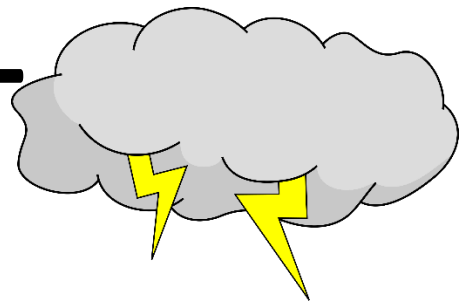




# KEEP CALM AND USE YOUR ESRT



PLAINEDGE MIDDLE SCHOOL

SESSION #: **5 Weather**

EARTH SCIENCE REGENTS REVIEW

Name: \_\_\_\_\_

Base your answers to questions 1 through 3 on Read the passage below:

### Greenhouse Effect

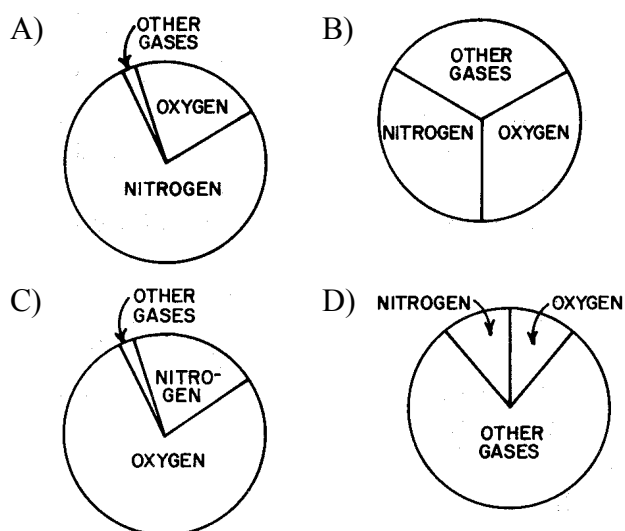
The warming of Earth's surface and lower atmosphere tends to intensify with an increase in atmospheric carbon dioxide. The atmosphere allows a large percentage of the visible light rays from the Sun to reach Earth's surface. Some of this energy is reradiated by Earth's surface in the form of long-wave infrared radiation. Much of this infrared radiation warms the atmosphere when it is absorbed by molecules of carbon dioxide and water vapor. A similar warming effect is produced by the glass of a greenhouse, which allows sunlight in the visible range to enter, but prevents infrared radiation from leaving the greenhouse.

The absorption of infrared radiation causes Earth's surface and the lowest layer of Earth's atmosphere to warm to a higher temperature than would otherwise be the case. Without this "greenhouse" warming, Earth's average surface temperature could be as low as  $-73^{\circ}\text{C}$ . The oceans would freeze under such conditions.

Many scientists believe that modern industrialization and the burning of fossil fuels (coal, oil, and natural gas) have increased the amount of atmospheric carbon dioxide. This increase may result in an intensified greenhouse effect on Earth causing significant alterations in climate patterns in the future. Scientists estimate that average global temperatures could increase by as much as  $5^{\circ}\text{C}$  by the middle of the 21st century.

- Which part of the electromagnetic spectrum is absorbed by the Earth's atmosphere to create the greenhouse effect?  
A) infrared      B) visible light      C) X-rays      D) Radio waves
  - Explain why most scientists believe an increase in the greenhouse effect will cause sea levels to rise.
  - State one possible change humans could make to significantly reduce the amount of greenhouse gases added to the atmosphere each year.
- 
- The Earth's atmosphere allows which part of the electromagnetic spectrum to reach earth the most?  
A) Gamma rays      B) infrared  
C) X-rays      D) visible light
  - The greatest atmospheric pressure occurs in the  
A) troposphere      B) stratosphere  
C) mesosphere      D) thermosphere

6. Which circle graph best represents the volume of gases in the troposphere?

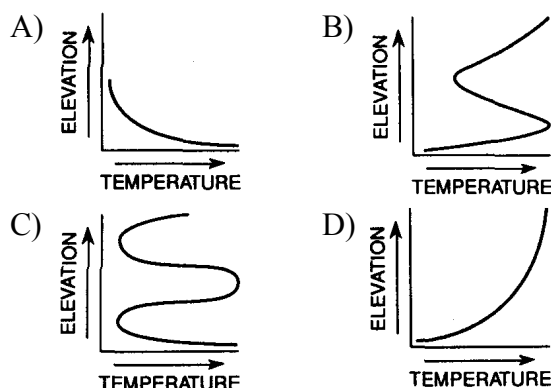


## REGENTS REVIEW: WEATHER

7. As altitude within the troposphere increases, the amount of water vapor generally

- A) decreases, only
- B) increases, only
- C) remains the same
- D) decreases, then increases

8. Which graph best represents the relationship between air temperature and elevation in the troposphere?



9. Which statement best describes the stratosphere?

- A) It is warmer at the top than at the bottom.
- B) It is located 75 kilometers above sea level.
- C) It has greater pressure at the top than at the bottom.
- D) It absorbs large amounts of water vapor from the troposphere.

10. As a weather balloon released from the surface of Earth rises through the troposphere, the instruments it carries will usually indicate that

- A) temperature, atmospheric pressure, and concentration of water vapor decrease
- B) temperature decreases, but atmospheric pressure and concentration of water vapor increase
- C) temperature increases, but atmospheric pressure and concentration of water vapor decrease
- D) temperature, atmospheric pressure, and concentration of water vapor increase

11. Ozone is concentrated in Earth's atmosphere at an altitude of 20 to 35 kilometers. Which atmospheric layer contains the greatest concentration of ozone?

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

12. An air temperature of  $95^{\circ}\text{C}$  most often exists in which layer of the atmosphere?

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

13. Which statement best explains why climates at continental shorelines generally have a smaller yearly temperature range than inland climates at the same latitude?

- A) Land is a poor absorber and a poor conductor of heat energy.
- B) Land changes temperature rapidly, due to the high specific heat and lack of transparency of land.
- C) Ocean water is a good absorber and a good conductor of heat energy.
- D) Ocean water changes temperature slowly, due to the high specific heat and transparency of water.

14. On sunny summer days, a breeze often develops that blows from large bodies of water toward nearby land masses because the

- A) temperature of the air above the land masses is greater
- B) specific heat of the land masses is greater
- C) temperatures of the bodies of water are greater
- D) air over the bodies of water becomes heavier with additional water vapor

15. Which substance has the highest specific heat?

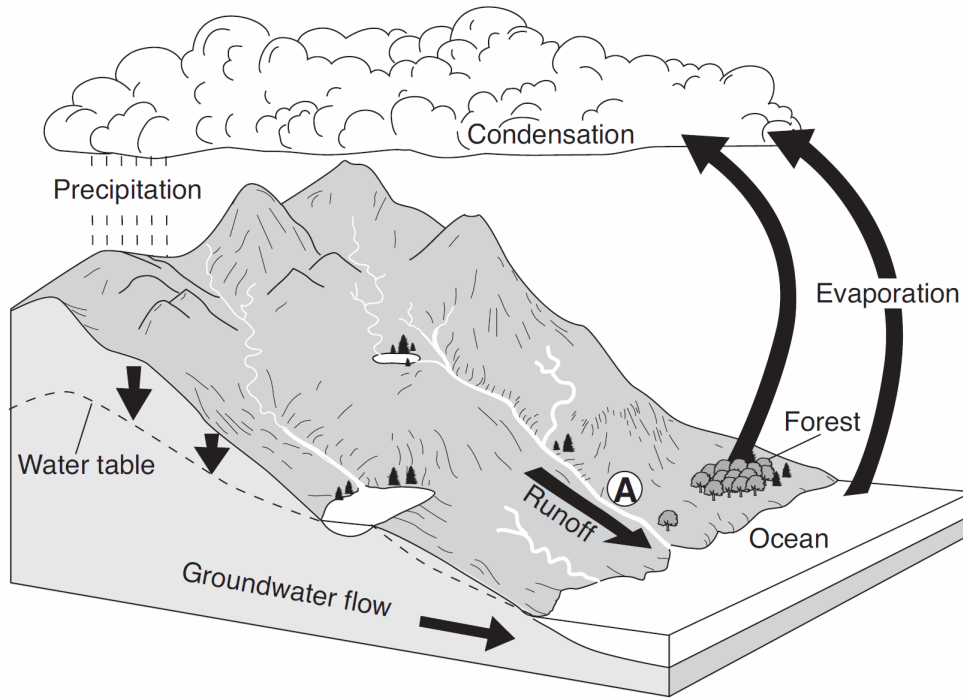
- A) iron
- B) water
- C) lead
- D) granite

16. A city located near the center of a large continent has colder winters and warmer summers than a city at the same elevation and latitude located on the continent's coast. Which statement best explains the difference between the cities' climates?

- A) Wind speeds are greater over land than over oceans.
- B) Air masses originate only over land.
- C) Land has a lower specific heat than water.
- D) Water changes temperature more rapidly than land.

