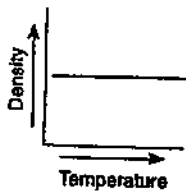
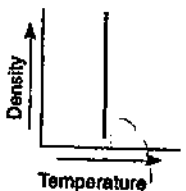
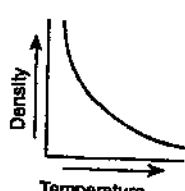
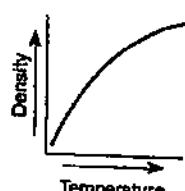


WEATHER

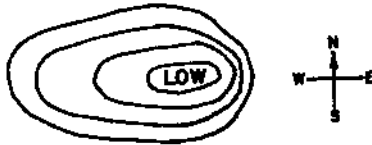
- Rapidly falling barometric pressure readings usually indicate
 - clearing conditions
 - approaching storm conditions
 - decreasing humidity
 - decreasing temperatures
- Which weather instrument has most improved the accuracy of weather forecasts over the past 40 years?
 - thermometer
 - sling psychrometer
 - weather satellite
 - weather balloon
- Which graph best represents the relationship between air temperature and air density in the atmosphere?
 - 
 - 
 - 
 - 
- Base your answer to the following question on the *Earth Science Reference Tables*.
In which zone of the atmosphere would a temperature of 85°C most likely occur?
 - troposphere
 - stratosphere
 - mesosphere
 - thermosphere
- In a certain area the air temperature and the dewpoint temperature are approaching the same value. The air pressure is decreasing and the cloud cover is increasing. What atmospheric change is most likely occurring in this area?
 - Warm, moist air is moving into the area.
 - Warm, dry air is moving into the area.
 - Cold, dry air is moving into the area.
 - A cold front has just passed through this area.
- A strong surface wind is blowing from city A toward city B. City B has a barometric pressure of 1,013 millibars. The barometric pressure of city A would most likely be
 - 988 mb
 - 1,002 mb
 - 1,013 mb
 - 1,026 mb

- As the temperature of the atmosphere at a given location increases, the air pressure will most likely
 - decrease
 - increase
 - remain the same
- According to the *Earth Science Reference Tables*, an air pressure of 29.65 inches of mercury is equal to
 - 984.0 mb
 - 999.0 mb
 - 1001.0 mb
 - 1004.0 mb
- Wind velocity is most directly dependent on the
 - gradient of the air pressure field
 - value of the Coriolis effect
 - moisture content of the air
 - rotational velocity of the Earth
- According to the *Earth Science Reference Tables*, an air pressure of 30.21 inches of mercury is equal to approximately
 - 1,015 mb
 - 1,017 mb
 - 1,020 mb
 - 1,023 mb
- Air pressure is usually highest when the air is
 - warm and humid
 - warm and dry
 - cold and humid
 - cold and dry
- Wind is caused mainly by air-pressure differences that result from
 - uneven heating of Earth's atmosphere
 - absorption of ultraviolet radiation by Earth's landmasses
 - radiation of heat from Earth's landmasses to water bodies
 - rotation of Earth on its axis
- According to the *Earth Science Reference Tables*, as the dewpoint temperature of a sample of air decreases, the amount of moisture in that sample of air
 - decreases
 - increases
 - remains the same
- Which gas in the atmosphere has the most influence on day-to-day weather changes?
 - ozone
 - oxygen
 - water vapor
 - carbon dioxide
- According to the *Earth Science Reference Tables*, at which of these latitudes would average annual precipitation be greatest?
 - 0°
 - 30° N
 - 90° N
 - 90° S

16. Base your answer to the following question on the *Earth Science Reference Tables*.

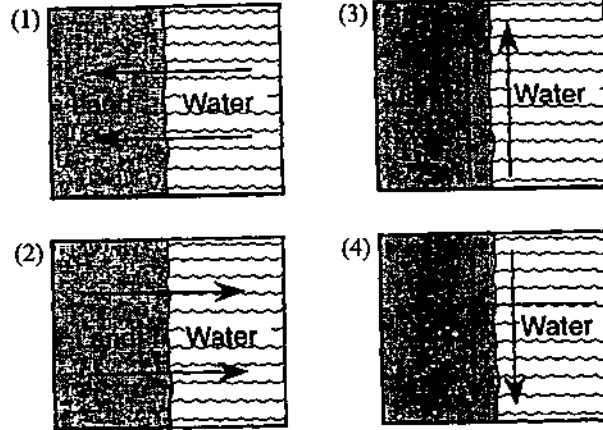
When the dry-bulb temperature is 14°C and the wet-bulb temperature is 8°C , the relative humidity is

- (1) 6% (3) 25%
 (2) 22% (4) 41%
17. The diagram below shows the isolines of air pressure around a low-pressure center. On which side of the low-pressure center will the wind speed be greatest?



