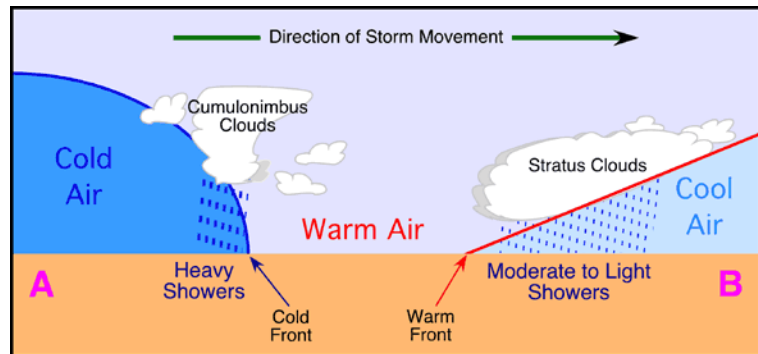
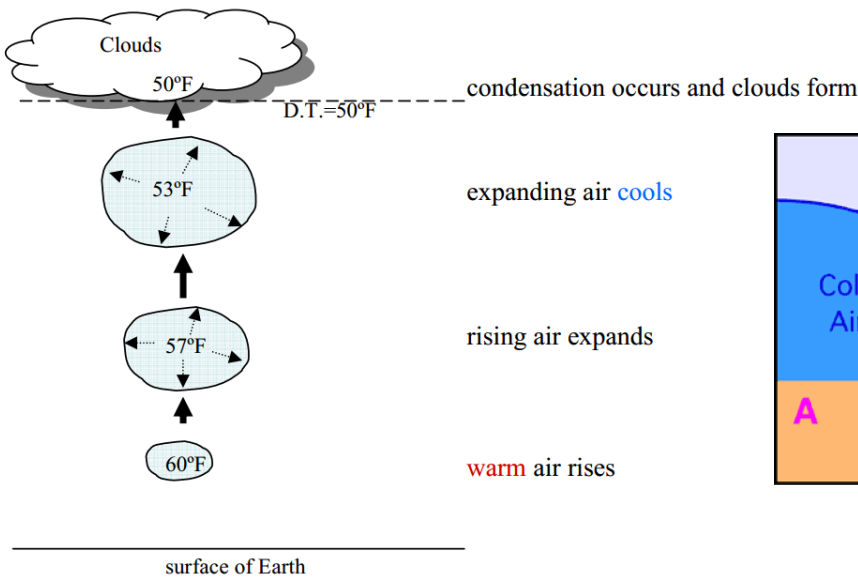


Practice Packet

Topic 7: Study of the Atmosphere



Vocabulary: _____

Lesson 1: _____

Lesson 2: _____

Lesson 3: _____

Lesson 4: _____

Lesson 5: _____

Lesson 6: _____

Lesson 7: _____

Content	6 oz water	6 oz water	6 oz water	9 oz water
Capacity	6 oz glass	9 oz glass	12 oz glass	12 oz glass
Relative Humidity	$\frac{6}{6} \times 100 = 100\%$	$\frac{6}{9} \times 100 = 67\%$	$\frac{6}{12} \times 100 = 50\%$	$\frac{9}{12} \times 100 = 75\%$

K.A. Lemke

Name: _____

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere
VOCABULARY

For each word, provide a short but specific definition from YOUR OWN BRAIN! No boring textbook definitions. Write something to help you remember the word. Explain the word as if you were explaining it to an elementary school student. Give an example if you can. Don't use the words given in your definition!

Weather: _____

Thermometer: _____

Isolines: _____

Isotherms: _____

Isobars: _____

Barometer: _____

Wind: _____

Anemometer: _____

Wind Vane: _____

Sea Breeze: _____

Land Breeze: _____

Water Vapor: _____

Evaporation: _____

Transpiration: _____

Humidity: _____

Relative Humidity: _____

Psychrometer: _____

Dew Point: _____

Condensation: _____

High Pressure: _____

Low Pressure: _____

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Cold Front: _____

Warm Front: _____

Air Masses: _____

Maritime: _____

Tropical: _____

Continental: _____

Polar: _____

Lesson 1 - Atmospheric Temperature, Pressure & Density

Objective:

- I can define weather
- I can name the 3 scales for temperature & how to use the ESRT chart
- I can name the instrument used to measure temperature
- I can describe air pressure & use the ESRT
- I can name the instruments used to measure pressure
- I can explain how moisture in the air affects density & pressure

Meteorology is the study of Earth's atmospheric changes, weather. Meteorologists, scientists that study weather, focus on the short term conditions of the atmosphere. There are several factors that affect weather. This makes predicting weather a challenge. Satellites and radar are just some of the latest technology that meteorologists use to help make those predictions. Although these tools are accurate, one small shift in the wind can either bring a storm to your area or send it to a completely different location.

You may recall that energy transfer is the movement of heat. When we think of heat we are referring to temperature. Temperature is the measure of the average kinetic energy. The greater the kinetic energy of a substance the warmer it is. The instrument used to measure temperature is a thermometer. There are three scales used to measure temperature, Fahrenheit ($^{\circ}\text{F}$), Celsius ($^{\circ}\text{C}$), and Kelvin.

1. What is meteorology? _____
2. What is the short term conditions of the atmosphere called? _____
3. Why is weather difficult to predict? _____
4. What is temperature? _____
5. What instrument used to measure temperature? _____
6. What are the three scales used to measure temperature? _____

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Temperature - ESRT pg 13

- 7. Write the names and symbols of the three scales on the chart?
- 8. Look at the scale in the first column (Fahrenheit). How many degrees does each line count by?
- 9. Look at the scale in the second column (Celsius). How many degrees does each line count by?
- 10. Look at the scale in the third column (Kelvin). How many degrees does each line count by?
- 11. Find the following temperatures for each scale.

	Fahrenheit	Celsius	Kelvin
Water Boils			
Water Freezes			
Room Temperature			

- 12. Temperature Conversions - Convert the following

Fahrenheit	Celsius	Kelvin
20		
	70	
		260
	40	

Air pressure is caused by the weight of the atmosphere. The higher your elevation, the less air there is above you and the pressure is less. Temperature also affects barometric pressure. As the air is heated, it becomes less dense and rises. Rising air means less pressure because the air is not pushing down as much. A barometer measures barometric pressure in inches of mercury or in millibars. On a weather map, isobars connect places of equal barometric pressure and show patterns in pressure systems. This is a key indicator of how the weather may be changing.

- 1. What causes air pressure? _____
- 2. Why is there less pressure as your elevation increases? _____
- 3. Explain how temperature affects pressure. _____
- 4. What two units are used in measuring barometric pressure? _____ and _____
- 5. What are drawn on weather maps to connect places of equal pressure? _____

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Pressure - ESRT Pg 13

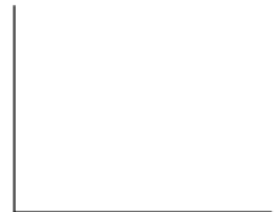
6. Write the names and symbols of the two scales on the chart?

7. Look at the scale in the left side. How many millibars does each line count by? _____ mb
8. Look at the scale in the right side. How many inches does each line count by? _____ in of Hg
9. One atmosphere is the approximate pressure at sea level. It is considered approximate because pressure at sea level changes depending on temperature. Referring to the chart, normal pressure at sea level is _____ mb & _____ inches
10. Using the Pressure Conversion Chart in the Earth Science Reference Tables complete the tables below.

Inches	Millibars
29.06	
29.94	
30.50	
29.44	

Inches	Millibars
1011.0	
1021.0	
1035.0	
991.0	

11. **State the relationship** between altitude and air pressure in the space below. **Draw the relationship** on the graph below.



12. **State the relationship** between temperature and air pressure in the space below. **Draw the relationship** on the graph below.



The Structure of the Atmosphere

- The atmosphere is made up of four layers:
 - Troposphere: the lowest layer, *where all weather occurs* and where most of the gases are found
 - Stratosphere: the second layer up, *where the ozone layer is found*
 - Mesosphere: the third layer up
 - Thermosphere: the fourth layer up
- These layers are all separated by *pauses* (i.e. the tropopause, stratopause, etc.)
- "*Selected Properties of the Earth's Atmosphere*" in the ESRTs will illustrate how temperature, air pressure, and water vapor concentration change as you travel up through these layers.

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Selected Properties of the Earth's Atmosphere ESRT pg 14

Use the "Selected Properties of Earth's Atmosphere" chart to answer the following questions.

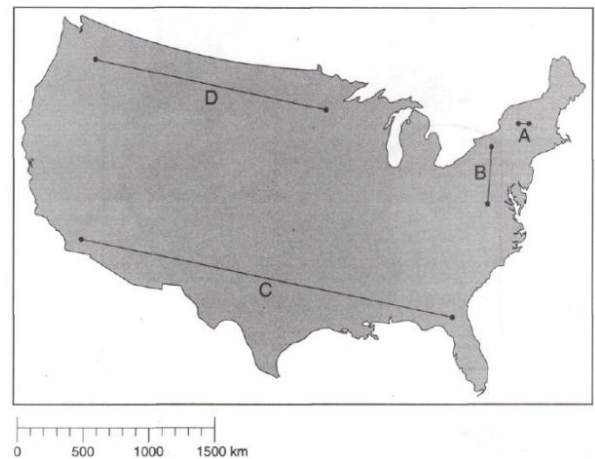
1. How does temperature change as altitude increases within the troposphere? _____
2. How does temperature change as altitude increases within the stratosphere? _____
3. How does temperature change as altitude increases within the mesosphere? _____
4. How does temperature change as altitude increases within the thermosphere? _____
5. What is the temperature at the tropopause? _____
6. What is the temperature at the stratopause? _____
7. What is the temperature at the mesopause? _____
8. What is the altitude of the tropopause? _____
9. What is the altitude of the stratopause? _____
10. What is the altitude of the mesopause? _____
11. What is the relationship between pressure and altitude?

12. What is the pressure at the tropopause? _____
13. What is the pressure at the Earth's surface? _____
14. What is the relationship between water vapor concentration and altitude?

15. What is the water vapor concentration at the Earth's surface? _____
16. What is the water vapor concentration at the tropopause? _____
17. In which layer does all weather occur? _____

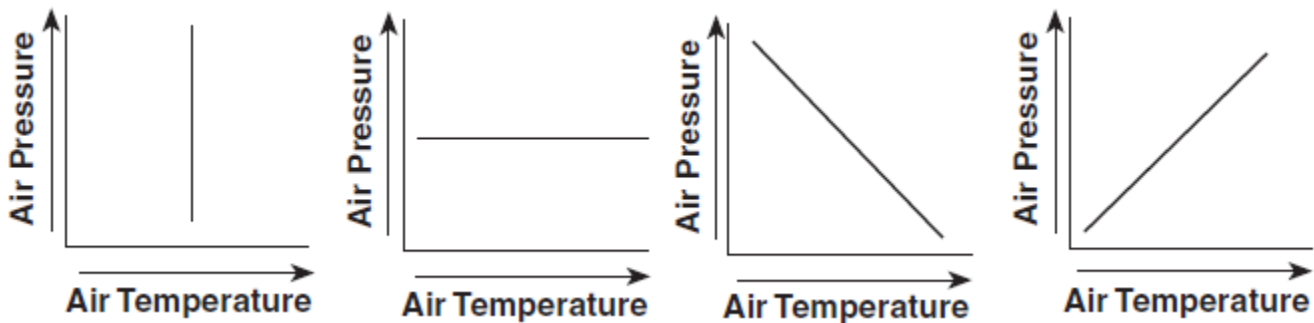
Regents Questions:

1. On the map of the United States shown below, four lines have been drawn and labeled A, B, C, and D. The length of which line best represents the distance from Earth's surface to the top of the mesosphere?
a. A b. B c. C d. D
2. What is the approximate percent of oxygen by volume present in Earth's lower atmosphere? (Review ESRT pg 1)
a. 21% b. 33% c. 46% d. 94%



PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

3. 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. thermometer and psychrometer
c. anemometer and barometer
d. thermometer and barometer
4. The ozone layer protects life on Earth by absorbing harmful ultraviolet radiation. The ozone layer is located between 17 kilometers and 35 kilometers above Earth's surface in which atmospheric temperature zone?
- a. troposphere
b. stratosphere
c. mesosphere
d. thermosphere
5. An air temperature of 30°C is equal to
- a. -22°F
b. -2°F
c. 74°F
d. 86°F
6. What is the average air pressure exerted by Earth's atmosphere at sea level, expressed in millibars and inches of mercury?
- a. 1013.25 mb and 29.92 in of Hg
b. 1012.65 mb and 29.91 in of Hg
c. 29.92 mb and 1013.25 in of Hg
d. 29.91 mb and 1012.65 in of Hg
7. Which graph best represents the change in air pressure as air temperature increases at Earth's surface?



ASSESS YOURSELF ON THIS LESSON: _____/7

If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

1. 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
2. An air pressure of 1,005 millibars is equivalent to approximately how many inches of mercury?
- a. 29.58
b. 29.62
c. 29.68
d. 29.72
3. A temperature of 73°F is approximately equal to a temperature of
- a. 17°C
b. 23°C
c. 26°C
d. 162°C

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/3

If you missed more than 1 see me for extra help and/or re-watch the lesson video assignment.

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Lesson 2 - Isolines

Objective:

- I can draw isotherms & isobars
- I can read an isotherm map

On a weather map, isotherms are lines drawn to show patterns of temperature. Isotherms connect places of equal temperature. On a weather map, isobars connect places of equal barometric pressure and show patterns in pressure systems.

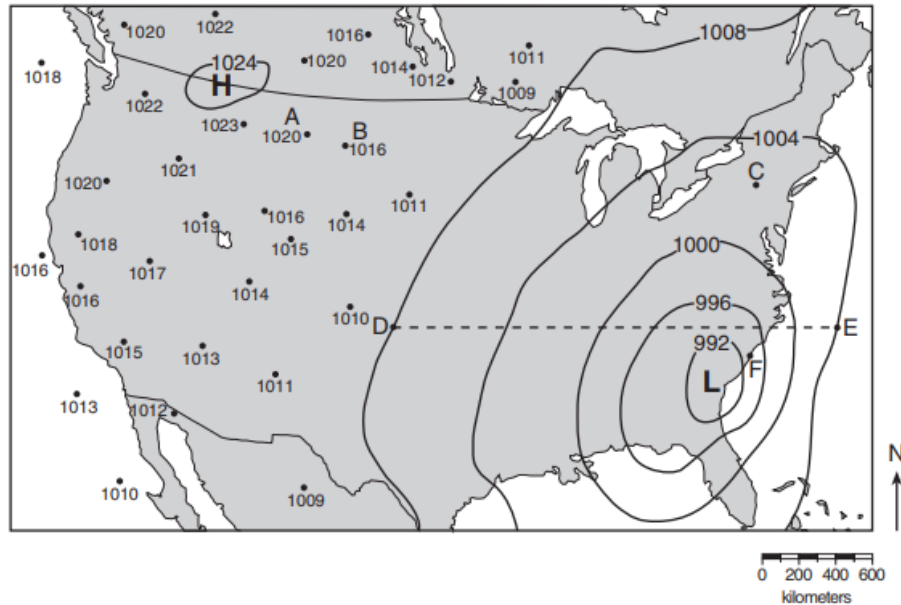
1. What are isotherms? _____
2. What do isotherms connect? _____
3. What do isobars connect? _____

Isoline RULES to LIVE by,

1. **DO NOT** cross two isolines
2. **DO NOT** end a line inside your map
3. All lines **stop at the edge** of the map or **make a circle**

Regents Questions:

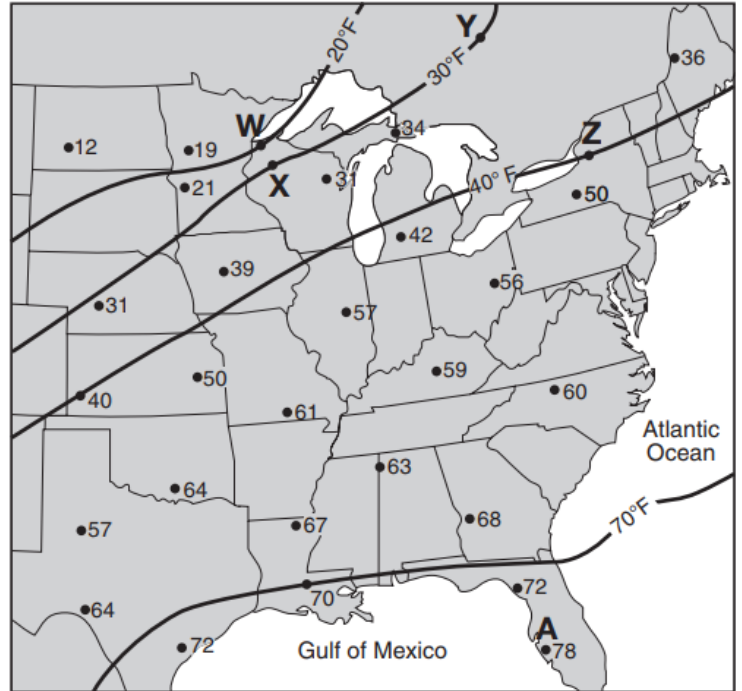
Base your answers to questions 1 through 4 on the weather map and on your knowledge of Earth science. The weather map shows the center of a high-pressure system (H) and the center of a low-pressure system (L) affecting North America. Isobars are drawn for the eastern portion of the map, and one isobar is drawn around the high-pressure center. Air pressures are shown at various points in the western portion of the map. All air pressures were recorded in millibars (mb). Points A through F represent surface locations.



