1. The map below shows the amount of snowfall, in inches, produced by a lake-effect snowstorm in central New York State.



The wind that produced this snowfall pattern most likely came from the

1) northeast	2) northwest	3) southeast	4) southwest
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2. Which map below shows the most likely storm track for a hurricane in the Atlantic Ocean?



3. The diagram below shows weather instruments A and B.



Which table correctly indicates the name of the weather instrument and the weather variable that it measures?

1)	Instrument		Weather Variable
	Letter	Name	Measured
	A	thermometer	humidity
	В	wind vane	wind direction

2)	
L)	

Instrument		Weather Variable	
Letter	Name	Measured	
А	thermometer	wind direction	
В	wind vane	humidity	

3)	Instrument		Weather Variable
	Letter	Name	Measured
	A	barometer	wind speed
	В	anemometer	air pressure

4)	Instrument		Weather Variable
	Letter	Name	Measured
	A	barometer	air pressure
	В	anemometer	wind speed

4. Data from two weather instruments have been recorded on the graph below. Line *A* on the graph represents air-temperature data. Line *B* was plotted using the scale for variable *B*.



Line *B* on the graph represents data from which weather instrument?

- 1) thermometer 2) barometer
- 3) psychrometer 4) anemometer
- 5. Which list correctly matches each instrument with the weather variable it measures?
 - wind vane—wind speed thermometer—temperature precipitation gauge—relative humidity
 - 2) wind vane—wind direction thermometer—dewpoint psychrometer—air pressure
 - barometer—relative humidity anemometer—cloud cover precipitation gauge—probability of precipitation
 - barometer—air pressure anemometer—wind speed psychrometer—relative humidity
- 6. Which weather change is most likely indicated by rapidly falling air pressure?
 - 1) Humidity is decreasing.
 - 2) Temperature is decreasing.
 - 3) Skies are clearing.
 - 4) A storm is approaching.
- 7. Weather-station measurements indicate that the dewpoint temperature and air temperature are getting farther apart and that air pressure is rising. Which type of weather is most likely arriving at the station?
 - 1) a snowstorm
 - 2) a warm front
 - 3) cool, dry air
 - 4) maritime tropical air

8. The map below shows high-pressure and low-pressure weather systems in the United States.



Which two lettered positions on the map are most likely receiving precipitation?

- 1) *A* and *B* 2) *B* and *D*
- 3) C and E 4) A and D
- 9. Which weather station model for a New York State location indicates that snow may be about to fall?



10. Base your answer to the following question on the weather map below, which shows a storm system centered near the Great Lakes. Letters *A* through *D* represent weather stations shown on the map.



What weather conditions are shown at location D?

- 1) cloudy skies with light snow
- 3) saturated air with no precipitation
- 11. Which weather conditions are most probable when the moisture content of the air increases, resulting in a lower atmospheric pressure?
 - 1) sunny and fair
 - 2) cold and windy
 - 3) partly cloudy, with skies becoming clear
 - 4) cloudy, with a chance of precipitation
- 12. A map of the United States is shown below.



Weather conditions in which location would be of most interest to a person predicting the next day's weather for New York State?

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

2) cloudy skies with freezing rain

- 4) partly cloudy skies with rain showers
 - 13. 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 statement best explains the difference between the cities' climates?
 - 1) Ocean surfaces change temperature more slowly than land surfaces.
 - Warm, moist air rises when it meets cool, dry air.
 - 3) Wind speeds are usually greater over land surfaces than over ocean surfaces.
 - 4) Ocean surfaces have a lower specific heat than land surfaces.
 - 14. Monsoons develop as a result of
 - 1) large changes between the temperatures of a continent and neighboring oceans
 - 2) a continent and neighboring oceans having nearly the same temperatures
 - 3) air rising over Earth's equatorial region
 - 4) air sinking over Earth's polar regions

15. 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?

- 1) Rising air compresses and cools in winter.
- 2) Water heats and cools more rapidly than land in winter.
- 3) Prevailing winds reverse direction in summer.
- 4) The vertical rays of the Sun shift north of the equator in summer.
- 16. Students wish to study the effect of elevation above sea level on air temperature and air pressure. They plan to hike in the Adirondack Mountains from Heart Lake, elevation 2,179 feet, to the peak of Mt. Marcy, elevation 5,344 feet. Which instruments should they use to collect their data?
 - 1) anemometer and psychrometer
 - 2) anemometer and barometer
 - 3) thermometer and psychrometer
 - 4) thermometer and barometer

17. Which graph best represents the relationship between air temperature and air density in the atmosphere?



18. A temperature of 104°F is approximately equal to

1)	220°C	2)	214°C
\mathbf{a}	1000		1000

- 3) 43°C 4) 40°C
- 19. An air temperature of 30°C is equal to

1)	–22°F	2)	−2°F
3)	74°F	4)	86°F

- 20. What is the average air pressure exerted by Earth's atmosphere at sea level, expressed in millibars and inches of mercury?
 - 1) 1013.25 mb and 29.92 in of Hg
 - 2) 29.92 mh and 1013.25 in of Hg
 - 3) 1012.65 mb and 29.91 in of Hg
 - 4) 29.91 mb and 1012.65 in of Hg

Base your answers to questions 21 through 24 on

the weather map below, which 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.