- (1) north (3) east
 (2) south (4) west
18. As wind velocity decreases, the distance between isobars on a weather map will
- (1) decrease (3) remain the same
 (2) increase
19. As a parcel of air rises, its temperature will
- (1) decrease due to expansion
 (2) decrease due to compression
 (3) increase due to expansion
 (4) increase due to compression
20. The air over the Equator generally rises because the air is
- (1) dry and cool with low density
 (2) moist and hot with low density
 (3) moist and cool with high density
 (4) dry and hot with high density
21. In the Northern Hemisphere, in which direction does surface wind circulate in a high-pressure air mass?
- (1) clockwise and toward the center
 (2) clockwise and away from the center
 (3) counterclockwise and toward the center
 (4) counterclockwise and away from the center
22. Most surface ocean currents are caused by
- (1) tides (3) prevailing winds
 (2) evaporation (4) salinity differences

23. Adjacent water and land surfaces have the same temperature at sunrise on a clear, calm day. A surface wind develops after the water and land are heated by the Sun for a few hours. On which map do the arrows best represent the direction of this wind?

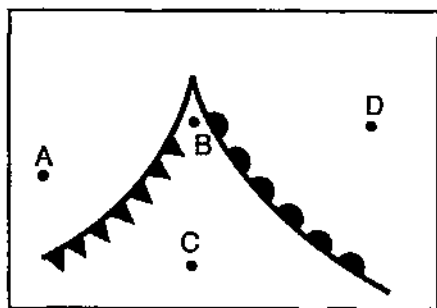


24. Which natural process best removes pollutants from the atmosphere?
- (1) evaporation (3) transpiration
 (2) precipitation (4) convection
25. Which diagram best represents the air circulation as seen from above in a high-pressure center (anticyclone) in the Northern Hemisphere?
- (1) (3)
 (2) (4)
26. How does air circulate within a cyclone (low-pressure area) in the Northern Hemisphere?
- (1) counterclockwise and toward the center of the cyclone
 (2) counterclockwise and away from the center of the cyclone
 (3) clockwise and toward the center of the cyclone
 (4) clockwise and away from the center of the cyclone

27. The diagram below represents a cross-sectional view of airmasses associated with a low-pressure system. The cold frontal interface is moving faster than the warm frontal interface. What usually happens to the warm air that is between the two frontal surfaces?



- (1) The warm air is forced over both frontal interfaces.
 - (2) The warm air is forced under both frontal interfaces.
 - (3) The warm air is forced over the cold frontal interface but under the warm frontal interface.
 - (4) The warm air is forced under the cold frontal interface but over the warm frontal interface.
28. At which location will a low-pressure storm center most likely form?
- (1) along a frontal surface between different airmasses
 - (2) near the middle of a cold airmass
 - (3) on the leeward side of mountains
 - (4) over a very dry, large, flat land area
29. Why do clouds usually form at the leading edge of a cold airmass?
- (1) Cold air flows over warm air, causing the warm air to descend and cool.
 - (2) Cold air flows under warm air, causing the warm air to rise and cool.
 - (3) Cold air contains more dust than warm air does.
 - (4) Cold air contains more water vapor than warm air does.
30. The map below represents a section of a surface weather map showing weather stations A through D.



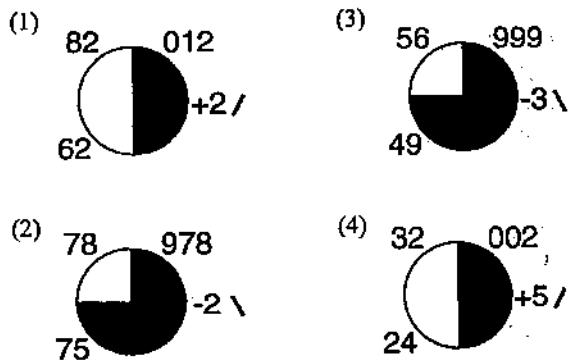
- At which weather station are the most unstable weather conditions occurring?
- (1) A
 - (2) B
 - (3) C
 - (4) D
31. Tornadoes occur when a very cold, dry air mass meets a very warm, wet air mass. Which two air masses would most likely form a tornado when they meet?
- (1) cP and cA
 - (2) cT and mP
 - (3) cP and mT
 - (4) mP and mT

