

NAME: _____

WEATHER NOTES

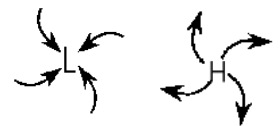
Log onto YouTube and search for [jocrisci channel](#).

REFERENCE TABLES (Videos 8.1 & 8.2 ESRT 12, 13a, 14b)

- Use the temperature scales on page 13. (notes-air temperature conversions)
 - 80°C to °F
 - 443 K to °F
 - At what temperature °F does ice melt?
 - At what temperature °C does water freeze?
- Determine the dew point temperature and relative humidity from the tables on page 12
 - What is the relative humidity if the air temperature is 16°C and the wet bulb temperature is 10°C?
 - The air temperature is 5°C and the wet bulb temperature is 3°C. What is the relative humidity?
 - If the relative humidity is 74 % and the dry bulb temperature is 20°C, what is the dew point temperature?
- Use the pressure scales on page 13
 - A pressure of 1017 mb equals _____ inches
 - A pressure of 29.5 inches equals _____ mb
 - If a barometer reads 1020 mb and a few hours later a storm passes over the area, give one possible reading of the barometer during the storm.
- Read a station model. (lab-notes)
- Read the planetary wind diagram on page 14. (notes-planetary winds and moisture belts)

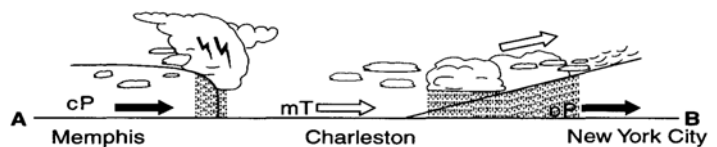
ATMOSPHERIC VARIABLES (Videos 8.3 & 8.4)

- You must know the relationships between temperature, dew point, relative humidity, and the probability of precipitation. (How clouds form)
- You must know the relationship between air pressure, wind direction and weather.



WEATHER MAP ANALYSIS (Videos 8.5 ESRT 13b)

- Describe the type and source of an air mass affecting the areas in the image to the right.
- Describe the general weather of both fronts.
- Forecast the weather for an area.



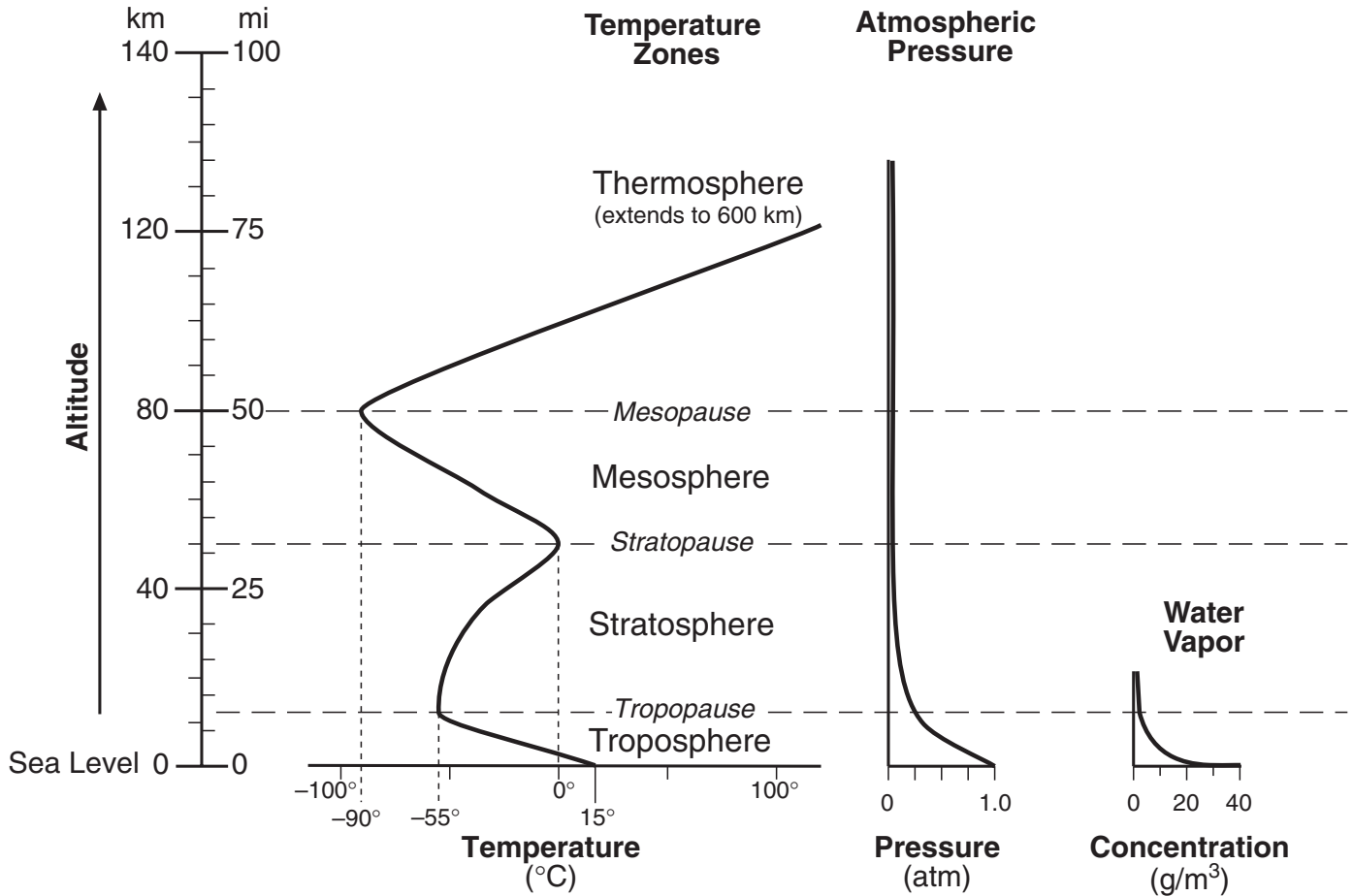
VIOLENT WEATHER (Videos 8.6 & 8.7)