21. The arrows on which map show the most likely path in which these two pressure centers will move over the next few days?



22. The arrows on which map best show the pattern of surface winds around these two pressure centers?



23. Which map shows the most likely location of clouds associated with these pressure centers?



24. The data used to construct the isolines on this map were recorded in which units?

1) inches2) millibars3) feet4) meters

- 25. Which weather variable generally *decreases* when wind speed is increasing, clouds are thickening, and visibility drops?
 - 1) relative humidity 2) dewpoint
 - 3) precipitation 4) air pressure

Base your answers to questions 26 and 27 on the weather map below, which 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.



26. Which map best represents the type of fronts and direction of movement of these fronts in relation to the low-pressure center?





27. The arrows on which map best represent the surface wind pattern around this low-pressure center?



28. 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?

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

29. 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?



- 30. The highest surface wind speeds occur when there is a
 - 1) 4-millibar air-pressure difference between two nearby locations
 - 2) 4-millibar air-pressure difference between two distant locations
 - 3) 20-millibar air-pressure difference between two nearby locations
 - 4) 20-millibar air-pressure difference between two distant locations
- 31. Which graph best represents the change in air pressure as air temperature increases at Earth's surface?



32. An instrument used to measure a weather variable is shown below.



Which weather variable is measured by this instrument?

- 1) wind direction 2) air pressure
- 3) wind speed 4) amount of rainfall
- 33. A barometric pressure of 1021.0 millibars is equal to how many inches of mercury?
 - 1) 29.88 2) 30.15 3) 30.25 4) 30.50
- 34. Earth's surface winds generally blow from regions of higher
 - 1) air temperature toward regions of lower air temperature
 - 2) air pressure toward regions of lower air pressure
 - 3) latitudes toward regions of lower latitudes
 - 4) elevations toward regions of lower elevations

Base your answers to questions **35** and **36** on the weather map below, which shows a low-pressure system centered near Poughkeepsie, New York. Isobars shown are measured in millibars.



- 35. Surface winds are most likely blowing from
 - 1) Danbury toward New York City
 - 2) Poughkeepsie toward Scranton
 - 3) Binghamton toward Danbury
 - 4) Port Jervis toward Binghamton
- 36. Which city is most likely experiencing winds of the greatest velocity?
 - 1) New York City 2) Binghamton
 - 3) Poughkeepsie 4) Scranton
- 37. The table below shows air-pressure readings taken at two cities, in the same region of the United States, at noon on four different days. Air-Pressure Readings

Day	City A Air Pressure (mb)	City B Air Pressure (mb)
1	1004.0	1004.0
2	1000.1	1002.9
3	1000.2	1011.1
4	1010.4	1012.3

The wind speed in the region between cities A and B was probably the greatest at noon on day

1) 1 2) 2 3) 3 4) 4

38. Various weather conditions at LAX Airport in Los Angeles are shown on the station model below.



What were the barometric pressure and weather conditions at the airport at the time of the observation?

- 1) 914.6 mb of pressure and smog
- 2) 914.6 mb of pressure and a clear sky
- 3) 1014.6 mb of pressure and smog
- 4) 1014.6 mb of pressure and a clear sky
- 39. Air pressure is usually highest when the air is
 - 1) warm and humid 2) warm and dry
 - 3) cold and humid 4) cold and dry
- 40. A high-pressure center is generally characterized by
 - 1) cool, wet weather 2) cool, dry weather
 - 3) warm, wet weather 4) warm, dry weather
- 41. 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?
 - 1) Warm, moist air is moving into the area.
 - 2) Warm, dry air is moving into the area.
 - 3) Cold, dry air is moving into the area.
 - 4) A cold front has just passed through this area.
- 42. What is the relative humidity when the dry-bulb temperature is 16°C and the wet-bulb temperature is 14°C?
 - 1) 90% 2) 80% 3) 14% 4) 13%