32. The weather characteristics of air mass result primarily from its
- (1) geographic origin
 - (2) size and shape
 - (3) rate of movement
 - (4) direction of movement
33. Which type of air mass would most likely have low humidity and high air temperature?
- (1) cT
 - (2) cP
 - (3) mT
 - (4) mP
34. Which surface features would give an air mass mT characteristics?
- (1) warm, moist surfaces
 - (2) cold, moist surfaces
 - (3) warm, dry surfaces
 - (4) cold, dry surfaces
35. An air mass originating over the North Pacific Ocean would most likely be
- (1) continental polar
 - (2) continental tropical
 - (3) maritime polar
 - (4) maritime tropical
36. Compared to a maritime tropical airmass, a maritime polar airmass has
- (1) lower temperature and less water vapor
 - (2) lower temperature and more water vapor
 - (3) higher temperature and less water vapor
 - (4) higher temperature and more water vapor
37. In winter, a cold, dry air mass from Canada moves across Lake Ontario. The air over the lake is warmer and more humid than the air over the land. Which weather condition is most likely to occur as the air mass reaches Oswego?
- (1) lake-effect snowstorm
 - (2) tornado
 - (3) warm, sunny weather
 - (4) hurricane
38. Present-day weather predictions are based primarily upon
- (1) land and sea breezes
 - (2) cloud height
 - (3) ocean currents
 - (4) airmass movements
39. A cold front is moving eastward across New York State at an average speed of 50 kilometers per hour. Approximately how long will the front take to move from Buffalo to Albany? [Refer to the *Earth Science Reference Tables*.]
- (1) 5 hours
 - (2) 8 hours
 - (3) 3 hours
 - (4) 10 hours
40. A low-pressure center located in the midwestern United States generally moves toward the
- (1) northeast
 - (2) southeast
 - (3) northwest
 - (4) southwest
41. A low-pressure system near Utica, New York, causes heavy precipitation. If this system followed the usual track, which city most likely had the same weather conditions a few hours earlier?
- (1) Syracuse
 - (2) Kingston
 - (3) Albany
 - (4) Plattsburgh

42. Compared to the accuracy of the 24-hour weather forecasts of the 1930's, the 24-hour weather forecasts of the 1990's are usually

- (1) less accurate
- (2) more accurate
- (3) equally accurate

43. Which weather station model indicates the highest relative humidity?



44. The primary source of moisture for the atmosphere is the Earth's

- (1) ground water
- (2) vegetation
- (3) rivers and lakes
- (4) oceans

45. Moisture is evaporating from a lake into stationary air at a constant temperature. As more moisture is added to this air, the rate at which water will evaporate will probably

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

46. The rate of evaporation of water can be increased by

- (1) increasing the amount of moisture in the air
- (2) decreasing the temperature of the water
- (3) increasing the temperature of the air
- (4) decreasing the circulation of the air

47. Two identical towels are hanging on a clothesline in a sunny location. One towel is wet; the other is dry. What is one reason that the wet towel feels cooler than the dry towel?

- (1) Water in the wet towel is evaporating.
- (2) Water in the wet towel prevents absorption of heat energy.
- (3) The dry towel receives more heat energy from the Sun than the wet towel does.
- (4) The dry towel has more room for heat storage than the wet towel does.

48. Which processes provide the greatest amount of moisture to the atmosphere?

- (1) evaporation and transpiration
- (2) evaporation and infiltration
- (3) condensation and transpiration
- (4) condensation and infiltration

49. Which event is a direct result of transpiration and evaporation?

- (1) The atmosphere warms.
- (2) Cloud cover decreases.
- (3) Moisture enters the atmosphere.
- (4) Moisture leaves the atmosphere.

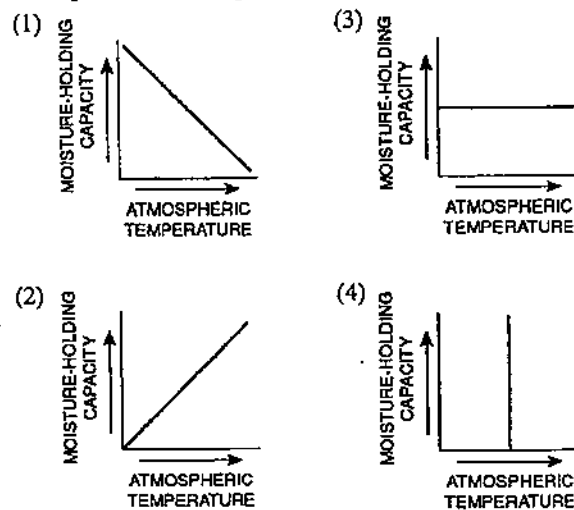
50. Which event is a direct result of evaporation and transpiration?