- Explain two things that cause a hurricane to lose strength.
- Describe how large a hurricane is and how long it affects an area.
- Identify the area from which hurricanes originate.

Weather Facts

- Video 8.1 & 8.2 ESRT 13a
1. A barometer measures / air pressure
 2. Air pressure or barometric pressure is caused by / weight of the air
 3. Cold air is high pressure because / the molecules are close together, sinks and compresses (Heavy)
 4. Hot air is low pressure because / the molecules are far apart, expands, and cool (Room for H₂O)
 5. An anemometer measures / wind speed ~ Wind vane measures / wind direction
 6. Wind is named for / the direction it comes from
 7. Wind is caused by / differences in air pressure H → L
 8. Isobars close together indicate / a fast wind speed --- far apart, calm winds
- Video 8.3 ESRT 14b
9. The weather in a **high** is / **happy**, nice, cool and dry (sunny no precipitation)
 10. The weather in a **low** is / **lousy**, bad, warm and wet (cloudy and precipitation)
 11. The circulation around a low pressure system is / LICC, (**L**ow, **I**nward, **C**ounter**C**lockwise)
 12. The circulation around a high pressure system is / HOC (**H**igh, **O**utward, **C**lockwise)
 13. Sea Breeze / daytime, land is hot (Low Pressure), ocean is cold (High Pressure) winds go H → L
 14. Land breeze occurs at / night and is the exact opposite of the conditions above
 15. Coriolis effect / winds and ocean currents deflected due to Earth's rotation
- Video 8.4 ESRT 12
16. Sling psychrometer has a wet and dry bulb to measure / dew point and relative humidity
 17. The closer air temperature is to the dew point / the greater the chance of precipitation
 18. Dewpoint temperature is the / temperature at which the air is saturated (filled) with water
 19. Relative humidity is the / percent of water in the air
 20. 100 % relative humidity / = precipitation, clouds, and/or fog
 21. Warm air is capable of holding more / water vapor than cold air
 22. **Clouds form when / warm, moist air rises, expands, cools, & condenses (at the dew point!)**
 23. Cloud droplets form on tiny dust particles in the air called / condensation nuclei
- Video 8.5 ESRT 13b
24. Weather systems in the US usually move / from west to east (with a hook to the NE)
 25. **The 500 rule says / over 500 add a 9, below 500 add a 10, and always add a decimal**
 26. What is the source region of a cold and dry (cP) air mass / Central Canada
 27. What is the source region of a warm and moist (mT) air mass / Gulf of Mexico (warm waters)
 28. Warm air rises because / it is less dense than cold air! (the molecules are more compact in cold air)
 29. At the cold front air is / very unstable, thunderstorm occur (short, heavy rain)
 30. In front of a warm front air is / stable long, drizzle occurs (long, light rain)
- Videos 8.6 & 8.7
31. Hurricanes form / over warm oceans in summer and autumn
 32. Hurricanes lose strength / as they move over land or cool water
 33. To prepare for a hurricane / prepare escape route, board up windows, store up food, water, batteries
 34. Tornadoes are / short lived (a minute or less) small in size – prepare by practicing where to go during a tornado – go to the basement or sheltered area

THE ATMOSPHERE



“Selected Properties of Earth’s Atmosphere”

For the following questions, refer to the Earth Science Reference Tables, page _____

1. In which sphere is most of the water vapor found? _____
2. What happens to atmospheric pressure as altitude increases? _____
3. In which sphere does weather occur? _____
4. What happens to the temperature in each sphere as altitude increases? It . . .

Troposphere _____ Mesosphere _____
 Stratosphere _____ Thermosphere _____

Selected Properties of Earth's Atmosphere: Earth Science Reference Table page 14

Name the boundary that separates each of the following:

- (a) the troposphere and the stratosphere _____
- (b) the stratosphere and the mesosphere _____
- (c) the mesosphere and the thermosphere _____

Layer	Highest Altitude		Temperature Range (°C)	
	Miles	Kilometers		
Troposphere			From	to
Stratosphere			From	to
Mesosphere			From	to
Thermosphere			From	to

1. Which layer of the atmosphere is most of the water vapor is located. _____
2. Name the layer, closest to Earth's surface, where the temperature increases as you increase altitude _____
3. What happens to atmospheric pressure as you increase altitude. _____
4. What is the atmospheric pressure at sea level _____ atm
5. What is the temperature at the Tropopause? _____
6. At what boundary is the coldest temperatures found? _____
7. Name the boundary where the atmospheric pressure is approximately .25 atms.