1. On the map, draw the 1012 mb, 1016 mb, and 1020 mb isobars. Extend the isobars to the edges of the map.
2. Convert the air pressure at location A from millibars (mb) to inches of mercury (in of Hg).
3. Calculate the air pressure gradient between locations A and B in millibars per kilometer.
4. Identify one possible air pressure at the center of the low-pressure system.

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Base your answers to questions 5 through 7 on the map and on your knowledge of Earth science. The map shows surface air temperatures for some locations in the United States on a day in November. The 20°F, 30°F, 40°F, and 70°F isotherms are shown. Points A, W, X, Y, and Z represent locations on Earth's surface. The air temperature at location A is shown.



5. On the map in your answer booklet, draw both the 50°F and 60°F isotherms. Extend each isotherm to the edge of the map.
6. Identify the air temperature at Watertown, New York.
7. Describe the evidence shown on the map that indicates that the temperature gradient between locations W and X is greater than the temperature gradient between locations Y and Z.

8. On the map, draw the 60°F isotherm from location A to the western edge of the map.
9. Calculate the temperature gradient along a straight line between point B and point C on the map.

10. What instrument was used to find the temperatures on this map?

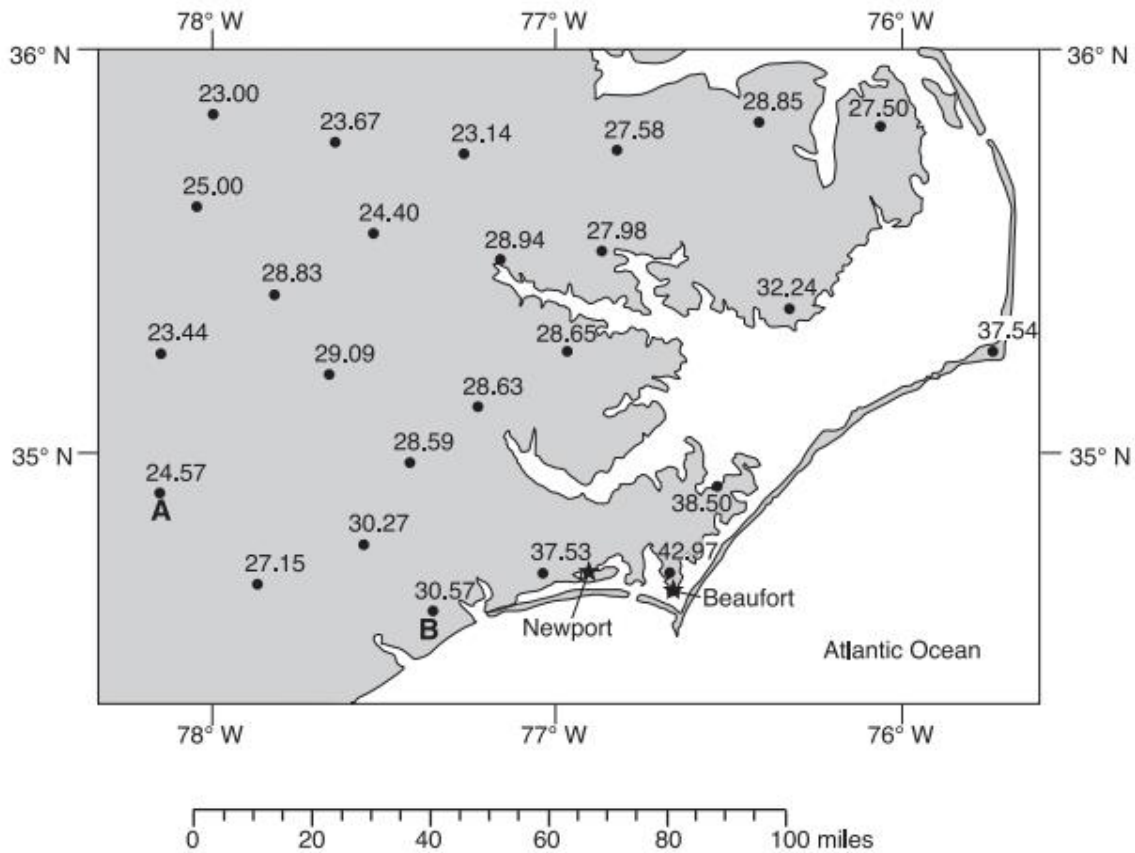


0 100 200 300 400 mi

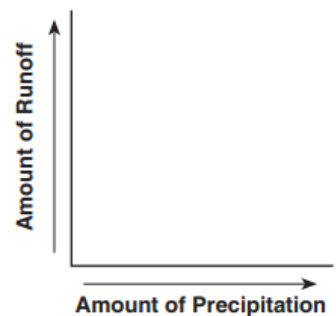
ASSESS YOURSELF ON THIS LESSON: _____/10
 If you missed more than 2, do the Additional Practice. If not, go on to the next hw video!!!

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Base your answers to questions 1 through 4 on the map in your answer booklet. The map shows the precipitation totals, in inches, from January 2003 through May 2003 for the North Carolina locations represented by dots. Precipitation totals for locations *A* and *B* are recorded on the map. The towns of Newport and Beaufort are labeled on the map.



1. On the map, use a smooth, curved line to draw the 25.00-inch precipitation isoline. The isoline must extend to the edges of the map.
2. Calculate the rainfall gradient between locations *A* and *B* on the map to the *nearest hundredth*. Label your answer with the correct units.
3. Identify the city shown on the *Generalized Bedrock Geology of New York State* map in the *Earth Science Reference Tables* that is closest to the longitude of Newport, North Carolina.
4. On the grid draw a line to show the general relationship between the amount of precipitation and the amount of runoff in Beaufort, North Carolina, if the ground is saturated.



ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE:
 _____/4
 If you missed more than 1 you should see me for extra help and/or re-watch the lesson video assignment.

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Lesson 3 - Wind

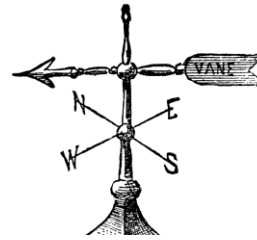
Objective:

- I can define wind
- I can explain what causes wind
- I can name the instrument used to measure wind
- I can describe planetary winds & use the ESRT
- I can describe local breezes
- I can understand water currents & use the ESRT

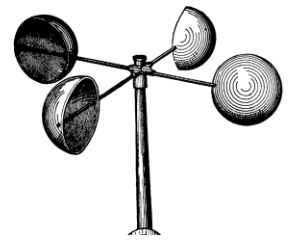
Wind is the horizontal movement of air. It is caused by the uneven heating of Earth's surface. Remember, it takes water longer to heat up and cool down than air because it has a higher specific heat and dark surfaces heat and cool faster than light surfaces. These are examples of uneven heating.

Differences in temperature result in differences in pressure. The greater the difference in pressure, the faster the wind. On a weather map, the closer the isobars the faster the wind speed.

Because wind has two variable, speed and direction, two instruments are used to measure it. Wind direction is named from where the wind is blowing from.



Wind Vane



Anemometer

1. What is wind? _____
2. What causes wind? _____
3. Explain how differences in temperature affects wind speed. _____

4. How are isobars spaced if the wind speed is very fast? _____
5. What two variables does wind have? _____ and _____
6. Name the instrument used to measure wind speed. _____
7. Name the instrument used to measure direction. _____
8. How are winds named? _____
9. Which direction is the North wind blowing from? _____
10. If a north wind is blowing, what kind of temperatures can you expect? _____

Local Winds: Some local winds reflect the fact that the land heats up _____ than the water, but the water _____ warmer longer.

Heating of Land & Water:

	Day (Warmer or Cooler)	Night (Warmer or Cooler)	Cools quicker?	Heats faster?
Land				
Ocean				

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

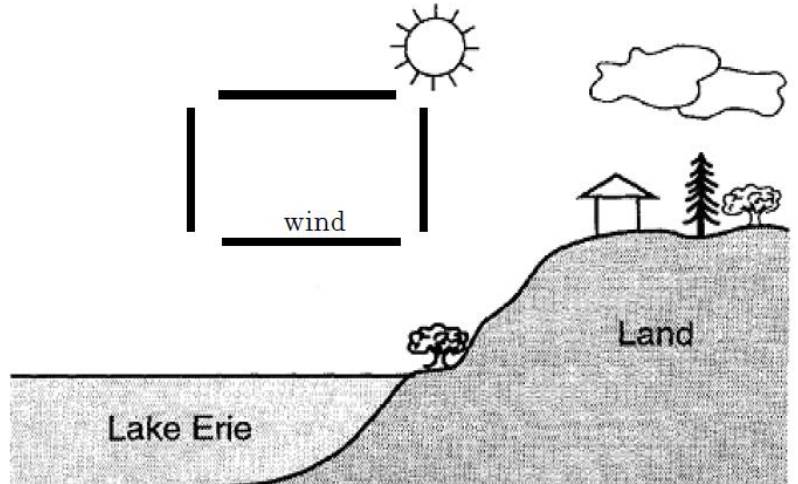
1. What happens to the density of the air as it is heated? _____
2. Warm air _____ Cold air _____
3. Convection currents form.

4. During the day, when the sun is out, which surface is going to warm up faster (land or water) ?

5. In the diagram draw an **upward** arrow on the **thick line provided**, above the surface (land or water) where the air is **rising**.

6. Draw a **downward** arrow on the **thick line provided**, above the surface (land or water) where the air is **sinking**.

7. Draw the arrows on the two horizontal lines provided, that represents a convection current that illustrates the movement of the air.



8. Circle the word in parenthesis that best completes the sentence.

- a. Water heats up (faster / slower) than land because it has a (higher / lower) specific heat.
- b. Warm air rises over the (land / water) because the (land / water) heats up faster than the (land / water).
- c. The air over the land has a (higher / lower) pressure than the water because the air is (rising / sinking). The wind is blowing from (high / low) pressure to (high / low) pressure.

9. At night, when the sun is no longer out, which surface is going to **cool down faster** (land or water)?

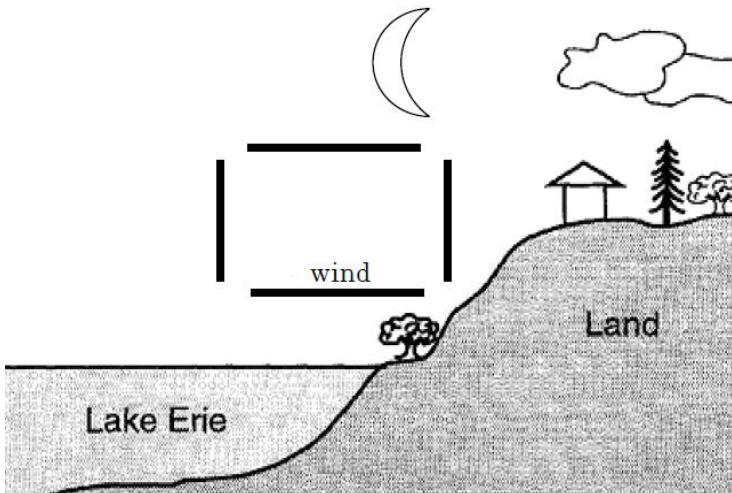
10. In the diagram draw an **upward arrow** on the **thick line provided**, above the surface (land or water) where the air is **rising**.

11. Draw a **downward arrow** on the **thick line** provided, above the surface (land or water) where the air is **sinking**.

12. Draw the arrows on the two horizontal lines provided, that represents a convection current that illustrates the movement of the air.

13. Circle the word in parenthesis that best completes the sentence.

- a. Water heats up (faster / slower) than land because it has a (higher / lower) specific heat.
- b. Warm air rises over the (land / water) because the (land / water) cools down faster than the (land / water).
- c. The air over the land has a (higher / lower) pressure than the water because the air is (rising / sinking). The wind is blowing from (high / low) pressure to (high / low pressure)



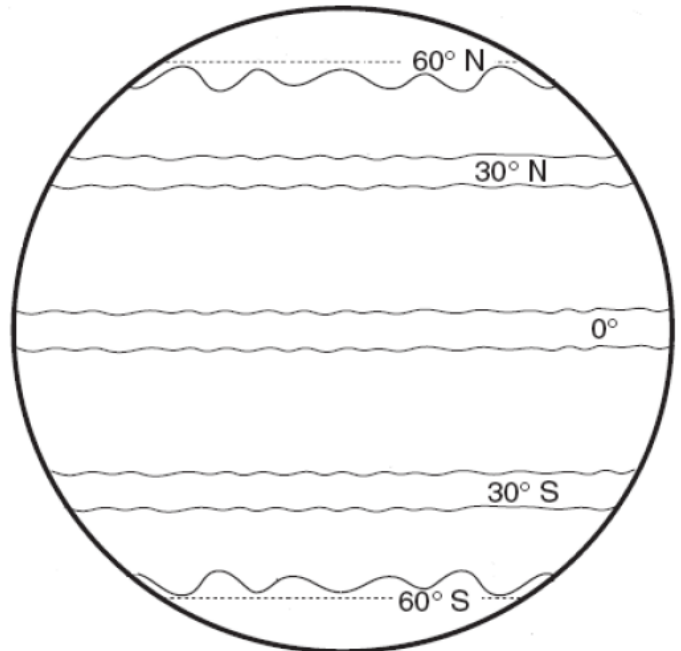
PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

14. During the daytime, would you face towards the land or the ocean to feel a breeze blowing on your face?
15. Would this daytime breeze be warm or cool? _____
16. In the first example, when the sun was out, the wind blew from the (land / water) to the (land / water). This is called a (land breeze / sea breeze).
17. Would you face towards the land or the ocean to feel a breeze on your face at night?
18. In the second example, when the sun was not out, the wind blew from the (land / water) to the (land / water). This is called a (land breeze / sea breeze).
19. In both diagrams, wind blew from (high to low pressure / low to high pressure).
20. Make a general statement concerning how large bodies of water affect the climate of nearby coastal communities.

Global Winds: Solar energy pours more efficiently into the atmosphere at the Equator where it enters from directly overhead. In general, warm tropical air tends to flow toward the cool poles, while polar air slides toward the Equator. However the Earth is large & spins, complicating things. Earth's spin results in a **Coriolis Effect**, where winds are shifted to the right in the Northern Hemisphere & to the left in the Southern Hemisphere. Earth's air masses break up into cells that results in certain consistent wind patterns.

"Planetary Wind and Moisture Belts in the Troposphere" Earth Science Reference Tables pg 14

1. Label the areas that would be wet or dry.
2. Label the areas that would be high pressure or low pressure. (Remember low pressure is **warm & wet**)
3. Copy the wind arrows illustrating the direction and deflection from the ESRT.
4. Winds blow from _____ pressure to _____ pressure.
5. Name the planetary winds that influence New York State? (between 40°N and 45°N latitude)
6. What direction do the planetary winds move the weather systems in New York State?



PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

"Surface Ocean Currents" Earth Science Reference Tables pg 4

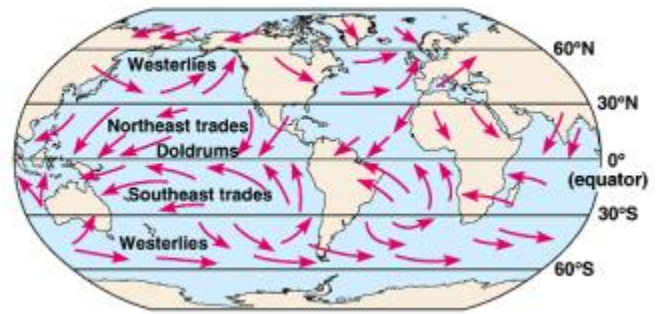
1. Take a look at the global wind patterns map & the ocean currents map in your ESRT. What do you notice about the global wind and surface current patterns?

2. The global winds generally travel in either a clockwise or counterclockwise direction. Look at the global winds and compare the general direction of flow in the Northern Hemisphere with the general direction in the Southern Hemisphere.

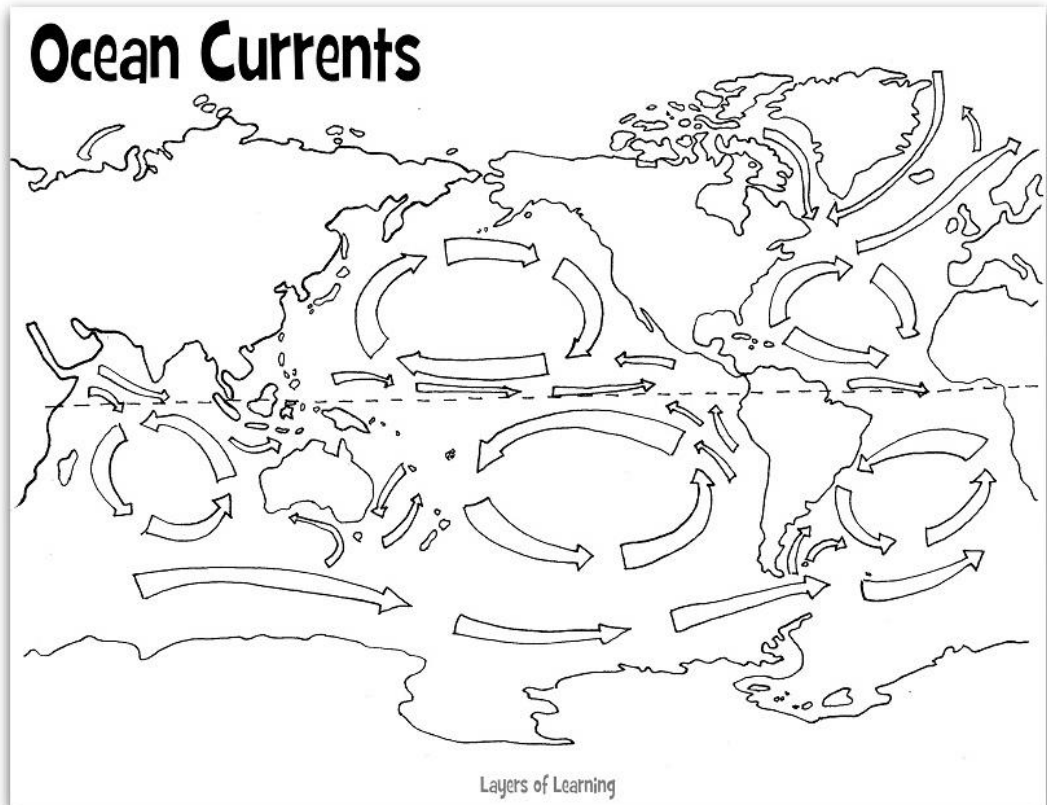
- a. In the Northern Hemisphere the general direction is _____.
- b. In the Southern Hemisphere the general direction is _____.
- c. The difference in direction is caused by the _____.

3. Using the table below **label** with the appropriate **number** and **color** the currents in the picture (red = warm, blue = cold). ****Some Numbers will be used more than once. ****

Global Wind Patterns



#	Name	Warm or Cool
1	Kuroshio C.	
2	West Australian C.	
3	Antarctic Circumpolar C.	
4	Peru C.	
5	North Pacific C.	
6	East Australia C.	
7	California C.	
8	South Equatorial C.	
9	North Equatorial C.	
10	Equatorial Countercurrent	
11	West Greenland C.	
12	East Greenland C.	
13	Brazil C.	



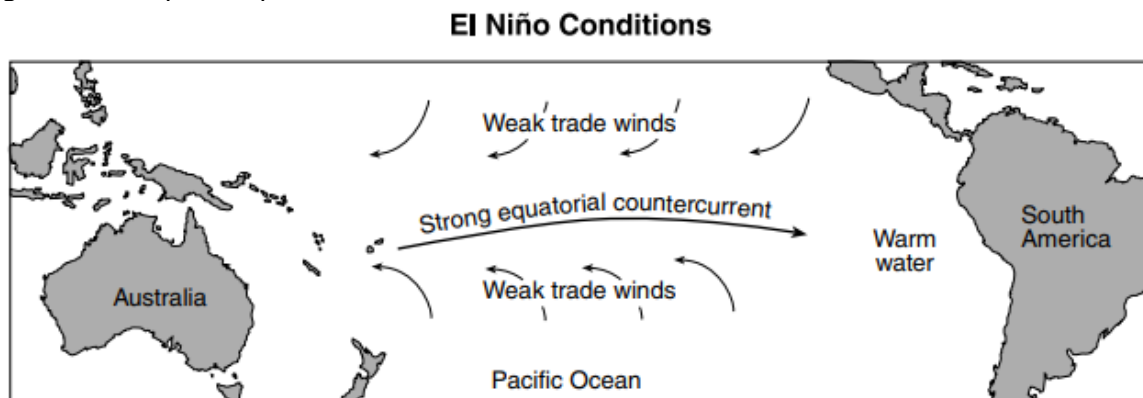
14	North Atlantic C.	
15	Norwegian C.	
16	Gulf Stream C.	

17	Benguela C.	
18	Canary C.	

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

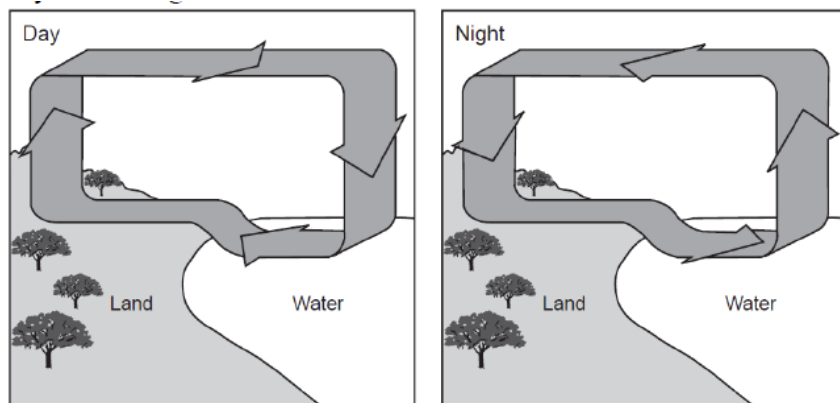
Regents Questions

1. The deflection of Earth's planetary winds is an example of
 - a. the Coriolis effect
 - b. the Doppler effect
 - c. convection
 - d. gravitational pull
2. Which New York State location is most often affected by lake-effect snow storms caused by winds blowing over Lake Ontario?
 - a. Jamestown
 - b. Oswego
 - c. Plattsburgh
 - d. Riverhead
3. The map below shows the weak trade winds and strong equatorial countercurrent in the Pacific Ocean during El Niño conditions. This causes warm surface ocean water to migrate eastward, lowering the atmospheric pressure above this warm water.



What are the most likely changes to atmospheric temperature and precipitation along the west coast of South America during El Niño conditions?

- a. lower temperatures and lower amounts of precipitation
 - b. lower temperatures and higher amounts of precipitation
 - c. higher temperatures and lower amounts of precipitation
 - d. higher temperatures and higher amounts of precipitation
4. The diagram below represents the circulation of air above Earth's surface at a coastal location during the day and at night. This local air movement is best described as an example of
 - a. conduction between Earth's surface and the atmosphere above it
 - b. condensation of water vapor during the day, and evaporation of water during the night
 - c. convection resulting from temperature and pressure differences above land and water
 - d. greater radiation from the warmer ocean during the day and from the warmer land at night

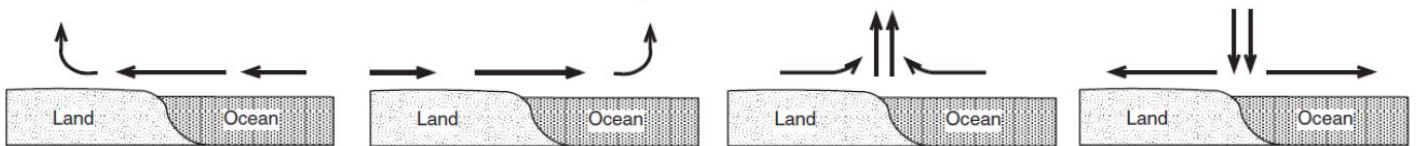


PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

5. Which weather instrument is used to measure wind speed recorded on a weather map?
 - a. anemometer
 - b. thermometer
 - c. wind vane
 - d. barometer

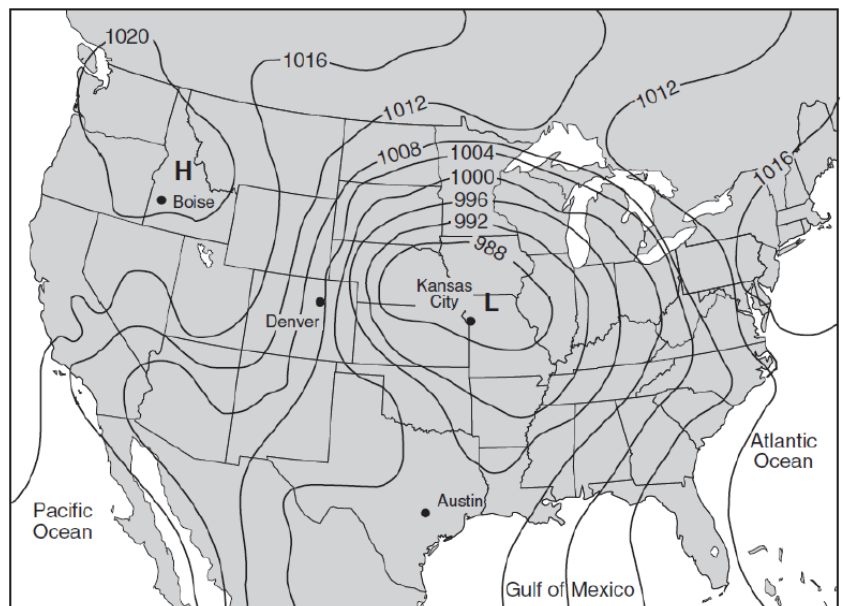
6. Ocean gyres in the Northern Hemisphere consist of a number of surface ocean currents that, together, generally flow clockwise in a roughly circular pattern. Which list contains three warm surface ocean currents that make up most of the North Atlantic Ocean gyre?
 - a. Kuroshio Current, North Pacific Current, and California Current
 - b. Canary Current, North Equatorial Current, and Equatorial Countercurrent
 - c. Labrador Current, North Atlantic Current, and East Greenland Current
 - d. North Equatorial Current, Gulf Stream Current, and North Atlantic Current

7. Adjacent land and ocean surfaces have the same temperature at sunrise on a clear, calm, summer day. Then the land and water are heated by the Sun for several hours. Which cross section shows the most likely direction of surface winds that will develop at this ocean shore?



8. Why are the beaches that are located on the southern shore of Long Island often considerably cooler than nearby inland locations on hot summer afternoons?
 - a. A land breeze develops due to the lower specific heat of water and the higher specific heat of land.
 - b. A sea breeze develops due to the higher specific heat of water and the lower specific heat of land.
 - c. The beaches are closer to the Equator than the inland locations are.
 - d. The beaches are farther from the Equator than the inland locations are.

9. The map indicates an air-pressure field over North America. Isobar values are recorded in millibars. At which city was the greatest wind speed occurring?
 - a. Boise
 - b. Denver
 - c. Kansas City
 - d. Austin

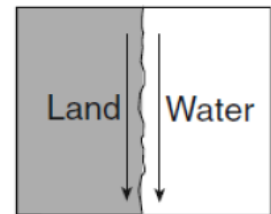
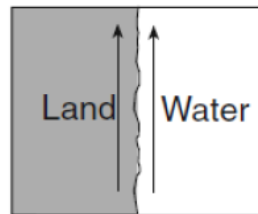
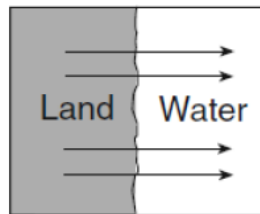
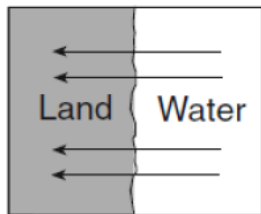


ASSESS YOURSELF ON THIS LESSON: _____/9

If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

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1. The deflection of prevailing winds and ocean currents in the Northern Hemisphere is called
 - a. eccentricity
 - b. refraction
 - c. the Coriolis effect
 - d. the Doppler effect
2. Which ocean current brings warm water to the southeastern coast of Africa?
 - a. Agulhas Current
 - b. West Australian Current
 - c. Benguela Current
 - d. Equatorial Countercurrent
3. Which natural event periodically weakens western surface ocean currents in the equatorial Pacific Ocean, resulting in a change in air temperature and precipitation patterns in the United States?
 - a. El Niño
 - b. ocean tides
 - c. transpiration
 - d. volcanic eruptions
4. Adjacent water and landmasses are heated by the morning Sun on a clear, calm day. After a few hours, a surface wind develops. Which map best represents this wind's direction?



5. Earth's surface winds generally blow from regions of higher
 - a. air temperature toward regions of lower air temperature
 - b. air pressure toward regions of lower air pressure
 - c. latitudes toward regions of lower latitudes
 - d. elevations toward regions of lower elevations

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/5

If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment.

Lesson 4 - Humidity & Dew Point

Objective:

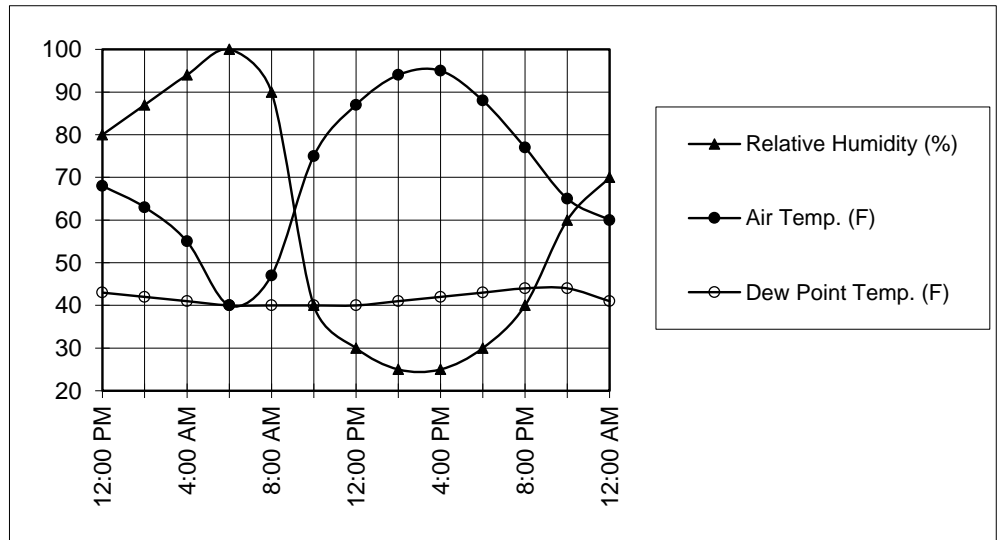
- I can define atmospheric moisture & describe how it enters the atmosphere
- I can describe factors that increase & decrease evaporation
- I can describe humidity & how temperature affects it
- I can name the instrument used to measure humidity
- I can define Dewpoint
- I can explain cloud formation
- I can use the Relative Humidity & Dew Point ESRT charts

Humidity is the amount of water vapor in the air. Relative humidity is the ratio between the amount of moisture in the atmosphere and how much moisture the atmosphere can hold. It is measured in percent (%). When the air is "holding" as much water vapor as it can the air is saturated. The dew point temperature is the temperature at which the air is saturated. When the air is saturated, the relative humidity is 100%. Warm air can "hold" more water vapor than cold air. The more water vapor in the air the more humid it is. That's why in the summer you may say it is hot and humid. Because cold air cannot "hold" as much water vapor it is never said that it is "cold and humid". Dewpoint & relative humidity are measured with a sling psychrometer or hygrometer.