- (1) The atmosphere warms.
- (2) Cloud cover decreases.
- (3) Moisture enters the atmosphere.
- (4) Moisture leaves the atmosphere.

51. Liquid water will continue to evaporate from the Earth's surface, increasing the amount of atmospheric water vapor, until

- (1) transpiration occurs
- (2) the relative humidity falls below 50%
- (3) the atmosphere becomes saturated
- (4) the temperature of the atmosphere becomes greater than the dewpoint temperature

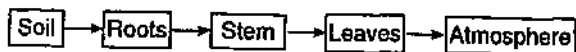
52. Which graph best represents the relationship between the moisture-holding capacity (ability to hold moisture) of the atmosphere and atmospheric temperature?



53. Under which set of atmospheric conditions does water usually evaporate at the fastest rate?

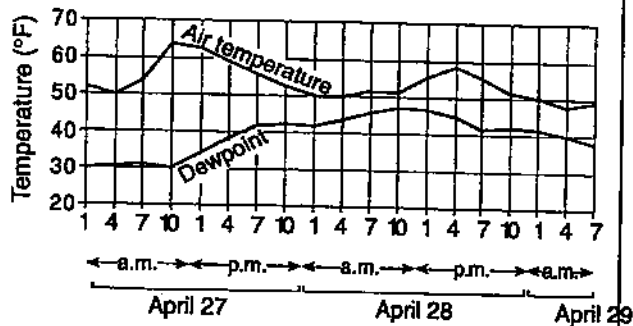
- (1) warm temperatures, calm winds, and high humidity
- (2) warm temperatures, high winds, and low humidity
- (3) cold temperatures, calm winds, and low humidity
- (4) cold temperatures, high winds, and high humidity

54. The flowchart below shows one process by which moisture enters the atmosphere.



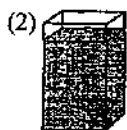
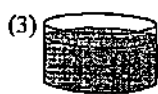
The last step of this process is known as

- (1) condensation (3) radiation
 (2) convection (4) transpiration
55. The graph below is a computer-generated forecast of air temperature and dewpoint for a city during a period of 2 1/4 days.



At which time during this period is the rate of evaporation expected to be highest?

- (1) April 27 at 10 a.m. (3) April 28 at 4 p.m.
 (2) April 28 at 10 a.m. (4) April 29 at 4 a.m.
56. All of the containers shown below contain the same volume of water and are at room temperature. In a two-day period, from which container will the *least* amount of water evaporate?

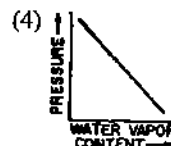
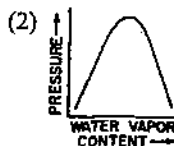
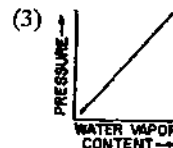
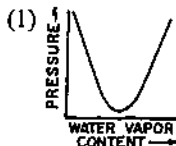


57. As the dewpoint temperature and the air temperature approach the same value, the probability of precipitation
- (1) decreases (3) remains the same
 (2) increases

58. According to the *Earth Science Reference Tables*, what is the approximate dewpoint temperature if the dry-bulb temperature is 17°C and the wet-bulb temperature is 11°C?

- (1) 5°C (3) 11°C
 (2) 8°C (4) 15°C

59. Which graph best shows the relationship between atmospheric pressure and water vapor content at the Earth's surface?



60. What is the approximate dewpoint temperature if the dry-bulb temperature is 26°C and the wet-bulb temperature is 21°C?