## REGENTS REVIEW: WEATHER

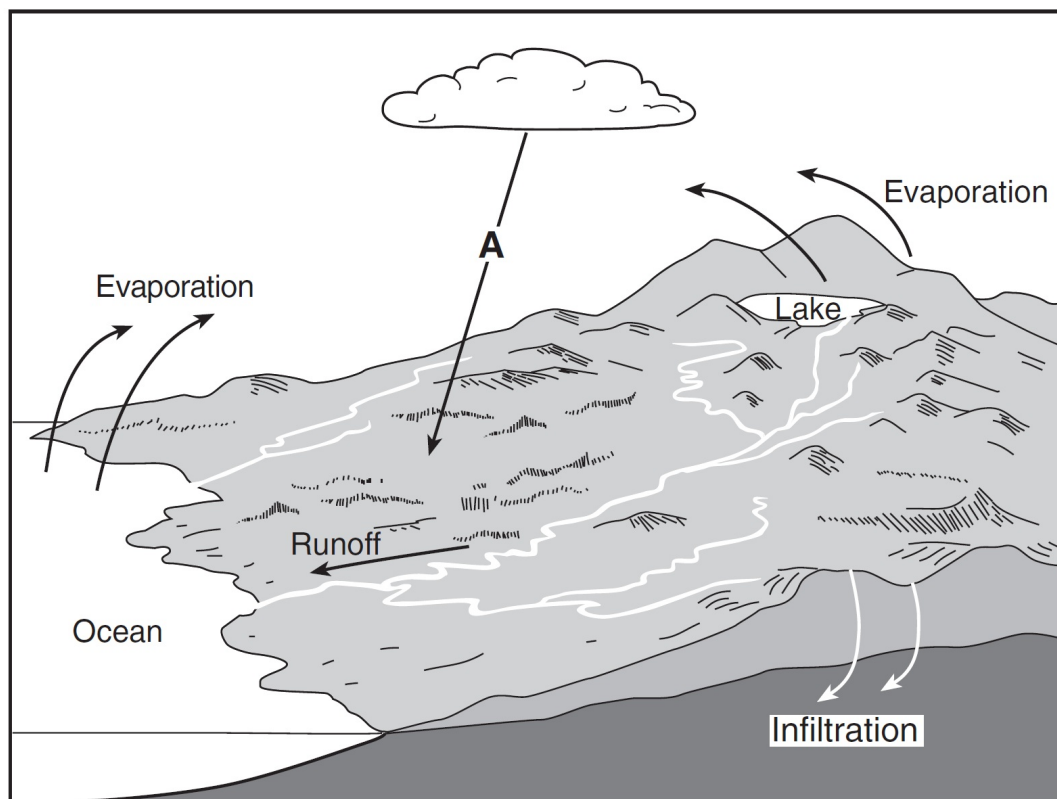
17. Base your answer to the following question on the diagram below, which represents Earth's water cycle. The arrows represent some water cycle processes. Letter *A* indicates a surface location on Earth.



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

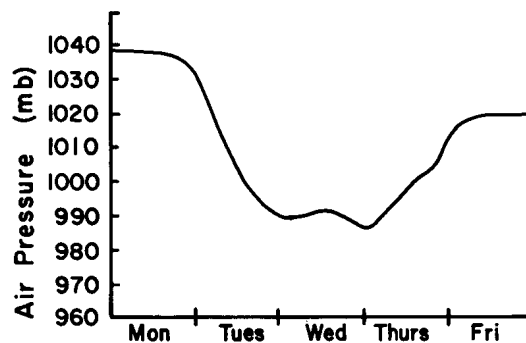
## REGENTS REVIEW: WEATHER

18. Base your answer to the following question on the model below and on your knowledge of Earth science. The model shows the movement of water in the water cycle. Arrow *A* represents a process within the water cycle.



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

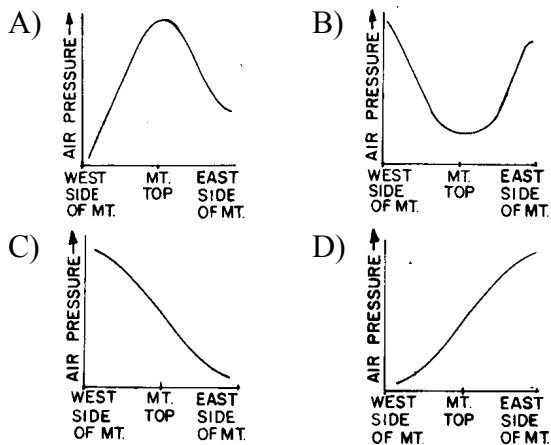
19. When 1 gram of liquid water at  $0^{\circ}$  Celsius freezes to form ice, how many total Joules of heat are lost by the water?  
A) 4.18   B) 2.11   C) 334   D) 2260
20. The graph below shows the surface air pressure at a certain city during a five-day period. On which day was the warmest airmass probably over the city for the entire day?



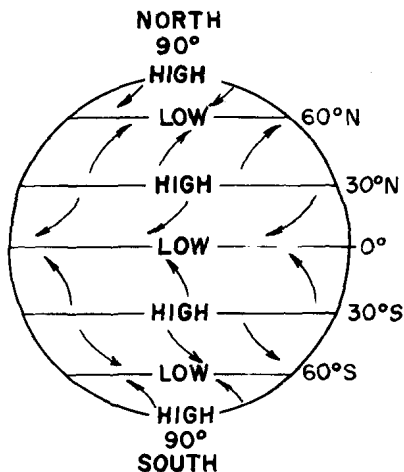
- A) Monday                      B) Tuesday  
C) Wednesday                D) Friday

## REGENTS REVIEW: WEATHER

21. An observer recorded the barometric pressure while traveling up the west side of a mountain and down the other side. Which graph best represents the probable air pressure changes that were observed?



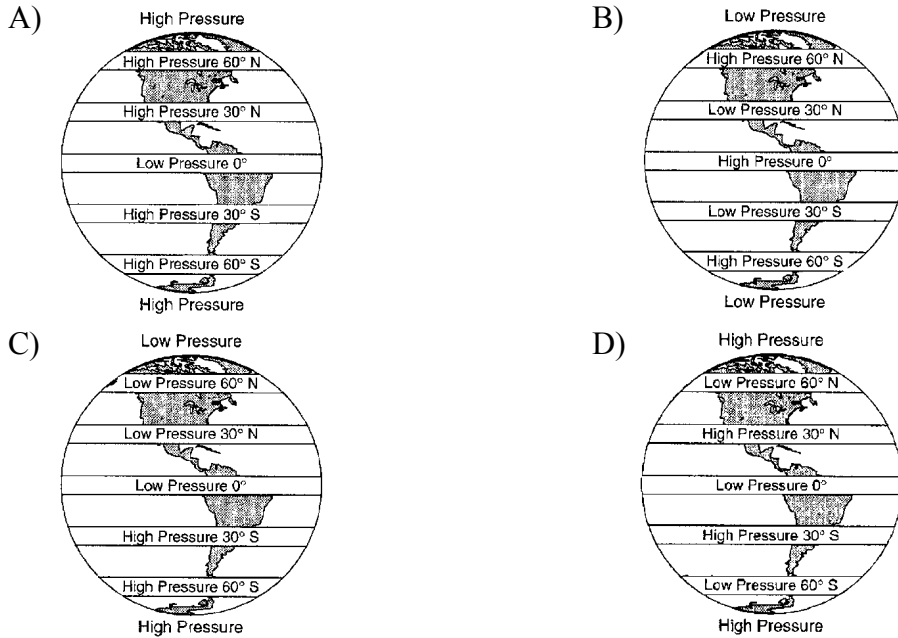
22. The diagram below shows the Earth's high and low air pressure belts and direction of prevailing winds for a particular time of the year. The winds do *not* appear to blow in a straight line from the high-pressure belts to the low-pressure belts. Which statement best explains this observation?



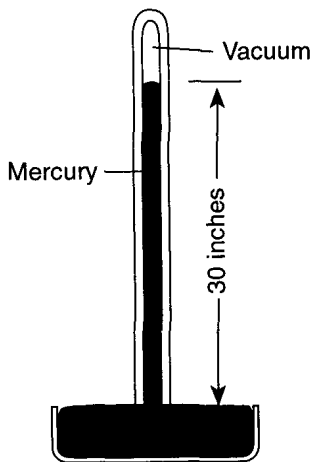
- A) Wind direction is modified by the Earth's rotation.
- B) Wind direction is modified by land forms.
- C) Wind direction is modified by water areas.
- D) Wind direction is modified by the Sun's motion.
23. An air pressure of 29.47 inches of mercury is equal to
- A) 996 mb                      B) 998 mb
- C) 1,002 mb                    D) 1,014 mb

## REGENTS REVIEW: WEATHER

24. Which map represents the normal location of high and low air-pressure belts on the Earth?



25. Base your answer to the following question on the diagram below of a weather instrument.

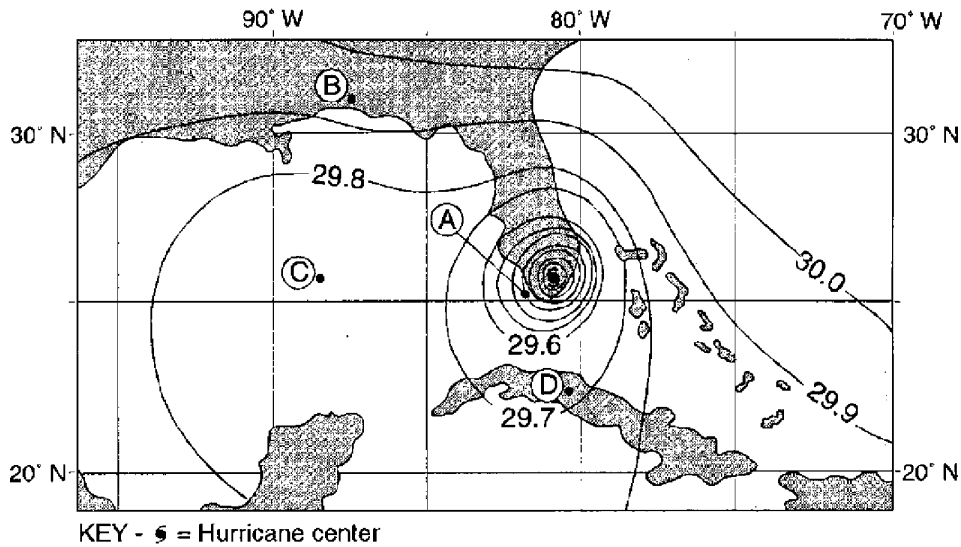


Which weather variable is this instrument designed to measure?

