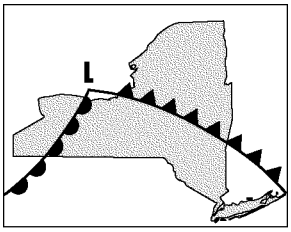


53) Which map *best* represents the type of fronts and direction of movement of these fronts in relation to the low-pressure center shown?

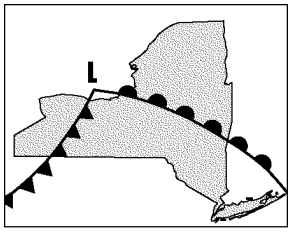
A)



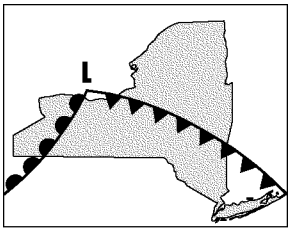
C)



B)

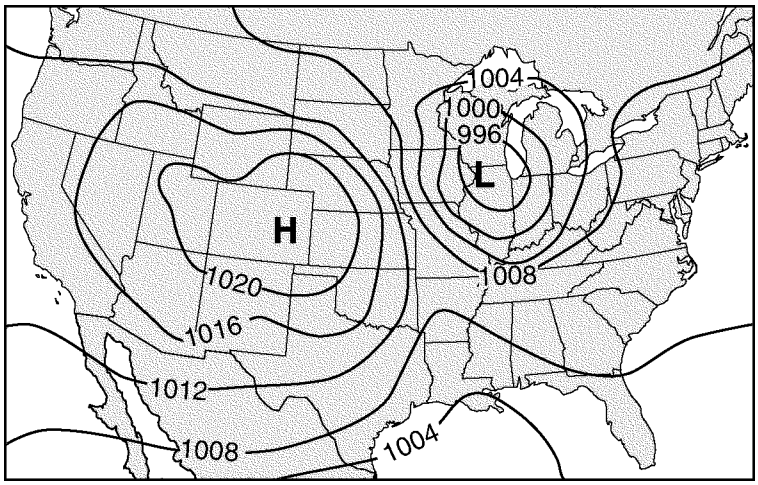


D)



Questions 54 through 57 refer to the following:

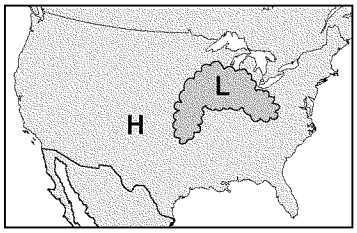
The weather map below shows the locations of a high-pressure center (**H**) and a low-pressure center (**L**) over a portion of North America. The isolines indicate surface air pressures.

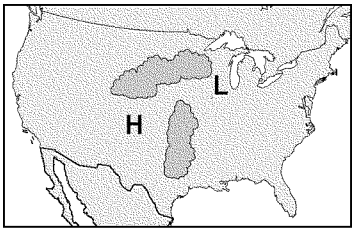


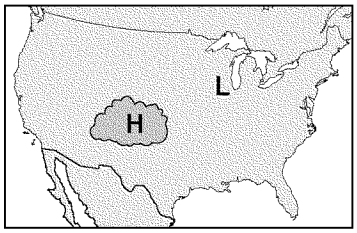
54) The data used to construct the isolines on the given map were recorded in which units?

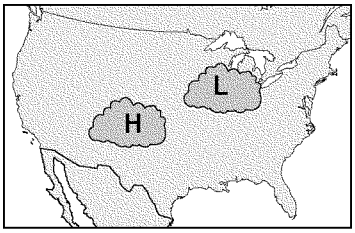
A) inches
B) millibars
C) feet
D) meters

55) Which map shows the most likely location of clouds associated with the given pressure centers?

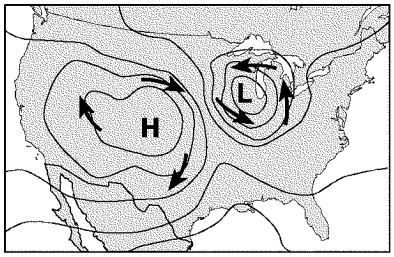
A)


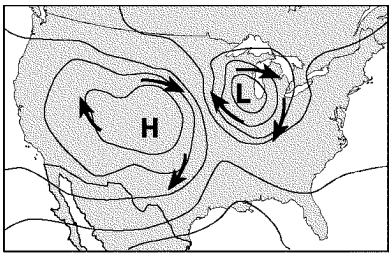
C)


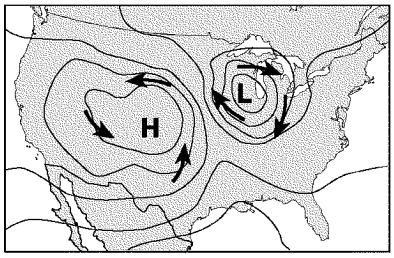
B)


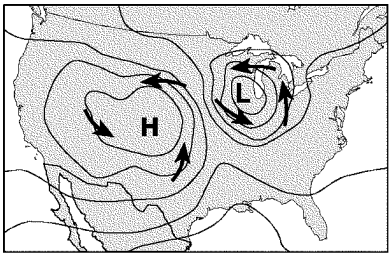
D)


56) The arrows on which map *best* show the pattern of surface winds around the two given pressure centers?

A)


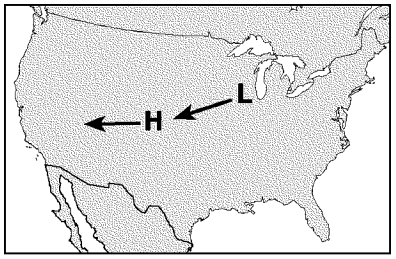
C)


B)


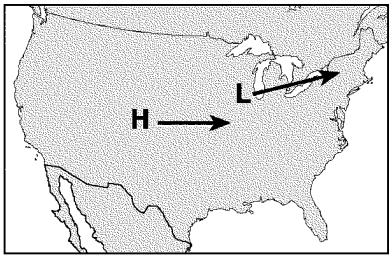
D)


57) The arrows on which map show the most likely path in which the two given pressure centers will move over the next few days?

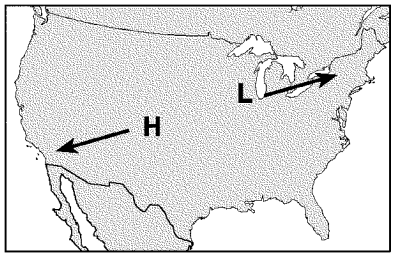
A)



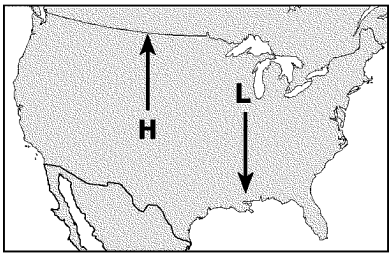
C)



B)



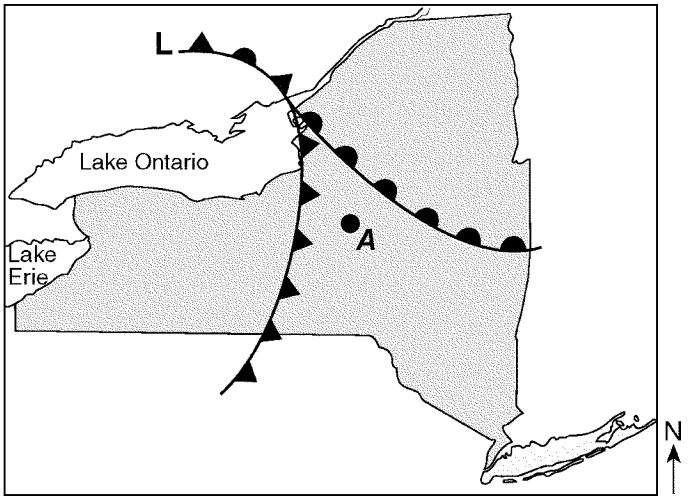
D)



58) The winds shift from southwest to northwest as heavy rains and hail begin to fall in Albany, New York. These changes are most likely caused by the arrival of

A) a **cT** air mass
B) a warm front
C) an **mT** air mass
D) a cold front

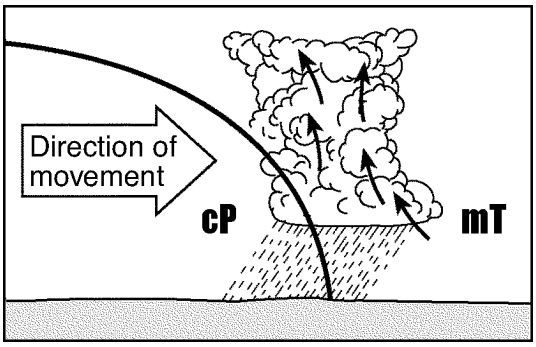
59) The weather map below shows a portion of a low-pressure system.



Which type of front will most likely pass over location *A* during the next two hours?

A) occluded
B) cold
C) warm
D) stationary

60) A cross section of a weather front is shown below.



Which symbol would be used to represent this front on a weather map?

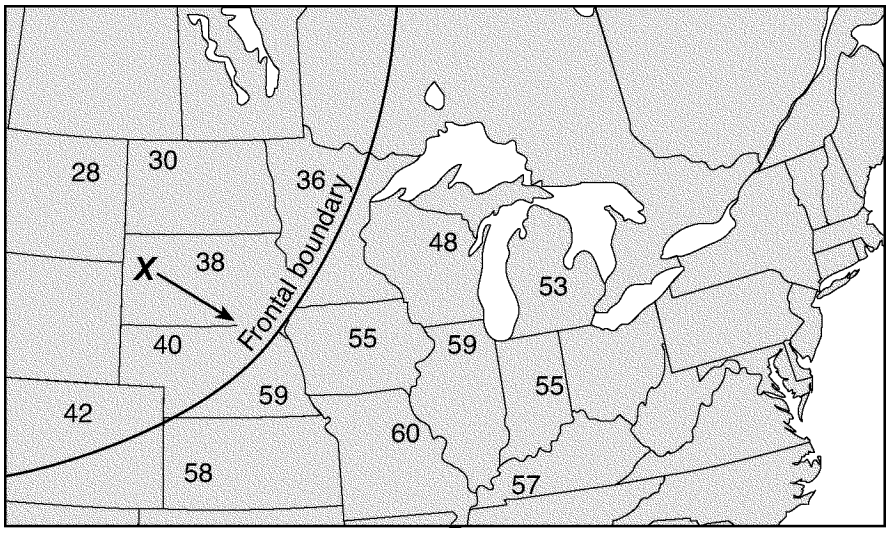
A) 

B) 

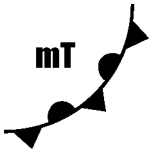
C) 

D) 

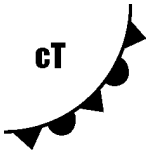
61) The map below shows surface air temperatures, in degrees Fahrenheit, reported by weather stations in the north-central United States. Letter ***X*** represents an air mass moving in the direction shown by the arrow. A line marks a frontal boundary advancing in a southeasterly direction.

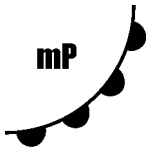


Which weather-map symbols *best* represent air-mass ***X*** and the frontal boundary shown on the map?