- (1) 5°C (3) 18°C
 (2) 12°C (4) 23°C

61. Which event usually occurs when air is cooled to its dewpoint temperature?

- (1) freezing (3) condensation
 (2) evaporation (4) transpiration

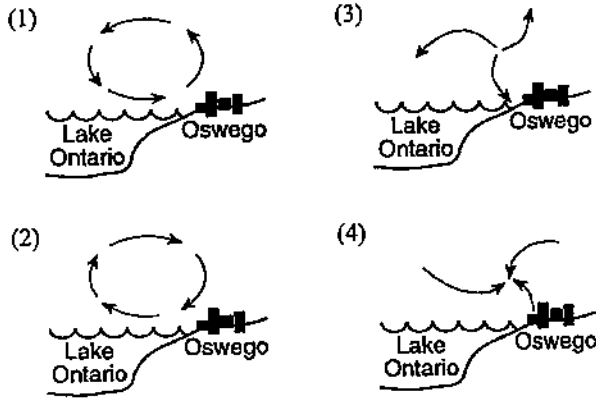
62. A cool breeze is blowing toward the land from the ocean on a warm, cloudless summer day. This condition is most likely caused by

- (1) a high-pressure system over the land
 (2) a hurricane approaching from the ocean
 (3) a cold front that is slowly approaching the land from the ocean
 (4) the air temperature being higher over the land than over the ocean

63. Winds blow from regions of

- (1) high air temperature to regions of low air temperature
 (2) high air pressure to regions of low air pressure
 (3) high precipitation to regions of low precipitation
 (4) convergence to regions of divergence

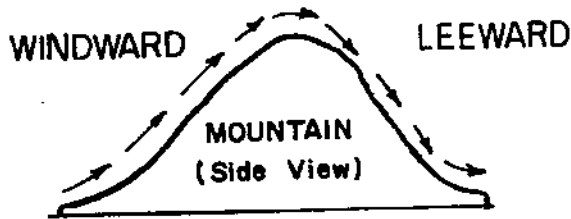
64. Which cross section best shows the normal movement of the air over Oswego, New York, on a very hot summer afternoon?



65. Precipitation often occurs along a frontal surface because the air along a frontal surface

- (1) has a high density
- (2) contains condensation nuclei
- (3) is rising
- (4) is low in humidity

66. The diagram below shows the direction of movement of air over a mountain.



As the air moves down the leeward side of the mountain, the air will

- (1) warm due to compression
- (2) warm due to expansion
- (3) cool due to compression
- (4) cool due to expansion

67. The change from the vapor phase to the liquid phase is called

- (1) evaporation
- (2) condensation
- (3) precipitation
- (4) transpiration

68. Which event will most likely occur in rising air?

- (1) clearing skies
- (2) cloud formation
- (3) decreasing relative humidity
- (4) increasing temperature

69. Condensation will most likely occur in a given volume of air when the air is

- (1) saturated and contains no condensation nuclei
- (2) saturated and contains condensation nuclei
- (3) unsaturated and contains no condensation nuclei
- (4) unsaturated and contains condensation nuclei

70. The base of a cumulus cloud was determined to be 500 meters above the Earth's surface. This is the altitude at which

- (1) cumulus clouds always form
- (2) no dust is present in the air
- (3) the air temperature drops below 0°C
- (4) the air temperature equals the dewpoint temperature

71. The primary reason that clouds rarely form in the stratosphere is that

- (1) no condensation nuclei are present in the stratosphere
- (2) very little water vapor is present in the stratosphere
- (3) ozone prevents the formation of clouds
- (4) the temperature is too high for clouds to form

72. By which process are clouds, dew, and fog formed?

- (1) condensation
- (2) evaporation
- (3) precipitation
- (4) melting

73. In order for clouds to form, cooling air must be

- (1) saturated and have no condensation nuclei
- (2) saturated and have condensation nuclei
- (3) unsaturated and have no condensation nuclei
- (4) unsaturated and have condensation nuclei

74. Why is it possible for no rain to be falling from a cloud?

- (1) The water droplets are too small to fall.
- (2) The cloud is water vapor.
- (3) The dewpoint has not yet been reached in the cloud.
- (4) There are no condensation nuclei in the cloud.

75. Which two climate factors are most directly responsible for the amount of snowfall normally received in Buffalo, New York?

- (1) ocean currents and storm tracks
- (2) mountain barriers and average temperatures
- (3) elevation and potential evapotranspiration
- (4) prevailing wind direction and nearness to a large body of water

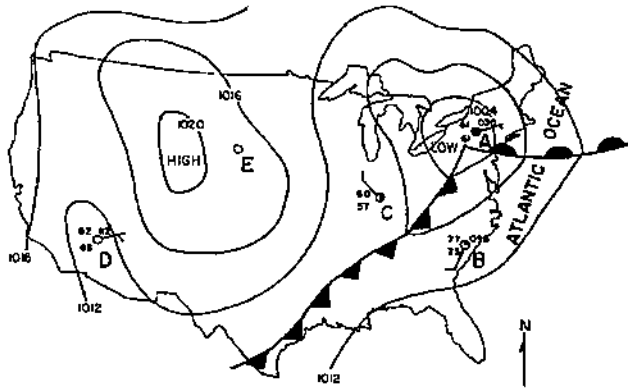
76. Which planetary wind pattern is present in many areas of little rainfall?