- A) visibility
- B) relative humidity
- C) dewpoint temperature
- D) air pressure

## REGENTS REVIEW: WEATHER

26. Base your answer to the following question on the weather map below, which shows a hurricane that was located over southern Florida. The isobars show air pressure in inches of mercury. Letters *A* through *D* represent four widely separated locations.



At which location were the winds of this hurricane the strongest?

- A) *A*                      B) *B*                      C) *C*                      D) *D*
- 
27. Air pressure is usually highest when the air is
- A) warm and humid    B) warm and dry  
C) cold and humid    D) cold and dry
28. During the warmest part of a June day, breezes blow from the ocean toward the shore at the beach. Which statement best explains why this happens?
- A) Winds usually blow from hot to cold areas.  
B) Winds never blow from the shore toward the ocean.  
C) Air pressure over the ocean is higher than air pressure over the land.  
D) Air pressure over the land is higher than air pressure over the ocean.
29. Which weather-station model shows an air pressure of 993.4 millibars?
- A)    B) 
  
C)    D) 
  

30. 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?

A) anemometer and psychrometer  
B) anemometer and barometer  
C) thermometer and psychrometer  
D) thermometer and barometer

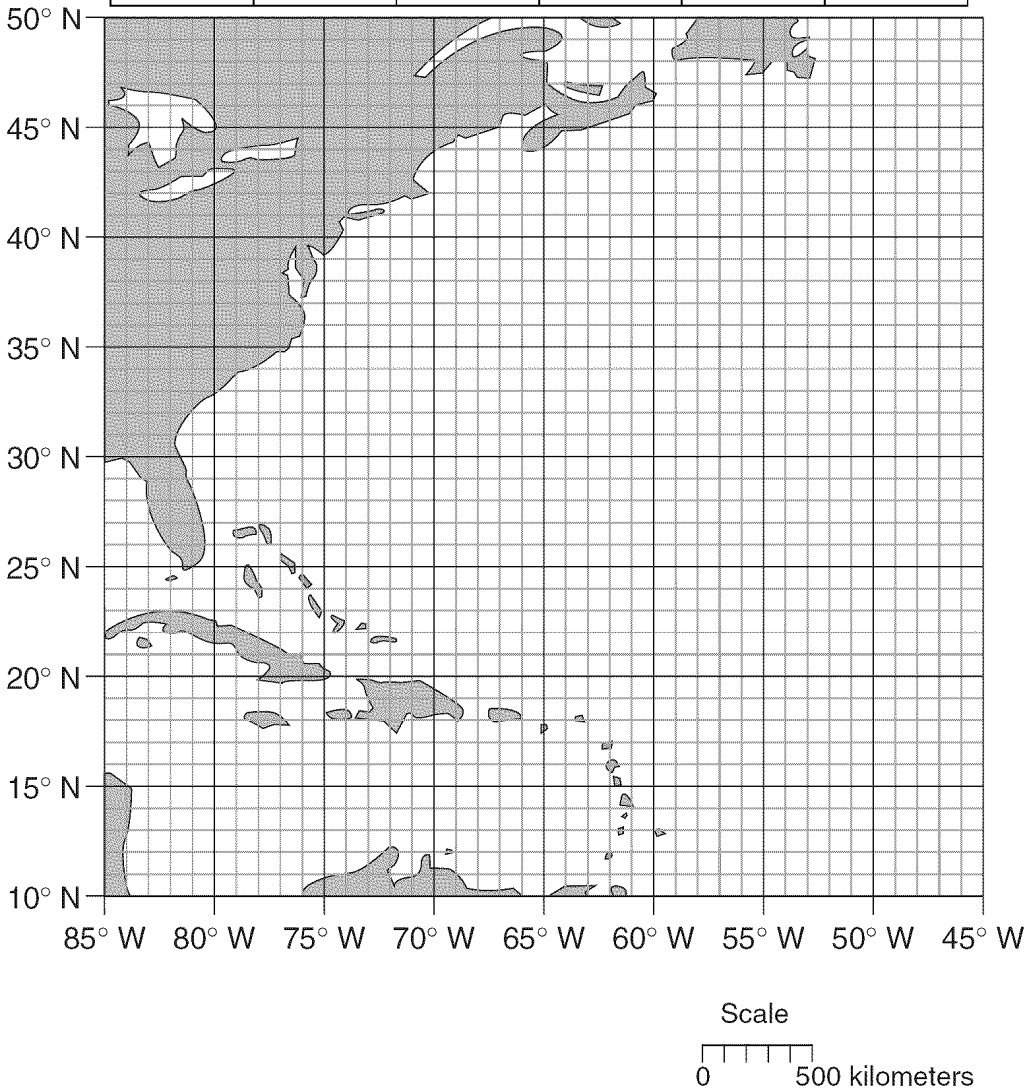


REGENTS REVIEW: WEATHER

31. Base your answer to the following question on the data table, which shows recorded information for a major Atlantic hurricane and the map below.

Hurricane Data

Date	Time	Latitude	Longitude	Maximum Winds (knots)	Air Pressure (mb)
Sept. 10	11:00 a.m.	19° N	59° W	70	989
Sept. 11	11:00 a.m.	22° N	62° W	95	962
Sept. 12	11:00 a.m.	23° N	67° W	105	955
Sept. 13	11:00 a.m.	24° N	72° W	135	921
Sept. 14	11:00 a.m.	26° N	77° W	125	932
Sept. 15	11:00 a.m.	30° N	79° W	110	943



Describe the relationship between air pressure and wind speed associated with this hurricane.

## REGENTS REVIEW: WEATHER

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32. Which weather change is most likely indicated by rapidly falling air pressure?

- A) Humidity is decreasing.
- B) Temperature is decreasing.
- C) Skies are clearing.
- D) A storm is approaching.

33. 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

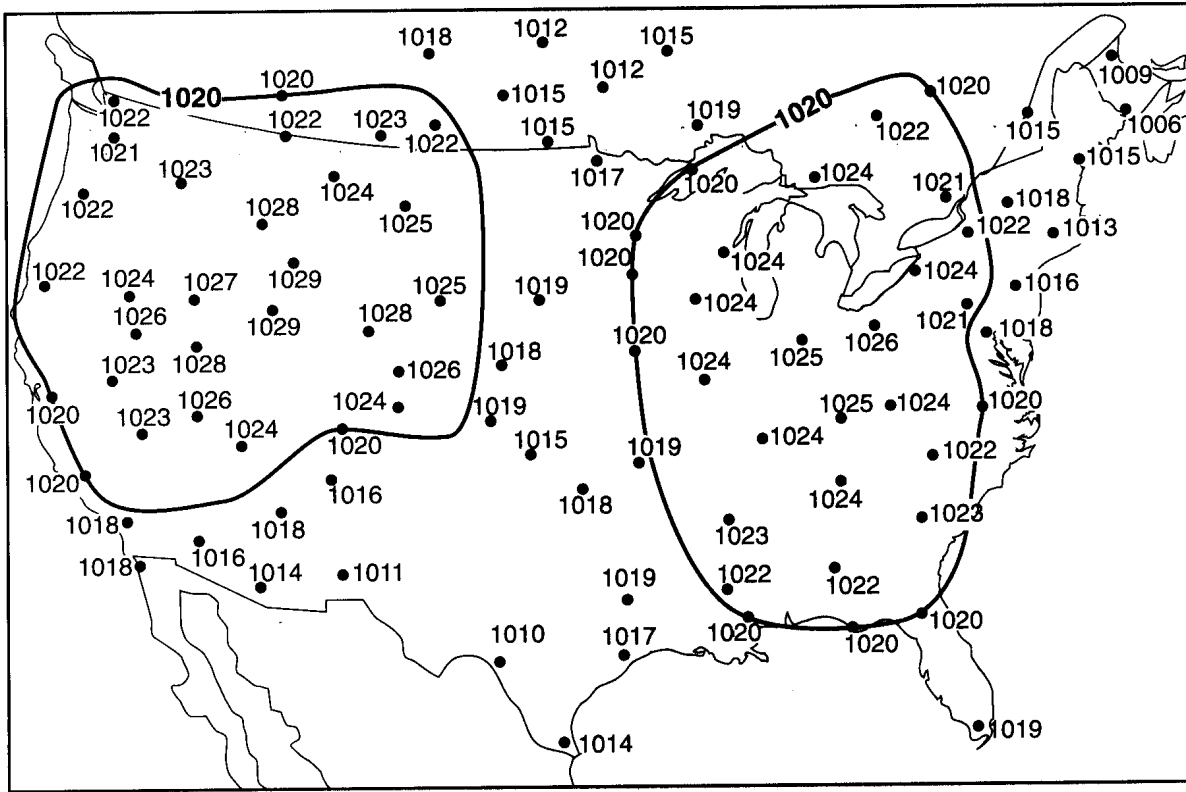
The wind speed in the region between cities *A* and *B* was probably the greatest at noon on day

- A) 1      B) 2      C) 3      D) 4

## REGENTS REVIEW: WEATHER

34. Base your answer to the following question on the weather map provided below, which shows surface air-pressure readings, in millibars, at various locations in the United States and Canada. The 1020-millibar isobars have been drawn and labeled.