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1. What is humidity? _____
 2. What is relative humidity? _____
 3. What is relative humidity measured in? _____
 4. What is dew point? _____
 5. What temperature air can hold more water vapor? _____
 6. What does humid mean? _____
 7. What instrument is used to measure relative humidity & dewpoint? _____
-
8. Copy & memorize the statement below:
When the air temperature & the dew point are the same or almost the same your get rain.
-

Refer to the graph, which shows the hourly surface temperature, dew point, and relative humidity for a twenty-four hour period during the month of May for the following questions.



9. The lowest air temperature occurred at what time? _____
10. The highest relative humidity reading occurred at what time? _____
11. The highest air temperature occurred at about what time? _____
12. The lowest relative humidity occurred at about what time? _____
13. According to the graph, what happens to the relative humidity as the air temperature increases? _____
14. At what time(s) did the air temperature equal the dew point? _____
15. What was the relative humidity (%) when the air temperature equaled the dew point? _____
16. Condensation (cloud formation) is most likely to occur at approximately what time? _____
17. At approximately what time was the rate of evaporation highest? _____
18. The greatest change in air temperature occurred during the period from:
 - a. midnight to 6AM
 - b. noon to 6PM
 - c. 6AM to noon
 - d. 6PM to midnight

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"Dewpoint ($^{\circ}\text{C}$) & Relative Humidity (%)" Earth Science Reference Tables page 12

Terms:

Dry bulb - air temperature

Wet bulb - temperature of air that is cooled by evaporation of water (wet cloth)

Wet bulb depression - The difference (subtraction) between the wet bulb and dry bulb temperatures

Dewpoint Chart:

1. Highlight the top left column. What is the title of this column? _____
2. What is the "dry bulb" temperature? _____
3. Highlight the top row of the Dewpoint chart. Write down what it says in the space below.

4. How do you determine the difference between the Wet-Bulb and Dry-bulb Temperatures?

5. What are the units for Dewpoint as listed on the chart in your reference tables? _____
6. Compare the Dry-Bulb temperature with the Dewpoint temperature if the difference between the Wet-Bulb and Dry-Bulb is "0" (zero) _____

Relative Humidity Chart: (very similar to the Dewpoint Chart)

1. Highlight the top left column.
2. Highlight the top row of the Relative Humidity chart.
3. What are the units for Relative Humidity as listed on the chart in your reference tables? _____
4. If the difference between the Wet-Bulb and Dry-Bulb is "0" (zero), what is the Relative Humidity? _____

Example: When given the wet bulb and dry bulb temperatures, you can determine the dew point temperature and relative humidity. Follow the directions given in the example below.

Example 1: If the dry bulb temperature is 20°C and the wet bulb is 15°C , find the dew point temperature and the relative humidity.

Dew point:

1. Determine the difference between dry bulb and wet bulb. Dry bulb _____
Wet bulb _____
Difference _____
2. Using the Dewpoint Temperature chart, find the **dry bulb temperature** on the **left side**. Place a scrap paper across this row, for easier reading.
3. Find the **difference** between the wet bulb and dry bulb temperatures located on the **top**.
4. Follow that column down until you reach your scrap paper.
5. What is the Dewpoint temperature? _____ $^{\circ}\text{C}$

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Relative Humidity: (use Example 1 numbers)

1. What was the difference between dry bulb and wet bulb? _____ Difference
2. Using the Relative Humidity chart, find the **dry bulb temperature** on the **left side**. Place a scrap paper across this row, for easier reading.
3. Find the **difference** between the wet bulb and dry bulb temperatures located on the **top**.
4. Follow that column down until you reach your scrap paper.
5. What is the Relative Humidity ? _____%

Example 2: Find the relative humidity and dew point temperature when the dry bulb temperature is 14°C and the wet bulb temperature is 9°C.

Dry bulb: _____ What is the Dew point Temperature? _____°C

Wet bulb: - _____

Difference _____ What is the Relative Humidity? _____%

Practice:

Fill in the following table: Be careful! Make sure you are using the correct chart. If you get stuck on a problem, there are some hints below that may help. *Try not to look at them first.*

Dry Bulb Temperature (°C)	Wet bulb Temperature (°C)	Difference between Wet & Dry Bulb (Depression)	Dew point Temperature (°C)	Relative Humidity (%)
16	9			
20	12			
4		4		
10		3		
26			6	
-8			-18	
28				31
0				28
	16	2		
	14	10		
		5		58
		8		33

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HINTS:

- ❖ The Wet-bulb temperature is always colder
- ❖ If you are given the dewpoint and dry-bulb temperatures, determine the difference first by looking at the top of the chart (same with relative humidity and dry-bulb)
- ❖ If given the difference and either dewpoint or relative humidity, start at the difference, find the given value and fill in the dry-bulb temperature first
- ❖ If the dry-bulb is an odd number, look at the temperature that is one degree warmer. The answer will be between that answer and the one above it.

Clouds

Condensation is the process by which water vapor (gas) changes phase and becomes liquid water. Condensation needs something to form on. This is called condensation nuclei.

Clouds are condensation. They consist of water droplets and ice crystals. In order for condensation to occur there must be water vapor present, the air must be saturated and condensation nuclei must be present. Water vapor enters the atmosphere by the process of evaporation. Warm, moist air rises. As the air rises it expands and cools. Once the air has reached the dewpoint, the air becomes saturated. Once this happens, condensation begins to occur. Water droplets form around dust particles that provide the condensation nuclei necessary for clouds to form. Precipitation is any form of water that falls to the Earth's surface. It occurs when the droplets are too big and heavy to remain suspended in the air and fall down towards Earth's surface.

1. What are clouds? _____
2. List the three things necessary for clouds to form. _____

3. What is condensation nuclei? _____
4. Fill in the blanks below to describe how clouds form.
 - a. warm, moist air _____
 - b. air _____ and _____ to the _____
 - c. _____ begins to occur
 - d. water droplets form on _____
5. When does precipitation occur? _____
6. Since water droplets form on dust particles, where does the dust go when it rains? _____
7. What does precipitation do for the atmosphere? _____

Regents Questions:

1. Which weather instrument is most useful in measuring relative humidity?
 - a. barometer
 - b. anemometer
 - c. psychrometer
 - d. wind vane
2. If the air temperature is 20°C and the relative humidity is 58%, what is the dewpoint?
 - a. 5°C
 - b. 12°C
 - c. 15°C
 - d. 38°C

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3. A student using a sling psychrometer measured a wet-bulb temperature of 10°C and a dry-bulb temperature of 16°C. What was the dewpoint?
 - a. -10°C
 - b. 45°C
 - c. 6°C
 - d. 4°C

4. Condensation of water vapor in the atmosphere is most likely to occur when a condensation surface is available and
 - a. the temperature of the air is below ODC
 - b. the air is saturated with water vapor
 - c. the air pressure is rising
 - d. a strong wind is blowing

5. Clouds usually form when
 - a. air temperature reaches the dewpoint
 - b. evaporation has warmed the surrounding air
 - c. relative humidity is 0%
 - d. condensation nuclei have been removed from the air

6. Which process is most likely to remove pollutants from the air?
 - a. evaporation
 - b. precipitation
 - c. transpiration
 - d. runoff

7. As the difference between the dewpoint temperature and the air temperature decreases, the probability of precipitation
 - a. remains the same
 - b. increases
 - c. decreases

8. What is the relative humidity if the dry-bulb temperature is 16°C and the wet-bulb temperature is 10°C?
 - a. 45%
 - b. 14%
 - c. 33%
 - d. 4%

9. The table shows the air temperature and dewpoint at each of four locations, A, B, C, and D. Based on these measurements, which location has the greatest chance of precipitation?
 - a. A
 - b. B
 - c. C
 - d. D

Location	A	B	C	D
Air temperature (°F)	80	60	45	35
Dewpoint (°F)	60	43	35	33

10. Most clouds form in the atmosphere when moist air
 - a. rises, expands, and cools to the dewpoint
 - b. rises, expands, and warms to the dewpoint
 - c. sinks, compresses, and cools to the dewpoint
 - d. sinks, compresses, and warms to the dewpoint

ASSESS YOURSELF ON THIS LESSON: _____/10
 If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

1. What is the dewpoint when the dry-bulb temperature is 12°C and the wet-bulb temperature is 7°C?
 - a. 1°C
 - b. -5°C
 - c. 28°C
 - d. 48°C

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2. Condensation of water vapor in the atmosphere is most likely to occur when a condensation surface is available and
 - a. the temperature of the air is below 0°C
 - b. the air is saturated with water vapor
 - c. the air pressure is rising
 - d. a strong wind is blowing

3. What is the dewpoint temperature when the air temperature is 18°C and the wet-bulb temperature is 13°C.
 - a. 9°C
 - b. 6°C
 - c. 25°C
 - d. 13°C

4. Which processes lead to cloud formation when humid air rises over India?
 - a. compression, warming to the dewpoint, and condensation
 - b. compression, warming to the dewpoint, and evaporation
 - c. expansion, cooling to the dewpoint, and condensation
 - d. expansion, cooling to the dewpoint, and evaporation

5. What is the relative humidity of the air when the dry-bulb temperature is 4°C and the dewpoint is 4°C?
 - a. 42%
 - b. 51%
 - c. 46%
 - d. 56%

6. The data table below shows the dry-bulb and wet-bulb temperatures measured with a psychrometer on four different days at the same location. According to the data shown in the table, which day had the highest relative humidity?

Temperatures Measured with a Psychrometer

Day	1	2	3	4
Dry-bulb temperature (°C)	0	5	10	15
Wet-bulb temperature (°C)	-5	0	5	10

- a. 1
- b. 2
- c. 3
- d. 4

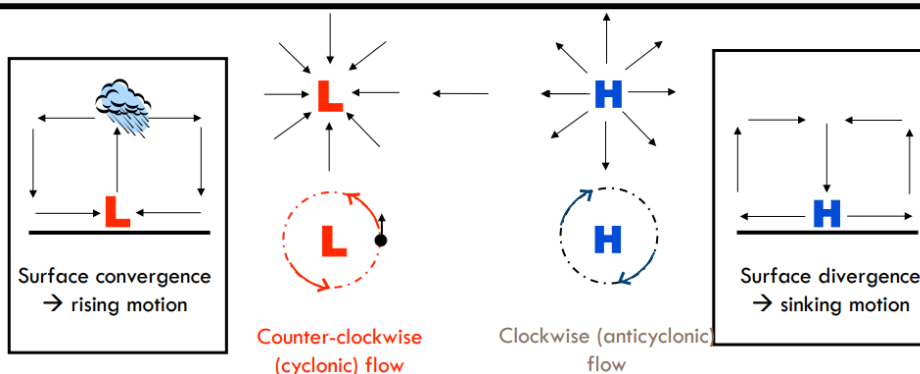
ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6

If you missed more than 2 you should see me for extra help and/or re-watch the lesson video assignment.

Lesson 5 - Air Masses

Objective:

- I can describe high & low pressure systems
- I can describe the four different weather fronts
- I can describe what an air mass is & where it came from
- I can find the Air Masses & Fronts on the ESRT



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In the table below, describe the typical characteristics of Highs and Lows.

	HIGH	LOW
Surface Winds Around Center [[clockwise)(counterclockwise]]		
Surface Winds relation to Center [[inward)(outward]]		
Vertical Motion at Center [[up)(down]]		
Temperature Change of Vertically Moving Air [[increases)(decreases]]		
State of the Sky Around Center [[clear)(cloudy]]		
General Weather Conditions [[fair)(stormy]]		

Air Masses & Fronts

An air mass is a large region of the atmosphere with uniform temperature and humidity. Each air mass takes on the characteristics of the area in which it had formed (source region). If it formed over water (maritime) the air would be moist, over land (continental) the air would be dry. An air mass that formed in lower latitudes (south of NY State) the air would be warm (tropical), in higher latitudes the air would be cold (polar). If it formed in very high latitudes the air would be extremely cold (arctic).

As an air mass moves it brings the conditions of the source region with them. For example, an air mass that forms in central Canada is going to be relatively dry (formed over land) and colder (coming from the north). As they travel, the characteristics of the air mass begins to change. Using the previous example, as an air mass moves south it will begin to get a little warmer.

A front is the boundary between two different air masses. As a front passes it usually brings a change in temperature, precipitation and change in wind direction. There are four different types of fronts: cold front, warm front, occluded front and stationary. These will be described separately.

1. What is an air mass? _____
2. What does the term "uniform" mean when referring to temperature and humidity above? _____
3. What is the area called where an air mass forms? _____
4. Describe the characteristics of an air mass that forms in the following regions:
 - a. Over land: _____
 - b. Over water: _____
 - c. In the North _____
 - d. In the South _____
5. For each of the locations below, circle the temperature and humidity that would be characteristic of an air mass that forms there.
 - a. Central Canada: [warm / cold] , [wet / dry]
 - b. Gulf of Mexico: [warm / cold] , [wet / dry]

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6. What is a front? _____
7. What three things might you expect if a front passes? _____

"Air Masses" Earth Science Reference Tables page 13

1. Copy the written form from the reference tables into the table below.
2. Determine the temperature and humidity that each symbol represents.

Symbol	Written Form	Type of Weather
cP		And
cT		And
mP		and
mT		and
cA		and

3. In the map below, write the correct abbreviation (cP, cT, mP, mT) in the corresponding location, to show the characteristics of an air mass that originated there. The "X" represents NY State.

4. Write the symbol for the air mass located in Central Canada. _____

5. Write the symbol for the air mass located over the Gulf of Mexico. _____

6. Write the symbol for the air mass located over Alaska _____

7. Write the symbol for the air mass located over the Northern Pacific Ocean _____

8. Write the symbol for the air mass located over the Northern Atlantic Ocean _____.

9. Write the symbol for the air mass located over the Southern Pacific Ocean _____.



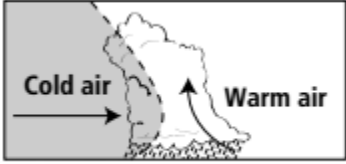
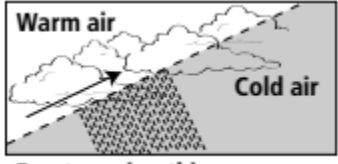
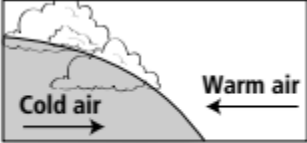
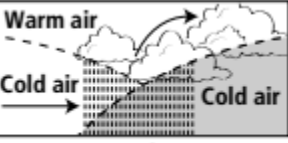
Circle the correct term that completes the sentences below.

10. As an air mass that originated in Central Canada moves south, it becomes [warmer / colder]

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- As an air mass that originated in The Gulf of Mexico moves north, it becomes [warmer / colder]
- As an air mass that originated in the North Atlantic Ocean moves over land, it becomes [wetter / dryer]

Air Fronts

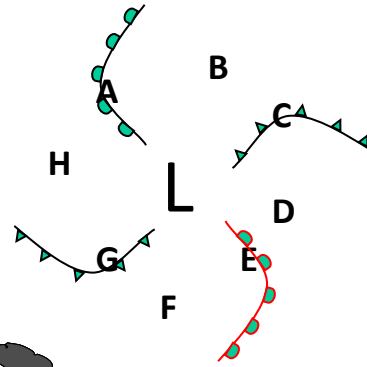
Type of Front	How it Forms	Weather it Brings	Symbol (ESRT pg 13)
<p>Cold Front</p>  <p>Front moving this way →</p>	Forms when a cold air mass pushes under a warm air mass, forcing the warm air to rise.	Heavy Storms - Precipitation occurs ON the frontal boundary	
<p>Warm Front</p>  <p>Front moving this way →</p>	Forms when a moist, warm air mass slides up and over a cold air mass.	Hours of rain or snow - precipitation occurs ahead of the frontal boundary	
<p>Stationary Front</p>  <p>Little or no forward movement of the front</p>	Forms when warm and cold air meet and neither air mass has the force to move the other. They remain <i>stationary</i> , or "standing still."		
<p>Ocluded Front</p>  <p>Front moving this way →</p>	Forms when a warm air mass gets caught between two cold air masses. The warm air mass rises as the cool air masses push and meet in the middle.		