8. In which layers of the atmosphere can the temperature be 15 °C? _____
9. What is the highest concentration of water vapor? _____ g/m³
10. In what layer is the highest concentration of water vapor found? _____

Weather Variables

Temperature _____

Instrument used to measure temperature: _____

Measured in . . .

° _____
 ° _____
 ° _____

Shown on a weather map with _____ - _____



Convert the temperatures below by using the conversion chart in the Earth Science Reference Tables, page ____.

Fahrenheit	Celsius	Kelvin
20		
	70	
		260
	40	
60		
		290
	-40	
		240
75		
	50	

Find the following temperatures:

	Fahrenheit	Celsius	Kelvin
Water boils			
Water freezes			
Body temperature			
Room temperature			

Fact(s) to memorize: 1 - 4

Air pressure

Instrument used to measure pressure:

Measured in . . . _____ and _____

Shown on a weather map with _____ - _____



Factors Affecting Air Pressure:

Using the Pressure Conversion Chart in the Earth Science Reference Tables page _____, complete the tables below.

Table with 2 columns: Inches, Millibars. Rows: 29.06, 29.94, 30.50, 29.44

Table with 2 columns: Millibars, Inches. Rows: 1011.0, 1021.0, 1035.0, 991.0

Normal pressure at sea level is _____ atmosphere and is equal to . . .

_____ millibars and _____ inches

Pressure and Wind

Fact(s) to memorize: 1 - 8

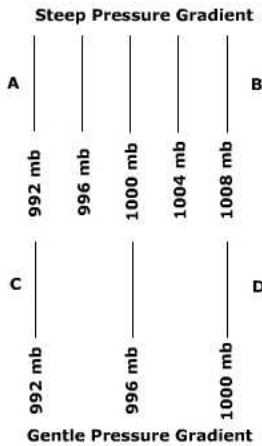


What instrument is used to measure wind speed?

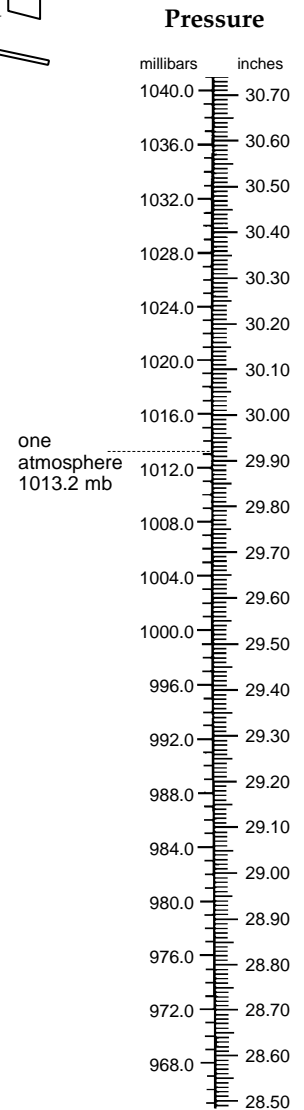
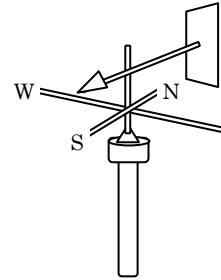
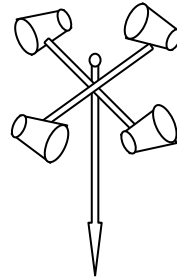
How are winds named?

What causes wind?

Which pressure gradient would result in greater wind velocity?



Air pressure?



Convert the following measurements using the chart on page 13 of the ESRTs.