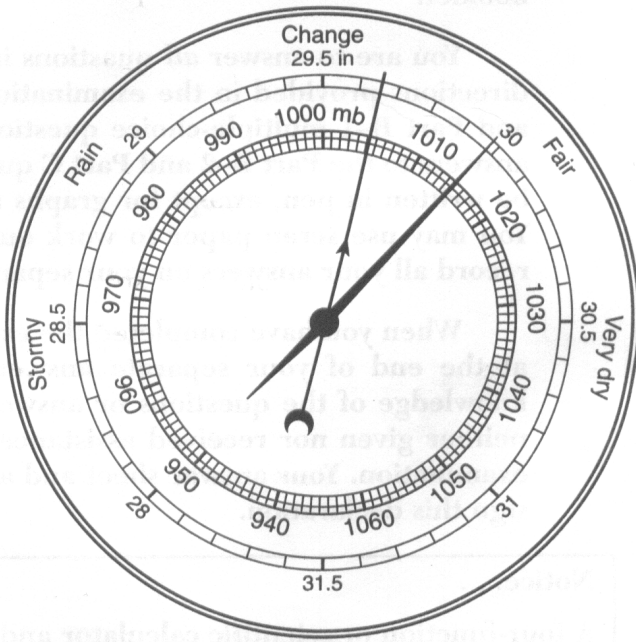
## Surface Air Pressures



Draw the 1024- and 1028-millibar isobars on the weather map provided above.

## REGENTS REVIEW: WEATHER

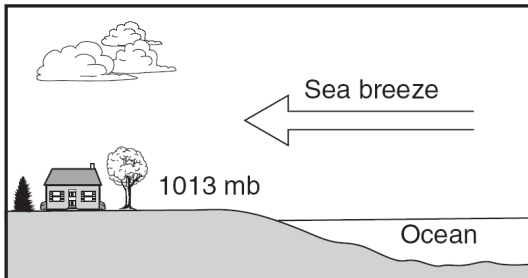
35. A weather instrument is shown below.



Which weather variable is measured by this instrument?

- A) wind speed
- B) precipitation
- C) cloud cover
- D) air pressure

36. The cross section below shows a sea breeze blowing from the ocean toward the land. The air pressure at the land surface is 1013 millibars.

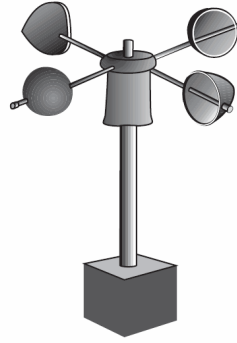


(Not drawn to scale)

The air pressure at the ocean surface a few miles from the shore is most likely

- A) 994 mb
- B) 1005 mb
- C) 1013 mb
- D) 1017 mb

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

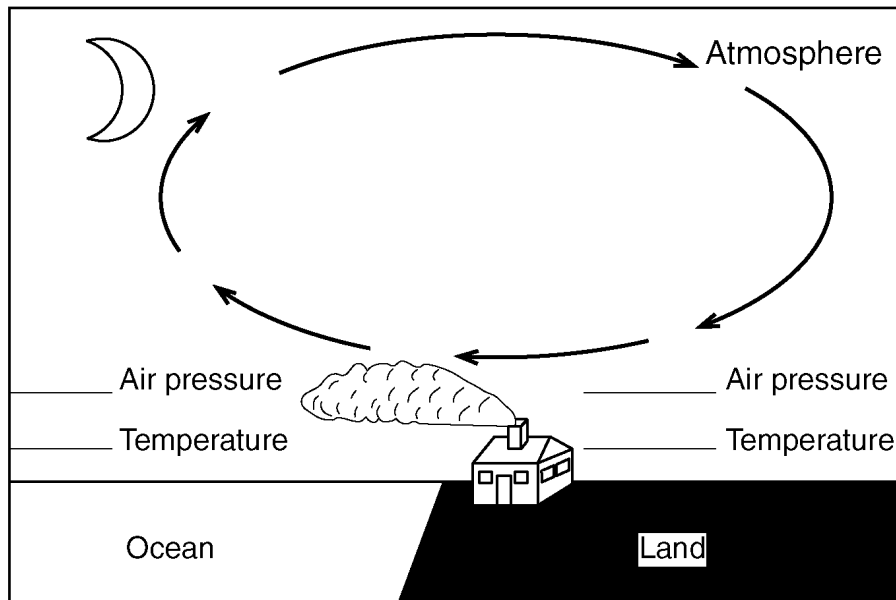


Which weather variable is measured by this instrument?

- A) wind direction
- B) air pressure
- C) wind speed
- D) amount of rainfall

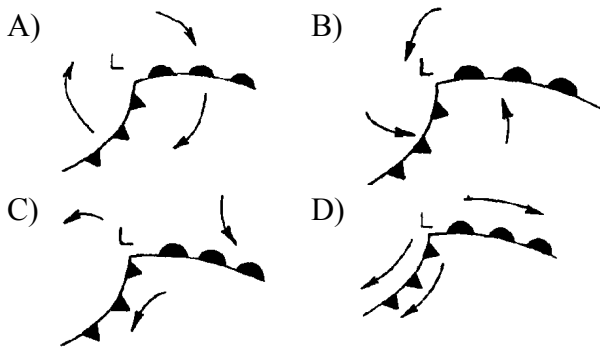
## REGENTS REVIEW: WEATHER

38. Base your answer to the following question on the cross section provided below, which represents a house at an ocean shoreline at night. Smoke from the chimney is blowing out to sea.



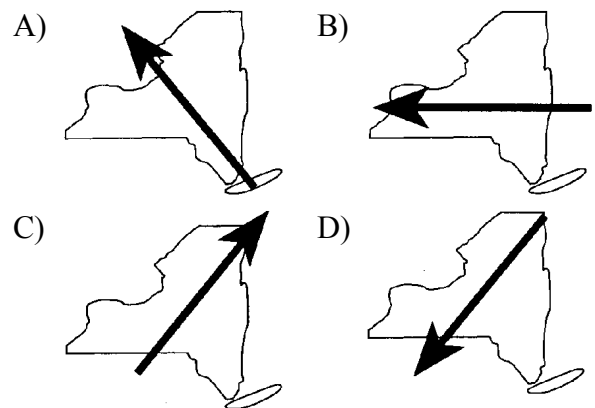
- a* Label the *two* lines provided on the cross section above to show where air pressure is relatively "high" and where it is relatively "low."
- b* Assume that the wind blowing out to sea on this night is caused by local air-temperature conditions. Label the *two* lines provided on the cross section above to show where Earth's surface air temperature is relatively "warm" and where it is relatively "cool."

39. Which diagram below best represents the air circulation around a Northern Hemisphere low-pressure center?



40. In the Northern Hemisphere, what is the direction of surface wind circulation in a low-pressure system?
- A) counterclockwise and outward from the center  
 B) counterclockwise and toward the center  
 C) clockwise and outward from the center  
 D) clockwise and toward the center

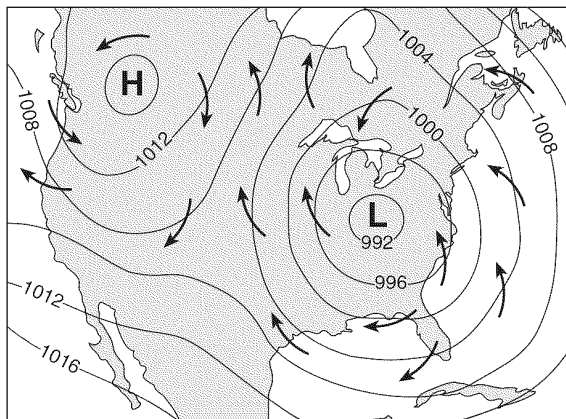
41. In which map does the arrow show the general direction that most low-pressure storm systems move across New York State?