- 43. An observer measured the air temperature and the dewpoint and found the difference between them to be 12°C. One hour later, the difference between the air temperature and the dewpoint was found to be 4°C. Which statement best describes the changes that were occurring?
 - 1) The relative humidity was decreasing and the chance of precipitation was decreasing.
 - 2) The relative humidity was decreasing and the chance of precipitation was increasing.
 - 3) The relative humidity was increasing and the chance of precipitation was decreasing.
 - 4) The relative humidity was increasing and the chance of precipitation was increasing.
- 44. Which gas in the atmosphere has the most influence on day-to-day weather changes?
 - 1) ozone 2) oxygen
 - 3) water vapor 4) carbon dioxide
- 45. The diagram below shows a weather instrument found at most weather stations.



The main function of this instrument is to measure which weather variable?

- 1) wind speed 2) wind direction
- 3) air pressure 4) relative humidity

46. Base your answer to the following question on the reading passage about lake-effect snow and the radar image map below, and on your knowledge of Earth science. The radar map shows areas where snowfall was occurring. The whitest area indicates where snowfall was heaviest.

Lake-Effect Snow

In late fall, cold air originating in Canada and then moving over the Great Lakes often produces lake-effect snow in New York State.

When the cold air mass moves across large areas of warmer lake water, water vapor enters the cold air. When this moist air moves over the cooler land, the moisture comes out of the atmosphere as snow. The effect is enhanced when the air that flows off the lake is forced over higher land elevations. The areas affected by lake-effect snow can receive many inches of snow per hour. As the lakes gradually freeze, the ability to produce lake-effect snow decreases.



Radar Image Map

Adapted from: www.erh.noaa.gov

Which map shows the most likely direction that winds were moving across Lake Ontario to produce this lake-effect snow?



47. Which map best represents the surface wind pattern associated with high-pressure and low-pressure systems in the Northern Hemisphere?



- 48. The climates of densely populated industrial areas tend to be warmer than similarly located sparsely populated rural areas. From this observation, what can be inferred about the human influence on local climate?
 - 1) Local climates are not affected by increases in population density.
 - 2) The local climate in densely populated areas can be changed by human activities.
 - 3) In densely populated areas, human activities increase the amount of natural pollutants.
 - 4) In sparsely populated areas, human activities have stabilized the rate of energy absorption.
- 49. Global warming is most likely occurring due to an increase in
 - 1) carbon dioxide and methane gases in the atmosphere
 - 2) oxygen and nitrogen gases in the atmosphere
 - ultraviolet radiation and x rays reflected from Earth
 - 4) visible light and radio waves reflected from Earth



50. Which graph best shows the relationship between transparency of the atmosphere and the amount of aerosols (tiny particles) put into the atmosphere?



51. The map of North America below shows the source region of an air mass forming mostly over Mexico.



This air mass originating over Mexico is classified as

- 1) continental polar 2) continental tropical
- 3) maritime polar 4) maritime tropical
- 52. Dry areas caused by sinking air and diverging surface winds are located at which two latitudes?
 - 1) 0° and 30° N 2) 0° and 60° S
 - 3) 30° N and 30° S 4) 60° N and 60°S
- 53. What is the dewpoint when the dry-bulb temperature is 8°C and the wet-bulb temperature is 2°C?
 - 1) 28°C 2) 6°C 3) 3°C 4) –9°C

Base your answers to questions 54 and 55 on the map below, which shows the position of the jet stream relative to two air masses and a low-pressure center (L) over the United States.



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

- 1) into the mT air mass to the west
- 2) into the cP air mass to the northwest
- 3) along the path of the jet stream to the northeast
- 4) along the path of the jet stream to the southwest

55. What is the difference in the air temperature and humidity between the cP and mT air masses?

- 1) The cP air mass is warmer and less humid.
- 2) The cP air mass is colder and more humid.
- 3) The mT air mass is warmer and more humid.
- 4) The mT air mass is colder and less humid.

56. 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*?



Base your answers to questions 57 and 58 on the weather map below, which shows a high-pressure center (H) and a low-pressure center (L), with two fronts extending from the low-pressure center. Points X and Y are locations on the map connected by a reference line.



57. Which map best shows the most probable areas of precipitation associated with these weather systems?



RR#4 - Multiple Choice

58. Which cross section best represents the fronts and air movements in the lower atmosphere along line *XY*?



- 59. Weather along most fronts is usually cloudy with precipitation because the warm air along most fronts is usually
 - 1) sinking and cooling, causing water to evaporate
 - 2) sinking and warming, causing water to evaporate
 - 3) rising and cooling, causing water vapor to condense
 - 4) rising and warming, causing water vapor to condense

60. The diagram below represents a cross section of air masses and frontal surfaces along line AB. The dashed lines represent precipitation.