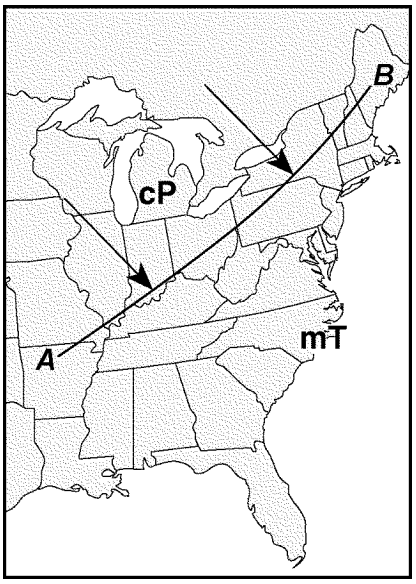
A) 

C) 

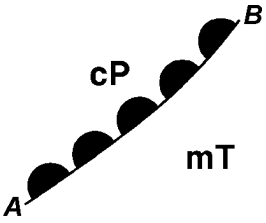
B) 

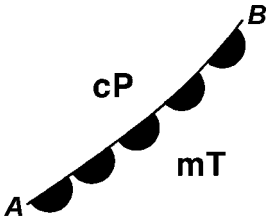
D) 

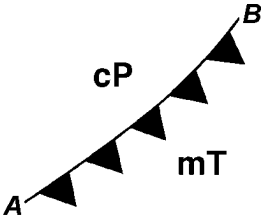
62) The weather map below shows a portion of the United States. Line *AB* represents a frontal boundary between two air masses. The two large arrows indicate the direction that a **cP** air mass is moving.

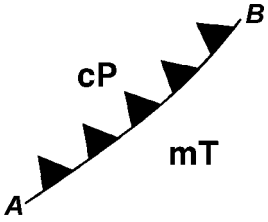


Which symbol correctly represents the frontal boundary at line *AB*?

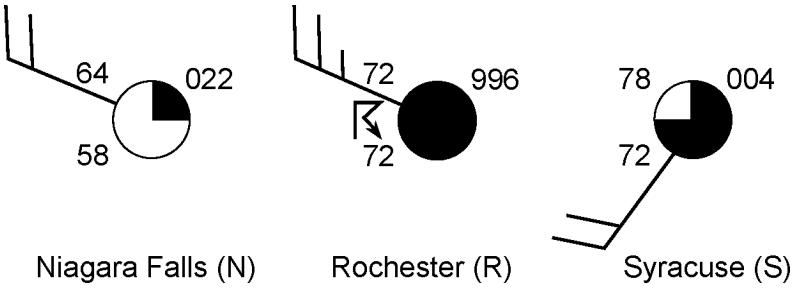
A)


C)


B)


D)


63) Weather station models for three New York State cities on the same day at the same time are shown below.

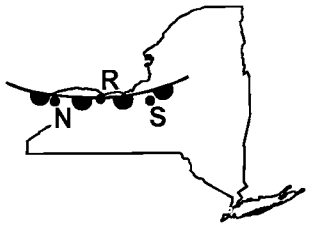


Niagara Falls (N) Rochester (R) Syracuse (S)

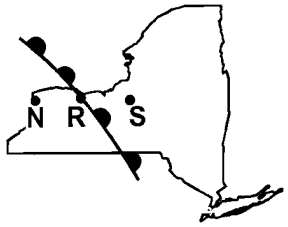
Which map shows the front that was most likely passing through Rochester at that time?

A)

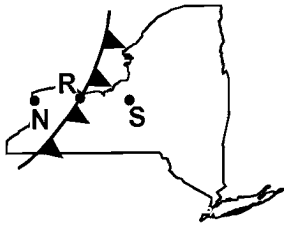
C)



B)

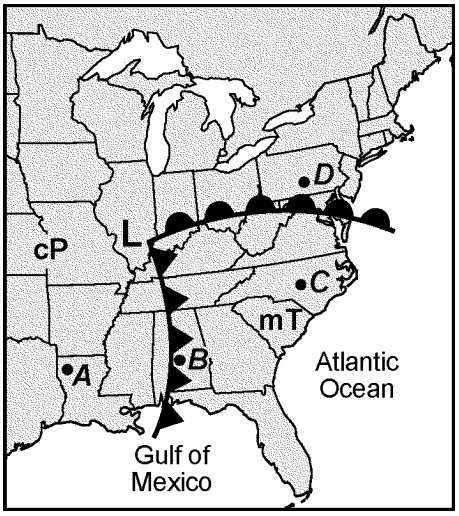


D)



Questions 64 through 66 refer to the following:

The weather map below shows a low-pressure system with two fronts extending from its center (**L**). Points *A*, *B*, *C*, and *D* represent locations on Earth's surface. Two different air masses are labeled.



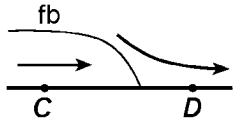
64) Which atmospheric conditions describe the air mass that is influencing weather conditions at location *C* on the given weather map?

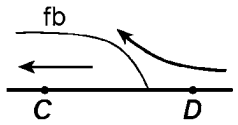
A) warm and moist
B) warm and dry
C) cool and dry
D) cool and moist

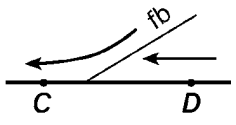
65) Which locations on the weather map shown are most likely experiencing precipitation?

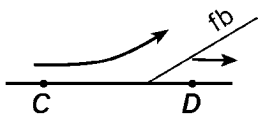
A) *A* and *B*
B) *D* and *B*
C) *C* and *D*
D) *B* and *C*

66) Which cross section *best* represents the frontal boundary (*fb*) and general pattern of air movements between locations *C* and *D* on the given weather map?

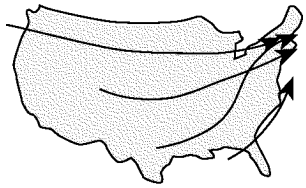
A) 

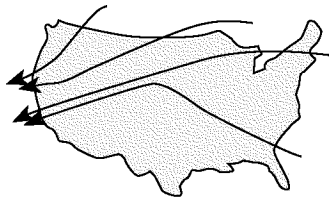
B) 

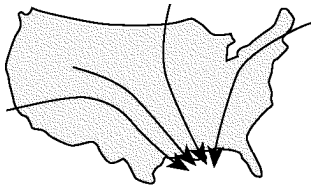
C) 

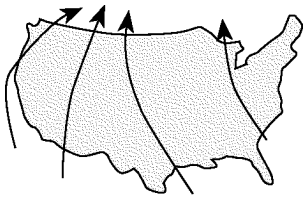
D) 

67) Which map shows normal paths followed by low-pressure storm centers as they pass across the United States?

A) 

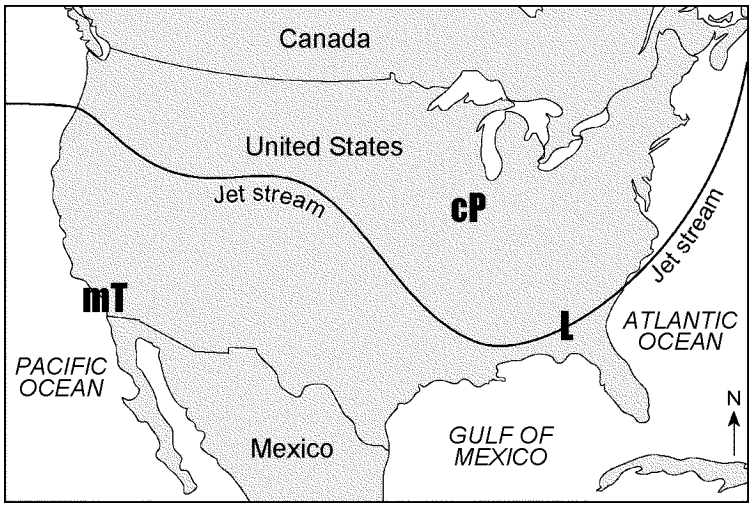
B) 

C) 

D) 

Questions 68 through 70 refer to the following:

The map below shows the position of the jet stream relative to two air masses and a low-pressure center (**L**) over the United States.



68) What is the difference in the air temperature and humidity between the **cP** and **mT** air masses on the given map?

A) The **cP** air mass is colder and more humid.
B) The **cP** air mass is warmer and less humid.
C) The **mT** air mass is warmer and more humid.
D) The **mT** air mass is colder and less humid.

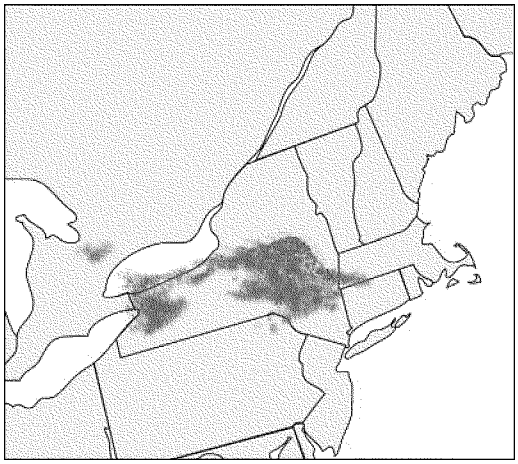
69) What is the general movement of the surface winds around the center of the low-pressure area shown on the map?

A) clockwise and inward
B) counterclockwise and inward
C) counterclockwise and outward
D) clockwise and outward

70) Assuming the low-pressure center (**L**) follows a typical storm track, it will move

A) into the **cP** air mass to the northwest
B) into the **mT** air mass to the west
C) along the path of the jet stream to the northeast
D) along the path of the jet stream to the southwest

71) On the map below, dark-gray areas represent regions of lake-effect snow on a December day.

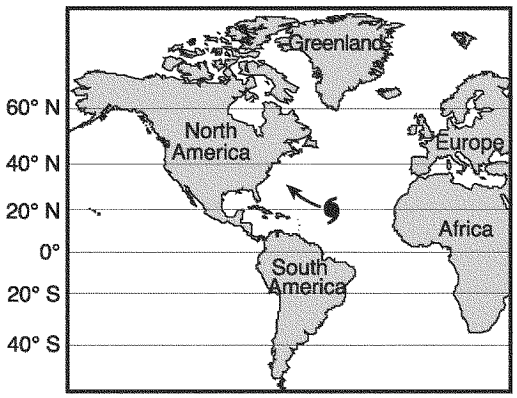


Which New York State location appears to be experiencing a lake-effect snowstorm?

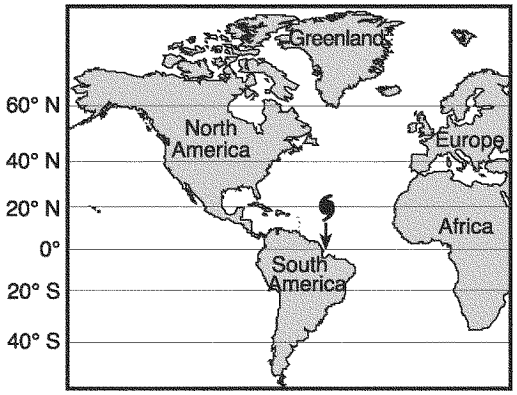
A) Plattsburgh
B) New York City
C) Watertown
D) Utica

72) Which map below shows the most likely storm track for a hurricane (🌀) in the Atlantic Ocean?

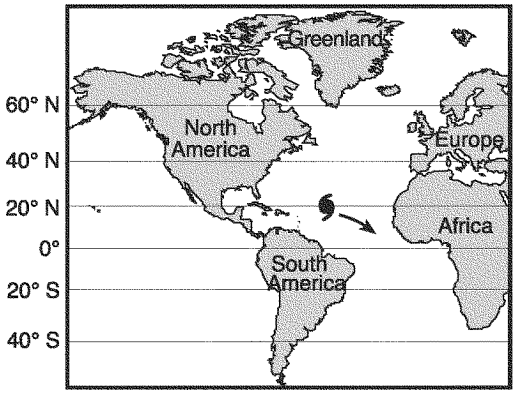
A)



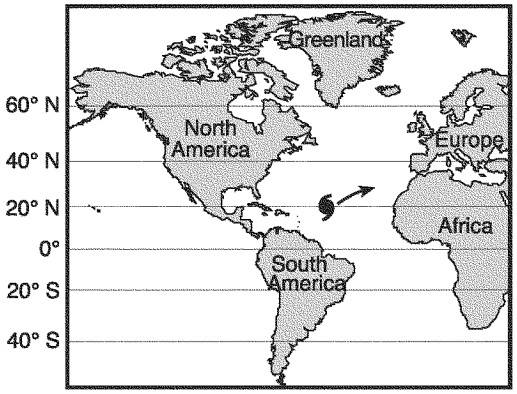
B)



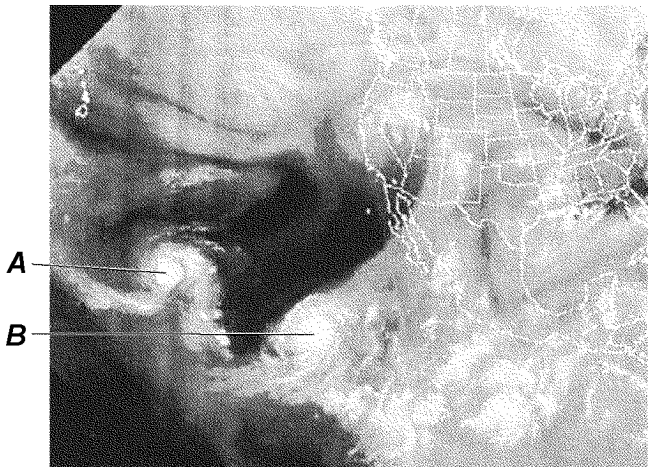
C)



D)



73) The weather satellite image below shows two large swirl-shaped cloud formations, labeled *A* and *B*, over the Pacific Ocean.