- Fronts** are always associated with (**high/low**) pressure systems.
- In a **Cold Front**, the cold air moves (**under/over**) warm air.
- In a **Cold Front** (**thunderheads/layers of clouds**) are seen.
- In a **Warm Front**, the warm air moves (**under/over**) the cold air.
- In a **Warm Front** (**thunderheads/a layer of clouds**) are seen.
- A **Cold Front** is the front edge of a _____ air mass.
- A **Warm Front** is the front edge of a _____ air mass.

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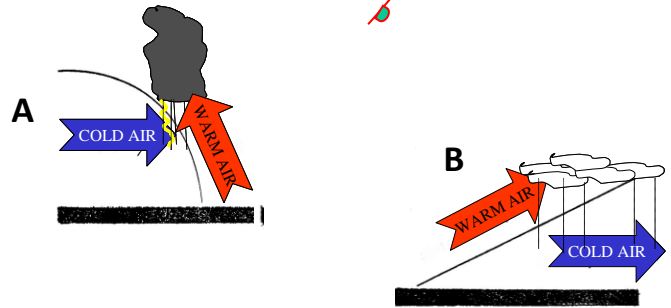
On the weather map diagram of the low pressure system to the right, identify the following:

8. _____ the "front" of cold air
9. _____ the "front" of warm air
10. _____ cold air
11. _____ warm air



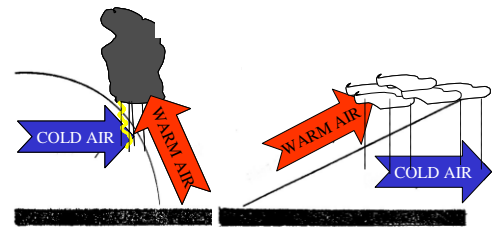
Identify the type of front from the side view..

12. _____ Warm Front
13. _____ Cold Front
14. _____ Cold Air Moving Under Warm Air
15. _____ Warm Air Moving Over Cold Air



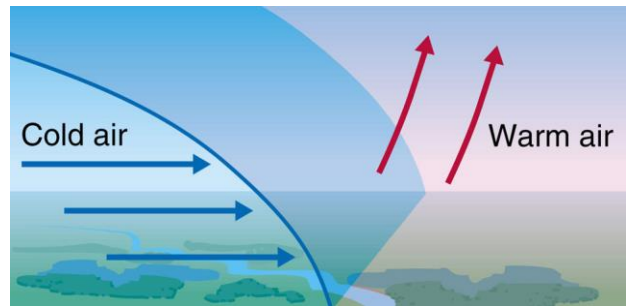
On the diagram of the two fronts below, identify the following

16. _____ Cold Air
17. _____ Warm Front
18. _____ Warm Air
19. _____ Cold Front



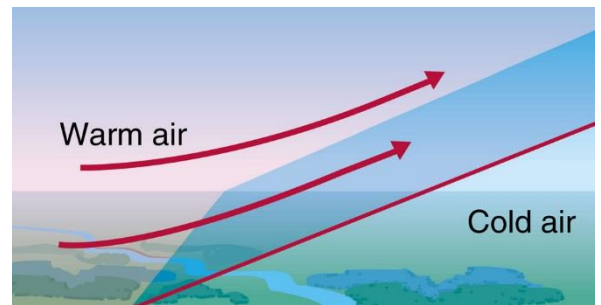
Examine the following diagram and answer the following questions.

20. What type of front is illustrated?
21. How did you identify this front?
22. Explain why warm air is pushed up by the cold airmass.
23. Where are clouds formed when there is a cold front?



Examine the following diagram and answer the following questions.

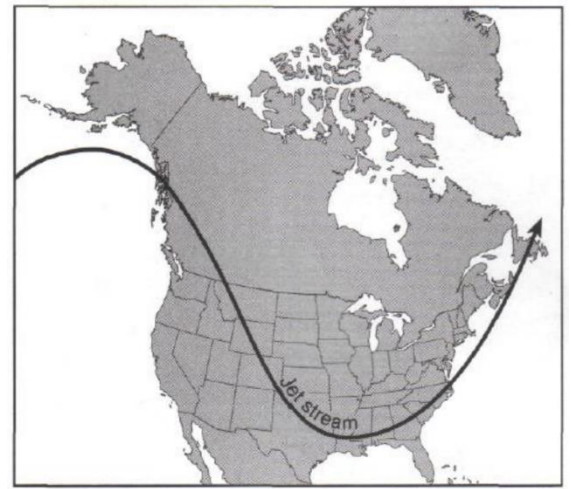
24. What type of front is illustrated?
25. How did you identify this front?
26. What happens to the warm air when it overtakes the cold air?
27. Where do clouds form when there is a warm front?



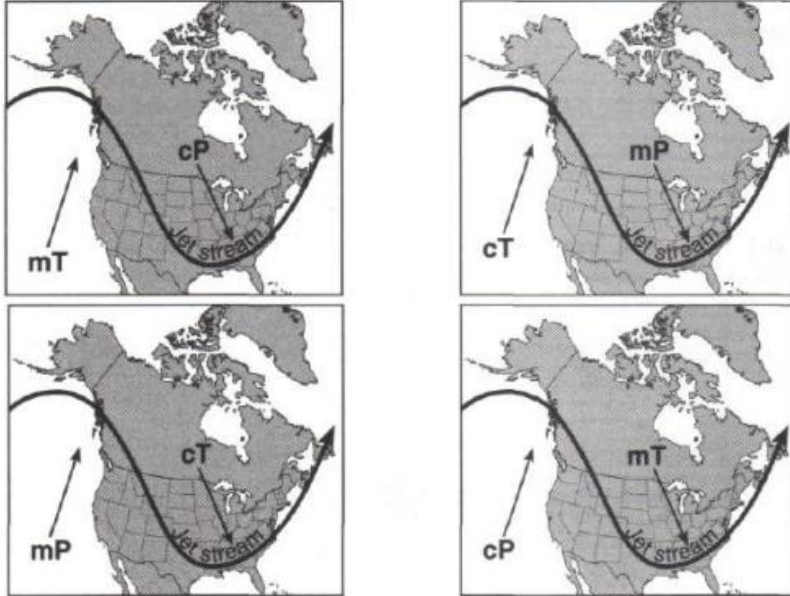
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Regents Questions:

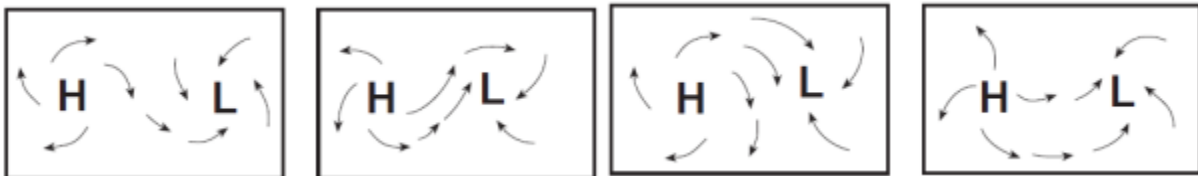
- The map below shows a position of the polar jet stream over North America in January.



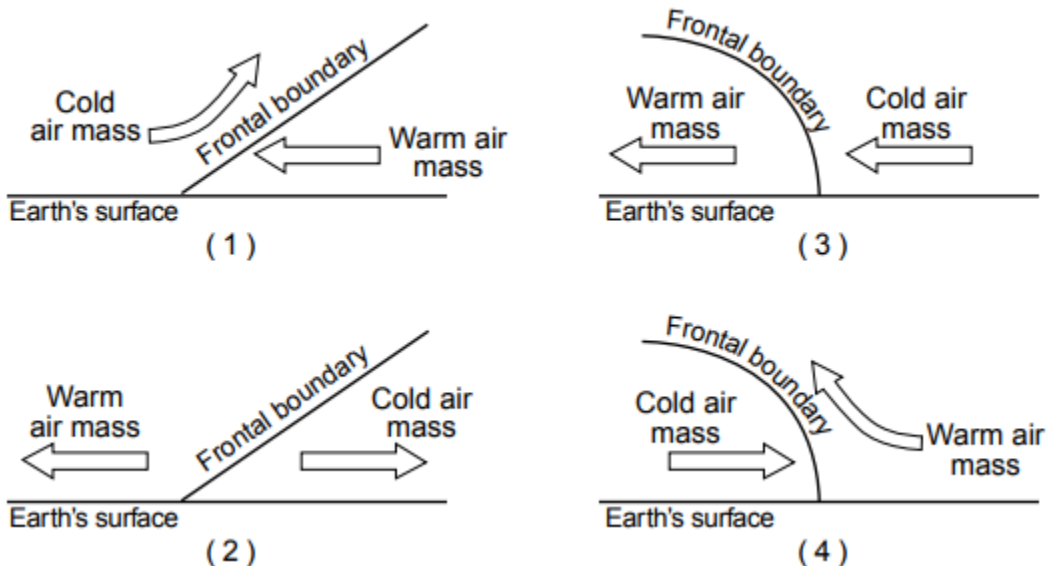
Which map best shows the air-mass movements associated with this jet stream position?



- Which map best represents the surface wind pattern around Northern Hemisphere high-pressure and low-pressure centers?

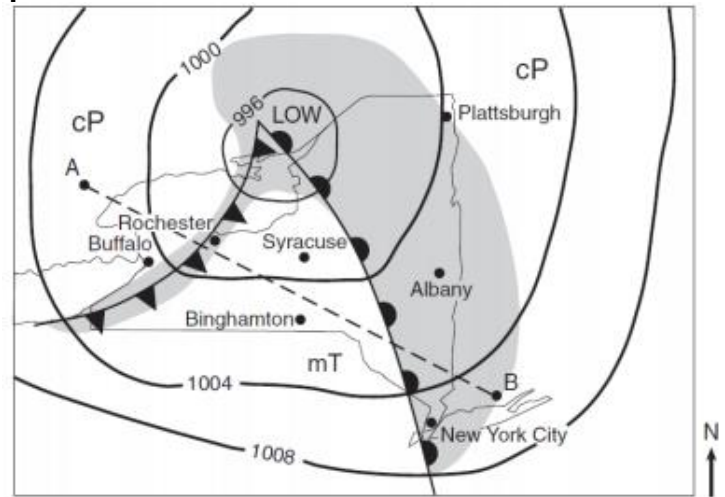


- Which cross section correctly represents a cold front and the air-mass movements associated with this front?

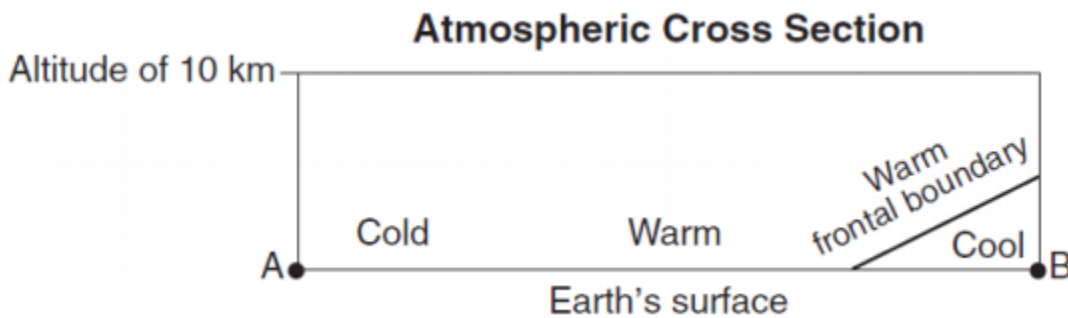


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Base your answers to questions 4 and 5 on the weather and on your knowledge of Earth science. The map indicates the location of a low-pressure system over New York State during late summer. Isobar values are recorded in millibars. Shading indicates regions receiving precipitation. The air masses are labeled mT and cP. The locations of some New York State cities are shown. Points A and B represent other locations on Earth's surface.

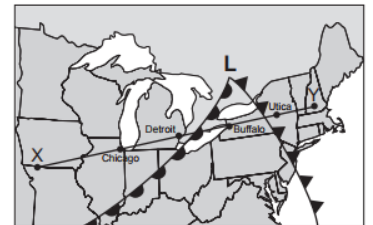
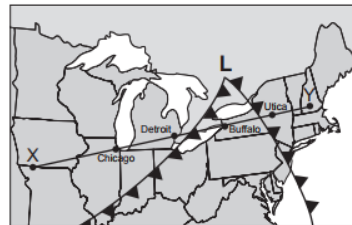
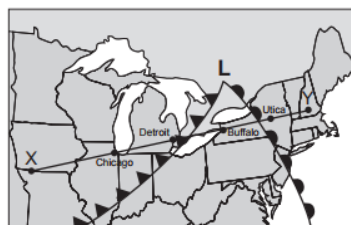
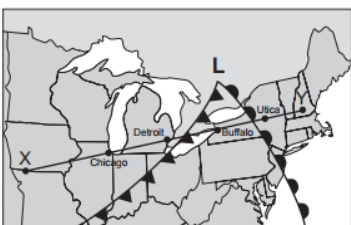
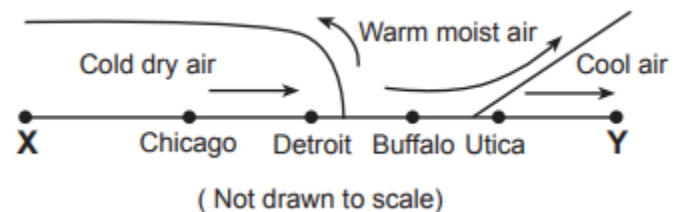


- An air mass acquires the characteristics of the surface over which it forms. Circle the type of Earth surface: *land* or *ocean* and describe the relative temperature of the surface over which the mT air mass most likely formed.
- The cross section *below* represents the atmosphere along the dashed line from A to B on the map. The warm frontal boundary is already shown on the cross section. Draw a curved line to represent the shape and location of the cold frontal boundary.



- Which two-letter symbol represents the most likely air mass formed over portions of the Indian Ocean?
 a. mP b. cP c. mT d. cT
- The cross section of the atmosphere below represents the air motion near two frontal boundaries along reference line XY on Earth's surface.

Which weather map correctly identifies these fronts and indicates the direction that these fronts are moving?



PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

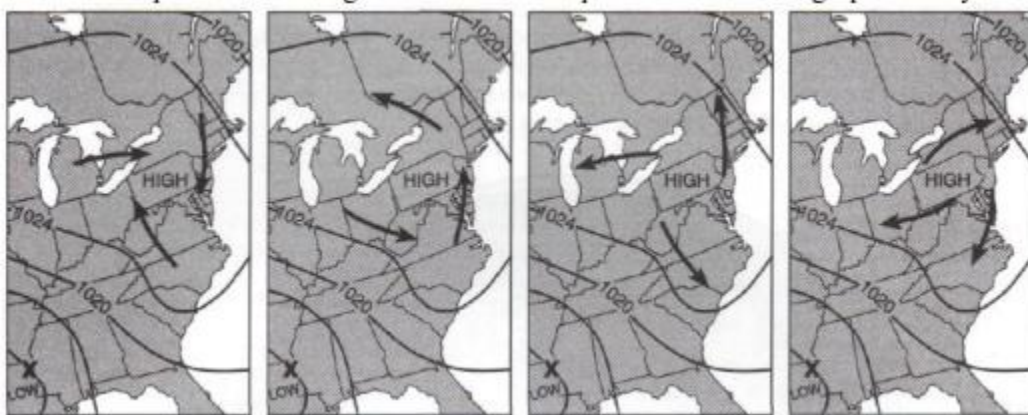
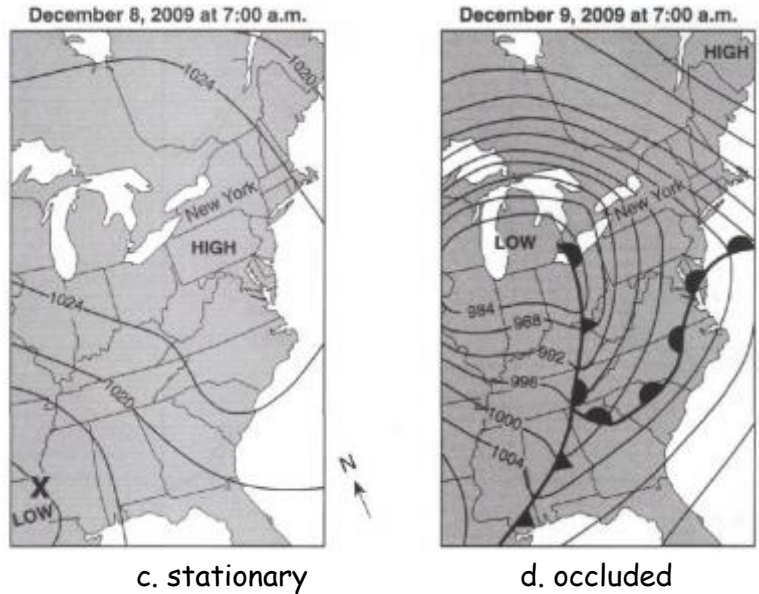
Base your answers to questions 8 through 12 on the weather maps below and on your knowledge of Earth science. The weather maps show the eastern United States on two consecutive days. Some isobars are labeled in millibars (mb). Letter X represents a location on Earth's surface on December 8, 2009.