Which weather map best represents this frontal system?



Base your answers to questions **61** through **63** on the weather map below, which shows a weather system that is affecting part of the United States.



61. Which diagram shows the surface air movements most likely associated with the fronts?



62. Which map best shows the areas in which precipitation is most likely occurring? [Darkened areas represent precipitation.]



63. What is the total number of different kinds of weather fronts shown on this weather map?

1) 1 2) 2 3) 3 4) 4

64. A weather station model for a location in New York State is shown below.



The air mass over this location is best described as

- 1) cold with low humidity and high air pressure
- 2) cold with high humidity and low air pressure
- 3) warm with high humidity and low air pressure
- 4) warm with low humidity and high air pressure
- 65. Which map shows the two correctly labeled air masses that frequently converge in the central plains to cause tornadoes?



66. The graph below shows changes in the atmosphere occurring above typical air-mass source regions *A*, *B*, *C*, and *D*. Changes in air temperature and altitude are shown as the graphed lines. Changes in water-vapor content, in grams of vapor per kilogram of air, are shown as numbers on each graphed line.



Which list best identifies each air-mass source region?

- 1) A cT, B cP, C mP, D mT
- 2) A cP, B mP, C mT, D cT
- 3) A mP, B mT, C cT, D cP
- 4) A mT, B cT, C cP, D mP
- 67. An Earth science student observed the following weather conditions in Albany, New York, for 2 days: The first day was warm and humid with southerly winds. The second day, the temperature was 15 degrees cooler, the relative humidity had decreased, and wind direction was northwest. Which type of air mass most likely had moved into the area on the second day?
 - 1) continental tropical 2) continental polar
 - 3) maritime tropical 4) maritime polar
- 68. 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

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



70. The station model below shows some weather conditions at a location on Earth's surface.



Which present weather symbol represents the most likely type of precipitation occurring at this location?



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



What was the most likely dewpoint at this location? 1) 32°F 2) 40°F 3) 61°F 4) 70°F 72. Weather station models for three New York State cities on the same day at the same time are shown below.



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



RR#4 - Multiple Choice

Base your answers to questions **73** through **76** on the weather map below. The map shows isobars and seven weather station models. Four of the weather stations are identified by letters *A*, *B*, *C*, and *D*.



73. Which weather information shown at station B was measured with an anemometer and weather vane?

4) 138

- 1) 34 2) **(** 3)
- 74. What was the probable air pressure, in millibars, at station D?
 - 1) 1015.0 mb 2) 1017.0 mb 3) 1021.0 mb 4) 1036.0 mb
- 75. Which weather station had the highest relative humidity?
 - 1) A
 2) B
 3) C
 4) D
- 76. Which New York State weather station had clear skies?
 - 1) Albany 2) Buffalo 3) New York City 4) Syracuse

RR#4 - Multiple Choice

Base your answers to questions 77 and 78 on on the station models below, which show various weather conditions recorded at the same time on the same day at four different cities.



77. Which weather symbol best represents the type of precipitation that was most likely occurring in Utica?

3)

-27\

-27\

- 1) 🗶

during the last three hours?

27

1)

3)

-27

4) Utica

78. Which city had the lowest relative humidity?

79. Which station model correctly represents the

2)

weather conditions in an area that is experiencing

winds from the northeast at 25 knots and has had a

steady drop in barometric pressure of 2.7 millibars

4)

1) Chicago 3) Buffalo 2) Detroit

2)

80. The station model below shows the weather conditions at Houston, Texas, at 9 a.m. on a



What was the barometric pressure at Houston 3 hours earlier on that day?

- 1) 997.1 mb 2) 999.7 mb
- 3) 1003.3 mb 4) 1009.1 mb





82. Which weather station model indicates the greatest probability of precipitation?



Base your answers to questions **83** through **85** on the weather map below and on your knowledge of Earth science. The map of a portion of eastern North America shows a high-pressure center (**H**) and a low-pressure center (**L**), frontal boundaries, and present weather conditions.



- 83. The general surface wind circulation associated with the high-pressure center (**H**) is most likely
 - 1) clockwise and outward
 - 2) clockwise and inward
 - 3) counterclockwise and outward
 - 4) counterclockwise and inward
- 84. What was the most likely source region for the air mass over Pennsylvania?
 - 1) New York State 2) Pacific Ocean
 - 3) Gulf of Mexico 4) Canada
- 85. Which weather condition is shown along the cold front?
 - 1) fog 2) snow
 - 3) haze 4) thunderstorms