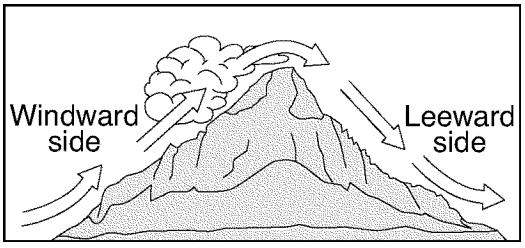
These large swirl-shaped cloud formations most likely represent

A) warm fronts
B) polar air masses
C) tornadoes
D) hurricanes

74) In which planetary wind belt do most storms move toward the northeast?

A) 0D to 30D S
B) 30D S to 60D S
C) 30D N to 60D N
D) 0D to 30D N

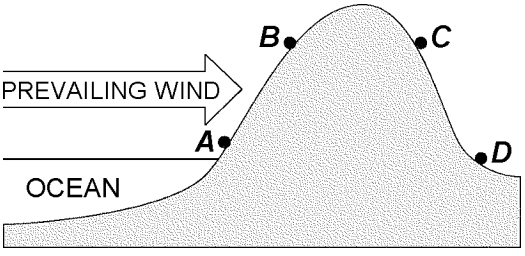
75) The diagram below shows air movement over a mountain.



Compared to the climate on the windward side of the mountain, the climate on the leeward side of the mountain is

A) drier and warmer
B) more humid and cooler
C) drier and cooler
D) more humid and warmer

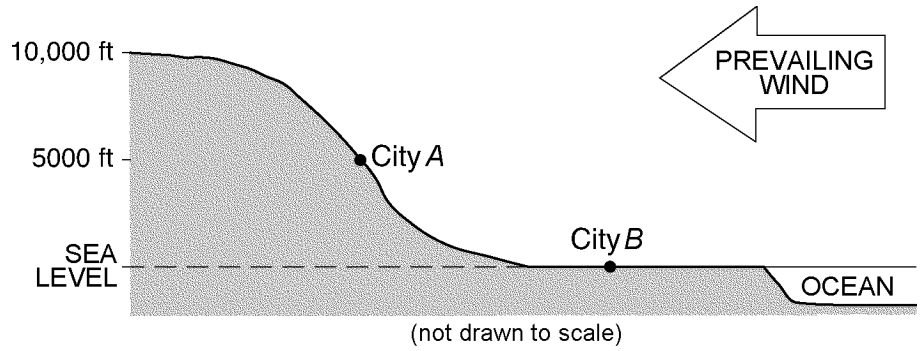
76) The cross section below represents four locations on a mountain. The arrow indicates the prevailing wind direction.



Which location has the *warmest* and *most* arid climate?

A) *A*
B) *B*
C) *C*
D) *D*

77) The cross section below shows two cities, *A* and *B*, at different elevations.



Compared to the yearly temperature and precipitation at city *B*, city *A* most likely has

A) higher temperatures and less precipitation
B) lower temperatures and more precipitation
C) lower temperatures and less precipitation
D) higher temperatures and more precipitation

78) The direction of movement of the major surface ocean currents is *most* affected by Earth's

A) tidal action
B) tilted axis
C) prevailing winds
D) rate of revolution

79) What controls the direction of movement of *most* surface ocean currents?

A) varying salt content in the ocean
B) density differences at various ocean depths
C) seismic activity
D) prevailing winds

80) Which ocean current warms the climate of northwestern Europe?

A) North Atlantic Current
B) North Equatorial Current
C) Canary Current
D) Labrador Current

81) The Gulf Stream and North Atlantic Current modify the climate of northwestern Europe by making the climate

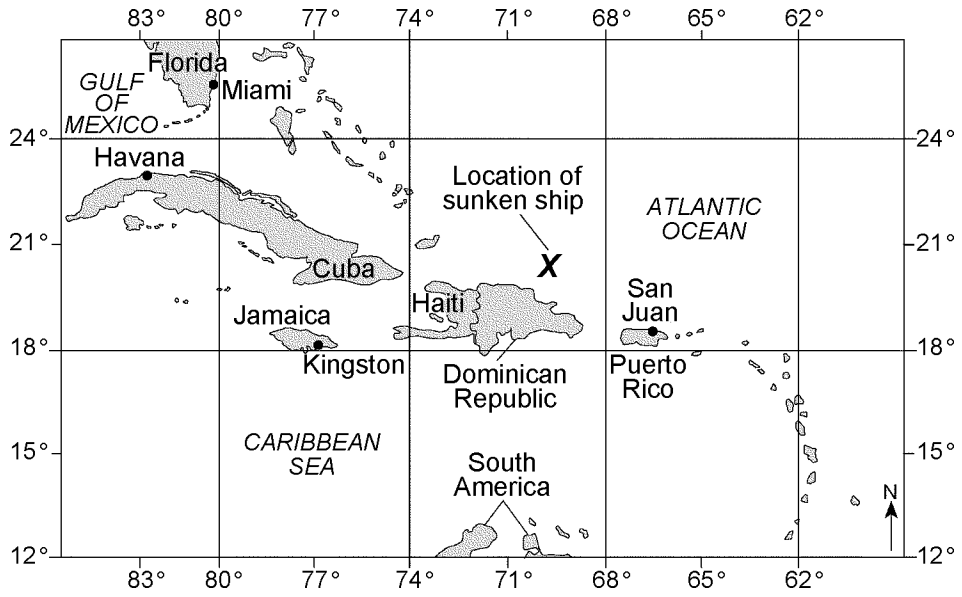
A) cooler and more humid
B) cooler and drier
C) warmer and drier
D) warmer and more humid

82) Which two 23.5D-latitude locations are influenced by cool surface ocean currents?

A) the west coast of Africa and the east coast of South America
B) the west coast of North America and the west coast of South America
C) the east coast of Asia and the east coast of North America
D) the east coast of North America and the west coast of Australia

83) The map below shows sections of the Atlantic Ocean, the Caribbean Sea, and the Gulf of Mexico.

SHIPWRECK:
In 1641, the crew of the ship *Concepcion* used the Sun and stars for navigation. The crew thought that the ship was just north of Puerto Rico, but ocean currents had carried them off course. The ship hit a coral reef and sank off the coast of the Dominican Republic. The **X** on the map marks the location of the sunken ship.



The *Concepcion* was carried off course to the northwest by an ocean current flowing from the

A) Florida Current
B) Gulf Stream Current
C) North Equatorial Current
D) North Atlantic Current

84) Which natural event temporarily slows or reverses surface ocean currents in the equatorial region of the Pacific Ocean, causing a disruption of normal weather patterns?

A) volcanic eruptions
B) El Niño
C) monsoons
D) deforestation

85) During an El Niño event, surface water temperatures increase along the west coast of South America. Which weather changes are likely to occur in this region?

A) increased air temperature and increased precipitation
B) decreased air temperature and decreased precipitation
C) increased air temperature and decreased precipitation
D) decreased air temperature and increased precipitation

86) The table below shows the average January air temperature from 1901 to 2006 in two different cities in New York State.

DATA TABLE

City	**Average January Air Temperature** (°F)
Albany	21.4
New York City	29.7

The most likely cause of this air temperature difference is that New York City is located

A) at a higher elevation
B) in a different prevailing wind belt
C) at a higher latitude
D) near a large body of water

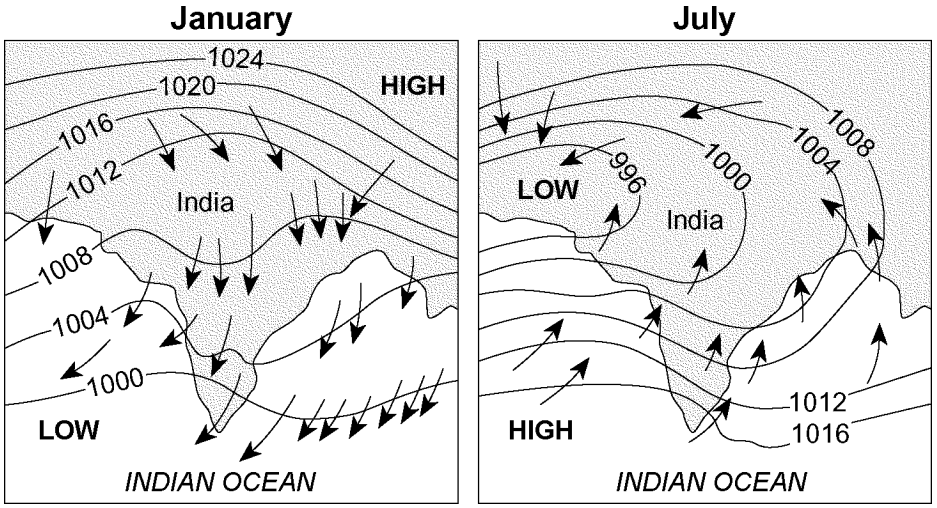
87) A city located on the coast of North America has warmer winters and cooler summers than a city at the same elevation and latitude located near the center of North America. Which one of the following statements *best* explains the difference between the climates of the two cities?

A) Wind speeds are usually greater over land than over ocean water.
B) Ocean surfaces change temperature more slowly than land surfaces.
C) Warm, moist air rises when it meets cool, dry air.
D) Water has a lower specific heat than land.

88) Monsoons develop as a result of

A) air sinking over Earth's polar regions
B) a continent and neighboring oceans having nearly the same temperatures
C) large changes between the temperatures of a continent and neighboring oceans
D) air rising over Earth's equatorial region

89) Arrows on the maps below show differences in the direction of winds in the region of India and the Indian Ocean during January and July. Isobar values are recorded in millibars.

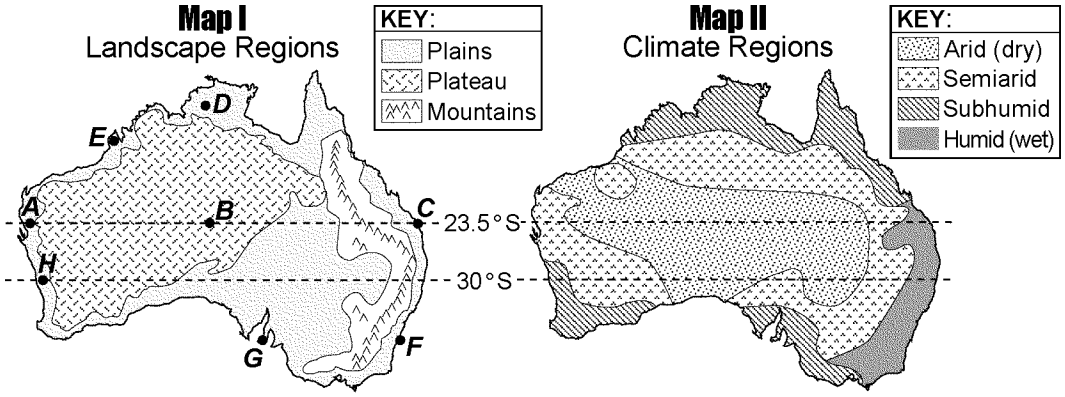


Heavy monsoon rains usually occur in India during

A) July, when winds blow from the ocean
B) January, when winds blow from the land
C) July, when winds blow toward high pressure
D) January, when winds blow toward high pressure

Questions 90 through 92 refer to the following:

Two maps of Australia are shown below.Map *I* shows Australia's major landscape regions. Letters *A* through *H* represent locations in Australia. Map *II* shows Australia's general climate regions.