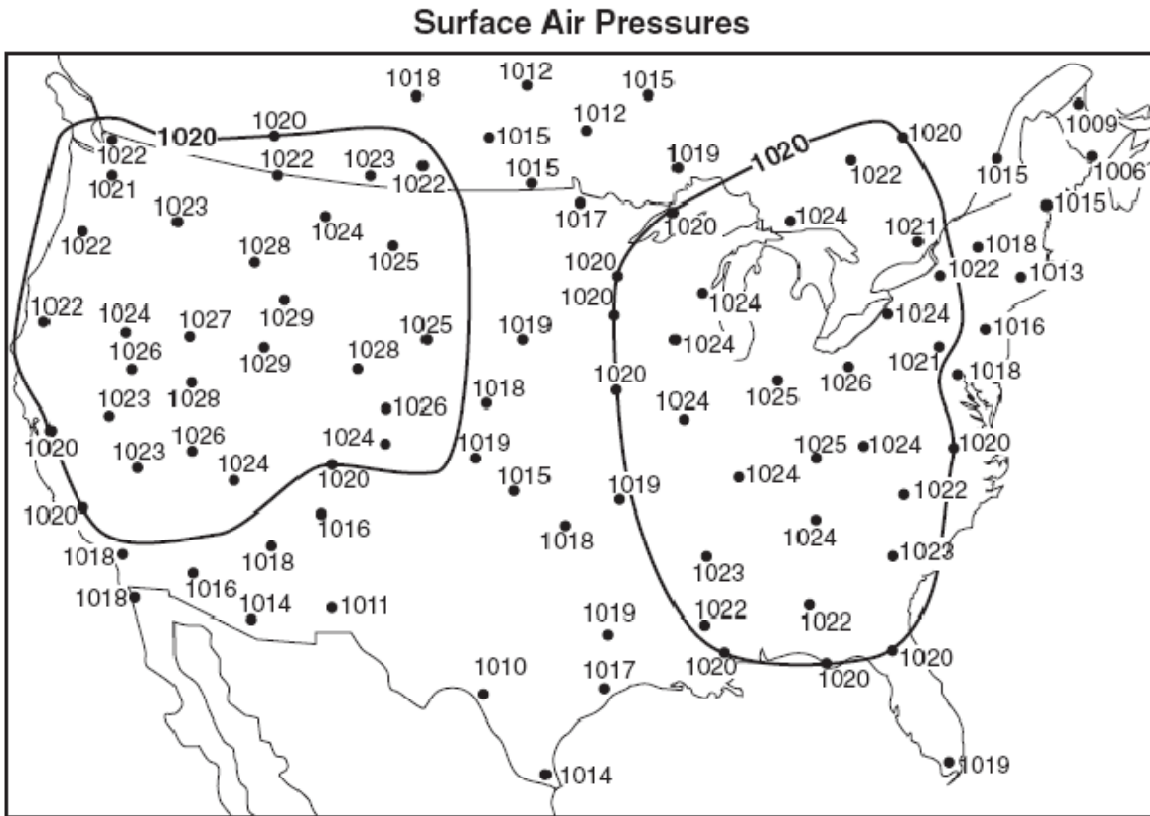
mb	Inches of Mercury
1007	
	29.44
1022	
	29.35

Wind blows from areas of _____ to areas of _____.

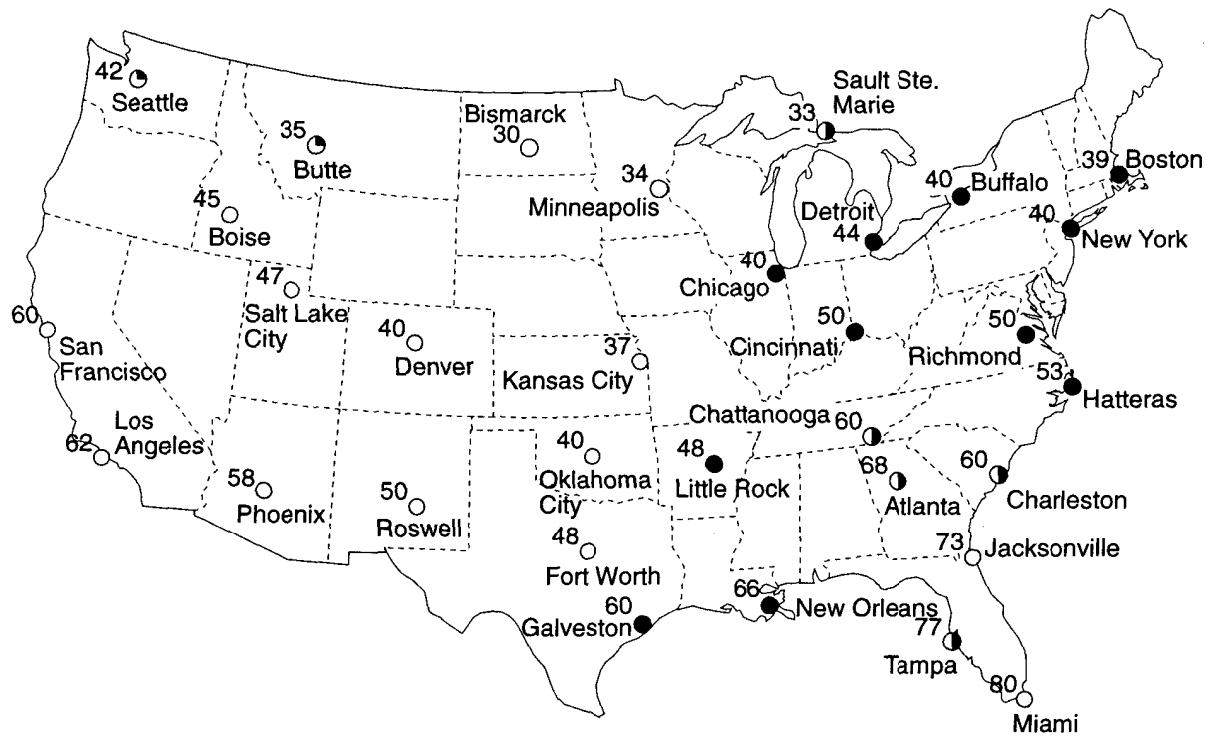
Draw the relationship between air pressure and altitude.