8. What was the barometric pressure for location X on December 8?
 - a. 1016 mb
 - b. 1008 mb
 - c. 1012 mb
 - d. 1004 mb

9. In which direction did the high-pressure center move from December 8, 2009, to December 9, 2009?
 - a. southwest
 - b. northwest
 - c. southeast
 - d. northeast

10. Which type of front was located just south of New York City on December 9?
 - a. cold
 - b. warm
 - c. stationary
 - d. occluded

11. Which map best shows the general surface wind pattern around the high-pressure system on December 8?



12. Which information shown on the weather maps best indicates that wind speeds in New York State were greater on December 9 than on December 8?
 - a. The isobars were closer together on December 9.
 - b. The fronts were closer together on December 9.
 - c. The air pressure over New York State was lower on December 9.
 - d. The air pressure over New York State was higher on December 9.

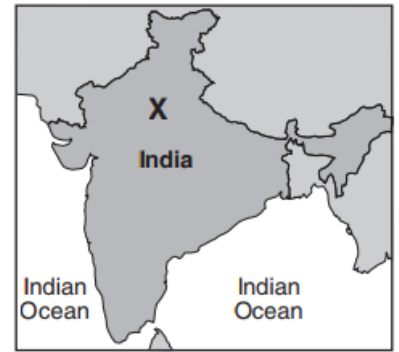
ASSESS YOURSELF ON THIS LESSON: _____/12
 If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

1. Which type of air mass would most likely form over the Pacific Ocean north of the Aleutian Trench?
 - a. mP
 - b. cP
 - c. mT
 - d. cT

2. Which type of air mass most likely has high humidity and high temperature?
 - a. cP
 - b. mT
 - c. cT
 - d. mP

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

3. The map shows location X in northern India. Summer monsoon rains normally occur in India when
- high pressure exists near location X, pulling moisture in from the Indian Ocean
 - high pressure exists near location X, pushing moisture out to the Indian Ocean
 - low pressure exists near location X, pulling moisture in from the Indian Ocean
 - low pressure exists near location X, pushing moisture out to the Indian Ocean
4. A high pressure center is generally characterized by
- Cool, wet weather
 - Warm, dry weather
 - Cool, dry weather
 - Warm, wet weather



5. Which diagram correctly represents the air circulation in a Northern Hemisphere high pressure airmass?



6. An air mass located over the central United States will most likely move toward the
- Southwest
 - Northwest
 - Southeast
 - Northeast

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6

If you missed more than 2 you should see me and/or re-watch the lesson video assignment.

Lesson 6: Station Models

A station model is a symbol on a weather map that helps meteorologist plot weather data in a condensed form. The station model contains information about temperature, dewpoint temperature, air pressure, wind, cloud cover, precipitation and current weather conditions.

Temperature and Dew Point
are always given in °F

Visibility
given in miles

Present Weather Symbols

Drizzle	Rain	Smog
Snow	Sleet	Freezing Rain
Hail	Thunderstorms	Rain Showers
Fog	Haze	Snow Showers

Cloud Cover

clear sky
partly cloudy sky
partly cloudy sky
mostly cloudy sky
overcast sky

% Cloud Cover: (75%)

Barometric Pressure

decimal point is omitted in front of the last digit of the number

if number is >500, place 9 in front of reading

if number is <500, place 10 in front of reading

Change in Pressure
decimal point omitted from reading

symbols before number:
+ pressure higher than 3 hrs ago
- pressure lower than 3 hrs ago

symbols after number:
/ pressure rising steadily
\ pressure falling steadily
- pressure has remained steady

Wind Velocity (mph)

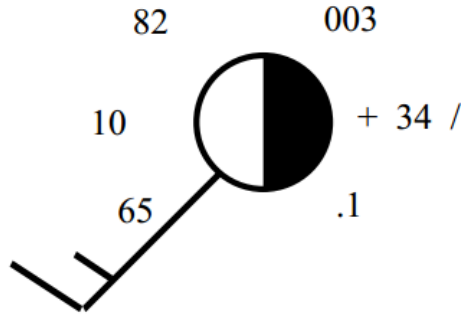
	calm
	calm, sky obscured
	1-2
	5 (+ or -)
	10
	25
	50
	75
	100
	145

Wind Direction
winds always blow along the shaft toward the center of the station

Wind Speed
half feather = 5 knots
whole feather = 10 knots

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

1. Label what each feature on the station model drawn below represents.



2. Draw the following present weather systems in the table below

Drizzle	Rain	Smog	Hail	Thunder- storms	Rain showers	Hurricane
Snow	Sleet	Freezing rain	Fog	Haze	Snow showers	Tornado

3. Find the chart on your reference tables labeled "Pressure".
- What is the highest pressure (in millibars) labeled on that chart? _____ mb
 - What is the lowest pressure, in millibars, labeled on the chart? _____ mb

The two pressures above are the approximate high and low limits of atmospheric air pressures that are observed at the earth's surface. Meteorologists take advantage of the limited range of observed pressures to encode them on the weather map.

4. The following explains how barometric pressures are encoded on a weather map.

Example 1: 1013.7 mb

- Drop the decimal point ex. 10137
- Report the last 3 digits ex. 137

Example 2: 989.6 mb

- 9896
- 896

Try encoding these:

Millibars / Station Model	Millibars / Station Model	Millibars / Station Model
1009.3 mb = 093	1022.2 mb =	994.9 mb =
984.2 mb = 842	1000.2 mb =	1000.5 mb =
1024.2 mb =	989.8 mb =	1008.2 mb =

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

5. Meteorologists encode the pressures that they report on their station models. The following explains how barometric pressures are decoded when reading a weather map:

Example 1: 146

- Replace the decimal point ex. 14.6
- Place a "9", then a "10", in front of the coded number ex. 914.6 1014.6
- Determine which of the 2 decoded pressures falls within the normal range of pressures at the earth's surface (960 - 1040 mb). (any number below 500 put 9 in front & any number above 500 put a 10 in front).

Example 2: 972

- 97.2
- more than 500 put a 9 in front - 997.2 mb

Try decoding these:

Station Model / Millibars	Station Model / Millibars	Station Model / Millibars
146 = 1014.6 mb	015 = mb	080 = mb
457 = 1045.7 mb	623 = mb	978 = mb
986 = mb	800 = mb	899 = mb

6. Good forecasting requires us to know what the barometer has been doing lately (rising, falling, or holding steady), and where the barometer is heading. This barometric pressure information is indicated as follows on the station model:

Example + 34 /

- The "+" means that the pressure is higher now than it was 3 hours ago.
- The "34" is code for 3.4 mb. This is how much higher the barometer is now than it was 3 hours ago.
- The "/" means the barometer is still rising now. It is called the barometric trend.

Example - 27 \

- The "-" means that the pressure is lower now than it was 3 hours ago.
- The "27" is code for 2.7 mb. This is how much lower the barometer is now than it was 3 hours ago.
- The "\" means the barometer is still falling now.

Example - 31 -

- The "-" means that the pressure is lower now than it was 3 hours ago.
- The "31" is code for 3.1 mb. This is how much lower the barometer is now than it was 3 hours ago.
- The "- -" means the barometer is holding steady now.

PRACTICE PACKET: TOPIC 7 Study of the Atmosphere

Answer the following questions for each barometric trend data.

- a. What is the barometric pressure?
- b. Is the pressure higher or lower in the last 3 hours?
- c. How much has the pressure changed in the last 3 hours?
- d. What was the pressure reading 3 hours ago?
- e. What is the pressure doing now (rising or falling)?

7. Pressure = 234

Trend = + 19 /

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

8. Pressure = 840

Trend = - 27 \

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

Draw a station model for each description below.

9. Completely cloudy

Wind = Northwest

Wind speed 15 knots

pressure = 1034.6 mb

barometric tendency = falling .1 mb

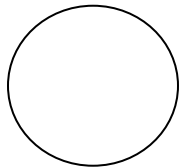
precipitation = 3 inches

temperature 45°F

present weather (drizzling)

visibility (.5 miles)

dew point 42°F



10. 100 % cloudy

Wind = Southwest

Wind speed 10 knots

pressure = 975.6 mb

barometric tendency = falling .1 mb

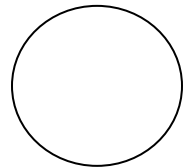
precipitation = .25 inches

temperature 55°F

present weather (fog)

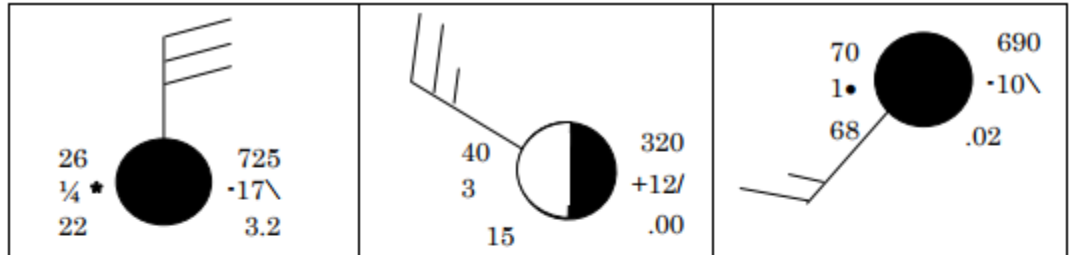
visibility (.125 miles)

dew point 55°F



PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

Determine each of the values below by looking at the diagram at the top of each column.

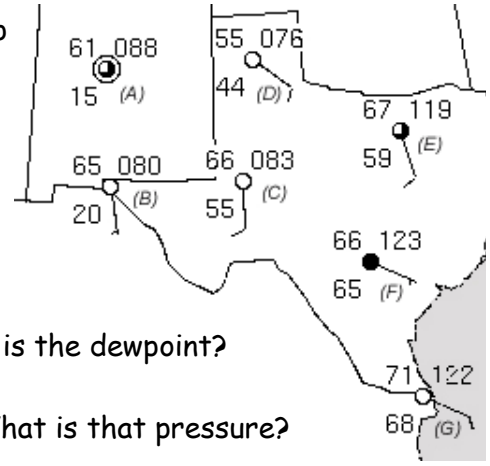


Wind Direction			
Wind Speed			
Cloud cover			
Air pressure			
Barometric tendency			
Precipitation			
Temperature			
Dew Point			
Present weather			
Visibility			

11. What is the relative humidity of the three stations above? (This is a little tricky - you'll need to use both charts on page 12 of the ESRT. Use the Dewpoint Chart first, and work 'backwards' to find the difference between the dry bulb and the wet bulb. Use that information to find the RH on the Relative Humidity chart)

- a. _____ b. _____ c. _____

12. The image to the left is part of an actual synoptic weather map of the US from March 11, 2003. It shows Texas, New Mexico, the Gulf of Mexico, and surrounding states. The stations have been labeled A - G for the purpose of this exercise.



- Which station is reporting the lowest temperature? What is the temperature?
- Which station is reporting the highest dewpoint? What is the dewpoint?
- Which station is reporting the highest air pressure? What is that pressure?
- Which station is reporting the lowest air pressure? What is that pressure?
- Where is the wind at station F coming from? At station B?
- Which station is the most likely to receive precipitation? Give **two** reasons why you chose that station.

PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

Regents Questions:

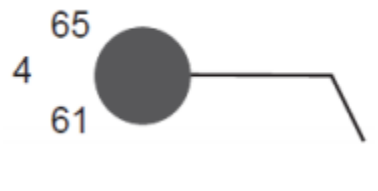
1. Which station model represents a location that has the greatest chance of precipitation?



2. Which weather map symbol is associated with extremely low air pressure?

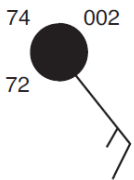


3. The station model shows some weather conditions at a location on Earth's surface. Which present weather symbol represents the most likely type of precipitation occurring at this location?

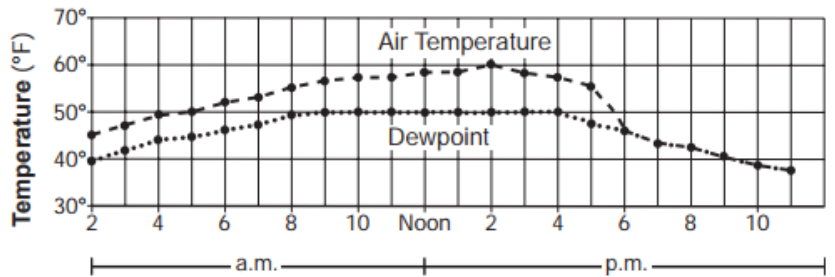


4. What are the dewpoint and wind direction shown on the station model?

- a. 72°F and wind from the northeast
- b. 74°F and wind from the northwest
- c. 72°F and wind from the southeast
- d. 74°F and wind from the southwest

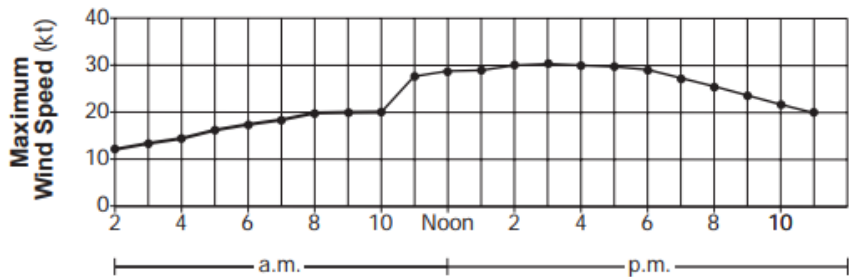


Base your answers to questions 5 and 6 on the graphs and on your knowledge of Earth science. The graphs show air temperatures and dewpoints in °F, and wind speeds in knots (kt) from 2:00 a.m. to 11:00 p.m. at a certain New York State location.

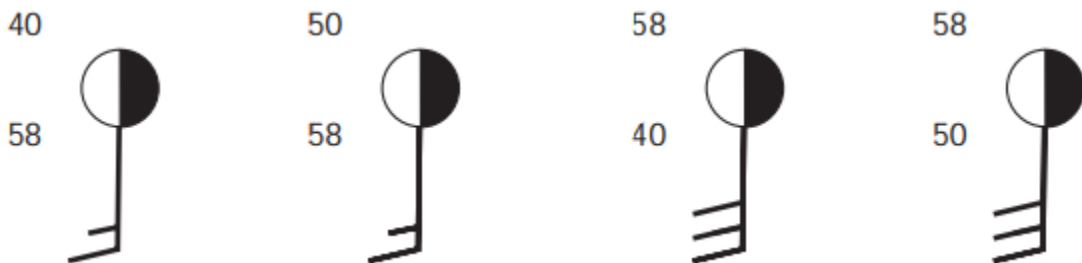


5. What was the relative humidity at 8:00 p.m.?

- a. 30%
- b. 45%
- c. 75%
- d. 100%



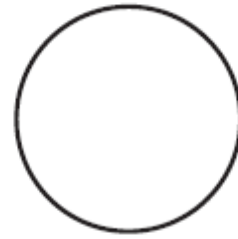
6. Which station model represents the weather data for this location at 4:00 p.m.?



PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

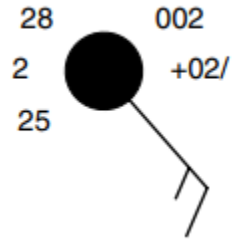
7. On the weather station model *in your answer booklet*, using the proper format, record the *four* weather conditions shown below.

Dewpoint: 48°F
 Air pressure: 998.3 mb
 Wind: from the southeast
 Wind speed: 10 knots

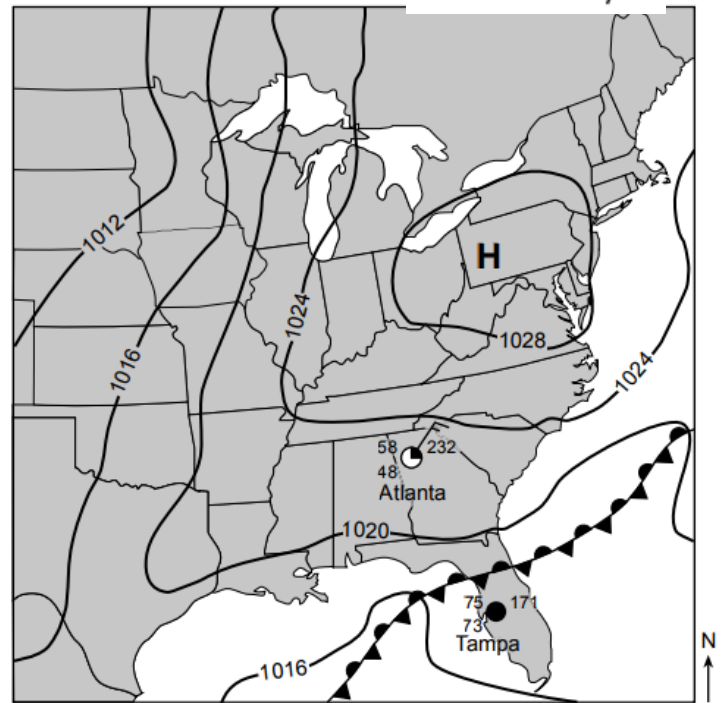


8. The station model below represents the weather conditions for a location in New York State. The barometric trend for the past three hours at this location indicates a steady increase of

- c. 0.2 mb b. 0.002 mb c. 2.0 mb d. 0.02 mb



Base your answers to questions 9 through 11 on the weather map and on your knowledge of Earth science. On the weather map, the location of the center of a high-pressure system (H) and a front are shown. Isobar values are labeled in millibars (mb). Weather station models represent the weather conditions at Atlanta, Georgia, and Tampa, Florida.



9. Describe one piece of evidence shown on the map that indicates that Tampa, Florida, has a high probability of precipitation.
10. Complete the table with the actual weather conditions represented by the weather station model at Atlanta, Georgia.

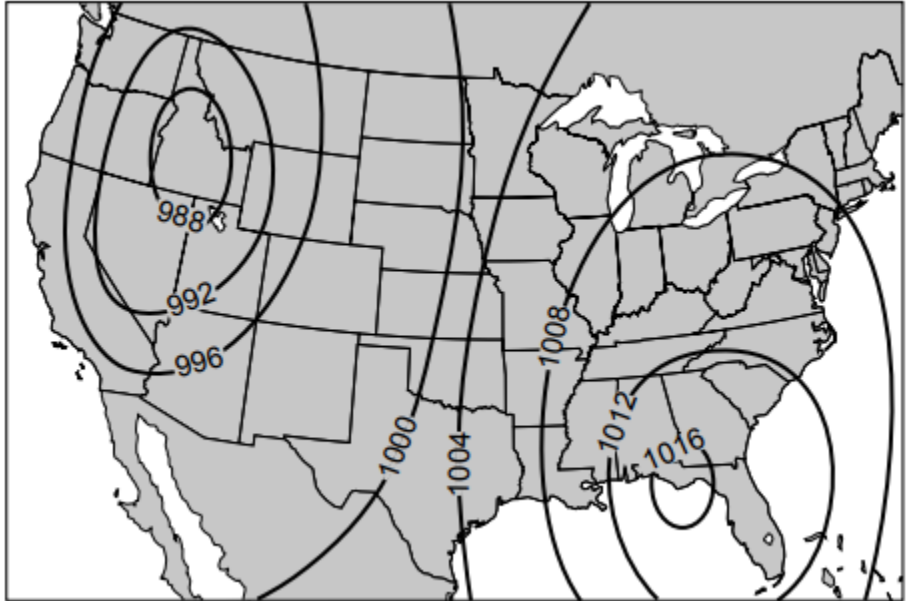
Atlanta, Georgia	
Weather Variable	Actual Value
Air temperature	°F
Barometric pressure	mb
Wind speed	knots
Wind direction	from the

11. Identify the type of front shown on the map. _____

ASSESS YOURSELF ON THIS LESSON: _____/11
 If you missed more than 3, do the Additional Practice. If not, go on to the next hw video!!!

PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

Base your answers to questions 1 through 3 on the map in your answer booklet and on your knowledge of Earth science. The weather map shows isobars, recorded in millibars (mb).

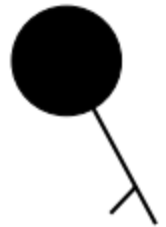


- On the map, place an L to indicate the location of the center of a low-pressure system and place an H to indicate the location of the center of a high-pressure system.
- A weather station recorded the barometric pressure on a weather station model as shown below. On the map in your answer booklet, place an X to represent a possible location for this weather station.



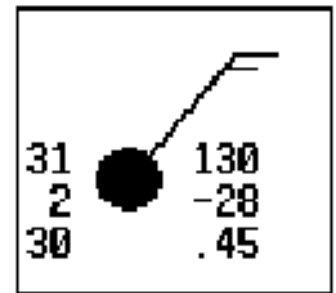
- The table below lists some weather conditions for another location on this map.

Temperature (°F)	Dewpoint (°F)	Precipitation (inches in past 6 hours)	Present Weather
76	74	0.85	Rain showers

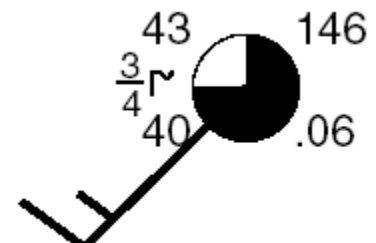


On the weather station model, using the proper format, record the weather conditions listed in the table.

Questions 4 & 5 refer to the following diagram below that shows a weather station.



- The barometric pressure is
 - 913.0 mb
 - 130.0 mb
 - 10.28 mb
 - 1013.0 mb
- The weather forecast for the next 6 hours at this station most likely would be
 - Sunny, cold, probable rain
 - Overcast, hot, poor visibility
 - Overcast, cold, probably snow
 - Overcast, hot, unlimited visibility
- What were the barometric pressure & weather conditions at the airport at the time of the observation?
 - 914.6 mb & smog
 - 1014.6 mb & smog
 - 914.6 mb & a clear sky
 - 1014.6 mb & a clear sky



ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/6

If you missed more than 2 you should see me and/or re-watch the lesson video assignment.

PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

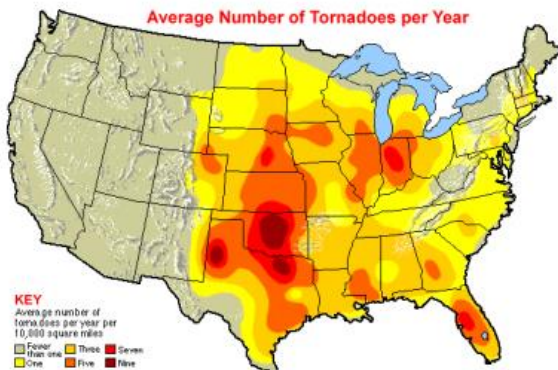
Lesson 7: Storm Safety

Objective:

- I can describe safety precautions for a thunderstorm
- I can describe safety precautions for a tornado
- I can describe safety precautions for a blizzard
- I can describe safety precautions for a hurricane

Thunderstorms - form from uplifting warm air associated with **cold fronts**

- located in inland regions
- produce heavy rains, hail, winds, thunder/lightning

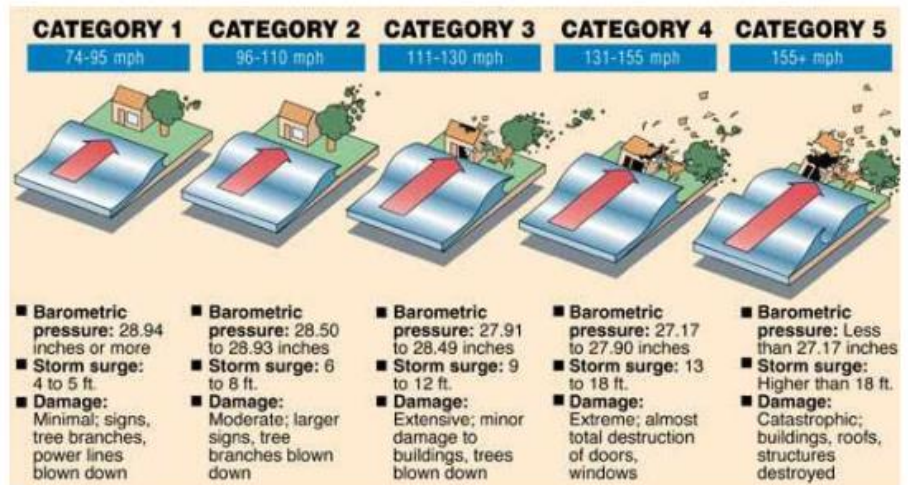


Tornadoes - a rapidly rotating low pressure funnel associated with strong thunderstorms and cold fronts in the spring

- very narrow: 100 ft - 1 mile in diameter
- produce winds up to 300 mph
- last for a few minutes to an hour

Hurricanes - form as low pressure centers over warm tropical waters in late summer/early fall

- gain energy from the condensation of moisture evaporated over warm ocean waters
- warm rising air produces a very strong low pressure system (large pressure gradient)
- Hurricanes quickly lose strength as they move over land - the energy source (warm ocean water) no longer available
- flooding along coastal areas cause most damage - called the **storm surge**
- minimum winds = 74 mph (120 km/hr)



Lake Effect Snow - prevailing winds move across the relatively warm Great Lakes and pick up moisture

- this moist air is uplifted over the Tug Hill where it snows due to the orographic effect




Blizzard - severe snowstorm

- characterized by strong sustained winds of at least 35 mph
- lasting for a prolonged period of time—typically three hours or more




PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

1. For each of the disasters below, describe or list things you can do to prepare for them and what to do if you are caught in the middle of the disaster.
 - a. A hurricane is approaching, what should you do?
 - b. You are caught in the middle of a hurricane, what should you do?
 - c. A tornado warning has been issued, what should you do?
 - d. You are caught in the middle of a tornado, what should you do?
 - e. There is a thunderstorm warning, what should you do?
 - f. You are caught in the middle of a thunderstorm, what should you do?
 - g. There is a blizzard warning, what should you do?
 - h. You are caught in the middle of a blizzard, what should you do?
2. Compare your answers for the previous disasters. Create a list of 5 common things you should do to prepare for **any** emergency situation.

Weather Instrument Review:

<p>Name:</p> <p>Measures:</p> <p>Unit(s):</p> 	<p>Name:</p> <p>Measures:</p> <p>Unit(s):</p> 	<p>Name:</p> <p>Measures:</p> <p>Unit(s):</p> 
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PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

<p>Name:</p> <p>Measures:</p> <p>Unit(s):</p> 	<p>Name:</p> <p>Measures:</p> <p>Unit(s):</p> 	<p>Name:</p> <p>Measures:</p> <p>Unit(s):</p> 
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Regents Questions:

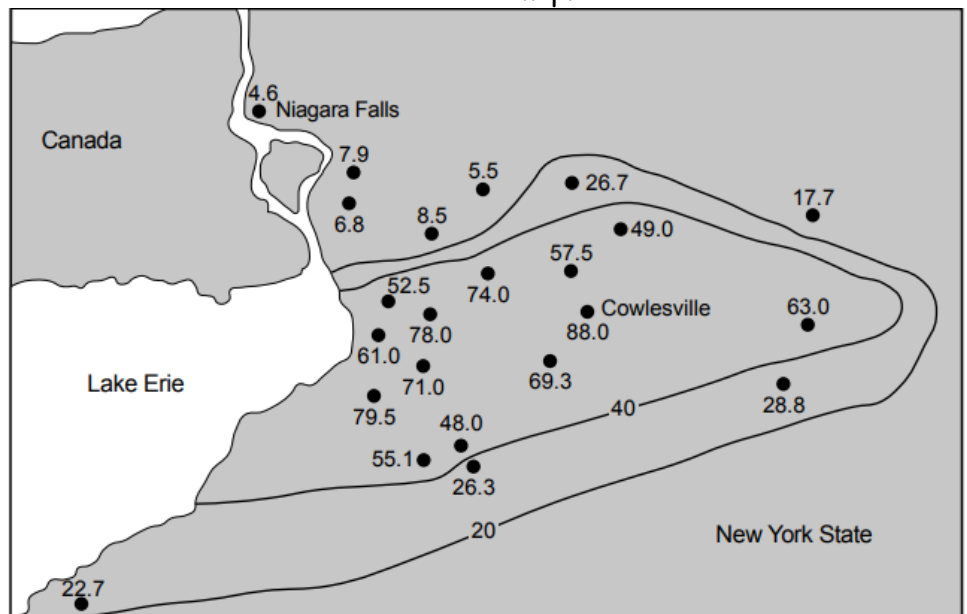
- Which New York State location is most often affected by lake-effect snow storms caused by winds blowing over Lake Ontario?
 - Jamestown
 - Oswego
 - Plattsburgh
 - Riverhead

- A severe thunderstorm warning was issued on a warm summer afternoon. Which present weather symbol represents the dangerous solid form of precipitation that is commonly associated with some of these severe thunderstorms?



Base your answers to questions 3 through 5 on the map and on your knowledge of Earth science. The map shows the total amount of snowfall, measured in inches, from a lake-effect snow storm that affected western New York from November 17 through November 21, 2014. The 20-inch and 40-inch snowfall isolines have been drawn. Niagara Falls and Cowlesville are labeled on the map.

- On the map, draw the 60-inch snowfall isoline. Extend the isoline to the edge of Lake Erie.
- Cowlesville, New York, received a total of 88 inches of snow in 85 hours. Calculate the average rate of snowfall in inches per hour (in/h) for Cowlesville.



- Describe two actions that people could take to prepare for a forecasted lake-effect snowstorm.