90) The *greatest* yearly temperature range was most likely recorded at which location on the given map?

A) *A* B) *B* C) *C* D) *D*

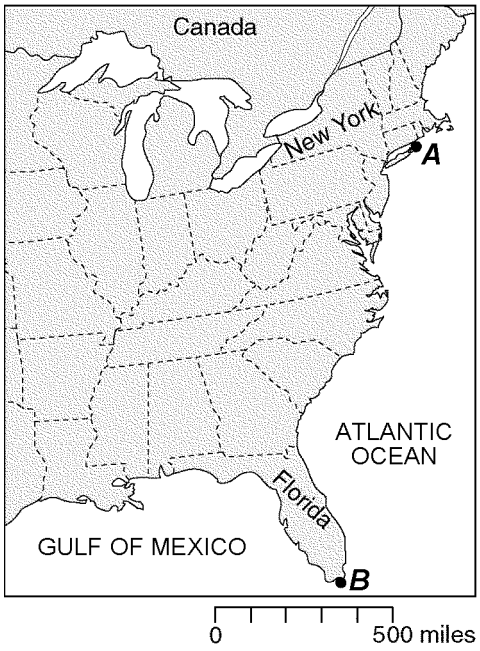
91) Which location on the map has a climate that is *most* affected by the East Australia Current?

A) *H* B) *G* C) *F* D) *E*

92) Which two locations on the given map have the *driest* climates?

A) *A* and *B*
B) *C* and *F*
C) *G* and *H*
D) *D* and *E*

93) The map below shows an eastern portion of North America. Points *A* and *B* represent locations on the eastern shoreline.



Which factor is primarily responsible for location *A* having a *lower* average yearly temperature than location *B*?

A) elevation
B) prevailing winds
C) nearness to a large body of water
D) latitude

94) El Cuy is a South American city located at 40D south latitude. The first day of winter at this location occurs on June 21. During which month would the *coldest* day of the year most likely occur at this location?

A) January
B) May
C) July
D) November

95) What *best* explains why, in early spring, ice remains longer on Lake Erie than on the surrounding land areas when the air temperature is above freezing?

A) Water has a higher specific heat than land.
B) Cool winds from the surrounding land cool the ice on the lake.
C) Energy is needed for water to evaporate.
D) Air temperature does not affect water temperature.

96) Complete the table below by identifying *one* instrument used to determine barometric pressure and *one* weather variable determined by using a psychrometer.

Weather Variable	Instrument Used
barometric pressure	
	psychrometer

97) Identify *one* process that causes clouds to form in rising moist air.

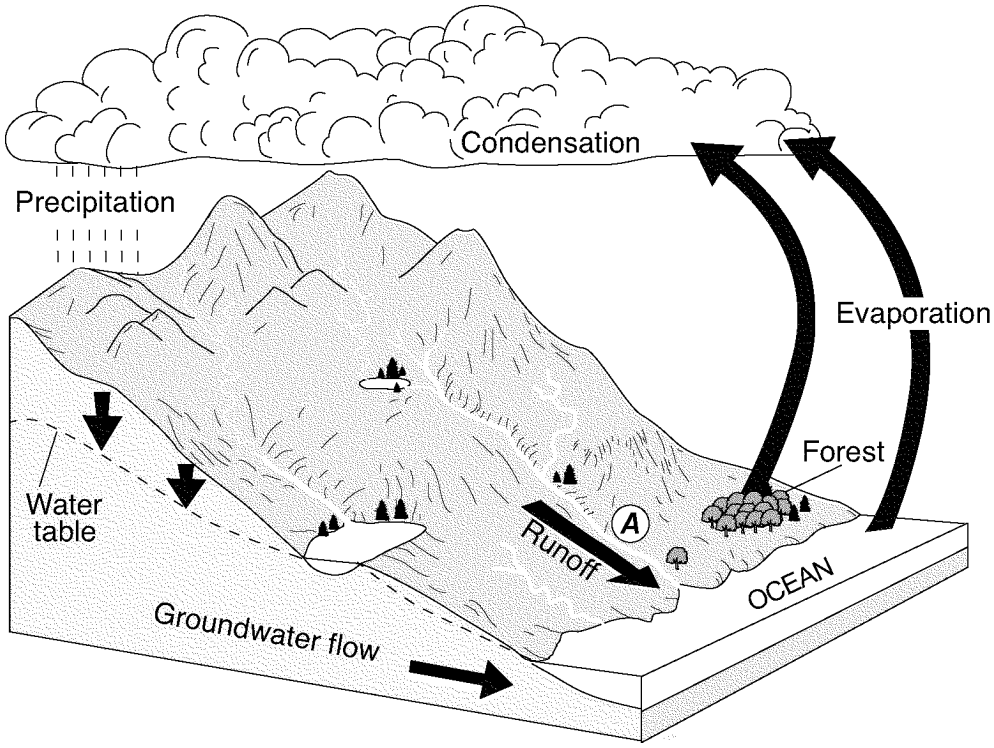
98) How many joules of heat energy are required to evaporate 2 grams of water from a lake surface?

99) How many joules (J) of heat energy are released by each gram of water vapor that condenses to form cloud droplets?

100) Describe the soil permeability and the land surface slope that allow the most infiltration of rainwater and the *least* runoff.

Questions 101 and 102 refer to the following:

The diagram below represents Earth's water cycle. The arrows represent some water cycle processes. Letter *A* indicates a surface location on Earth.

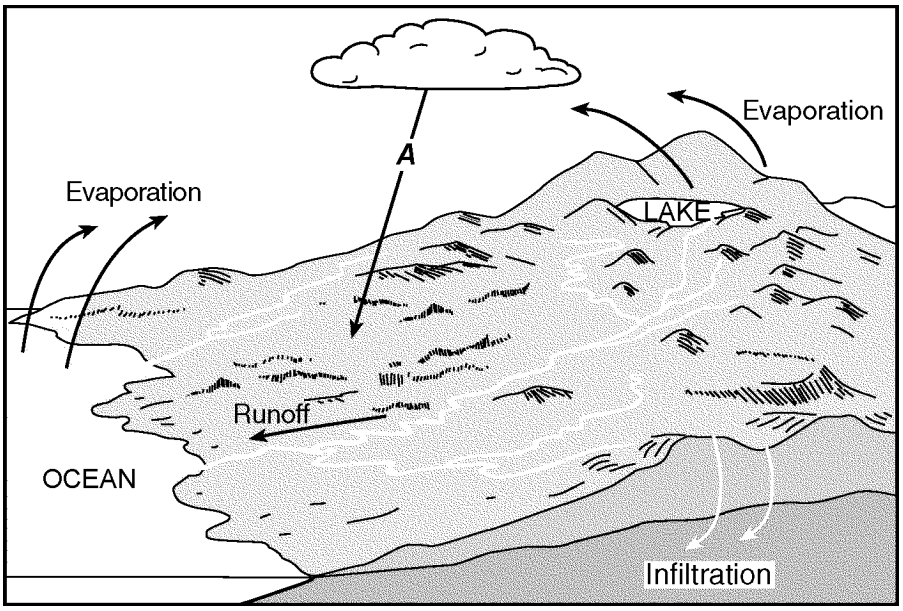


101) Other than evaporation, which water cycle process transfers large amounts of water vapor into the atmosphere from the forest?

102) Describe *one* surface condition change at location *A* on the given diagram that would decrease the rate of runoff.

Questions 103 and 104 refer to the following:

The model below shows the movement of water in the water cycle. Arrow *A* represents a process within the water cycle.

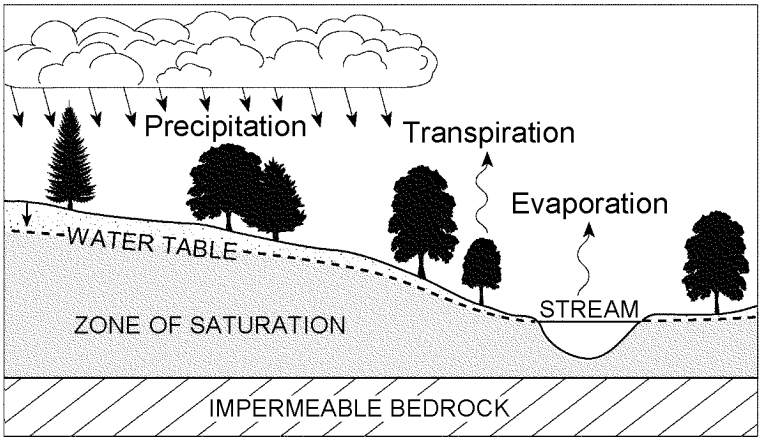


103) Identify *one* water cycle process represented by arrow *A* in the model shown.

104) A portion of the land surface shown was recently paved with asphalt and concrete. Describe the change in the amount of runoff and infiltration that will occur.

Questions 105 and 106 refer to the following:

The diagram below shows some processes in the water cycle.

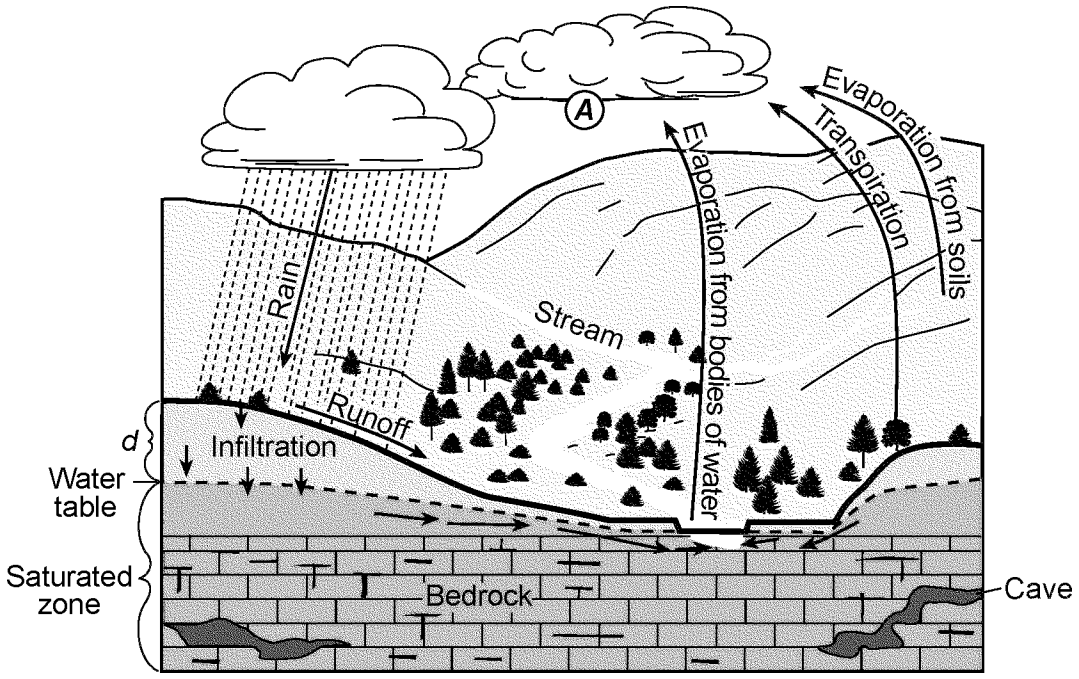


105) State the relationship between the amount of precipitation in the area shown and the height of the water table above the impermeable bedrock.

106) Describe *one* change that would cause *more* water to evaporate from the stream shown.