1. Draw the 1024 and 1028 isobar on the map below.

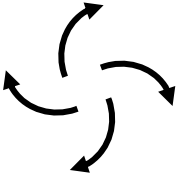
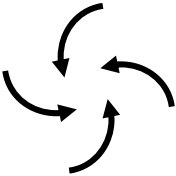


2. Draw the 30, 40, 50 and 60 isotherm on the map below.



Coriolis Effect – _____

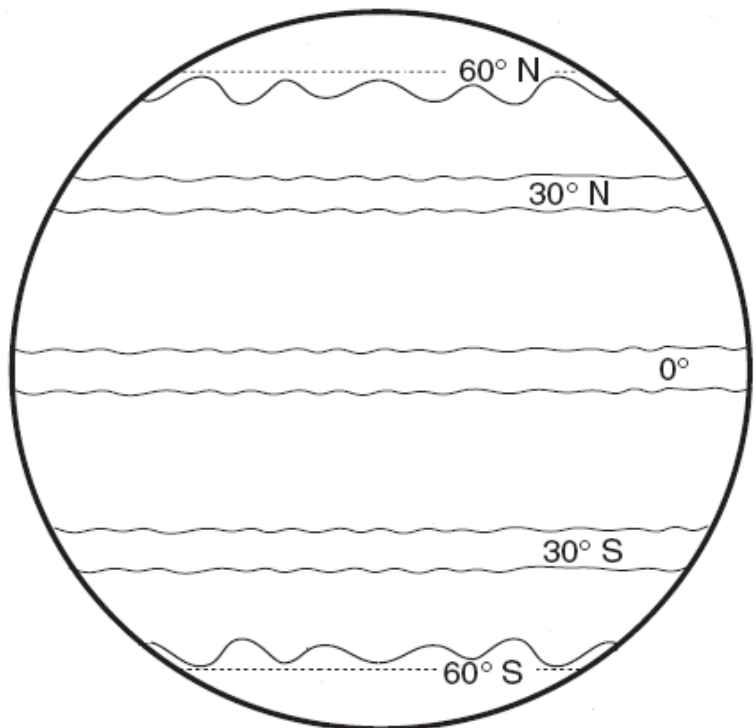
Weather Factors Associated with Different Pressure Areas

<i>High Pressure</i>	<i>Low Pressure</i>
	

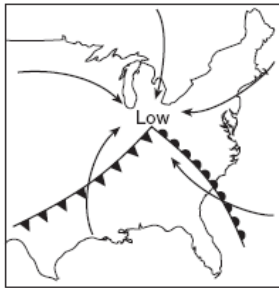
Planetary winds: ESRT pg _____

Fill in the diagram to the right.

- Draw the wind arrows illustrating the direction and deflection.
- Label the areas that would be wet or dry.
- Label the areas that would be high pressure or low pressure.



1. The arrows on which map best represent the direction of surface winds associated with this low-pressure system?



(1)



(2)

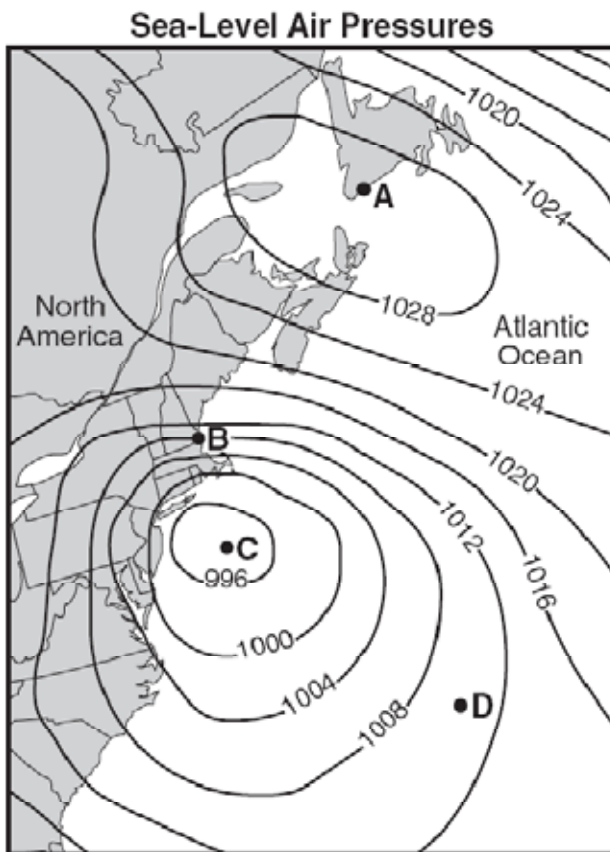


(3)



(4)

Base your answers to questions 2 through 12 on the map below, which shows sea-level air pressure, in millibars, for a portion of the eastern coast of North America. Points *A*, *B*, *C*, and *D* are sea-level locations on Earth's surface.