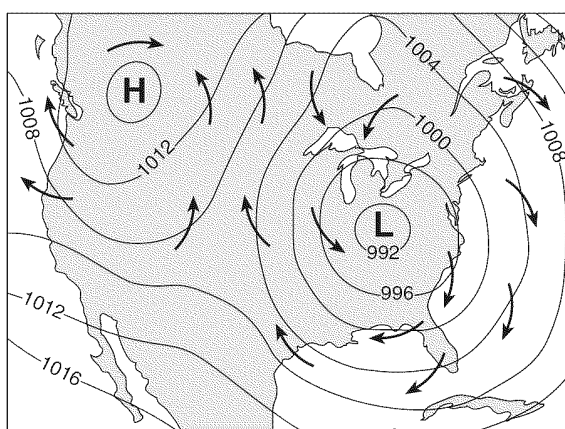
## REGENTS REVIEW: WEATHER

42. Which map best represents the direction of surface winds associated with the high-pressure and low-pressure systems?

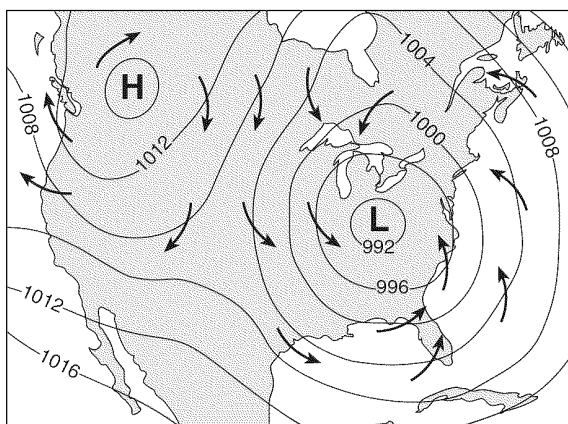
A)



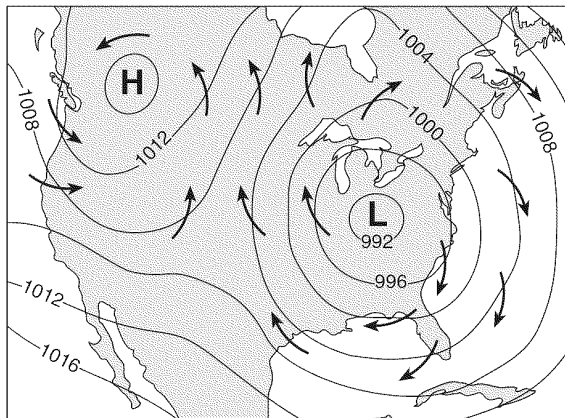
B)



C)



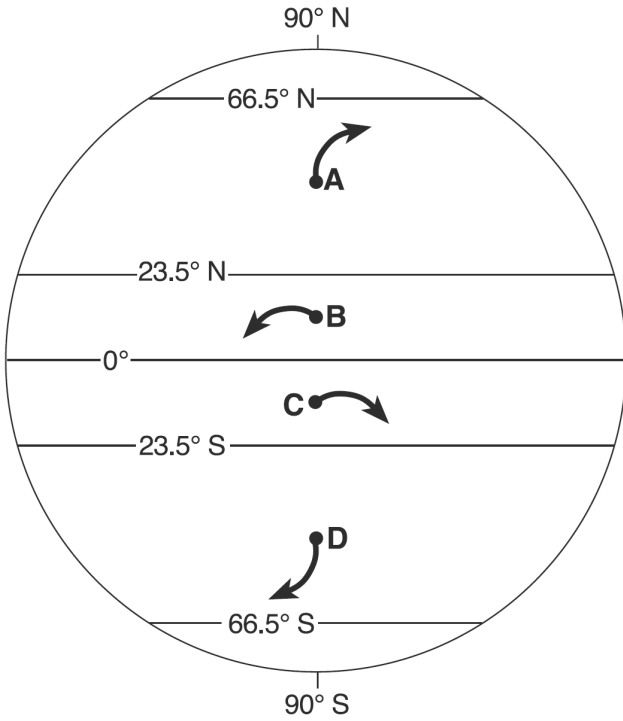
D)



## REGENTS REVIEW: WEATHER

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43. The arrows in the diagram below show changes in the direction of surface winds at four lettered locations, *A*, *B*, *C*, and *D*, on Earth.

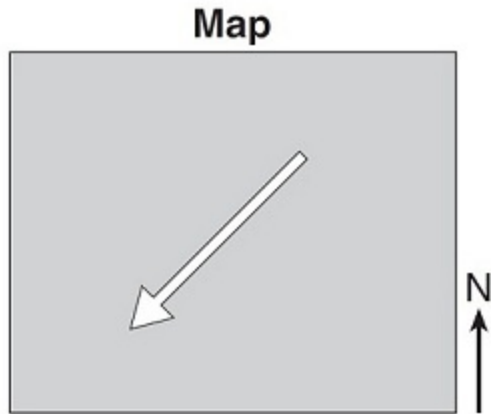


The arrow at which location correctly shows a deflection of the wind that could be due to the Coriolis effect?

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

## REGENTS REVIEW: WEATHER

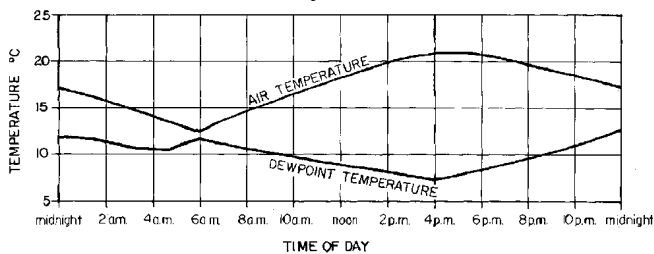
44. The arrow on the map below represents the direction a wind is blowing over a land surface in the Northern Hemisphere *without* showing the Coriolis effect.



Which dashed arrow represents how the wind direction will change in the Northern Hemisphere due to the Coriolis effect?

- A)
- B)
- C)
- D)

45. The graph below shows the changes in air temperature and dewpoint temperature over a 24-hour period at a particular location. At what time was the relative humidity *lowest*?



- A) midnight  
B) 6 a.m.  
C) 10 a.m.  
D) 4 p.m.

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

- A) clearing skies  
B) cloud formation  
C) decreasing relative humidity  
D) increasing temperature



## REGENTS REVIEW: WEATHER

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47. Under which conditions is a cloud most likely to form at the Earth's surface?
- A) The air temperature is above the dewpoint, and no condensation nuclei are present.
  - B) The air temperature is at the dewpoint, and condensation nuclei are abundant.
  - C) The relative humidity is zero, and condensation nuclei are abundant.
  - D) The air temperature and air pressure are stable, and condensation nuclei are scarce.
48. What is the wet-bulb temperature when the air temperature is 16°C and the relative humidity is 71%?
- A) 11°C B) 13°C C) 3°C D) 19°C
49. A sling psychrometer shows a dry-bulb reading of 14°C and a wet-bulb reading of 9°C. What are the dewpoint and the relative humidity?
- A) -10°C and 16% B) -10°C and 50%  
C) 4°C and 16% D) 4°C and 50%
50. The chart below shows the air temperature and the dewpoint temperature near the ground at a given location for four consecutive days. All temperatures were recorded at noon.

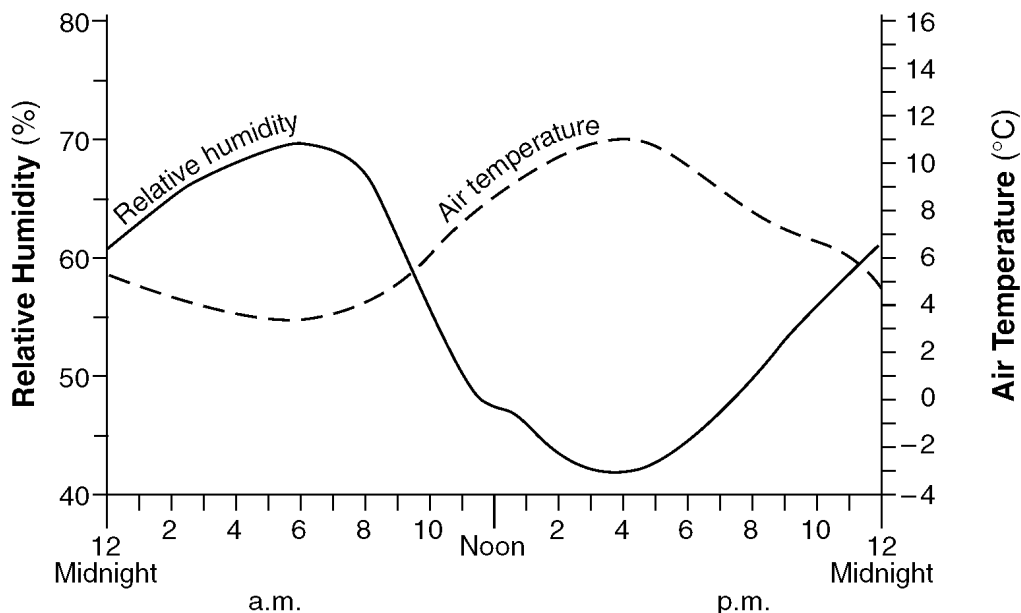
Day	Air Temperature (°C)	Dewpoint Temperature (°C)
1	20	11
2	18	17
3	16	14
4	20	13

Which statement is best supported by the data?