Questions 107 through 109 refer to the following:

The diagram below represents a portion of a stream and its surrounding bedrock. The arrows represent the movement of water molecules by the processes of the water cycle. The water table is indicated by a dashed line. Letter *A* represents a water cycle process occurring at a specific location. Letter *d* represents the distance between the water table and the land surface.



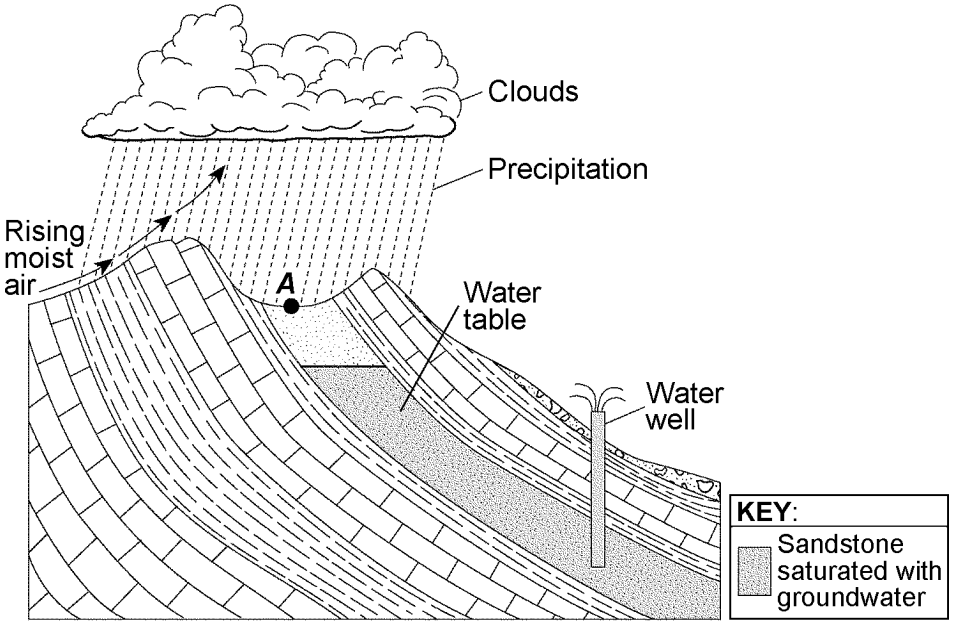
107) Identify water cycle process *A* in the given diagram, which produces cloud droplets.

108) Slightly acidic groundwater has been seeping through cracks and openings in the limestone bedrock of the area shown in the diagram, producing caves. State whether the type of weathering that produces these caves is mainly chemical or physical, and identify *one* characteristic of limestone that allows this type of weathering to occur.

109) Explain why the distance, *d*, from the water table to the land surface in the given diagram would *decrease* after several days of heavy rainfall.

Questions 110 and 111 refer to the following:

The cross section below shows water flowing out of a well drilled through tilted sedimentary bedrock. Point *A* represents a location on Earth's surface.

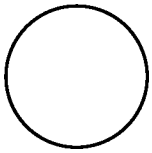


110) Describe *one* characteristic of the sandstone layer shown in the given cross section that allowed part of this layer to become saturated with groundwater.

111) Explain why point *A* in the given diagram would be a poor location for a garbage dump or landfill.

112) On the weather station model below, using the proper format, record the *four* weather conditions shown below.

Dewpoint: 48DF
Air Pressure: 998.3 mb
Wind: from the southeast
Wind speed: 10 knots

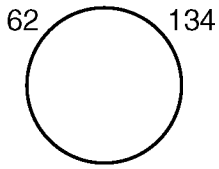


Questions 113 and 114 refer to the following:

A data table and a partial weather station model for Oklahoma City, Oklahoma are shown below.

DATA TABLE

Visibility	7 miles
Dewpoint	48°F
Wind Direction	from the south
Wind Speed	25 knots



113) On the partial weather station model for Oklahoma City provided, add the correct weather map symbols to indicate the weather conditions shown in the data table.

114) Based on the given information, state the actual barometric pressure at Oklahoma City.

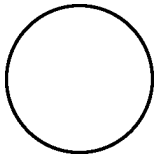
Questions 115 and 116 refer to the following:

The table below shows weather data recorded at Albany, New York.

DATA TABLE:

Location	**Temperature** (°F)	**Dewpoint** (°F)	**Cloud Cover** (%)	**Pressure** (mb)	**Wind Direction**	**Wind Speed** (knots)
Albany	58	36	25	1017.0	from the west	20

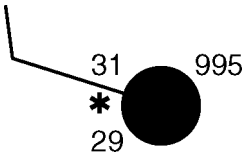
115) Complete the station model below, using the proper format to accurately represent the six weather conditions shown.



116) State *one* reason why rain was unlikely at the time the given data was collected. [*Support your answer by using the given data.*]

Questions 117 through 119 refer to the following:

The weather station model below shows atmospheric conditions at Oswego, New York.



117) Fill in the correct information below for *each* weather variable listed for the given station model.

Air temperature: _____DF

Dewpoint: _____DF

Wind speed: _____ knots

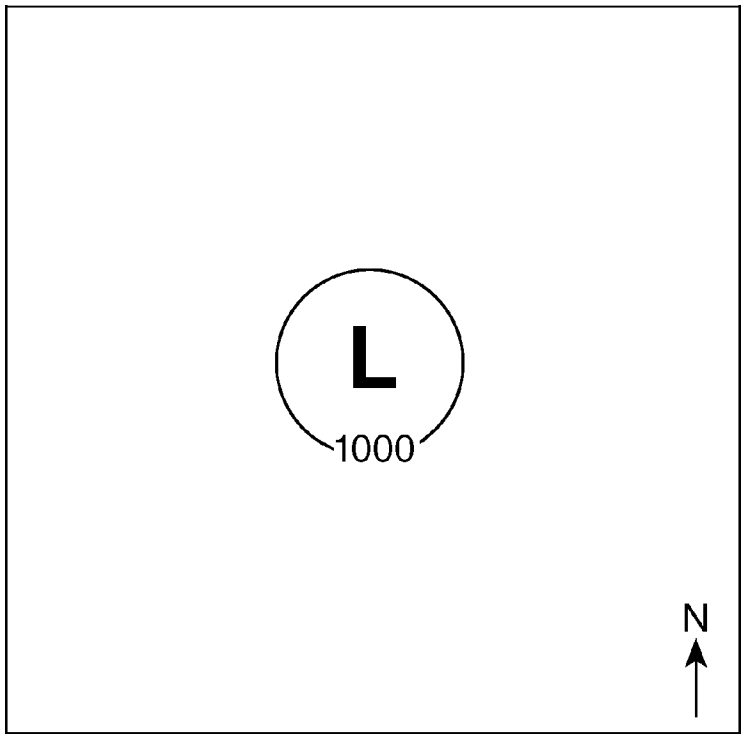
Cloud cover: _____%

118) Explain how the data on the station model shown indicate a high relative humidity.

119) Convert the coded air pressure shown on the station model into the actual millibars of air pressure.

Questions 120 and 121 refer to the following:

The map below represents the center of a low-pressure system indicated by **L**. The 1000-millibar (mb) isobar is drawn around the center of this low-pressure system.

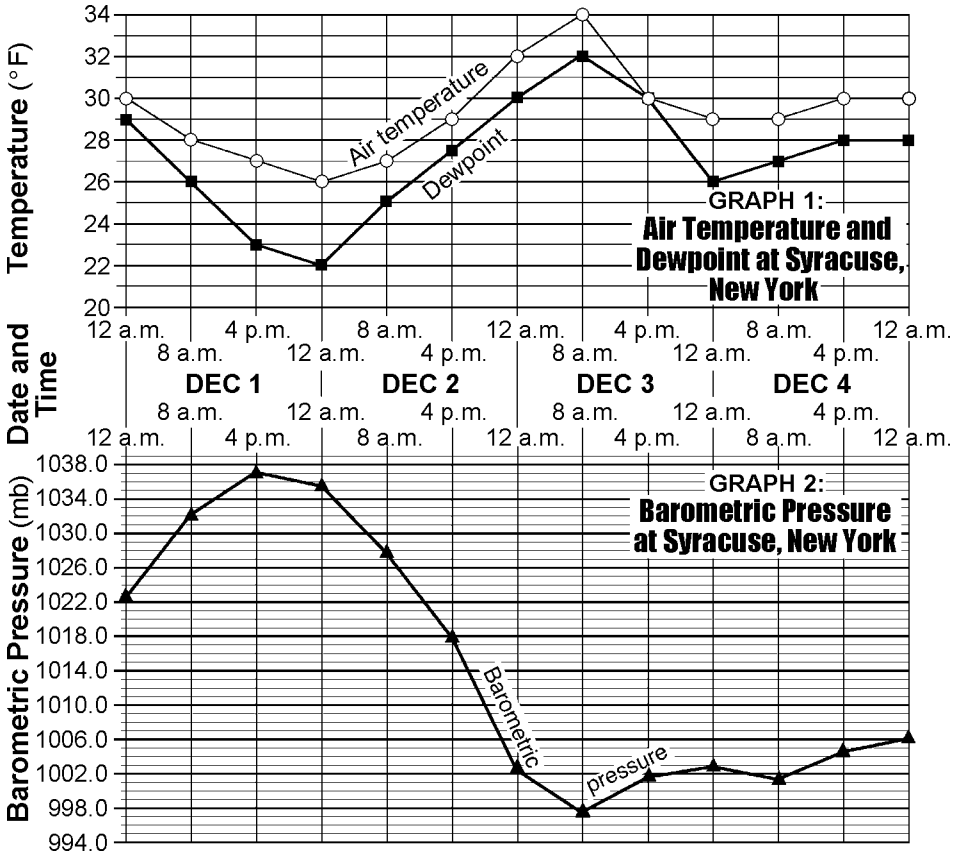


120) On the map provided, draw two additional isobars around the outside of the 1000-mb isobar in a way that indicates that the *strongest* winds are west of the low-pressure center.

121) Identify *one* factor that usually causes many low-pressure centers to generally move from west to east across the United States.

Questions 122 through 124 refer to the following:

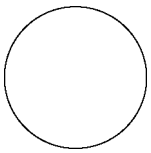
The weather graphs below show data recorded at Syracuse, New York, as a winter storm moved across the region between December 1 and December 4, 2007. Graph 1 shows air temperatures and dewpoints. Graph 2 shows barometric pressures.



122) Based on the data shown in the graphs, state the relationship between the air temperature and the barometric pressure in Syracuse on December 2.

123) According to the given graphs, on which date and at what time did the relative humidity reach 100% in Syracuse?

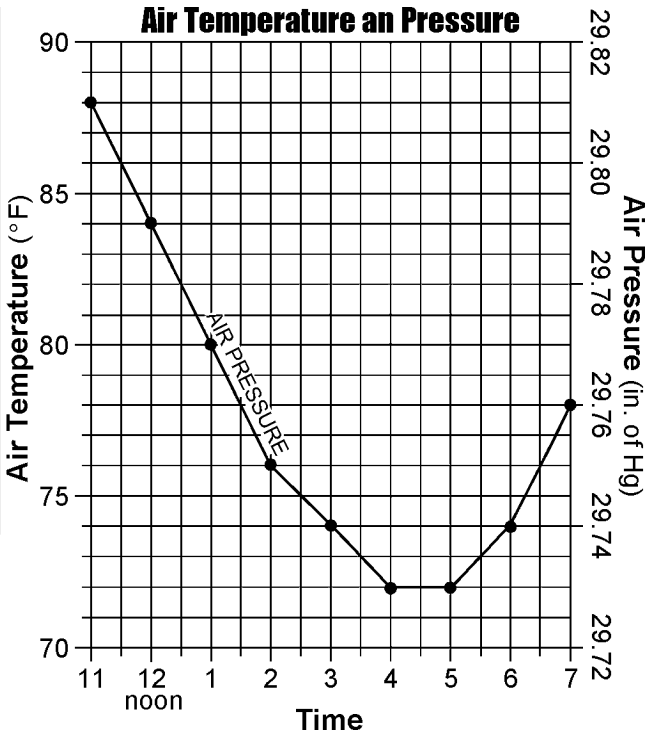
124) On the station model below, record the barometric pressure for Syracuse at 4 p.m. on December 2.