2. What weather instrument was used to measure the air pressures? _____

3. Which location (A, B, C, or D) recorded the highest wind speed? _____

4. Which location (A, B, C, or D) is in the center of a high pressure area? _____

5. Which location (A, B, C, or D) is in the center of a low pressure area? _____

6. What is the approximate air pressure of location D? _____

7. Between points A and B, which direction is the wind blowing? Towards _____

8. Which location (A or C) is the wind blowing counter clockwise? _____

9. At which location (A or C) is the wind blowing in a clockwise direction? _____

10. In which direction do the prevailing winds carry our weather systems across the United States? _____

11. At which location (A, B, C, or D) is the air rising? _____

12. At which location (A, B, C, or D) is the air sinking? _____

Relative Humidity _____

measured in _____

When the air is holding as much water vapor as it can, the air is _____

When the air is saturated, the relative humidity is _____

Temperature & Relative Humidity _____

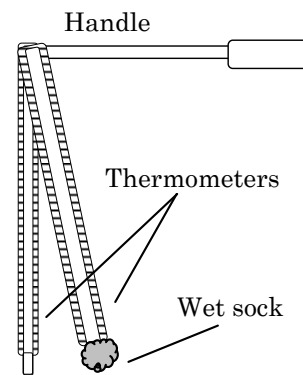
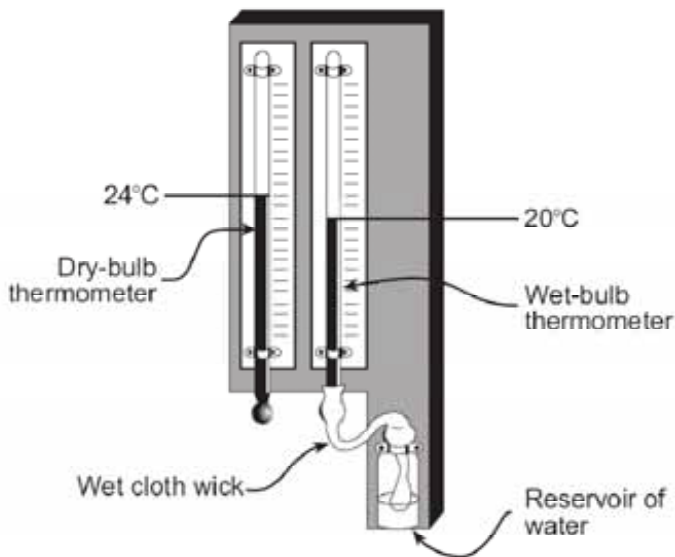
State the relationship between temperature and relative humidity.

As temperature increases, relative humidity _____

Draw the relationship on the graph to the right.



Instruments used to determine relative humidity:



Dew point Temperature _____

Determining Relative Humidity and Dew point Temperatures

Dry bulb – _____

Wet bulb – _____

When given the wet bulb and dry bulb temperatures, you can determine the dew point temperature and relative humidity by following the directions below.

Use the Dew point Temperature and Relative Humidity charts in the Earth Science Reference Tables on page _____.

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:

Determine the difference between dry bulb and wet bulb.

Dry bulb	
Wet bulb	-
Difference	

Using the Dew point Temperature chart, find the dry bulb temperature on the dew point chart (left side) and the difference between the wet bulb and dry bulb temperatures (top).

- Match these places within the chart. What is the Dew point Temperature? _____ °C

Relative Humidity:

Same as dew point, except use the Relative Humidity chart. Find the dry bulb temperature on the relative humidity chart (left side) and the difference between the wet bulb and dry bulb temperatures (top).

- Match these places within the chart. 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?	
Wet bulb	-		
Difference		What is the Relative Humidity?	

Fill in the following table: Be careful! Make sure you are using the correct chart.

Dry bulb temperature (°C)	Wet bulb Temperature (°C)	Difference between wet/dry bulb	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
17	13			
25		1		
5		2		
-9	-10			

- What is the dew point temperature if the dry bulb is 24°C and the wet bulb is 22°C? _____ °C
- What is the relative humidity if the dry bulb is 20°C and the wet bulb depression (difference between wet and dry bulb) is 6? _____ %
- What is the relative humidity if the dew point temperature is 6°C and the wet bulb depression is 1? _____ %
- What is the dew point temperature if the wet bulb depression is 6 and the relative humidity is 61%? _____ °C
- A student used a sling psychrometer to measure the humidity of the air. If the relative humidity was 65% and the dry-bulb temperature was 10°C, what was the wet-bulb temperature?
 (1) 5°C (2) 7°C (3) 3°C (4) 10°C

Fact(s) to memorize: 22 & 23

Condensation

Examples:

Three things needed for Condensation to occur:

(1)

(2)

(3)

Density of Air:

-

-

Formation of Clouds:

Precipitation –

Examples -

What does precipitation do for the environment?



Weather

Where does the energy for weather originate? _____

In the United States, the general direction that weather systems move is toward the _____.

Station Models

What page of the ESRTs has the key to decode the station model? _____

The temperature and dewpoint are measured in degrees _____.



Using the station model above, fill in the chart below using the decoding information from the ESRTs:

Temperature	Dew Point	% Cloud Cover	Air Pressure	Barometric Trend	Wind Direction	Wind Speed

RULE:

These numbers must be converted!
Do NOT simply write the numbers above.