- A) Relative humidity was highest on day 1.
  - B) The greatest amount of water vapor was in the atmosphere on day 2.
  - C) The base level for cloud formation was highest on day 3.
  - D) The chance of precipitation was greatest on day 4.
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## REGENTS REVIEW: WEATHER

51. Base your answer to the following question on the graph below, which shows the changes in relative humidity and air temperature during a spring day in Washington, D.C.

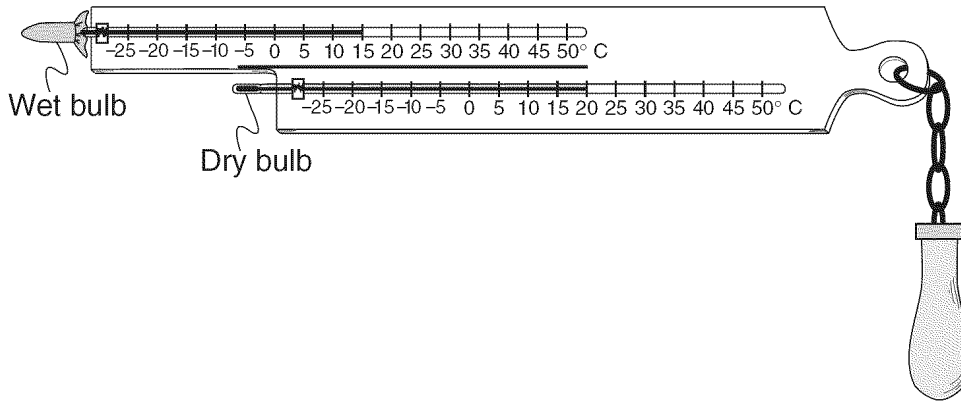


Which statement best describes the relationship between relative humidity and air temperature as shown by the graph?

- A) Relative humidity decreases as air temperature decreases.
  - B) Relative humidity decreases as air temperature increases.
  - C) Relative humidity increases as air temperature increases.
  - D) Relative humidity remains the same as air temperature decreases.
- 
52. Which list correctly matches each instrument with the weather variable it measures?
- A) wind vane—wind speed  
thermometer—temperature  
precipitation gauge—relative humidity
  - B) wind vane—wind direction  
thermometer—dewpoint  
psychrometer—air pressure
  - C) barometer—relative humidity  
anemometer—cloud cover  
precipitation gauge—probability of precipitation
  - D) barometer—air pressure  
anemometer—wind speed  
psychrometer—relative humidity

## REGENTS REVIEW: WEATHER

53. The diagram below shows a sling psychrometer.

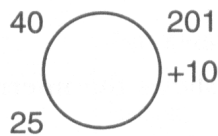


Based on the dry-bulb temperature and the wet-bulb temperature, what is the relative humidity?

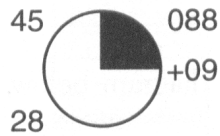
- A) 66%      B) 58%      C) 51%      D) 12%

Base your answers to questions 54 and 55 on the information on the four station models shown below. The weather data were collected at Niagara Falls, Syracuse, Utica, and New York City at the same time.

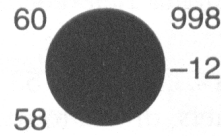
Niagara Falls



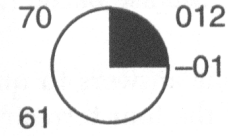
Syracuse



Utica



New York City

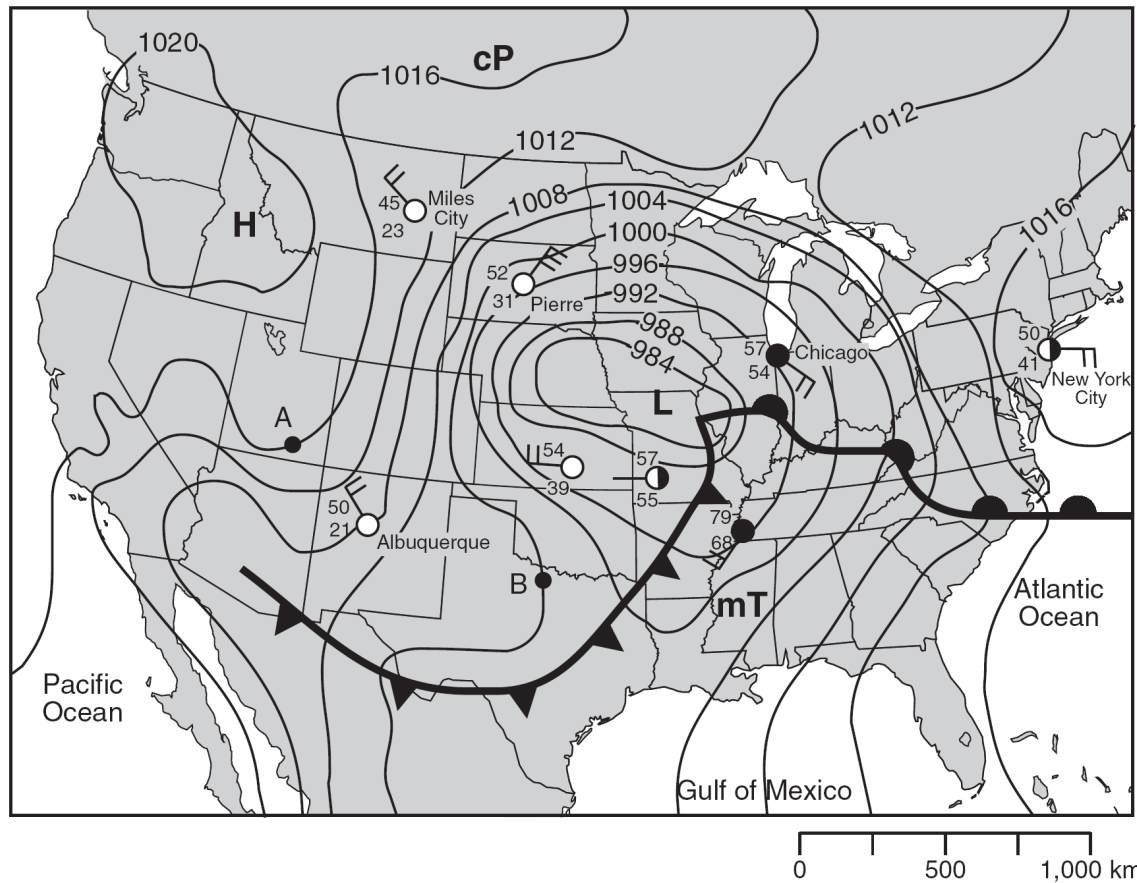


54. What was the air pressure in Niagara Falls?

55. Explain how the weather conditions shown on the station models suggest that Utica had the greatest chance of precipitation.

## REGENTS REVIEW: WEATHER

56. Base your answer to the following question on weather map below. The isobars show air pressures, in millibars. Points *A* and *B* indicate locations on the map.

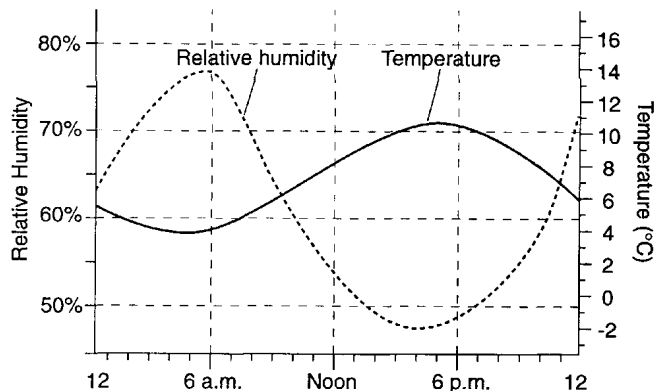


Write the names of the cities listed below in sequence from lowest relative humidity to highest relative humidity.

Albuquerque  
Chicago  
New York City

# REGENTS REVIEW: WEATHER

57. Base your answer to the following question on the graph below, which shows variations in air temperature and relative humidity for spring day in Oswego, New York.



At what time did the air most likely have the greatest capacity to hold water vapor?

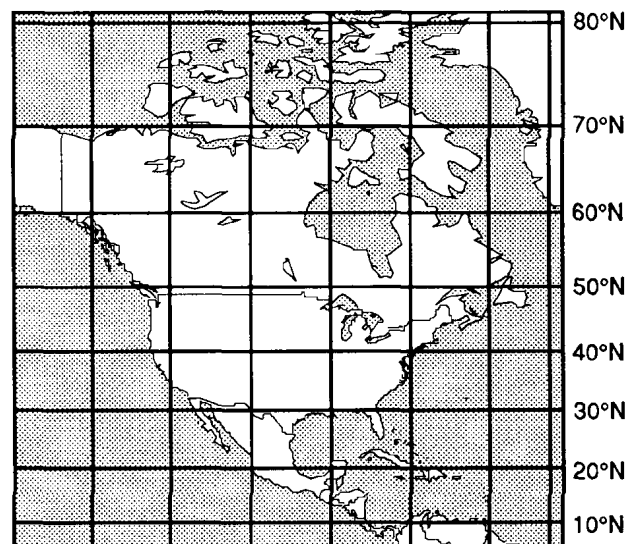
- A) 5 a.m.                      B) 10 a.m.  
C) 5 p.m.                      D) 10 p.m.
58. The incomplete flowchart below shows some of the changes that occur in warm air as it rises to form a cloud.