Questions 125 and 126 refer to the following:

The data table below shows the air temperature, in degrees Fahrenheit, and air pressure, in inches of mercury (Hg), recorded at a weather station in New York State from 11 a.m. to 7 p.m. on a day in September.

Time	Air Temperature (°F)	Air Pressure (in of Hg)
11 a.m.	77	29.81
12 noon	81	29.79
1 p.m.	84	29.77
2 p.m.	88	29.75
3 p.m.	87	29.74
4 p.m.	86	29.73
5 p.m.	85	29.73
6 p.m.	82	29.74
7 p.m.	79	29.76

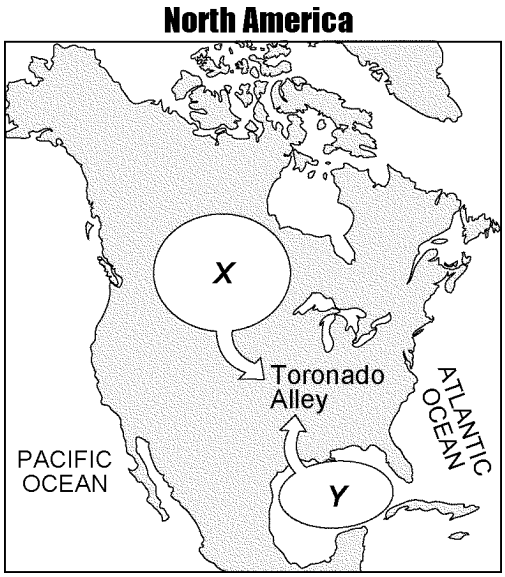


125) On the grid provided, construct a line graph by plotting the data for the air temperature for each time from 11 a.m. to 7 p.m. Connect the plots with a line. The data for air pressure have been plotted.

126) Using the given information, state the relationship between air temperature and air pressure from 11 a.m. to 2 p.m.

Questions 127 and 128 refer to the following:

The map below represents the geographic source regions of two air masses, *X* and *Y*. The arrows represent the convergence of these air masses, which may result in tornadoes.

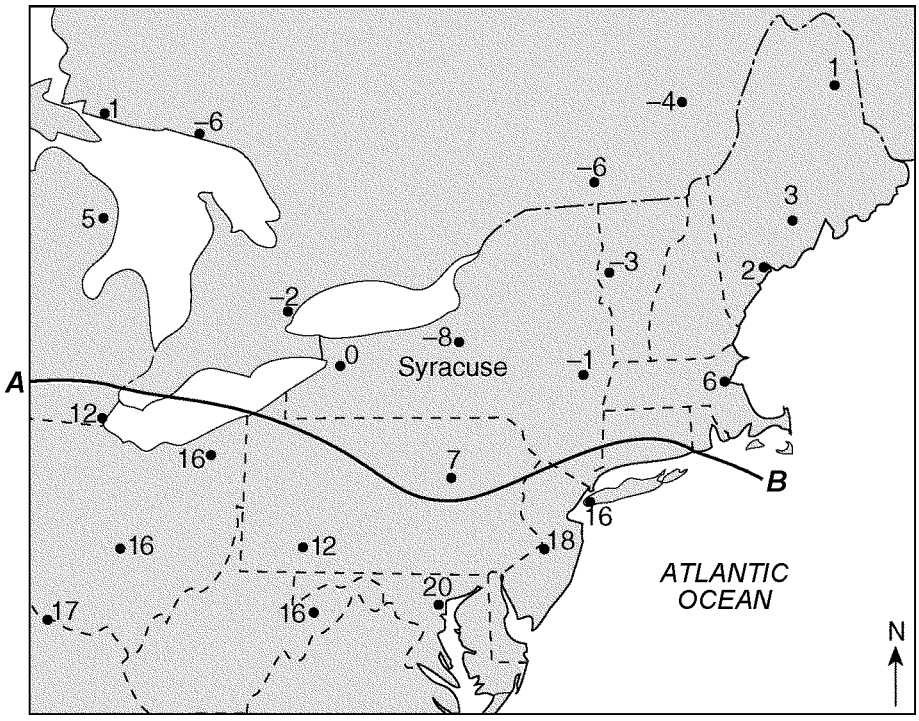


127) Use the standard two-letter air-mass symbols to identify air-masses *X* and *Y* on the given map.

128) A tornado watch or warning is issued for a location in the area labeled Tornado Alley on the given map. State *one* safety precaution that should be taken to avoid possible injury from this tornado.

Questions 129 through 131 refer to the following:

The weather map below shows air temperatures (in DF) at locations in the northeastern United States and part of Canada. Syracuse, New York, is labeled. Line *AB* represents a stationary frontal boundary.



129) Based on the data provided on the weather map, convert the air temperature at Syracuse from degrees Fahrenheit to degrees Celsius.

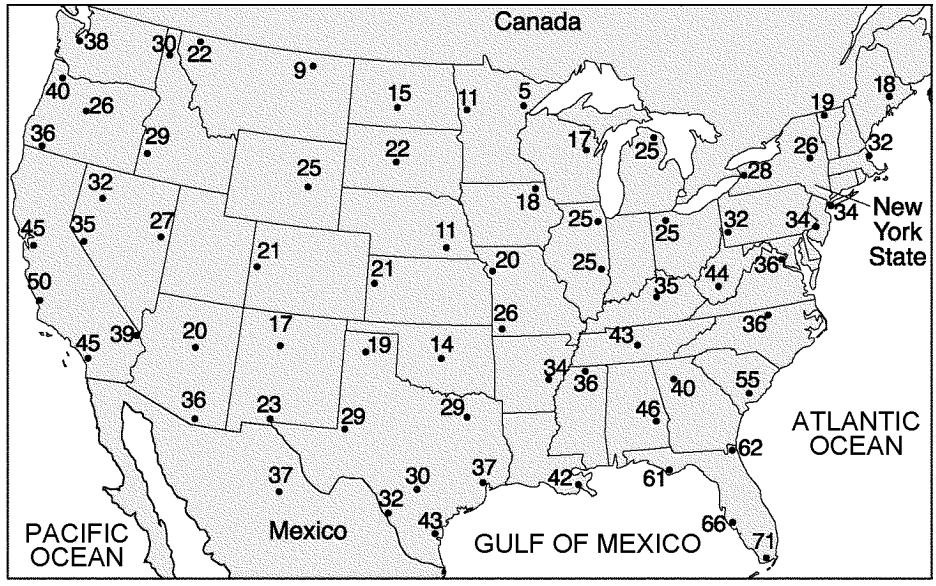
130) Write the two-letter weather map symbol for the type of air mass that is most likely located north of frontal boundary *AB* on the given weather map.

131) Explain why locations near the Atlantic Ocean on the weather map shown have air temperatures that are warmer than locations farther inland.

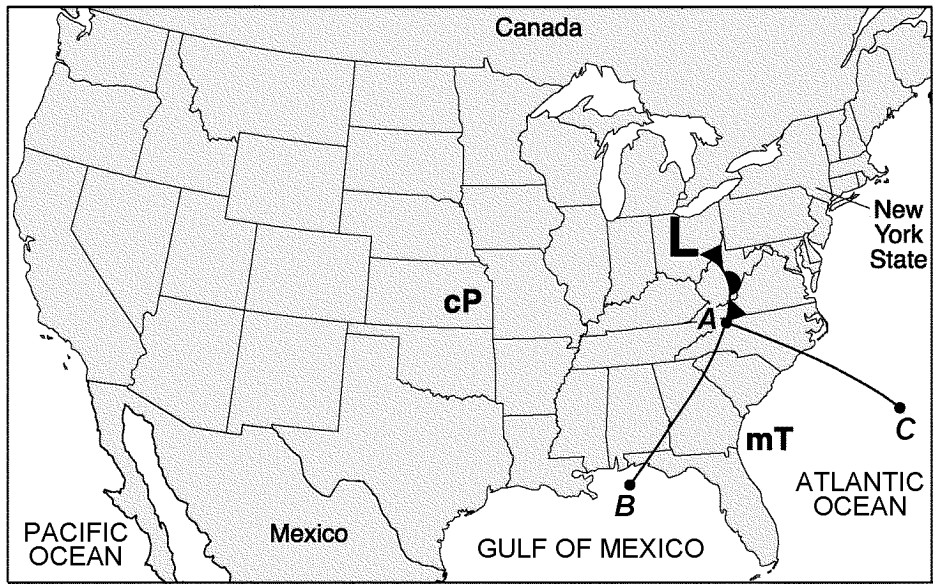
Questions 132 through 135 refer to the following:

Map 1 below shows air temperatures in the United States and Mexico, recorded in DF, at the points shown on the map. Map 2 below shows the location of a low-pressure system at the time these air temperatures were measured. An occluded front extends from the center of the low-pressure system (**L**) to point *A*. Lines *AB* and *AC* are two other frontal boundaries. Two air masses are shown. The storm system later moved toward New York State and produced an ice storm.

Map 1 – Temperatures (°F)



Map 2 – Weather Fronts



132) On map 2 of the diagram shown, draw weather front symbols on the correct sides of *both* line *AB* and line *AC* to show the *most* probable type and direction of movement of each front.

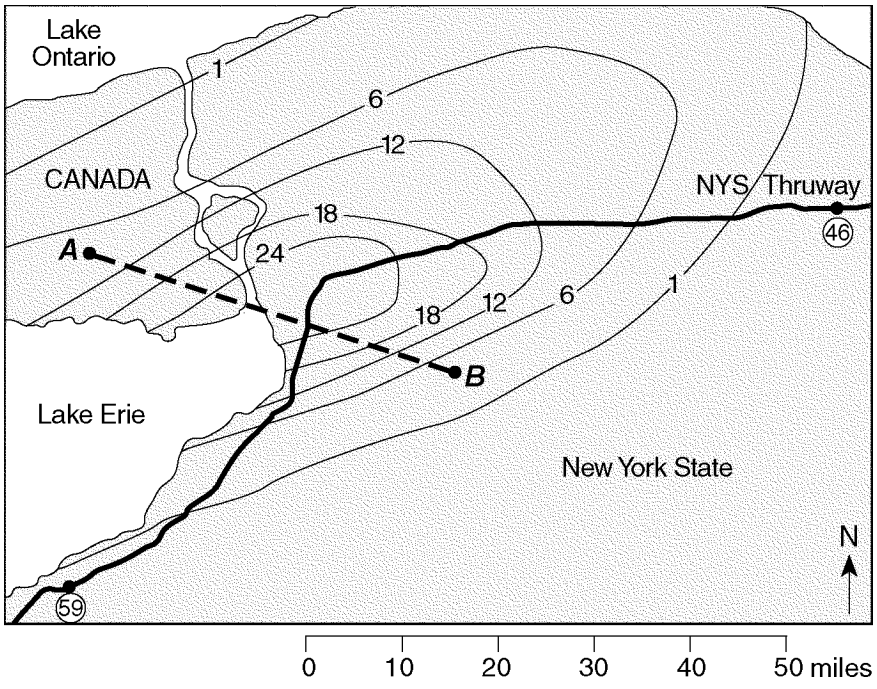
133) Describe the general surface wind pattern associated with the low-pressure system shown on map 2.

134) Explain what caused the center of the low-pressure system shown on map 2 to move toward New York State.

135) State *one* action New York State residents should have taken to prepare for the approaching ice storm.

Questions 136 through 140 refer to the following:

A LAKE-EFFECT SNOWSTORM:
A snowstorm affected western New York State on October 12 and 13, 2006. A blend of weather conditions caused more than 24 inches of heavy, wet, lake-effect snow, bringing much of western New York to a standstill. The New York State Thruway was closed to traffic between exits 46 and 59, which are circled on the map. The isolines on the map show the amount of snowfall, measured in inches, resulting from this storm. Points *A* and *B* represent locations on Earth's surface.