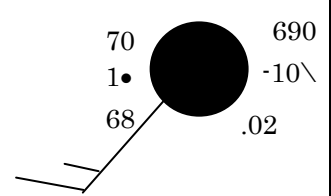
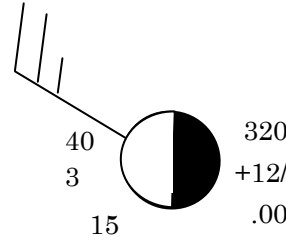
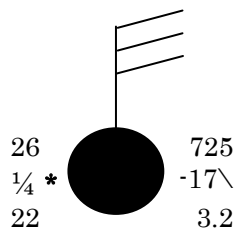
Station Model

- Temperature (°F) → 76
- Present weather → 28
- Visibility (mi) → $\frac{1}{2}$ ✱
- Dewpoint (°F) → 55
- Wind speed → 10 knots
- Amount of cloud cover (approximately 75% covered)
- Barometric pressure (1019.6 mb) → 138
- Barometric trend (a steady 1.9-mb rise the past 3 hours) → +19/
- Precipitation (inches past 6 hours) → .25
- Wind direction (from the southwest)

[whole feather = 10 knots
 half feather = 5 knots
 total = 10 knots]

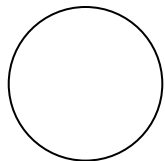
(1 knot = 1.15 mi/hr)

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

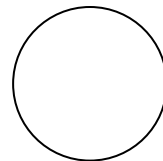


Wind Direction			
Wind Speed			
Cloud cover			
Air pressure			
Barometric tendency			
Precipitation			
Temperature			
Dew Point			
Present weather			
Visibility			

100 % cloudy
 pressure = 975.6 mb
 barometric tendency = falling .1 mb
 precipitation = .25 inches
 temperature 55°
 present weather (fog)
 visibility (.125 miles)
 dew point 55°
 Wind = Southwest
 Wind speed 10 knots



No clouds
 pressure = 1008.5 mb
 barometric tendency = rising .2 mb
 precipitation = 0 inches
 temperature 78°
 present weather (clear)
 visibility (full)
 dew point 47°
 Wind = Northeast
 Wind speed 25 knots



Station Models

On a station model, barometric pressure is **ALWAYS** written in a three - digit format.

Converting from millibars:

Drop wither the 9 or the 10 in the front of the number and loose the decimal point.

Millibars / Station Model	Millibars / Station Model	Millibars / Station Model
1009.3 mb =	1022.2 mb =	994.9 mb =
984.2 mb =	1000.2 mb =	1000.5 mb =
1024.2 mb =	989.8 mb =	1008.2 mb =
991.2 mb =	1011.3 mb =	971.4 mb =
1046.5 mb =	1007.5 mb =	1031.1 mb =
1049.9 mb =	957.6 mb =	961.3 mb =
999.9 mb =	1012.3 mb =	974.7 mb =
950.3 mb =	986.4 mb =	1033.9 mb =
973.4 mb =	962.2 mb =	1000.0 mb =

Converting from the station model format to millibars:

If the first number on the station model is 0 – 4, place a 10 in front of the number.

If the first number on the station model is 5 – 9, place a 9 in front of the number.

Place a decimal point between the last 2 numbers.

Station Model / Millibars	Station Model / Millibars	Station Model / Millibars
146 = mb	015 = mb	080 = mb
457 = mb	623 = mb	978 = mb
986 = mb	800 = mb	899 = mb
514 = mb	200 = mb	402 = mb
002 = mb	424 = mb	901 = mb
285 = mb	913 = mb	802 = mb
778 = mb	708 = mb	321 = mb
502 = mb	399 = mb	116 = mb
385 = mb	010 = mb	698 = mb

Air Masses

ESRT – pg _____

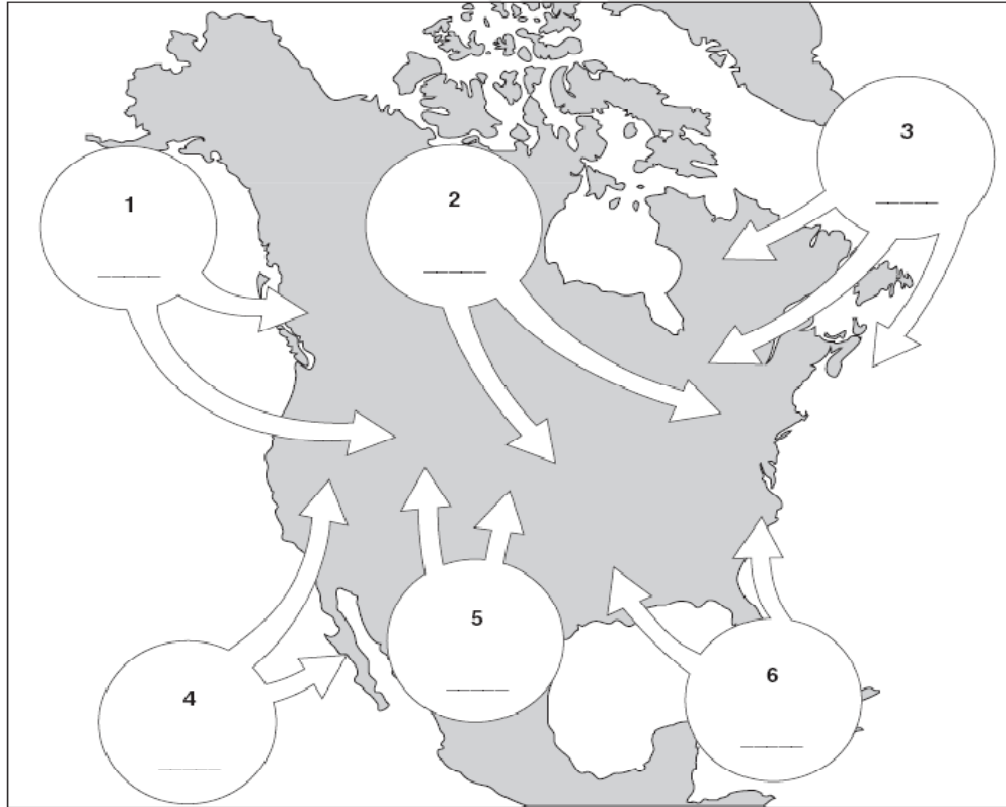
Symbol	Written form	Type of weather
cP		
cT		
mP		
mT		
cA		