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

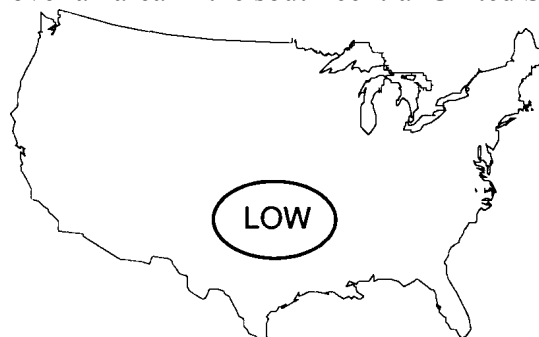
- A) The air warms as it expands.  
B) The air cools until it reaches the dewpoint.  
C) The air's relative humidity decreases to zero.  
D) The air enters the thermosphere.
59. An air mass originating over the North Pacific Ocean would most likely be
- A) continental polar  
B) continental tropical  
C) maritime polar  
D) maritime tropical

60. An airmass originates with its center located at 25° N and 90° W.



Based on the map, this air mass would be classified as

- A) cP    B) mP    C) cT    D) mT
61. The map below shows a low-pressure system located over an area in the south-central United States.



In the next few days, because of the prevailing winds, the air mass will probably move toward the

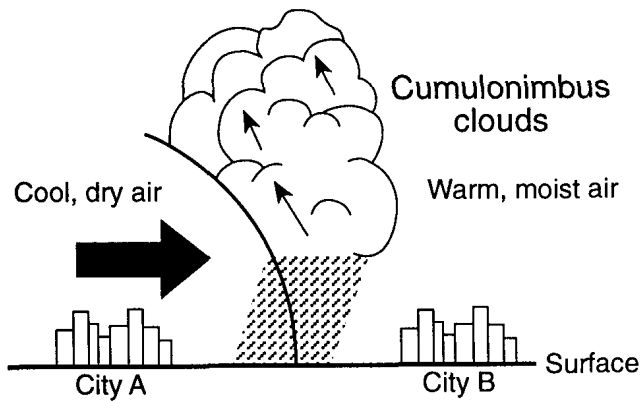
- A) southeast                      B) northeast  
C) southwest                      D) northwest
62. Which abbreviation indicates a warm air mass that contains large amounts of water vapor?
- A) cP    B) cT    C) mT    D) mP

## REGENTS REVIEW: WEATHER

63. Compared to a maritime tropical air mass, a continental polar air mass is

- A) cooler and contains less moisture
- B) cooler and contains more moisture
- C) warmer and contains less moisture
- D) warmer and contains more moisture

64. The cross section below shows a weather front. The large arrow shows the direction of the movement of the cool air mass.



Which type of weather front is shown?

- A) warm front
- B) cold front
- C) occluded front
- D) stationery front

65. Base your answer to the following question on the weather map of North America below. The map shows the location of a front and the air mass influencing its movement.

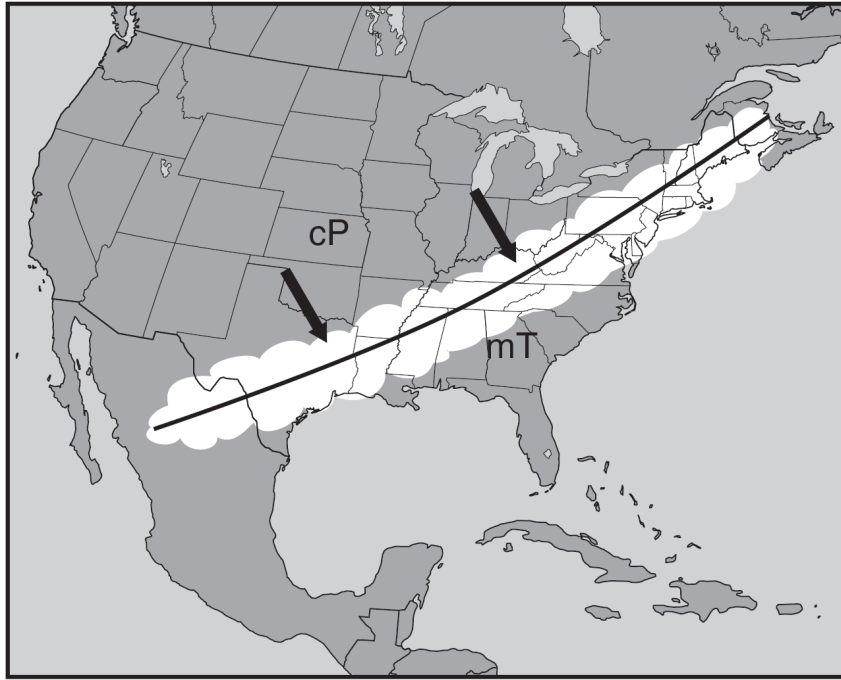


Which region is the probable source of the air mass labeled cP on the map?

- A) central Canada
- B) southwestern United States
- C) North Atlantic Ocean
- D) Gulf of Mexico

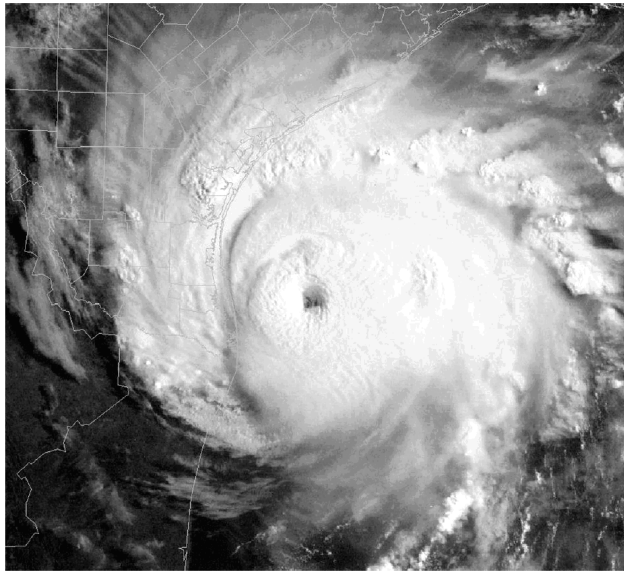
## REGENTS REVIEW: WEATHER

66. Base your answer to the following question on the weather map provided below, which shows a large white band of clouds moving toward the southeast. The line shown in the middle of the white cloud band is the frontal boundary between a cP air mass and an mT air mass. Two large arrows show the direction the front is moving.



On the frontal boundary line on the weather map provided above, draw the weather front symbol to represent the front moving toward the southeast.

Base your answers to questions 67 and 68 on the satellite image below, which shows a Northern Hemisphere hurricane.



67. When the eye of this hurricane reaches  $43^{\circ}$  N latitude, this hurricane will most likely be pushed by planetary winds toward the
- A) northwest      B) northeast      C) southwest      D) southeast

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68. Which air mass is normally associated with the formation of hurricanes?

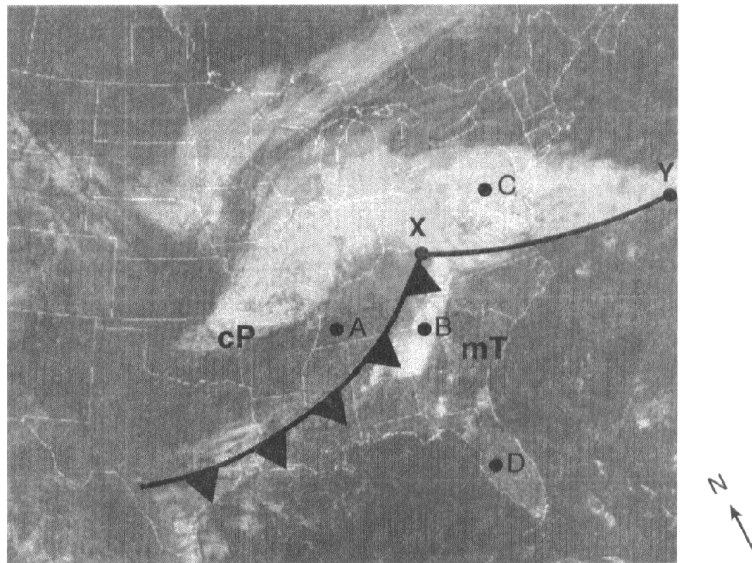
- A) continental tropical
- B) maritime tropical
- C) continental polar
- D) maritime polar

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69. The properties of an air mass are mostly determined by the

- A) rate of Earth's rotation
- B) direction of Earth's surface winds
- C) source region where the air mass formed
- D) path the air mass follows along a land surface

Base your answers to questions **70** through **73** on the satellite image shown below. The satellite image shows a low-pressure system over a portion of the United States. Air-mass symbols and frontal boundaries have been added. Line *XY* is one frontal boundary. Points *A*, *B*, *C*, and *D* represent surface locations. White area represent clouds.



70. In the picture above, draw the proper symbol to represent the most probable front on line *XY*.

71. State *one* process that causes clouds to form in the moist air along the cold front.

72. Describe *one* piece of evidence shown on the map that suggests location *A* has a lower relative humidity than location *B*.