- (1) Winds converge and air sinks.
- (2) Winds converge and air rises.
- (3) Winds diverge and air sinks.
- (4) Winds diverge and air rises.

77. 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

Base your answers to questions 78 through 81 on your knowledge of Earth science, the *Earth Science Reference Tables*, and the surface weather map shown below. The map shows weather systems over the United States and weather station data for cities *A*, *B*, *C*, and *D*. Note that part of the weather data for city *C* and all of the weather data for city *E* are missing. The pressure field (isobars) on the map has been labeled in millibars.



78. Which city is experiencing the highest air temperature?

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

79. What type of front extends eastward away from the low-pressure center?

- (1) cold (3) stationary
 (2) warm (4) occluded

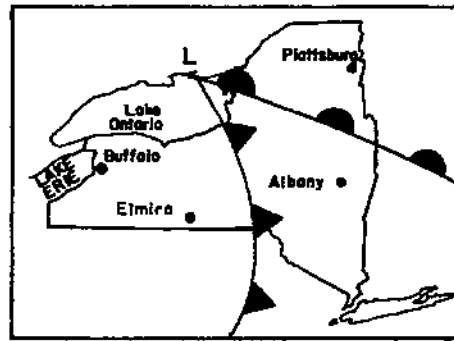
80. Which city is probably experiencing a slow, steady rain?

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

81. Which weather station model best represents the weather conditions probably existing at city *E*?

- (1) (3)
 (2) (4)

Base your answers to questions 82 and 83 on the weather map shown below.



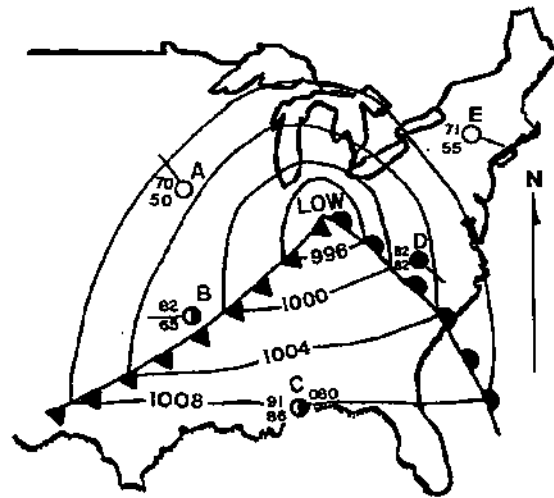
82. Which city is located in the warmest airmass?

- (1) Buffalo (3) Albany
 (2) Elmira (4) Plattsburg

83. Which city has most recently experienced a change in wind direction, brief heavy precipitation, and a rapid drop in air temperature?

- (1) Buffalo (3) Albany
 (2) Plattsburg (4) Elmira

Base your answers to questions 84 through 88 on the *Earth Science Reference Tables* and the diagram below which represents a surface weather map of a portion of the United States. The map shows a low-pressure system with frontal lines and five weather stations *A* through *E*. Note that part of the weather data is missing from each station. [All temperatures are in °F.]

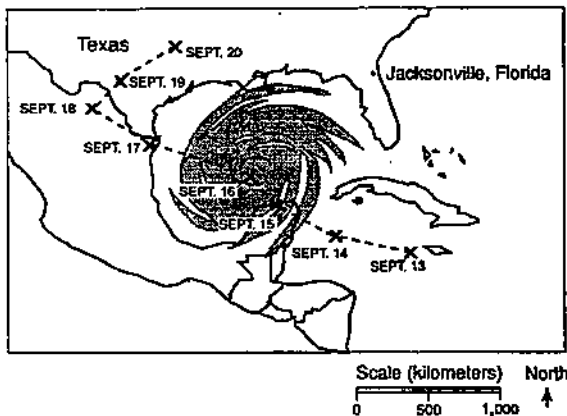


84. Which weather station has a relative humidity of 100%?

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

85. The weather at station *C* would most likely be
- (1) partly cloudy, windy, and very cold
 - (2) partly cloudy and warm
 - (3) overcast, humid, and cool
 - (4) very dry and extremely hot
86. The atmospheric pressure at the center of the low would most likely be
- (1) 988 millibars
 - (2) 990 millibars
 - (3) 994 millibars
 - (4) 997 millibars
87. The wind direction at station *A* is
- (1) northwest
 - (2) northeast
 - (3) southwest
 - (4) southeast
88. Assuming that the low-pressure system follows a normal storm track, which weather station is probably located in the path of the approaching center of the low?
- (1) *A*
 - (2) *B*
 - (3) *C*
 - (4) *E*