136) On the grid below, construct a profile of the given snowfall amounts along line *AB* by plotting the isoline amounts that cross line *AB*. The amounts for points *A* and *B* have been plotted. Complete the profile by connecting all the plots with a line.

137) Approximately how many miles was the given section of the Thruway closed due to the snowstorm?

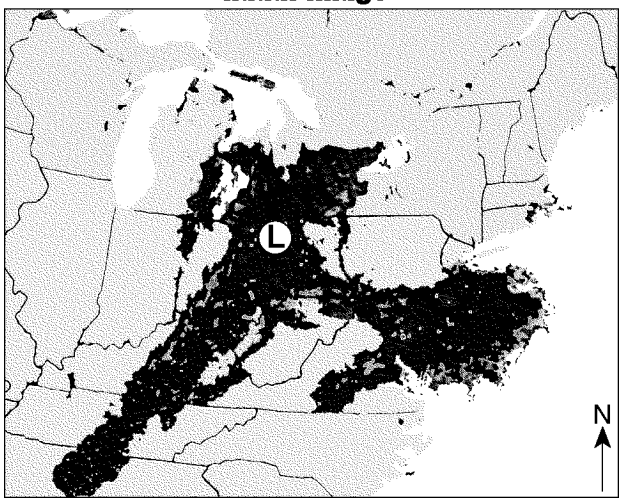
138) Determine the number of inches of snow that was received in Niagara Falls, New York, from the given snowstorm.

139) Identify the *most* probable direction from which the wind was blowing to produce the pattern of snowfall shown on the given map.

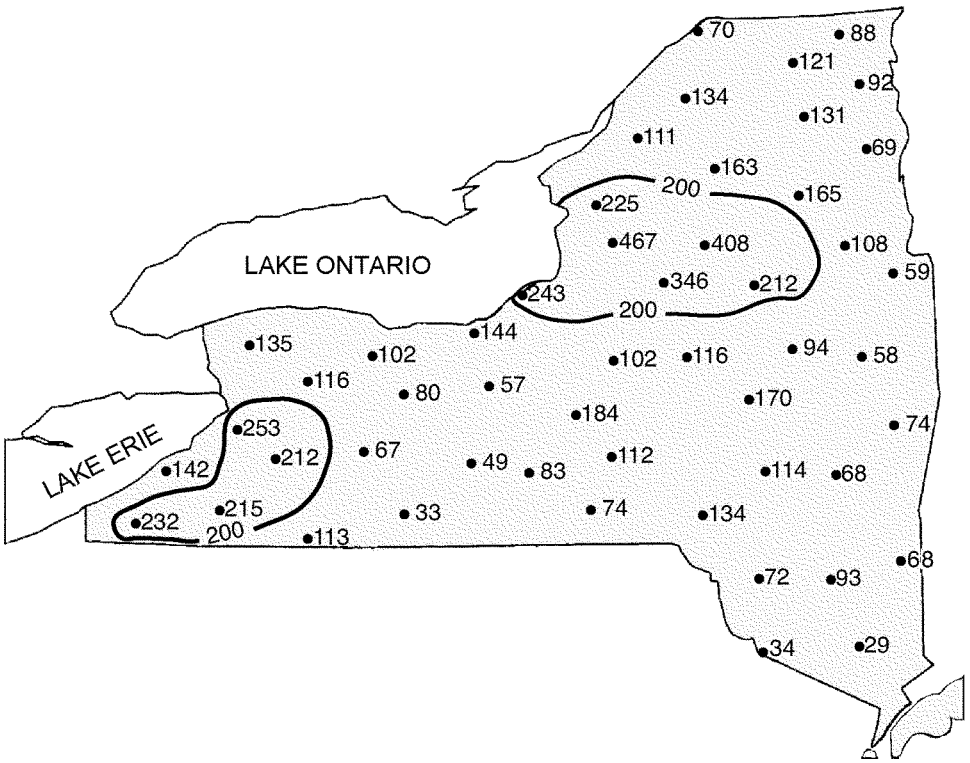
140) Identify *two* hazards to human life or property that can result from a snowstorm of the size described.

141) A radar image of a winter storm in Syracuse is shown below. The darkest regions on the radar image show areas of precipitation. Letter **L** marks the location of the center of the low-pressure system. Draw an arrow on the radar image to show the *most* probable path this winter storm followed. Begin the arrow at letter **L**.

Radar Image



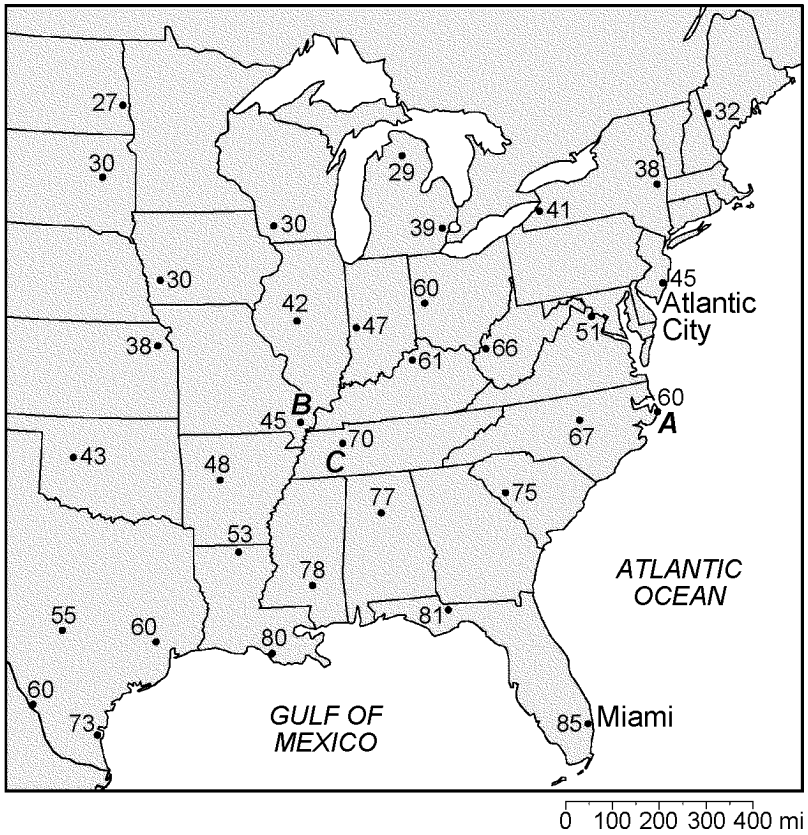
142) The map below shows the snowfall from the fall of 1976 through the spring of 1977, measured in inches, for most of New York State. The 200-inch snowfall isolines are shown on the map.



Identify *one* factor that contributes to the high snowfall amounts at locations on the eastern side of *both* Lake Erie and Lake Ontario.

Questions 143 through 145 refer to the following:

The map below shows surface air temperatures, in degrees Fahrenheit, for a portion of the United States. These temperatures were recorded at noontime on the same winter day. Two coastal cities are labeled: Atlantic City,New Jersey and Miami, Florida. Other selected locations are labeled *A*, *B*, and *C*.



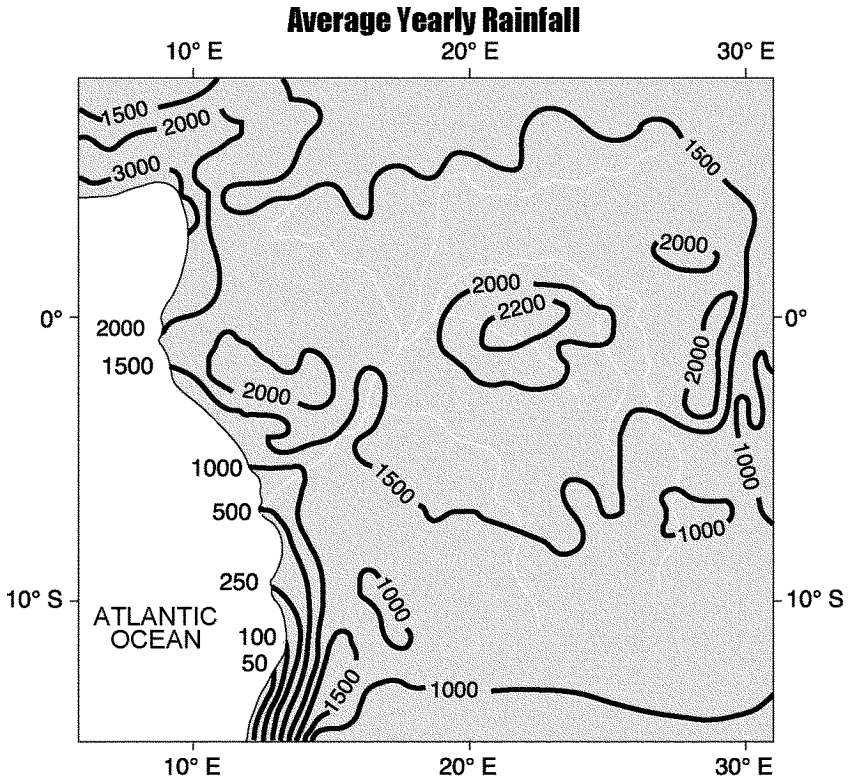
143) Calculate the temperature gradient between locations *B* and *C* on the given map in DF per mile.

144) Explain why the noontime winter air temperatures in Miami, Florida are usually *higher* than the noontime winter air temperatures in Atlantic City, New Jersey.

145) A frontal boundary exists between locations *B* and *C* on the given map. Identify *one* process that causes clouds to form in the moist air rising along this frontal boundary.

Questions 146 and 147 refer to the following:

The map below shows isolines of average yearly rainfall, in centimeters, for the Congo River region of Africa.



The climate of the Congo River region is mainly influenced by air from two source regions. One air-mass source region is over the Benguela Current along the west coast of Africa. This air mass moves at low altitudes toward the Congo River region. A second air-mass source region is located over the South Equatorial Current along the east coast of Africa. This air mass moves at higher altitudes over the Congo River region.

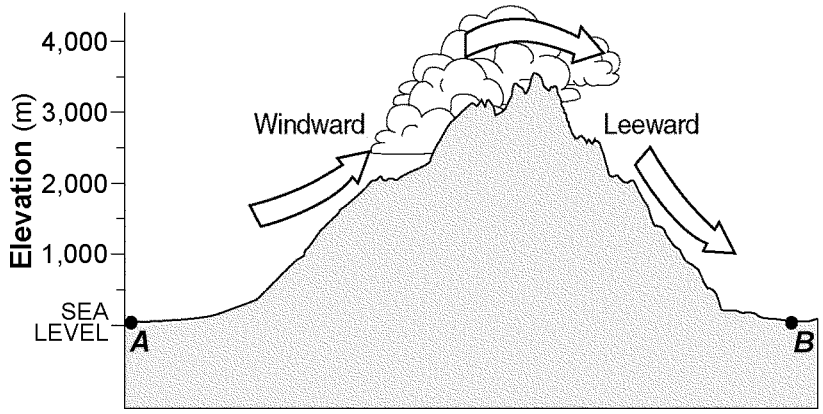
146) According to the given map, what is a possible average yearly rainfall amount received on the equator (0D) at 20DE?

147) Based on the given information, explain why air masses that form over the South Equatorial Current move at higher altitudes than air masses that form over the Benguela Current.

148) Explain why air cools as it rises up a mountain.

Questions 149 through 151 refer to the following:

The diagram below shows the windward and leeward sides of a mountain range. Arrows show the movement of air over a mountain. Points *A* and *B* represent locations at sea level on Earth's surface.