73. Explain why location *A* most likely has a cooler temperature than location *B*.

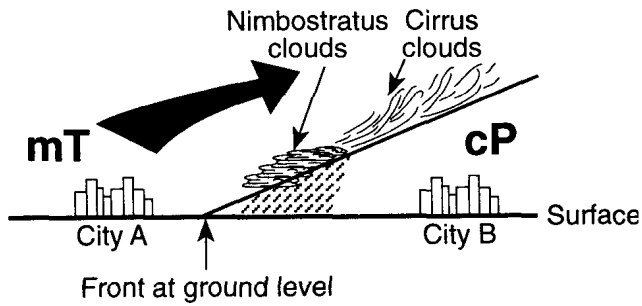
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74. Base your answer to the following question on the diagram below, which shows the frontal boundary between mT and cP air masses.



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

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

## REGENTS REVIEW: WEATHER

Base your answers to questions 75 and 76 on the magazine article and diagram below.

### Lake-Effect Snow

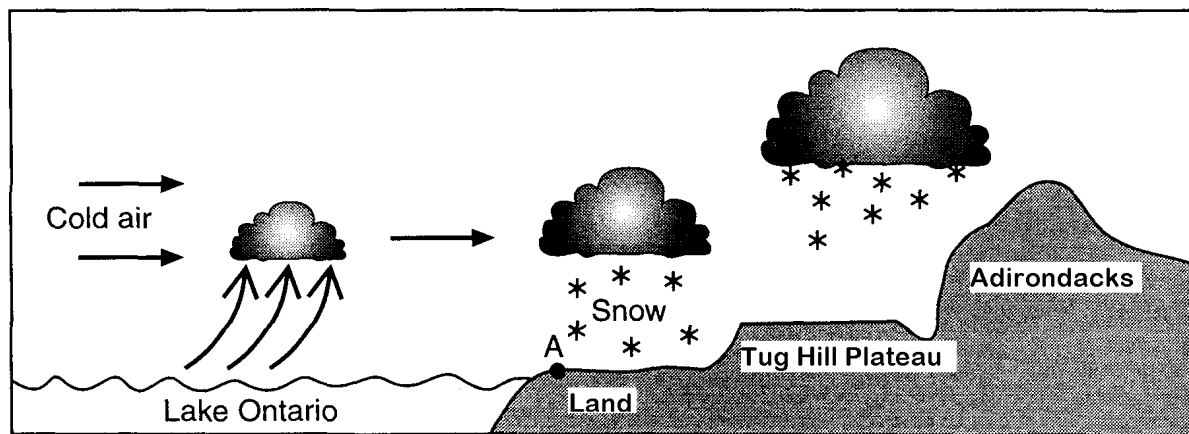
During the cold months of the year, the words "lake effect" are very much a part of the weather picture in many locations in New York State. Snow created by the lake effect may represent more than half the season's snowfall in some areas.

In order for heavy lake-effect snow to develop, the temperature of the water at the surface of the lake must be higher than the temperature of the air flowing over the water. The higher the water temperature and the lower the air temperature, the greater the potential for lake-effect snow.

A lake-effect storm begins when air flowing across the lake is warmed as it comes in close contact with the water. The warmed air rises and takes moisture along with it. This moisture, which is water vapor from the lake, is turned into clouds as it encounters much colder air above. When the clouds reach the shore of the lake, they deposit their snow on nearby land. A typical lake-effect storm is illustrated in the diagram below.

The area most likely to receive snow from a lake is called a "snowbelt." Lake Ontario's snowbelt includes the counties along the eastern and southeastern ends of the lake. Because the lake runs lengthwise from west to east, the prevailing westerly winds are able to gather the maximum amount of moisture as they flow across the entire length of the lake. There can be lake-effect snowfall anywhere around the lake, but the heaviest and most frequent snowfalls occur near the eastern shore.

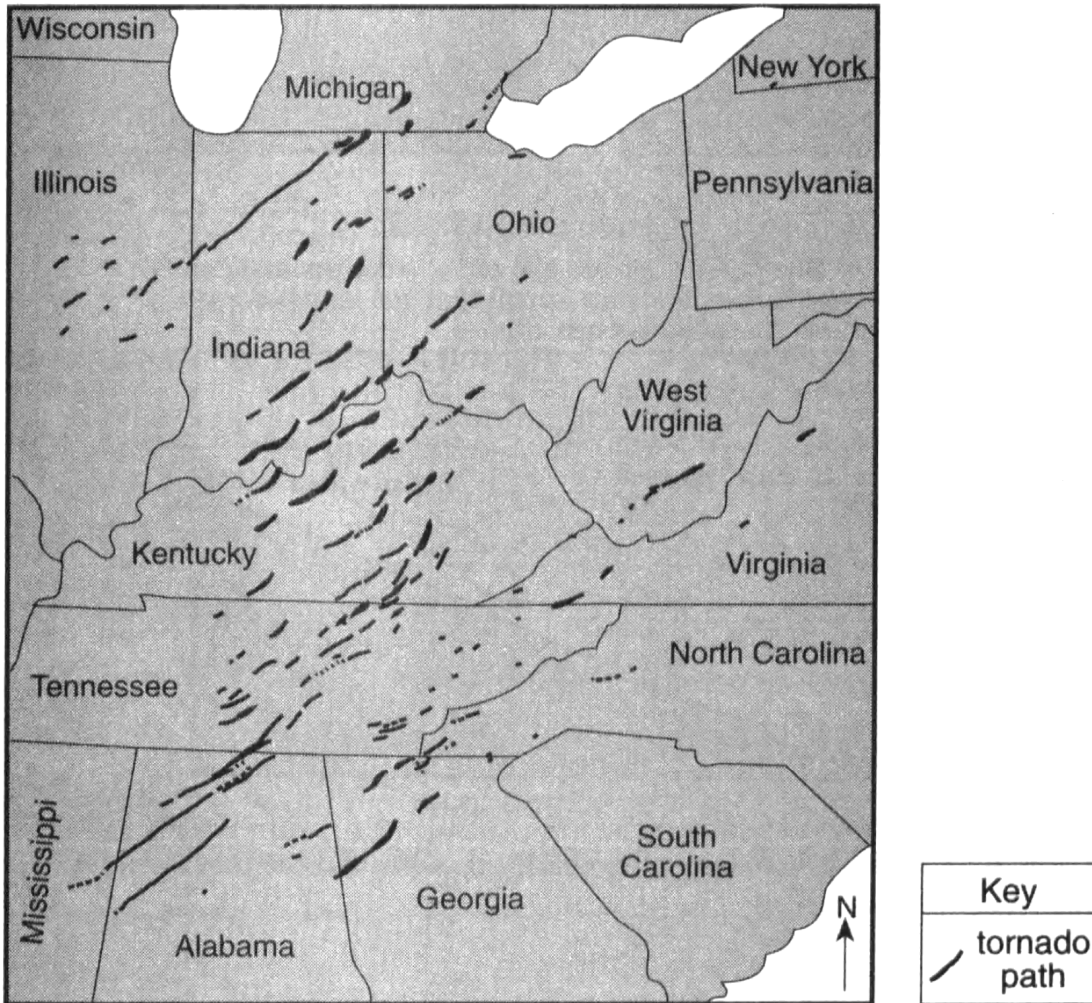
In parts of the snowbelt, the lake effect combines with a phenomenon known as orographic lifting to produce some very heavy snowfalls. After cold air has streamed over the length of Lake Ontario, it moves inland and is forced to climb the slopes of the Tug Hill Plateau and the Adirondack Mountains, resulting in very heavy snowfall.



75. State the relationship that must exist between water temperature and air temperature for lake-effect snow to develop.
76. State why locations east and southeast of Lake Ontario are more likely to receive lake-effect snow than are locations west of the lake.

## REGENTS REVIEW: WEATHER

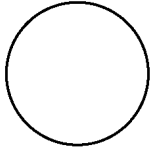
77. Base your answer to the following question on the map below, which shows a portion of the United States where 148 tornadoes occurred during a 24-hour period in April 1974. The paths of the tornadoes are shown.



A school receives a tornado warning. Describe one emergency action that a teacher and the students in a classroom should immediately take to protect themselves from injury.

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78. On the weather map station model above, using the proper format, record the *six* weather conditions shown below.

Wind: from the northwest

Wind speed: 10 knots

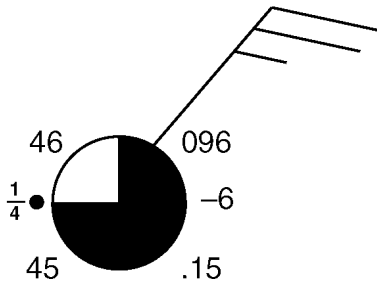
Barometric pressure: 1022.0 mb

Cloud cover: 50%

Visibility: 5 mi

Precipitation (in the past 6 hours): .45 in

79. The atmospheric conditions at a given location are represented by the weather station model below.



On the lines provided below, fill in the correct information for *each* variable listed, based on this weather station model.

Air Pressure: \_\_\_\_\_ **mb**

Air Temperature: \_\_\_\_\_ **°F**

Amount of precipitation during last six hours: \_\_\_\_\_ **inch(es)**

Cloud Cover: \_\_\_\_\_ **%**

Present Weather: \_\_\_\_\_