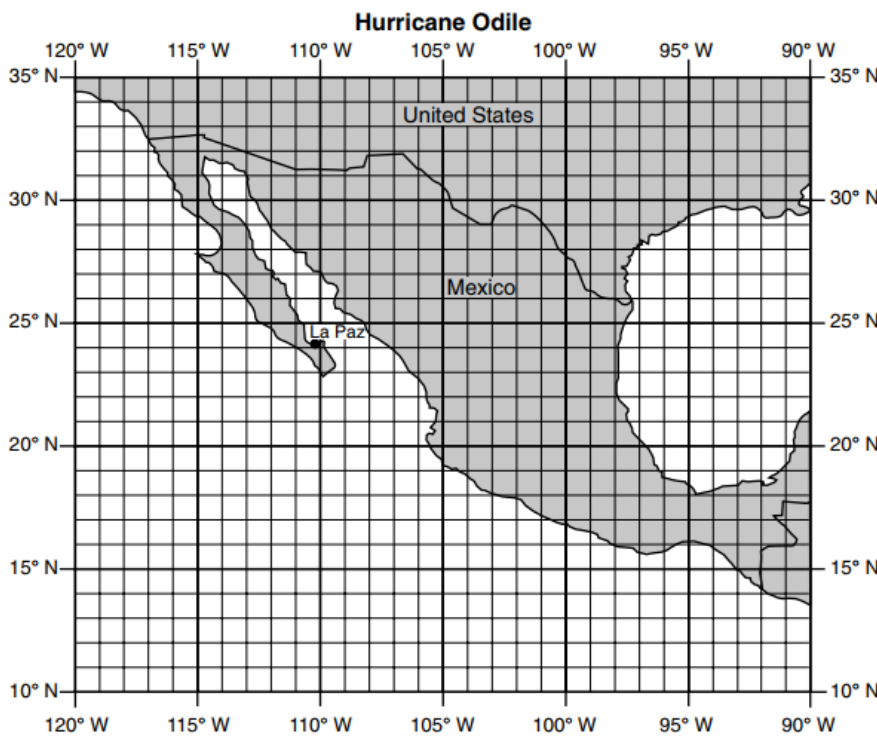
PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

Base your answers to questions 6 through 9 on the data table below, on the map, and on your knowledge of Earth science. The data table shows latitude and longitude locations of the center of Hurricane Odile recorded at the same time each day from September 12 to September 18, 2014. The data table also shows the hurricane's barometric pressure in millibars (mb) and wind speed in knots (kt). The location of La Paz, Mexico, is indicated on the map

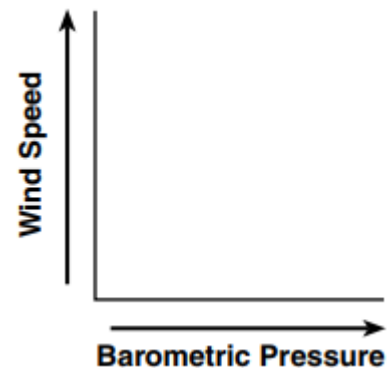
Hurricane Odile

Date	Location		Barometric Pressure (mb)	Wind Speed (kt)
	Latitude (° N)	Longitude (° W)		
September 12	15	105	993	50
September 13	16	106	983	65
September 14	19	107	918	120
September 15	23	110	941	110
September 16	27	113	987	55
September 17	30	114	995	40
September 18	31	112	1003	25

6. On the map, plot the seven locations of Hurricane Odile indicated by the latitudes and longitudes shown in the data table. Connect all seven plots with a line.



7. Using the set of axes in your answer booklet, draw a line to represent the general relationship between barometric pressure and wind speed associated with Hurricane Odile.



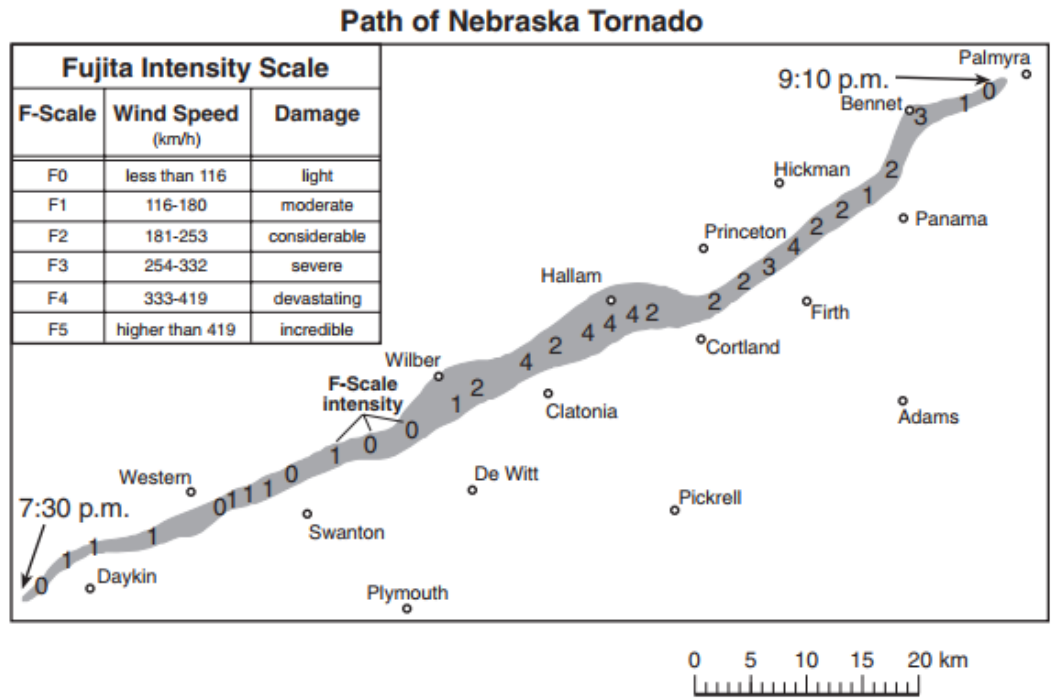
8. Identify one weather instrument that was used to measure the wind speed of Hurricane Odile.

9. Describe two actions that a person living in La Paz, Mexico, could take to prepare for an approaching hurricane.

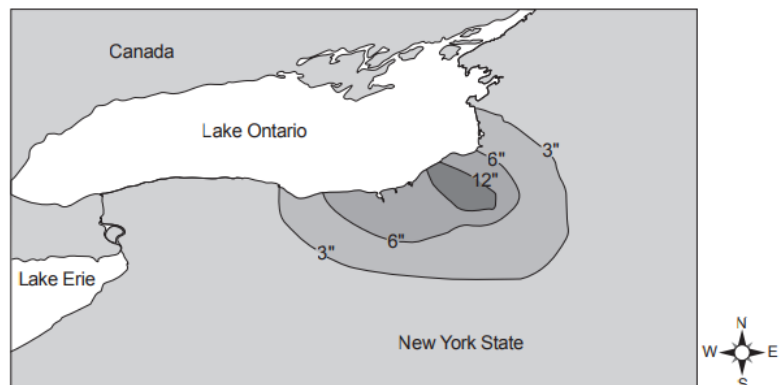
PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

Base your answers to questions 10 through 13 on the map and on your knowledge of Earth science. The map shows the path of a tornado that moved through a portion of Nebraska on May 22, 2004 between 7:30 p.m. and 9:10 p.m.

The path of the tornado along the ground is indicated by the shaded region. The width of the shading indicates the width of destruction on the ground. Numbers on the tornado's path indicate the Fujita intensity at those locations. The Fujita Intensity Scale (F-Scale), in the left corner of the map, provides information about wind speed and damage at various F-Scale intensities.



10. On the map below, place an X at a location where the tornado damage was greatest.
11. State a possible wind speed of the tornado, in kilometers per hour (km/h), when it was moving through the town of Bennet.
12. Identify the weather instrument usually used to measure wind speed.
13. Describe one safety precaution that should be taken if a tornado has been sighted approaching your home.
14. 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
 - a. northeast
 - c. southeast
 - b. northwest
 - d. southwest



ASSESS YOURSELF ON THIS LESSON: _____/14
 If you missed more than 3, do the Additional Practice.!

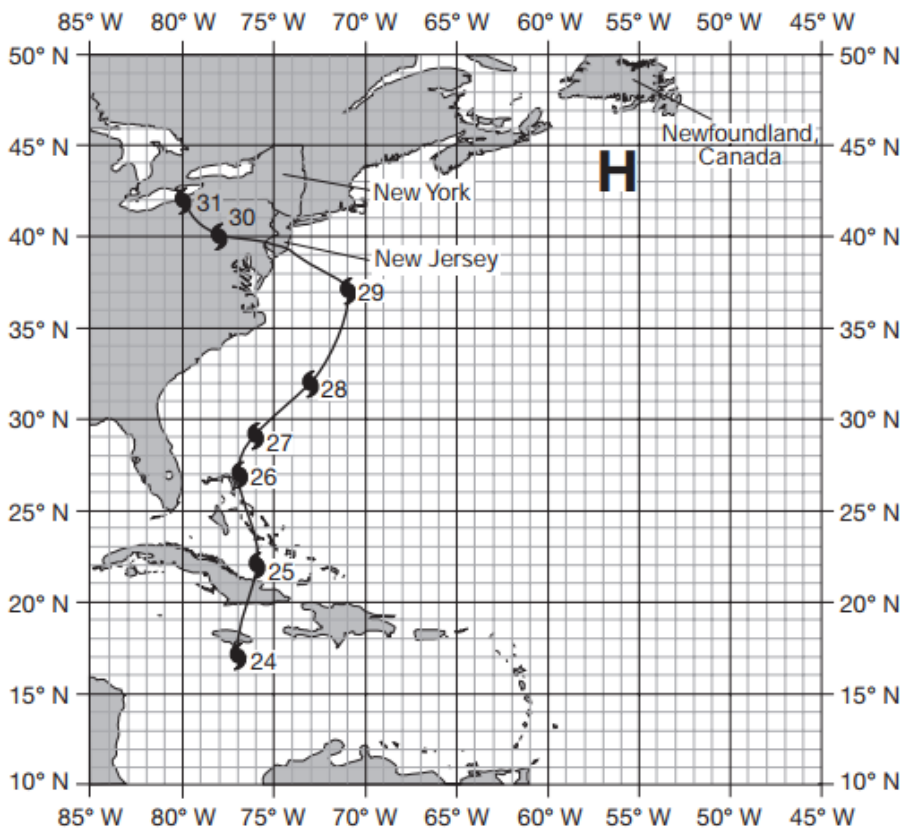
PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

Base your answers to questions 1 through 4 on the passage and map below and on your knowledge of Earth science. The map shows the positions of the eye (center) of Hurricane Sandy in its path from October 24 to October 31, 2012. A high-pressure center (H) is shown on the map.

Hurricane Sandy

In October 2012, Hurricane Sandy produced extreme damage to New York City and the coast of New Jersey due to high winds and a high storm surge. A storm surge is the rise in the level of ocean water along a coast that is caused by strong winds blowing toward land from a severe storm. High ocean tides, occurring at the same time, added to the height of the storm surge. A high-pressure center, located just south of Newfoundland, Canada, affected Hurricane Sandy by altering the path of the jet stream. This change in the jet stream, combined with surface wind circulation around the high-pressure center, caused Hurricane Sandy to curve westward, making landfall along the coast of New Jersey.

Path of Hurricane Sandy from October 24, 2012 to October 31, 2012



1. Describe the surface wind circulation around the high-pressure center (H) that is located south of Newfoundland.

2. Explain why Hurricane Sandy weakened on October 30 and October 31.

3. Using information from the map, complete the data table by identifying the latitude and longitude positions of the eye of Hurricane Sandy from October 27, 2012 to October 29, 2012. Express your latitude and longitude positions to the nearest whole degree.

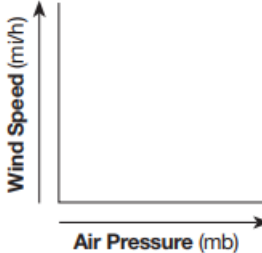
Position of Hurricane Sandy from October 24, 2012 to October 31, 2012

Date	Latitude° (N)	Longitude° (W)
October 24	17	77
October 25	22	76
October 26	27	77
October 27		
October 28		
October 29		
October 30	40	78
October 31	42	80

PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

4. The data table below shows the air pressure, measured in millibars (mb), and surface wind speed, measured in miles per hour (mi/h), recorded near the center of Hurricane Sandy on three separate days. On the set of axes, draw a line to represent the general relationship between air pressure and surface wind speed associated with Hurricane Sandy for these three days.

Date	Air Pressure (mb)	Surface Wind Speed (mi/h)
October 24, 2012	973	70
October 27, 2012	958	75
October 29, 2012	943	90



Base your answers to questions 5 through 8 on the passage and the graph below and on your knowledge of Earth science.

Great Lake Effects

The Great Lakes influence the weather and climate of nearby land regions at all times of the year. Much of this lake effect is determined by the relative temperatures of surface lake water compared to the surface air temperatures over those land areas. The graph below shows the average monthly temperature of the surface water of Lake Erie and the surface air temperature at Buffalo, New York.

In an average year, four lake-effect seasons are experienced. When surface lake temperatures are colder than surface air temperatures, a stable season occurs. The cooler lake waters suppress cloud development and reduce the strength of rainstorms. As a result, late spring and early summer in the Buffalo region tends to be very sunny.

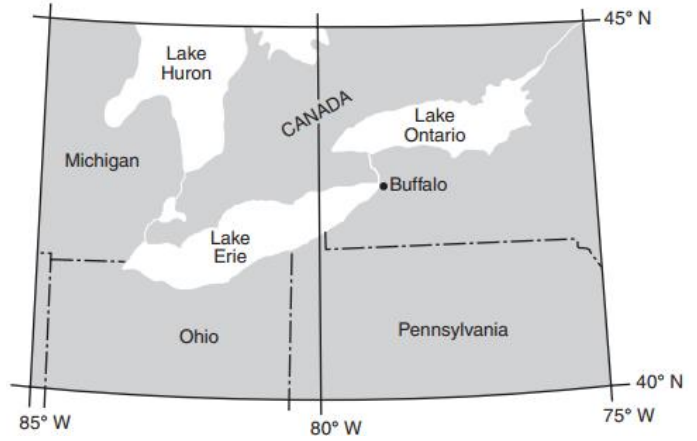
A season of lake-effect rains follows. August is usually a time of heavy nighttime rains, and much of the rainy season is marked by heavy, localized rainstorms downwind from the lake. Gradually, during late October, lake-effect rains are replaced by snows. Generally, the longer the time the wind travels over the lake, the heavier the lake effect becomes in Buffalo.

Finally, conditions stabilize again, as the relatively shallow Lake Erie freezes over, usually near the end of January. Very few lake-effect storms occur during this time period.

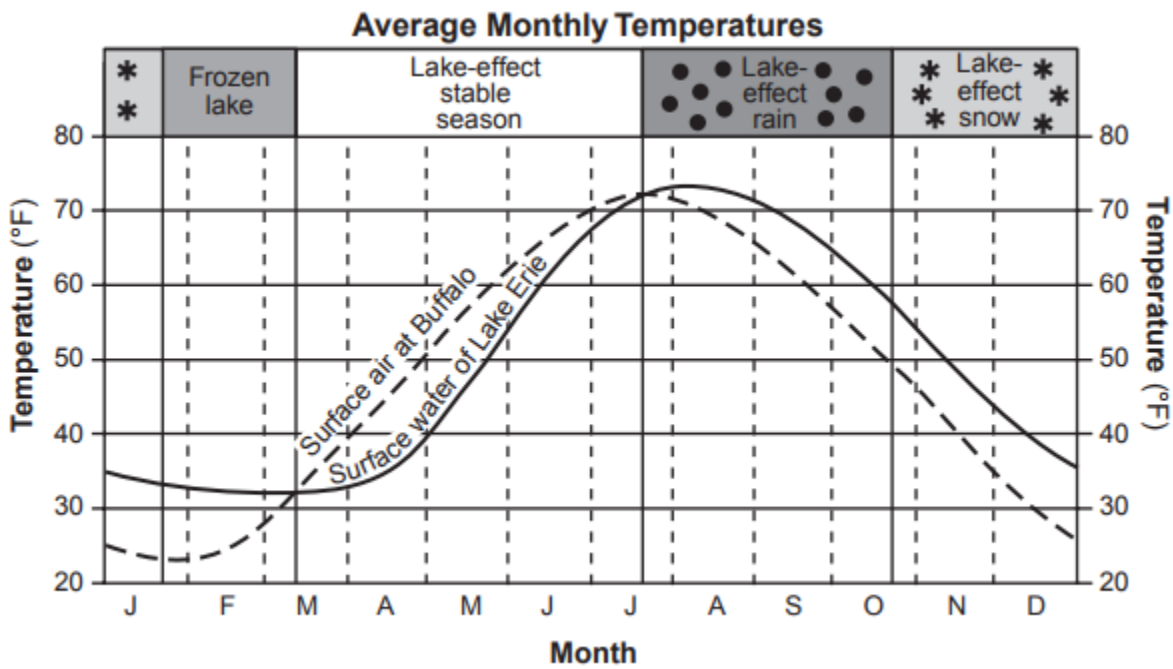
5. The passage states, "The cooler lake waters suppress cloud development..." because the water cools the air above its surface. Explain why this cool air above the lake surface reduces the amount of cloud development.
6. Identify one weather variable that determines whether Buffalo receives rain or snow from a lake-effect storm in October.

PRACTICE PACKET: TOPIC 7 Earth's Atmosphere

7. On the map, draw one straight arrow in Lake Erie to show the winter wind direction most likely to bring the heaviest lake-effect snows to Buffalo.



8. Explain why the Buffalo surface air temperatures increase faster and earlier in the year than do the surface water temperatures of Lake Erie.



Source: www.erh.noaa.gov (adapted)

ASSESS YOURSELF ON THIS ADDITIONAL PRACTICE: _____/8
 If you missed more than 2 you should see me and/or re-watch the lesson video assignment.