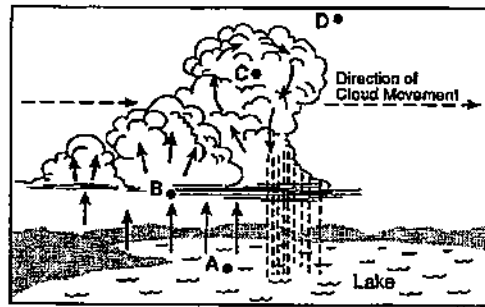
Base your answers to questions 89 through 93 on the *Earth Science Reference Tables* and the diagram below. The diagram represents a satellite image of Hurricane Gilbert in the Gulf of Mexico. Each **X** represents the position of the eye of the storm on the date indicated.



89. The general direction of Hurricane Gilbert's track from September 13 through September 18 was toward the
- (1) southwest
 - (2) southeast
 - (3) northwest
 - (4) northeast
90. The surface wind pattern associated with Hurricane Gilbert was
- (1) counterclockwise and toward the center
 - (2) counterclockwise and away from the center
 - (3) clockwise and toward the center
 - (4) clockwise and away from the center

91. What was the probable source of moisture for this hurricane?
- (1) carbon dioxide from the atmosphere
 - (2) winds from the coastal deserts
 - (3) transpiration from tropical jungles
 - (4) evaporation from the ocean
92. On September 18, Hurricane Gilbert changed direction. Which statement provides the most probable reason for this change?
- (1) The airmass was cooled by the land surface.
 - (2) The storm entered the prevailing westerlies wind belt.
 - (3) The amount of precipitation released by the storm changed suddenly.
 - (4) The amount of insolation received by the air mass decreased.
93. The air mass that gave rise to Hurricane Gilbert would be identified as
- (1) cP
 - (2) cT
 - (3) mT
 - (4) mP

Base your answers to questions 94 through 98 on the *Earth Science Reference Tables* and the diagram below. The diagram shows air movements associated with cumulus cloud formation over a lake during a summer day. *A*, *B*, *C*, and *D* are reference points.



94. Air rises from point *A* toward point *B* and forms clouds mainly because the air at point *A* has a
- (1) cool temperature and low water-vapor content
 - (2) cool temperature and high water-vapor content
 - (3) warm temperature and low water-vapor content
 - (4) warm temperature and high water-vapor content
95. At which point does the air temperature first reach the dewpoint?
- (1) *A*
 - (2) *B*
 - (3) *C*
 - (4) *D*
96. The arrows around point *C* represent the transfer of energy by
- (1) conduction
 - (2) convection
 - (3) radiation
 - (4) precipitation

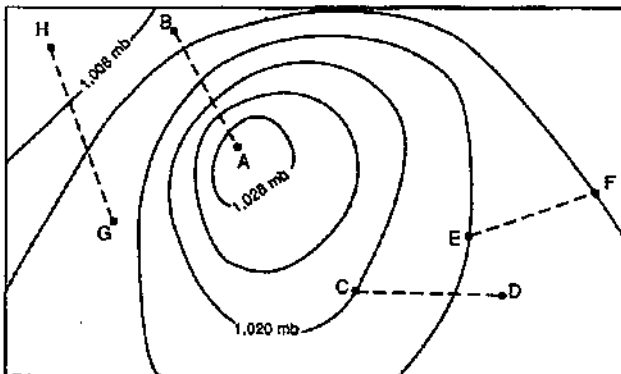
97. Point *D* is 10 kilometers above the Earth's surface. In which layer of the atmosphere is point *D* located?

- (1) upper troposphere (3) upper stratosphere
 (2) lower stratosphere (4) lower mesosphere

98. As the air rises past point *C*, the temperature of the air will

- (1) decrease as its volume decreases
 (2) decrease as its volume increases
 (3) increase as its volume decreases
 (4) increase as its volume increases

Base your answers to questions 99 through 103 on the *Earth Science Reference Tables*, the surface weather map below. The map represents a high-pressure center located over the central United States. The air pressure field lines are in millibars and the letters represent the locations of weather stations.