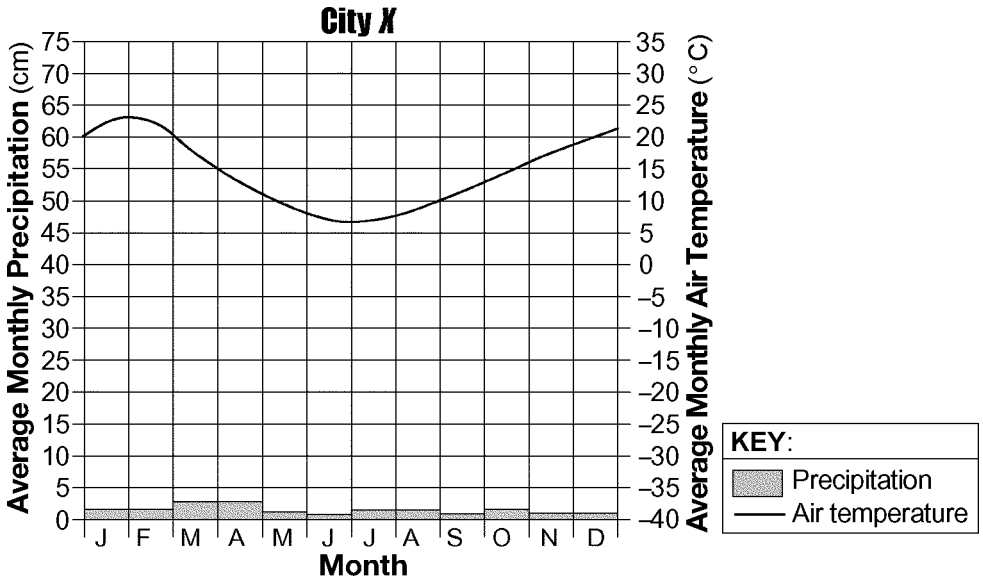
149) Identify *one* weather instrument that could be used to determine the dewpoint of the air at point *A* in the given diagram.

150) What is the relative humidity at the base (bottom) of the cloud on the windward side of the mountain shown?

151) Compared to the temperature and relative humidity of the air at point *A* in the given diagram, describe how the temperature and relative humidity of the air are different as the air arrives at point *B*.

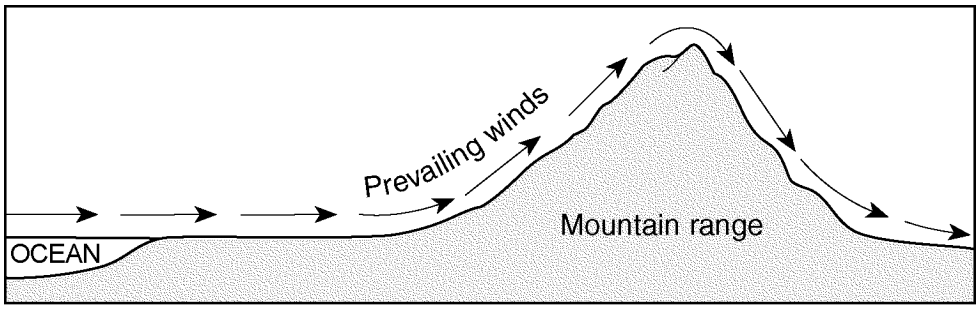
Questions 152 and 153 refer to the following:

The climate graph below shows the average monthly precipitation and average monthly air temperatures at city *X*. City *X* is located near a mountain range in the Southern Hemisphere.



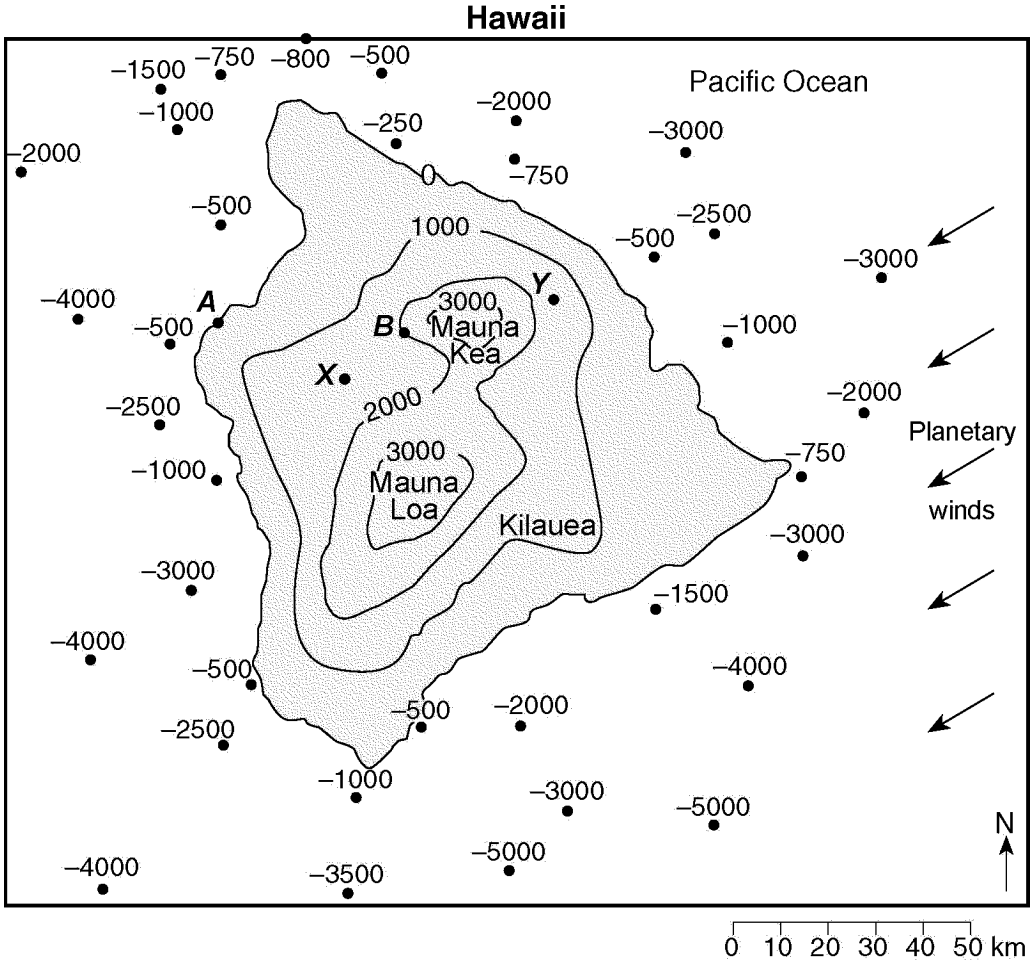
152) What evidence shown on the given graph indicates that city *X* is located in the Southern Hemisphere?

153) State whether the climate of city *X* is dry or wet. Then, on the cross section below, place an **X** on Earth's surface to indicate the most likely location of city *X*.



Questions 154 and 155 refer to the following:

On the topographic map of Hawaii below, points *A*, *B*, *X*, and *Y* represent surface locations on the island. Land elevations and Pacific Ocean depths are shown in meters.

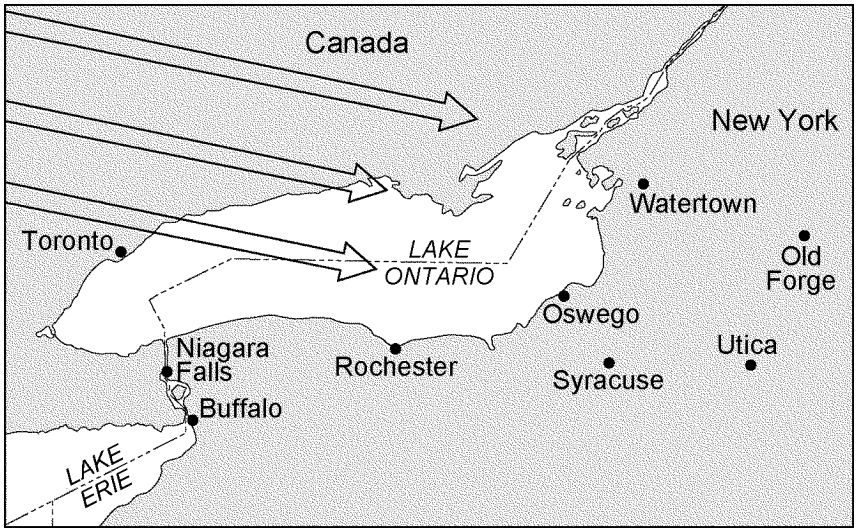


154) The average annual air temperature at location *A* in the given topographic map is approximately 77DF, while the average annual air temperature at location *B* is approximately 55DF. Explain why location *B* has cooler average temperatures.

155) The given topographic map shows the locations of three volcanoes on the island of Hawaii. The arrows represent the direction of the planetary winds. Explain why location *X* usually receives *less* annual precipitation than location *Y*.

Questions 156 through 158 refer to the following:

The map below shows a portion of New York State and Canada. The arrows represent the direction of the wind blowing over Lake Ontario for several days early one winter.



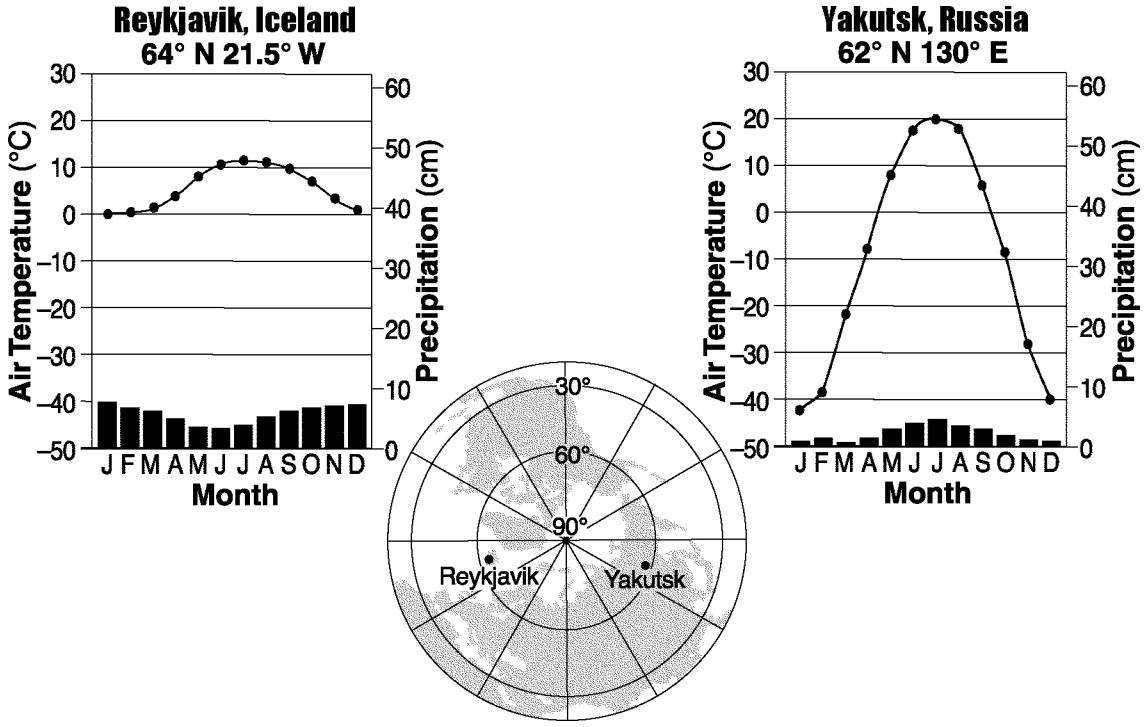
156) Explain why Oswego, New York usually gets more snow than Toronto, Canada when the wind is blowing in the direction shown on the map.

157) Explain why the average winter air temperature in Old Forge, New York is colder compared to the average winter air temperature in Watertown, New York.

158) Explain why the surface of Lake Erie freezes much later in the winter than the surrounding land surfaces.

Questions 159 through 162 refer to the following:

The map below shows a view of Earth from above the North Pole. Points on the map indicate the positions of Reykjavik, Iceland and Yakutsk, Russia. The graphs below show average monthly air temperature (line graphs) and amount of precipitation (bar graphs) for both locations.



159) Write the two-letter weather map symbol for an air mass that originates over Yakutsk.

160) Explain why Reykjavik has cooler summers and warmer winters than Yakutsk.

161) Describe *one* way the yearly precipitation in Yakutsk differs from that in Reykjavik.

162) Identify *one* warm and *one* cool ocean current that affect the climate of Iceland.