99. According to the *Earth Science Reference Tables*, the air pressure recorded at station *C* is equal to how many inches of mercury?

- (1) 29.95 (3) 30.12
 (2) 30.08 (4) 30.35

100. Which weather station would most likely have the same air pressure reading as station *G*?

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

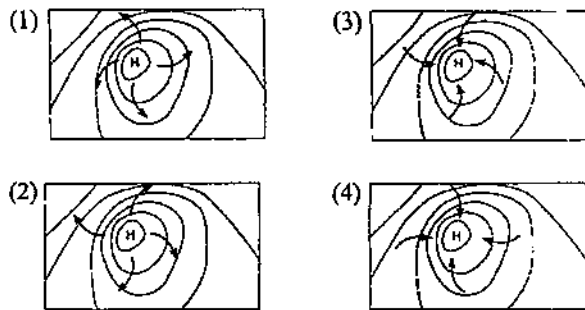
101. Along which dashed line would windspeeds be greatest?

- (1) *AB* (3) *CD*
 (2) *EF* (4) *GH*

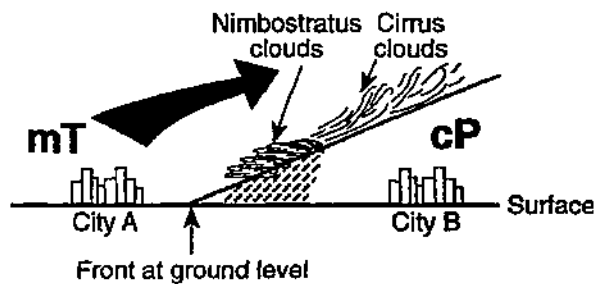
102. If the high-pressure center follows the typical direction of movement of an airmass across the United States, it will probably move toward the

- (1) southeast (3) northeast
 (2) southwest (4) northwest

103. In which diagram do the arrows best represent actual surface wind directions in this Northern Hemisphere high-pressure center?



Base your answers to questions 104 and 105 on the diagram below, which shows the frontal boundary between mT and cP air masses.



104. If the front at ground level is moving toward city *B*, which type of weather front is shown?

- (1) cold front (3) occluded front
 (2) warm front (4) stationary front

105. Why do clouds and precipitation usually occur along the frontal surface?

- (1) The warm air rises, expands, and cools.
 (2) The warm air sinks, expands, and warms.
 (3) The cool air rises, compresses, and cools.
 (4) The cool air sinks, compresses, and warms.

Base your answers to questions 106 through 109 on the *Earth Science Reference Tables* and data table below. The data table shows a classification system for hurricanes. A storm surge is a dome of water 65 to 80 kilometers wide that sweeps ashore at the coast near the point where the storm center (eye) hits the land.

Safir-Simpson Hurricane Scale

Hurricane Category	Central Air Pressure (mb)	Windspeed (km/hr)	Expected Storm Surge Height (m)	Expected Damage
1	over 979	119-153	1.2-1.5	Minimal
2	965-979	154-177	1.6-2.4	Moderate
3	945-964	178-209	2.5-3.8	Extensive
4	920-944	210-250	3.7-5.4	Extreme
5	below 920	over 250	over 5.4	Catastrophic

106. Which characteristic must a tropical storm have to be classified as a hurricane on the Safir-Simpson scale?
 (1) enough strength to cause catastrophic damage
 (2) a storm surge of at least 2.0 m
 (3) central air pressure over 980 mb
 (4) a windspeed of at least 119 km/hr
107. Which type of air mass is usually the source of the moisture that causes the strong winds and heavy rain found in hurricanes?
 (1) mT
 (2) mP
 (3) cT
 (4) cP
108. The difference between the windspeed of a category-1 hurricane and the windspeed of a category-5 hurricane is primarily caused by the differences in
 (1) types of clouds
 (2) amounts of precipitation
 (3) air-pressure gradients
 (4) air-temperature gradients
109. A hurricane with a central air pressure recorded at 28.70 inches has an expected storm surge of
 (1) 1.3 m
 (2) 2.0 m
 (3) 3.3 m
 (4) 4.0 m

110. Which graph best represents the most common relationship between the amount of air pollution and the distance from an industrial city?