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



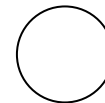
Weather Map Practice

1. The map provided below shows six source regions for different air masses that affect the weather of North America. The directions of movement of the air masses are shown. Using the standard two-letter air-mass symbols from the Earth Science Reference Tables, label the air masses by writing the correct symbol in each circle on the map.



2. Using the station model below, draw and label the following information. Cloud cover has been left out. Using the information determine what the coverage would be and shade in the station model.

Wind direction	Northeast
Wind speed	20 knots
Present weather	Hail
Visibility	¼ mile
Temperature	52 °F
Dew point	52°F
Cloud cover	?



Earth Science Reference Tables page _____

COLD FRONT:

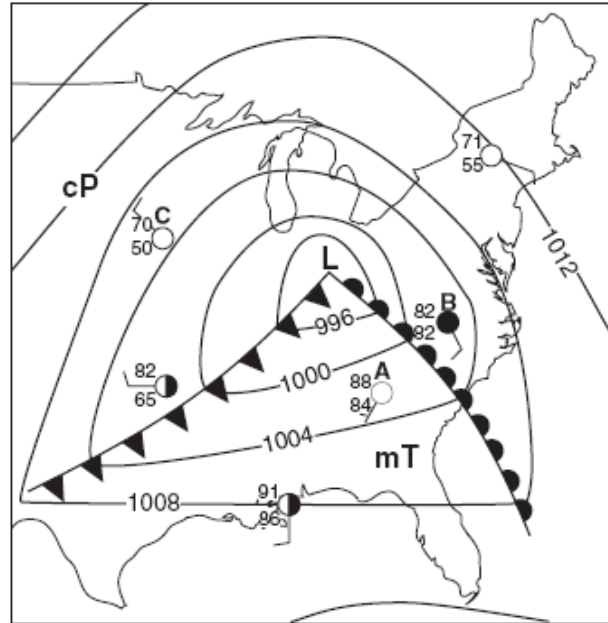
Weather Map Symbols

WARM FRONT

Weather Map Symbols

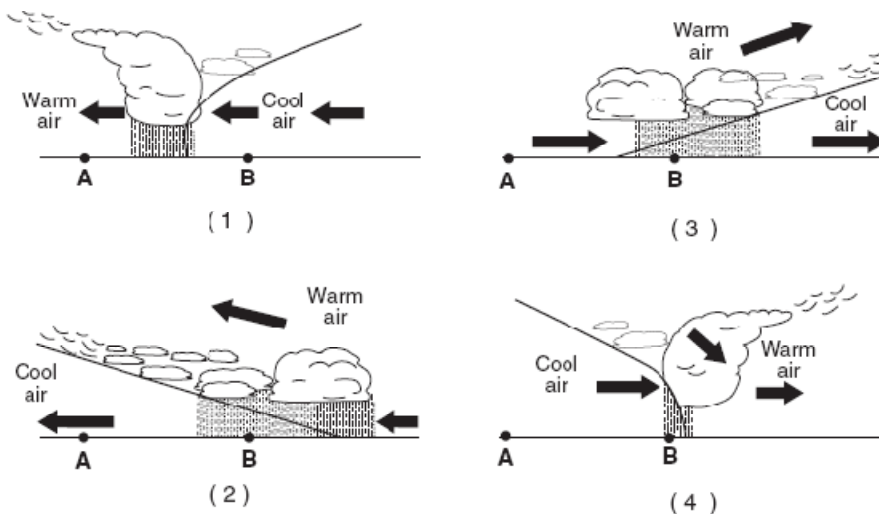
Base your answers to questions 3 – 12 on the weather map below. The map shows a low pressure system and some atmospheric conditions at weather stations A, B, and C.

3. What is the symbol for the warm and moist air mass? _____
4. What is the symbol for the cold and dry air mass _____
5. Where did the warm air mass originate? _____
6. Where did the cold air mass originate? _____
7. Which weather station (A, B, or C) has 100% relative humidity? _____
8. Which weather station (A, B, or C) will show colder temperatures within the next couple days? _____



9. In what direction is the wind blowing toward in weather station C? _____
10. List three things that indicate that this is a low pressure area on the map above.

11. Which cross sections below best represents the air masses, air movement, clouds and precipitation occurring behind and ahead of the warm front located between stations A and B?

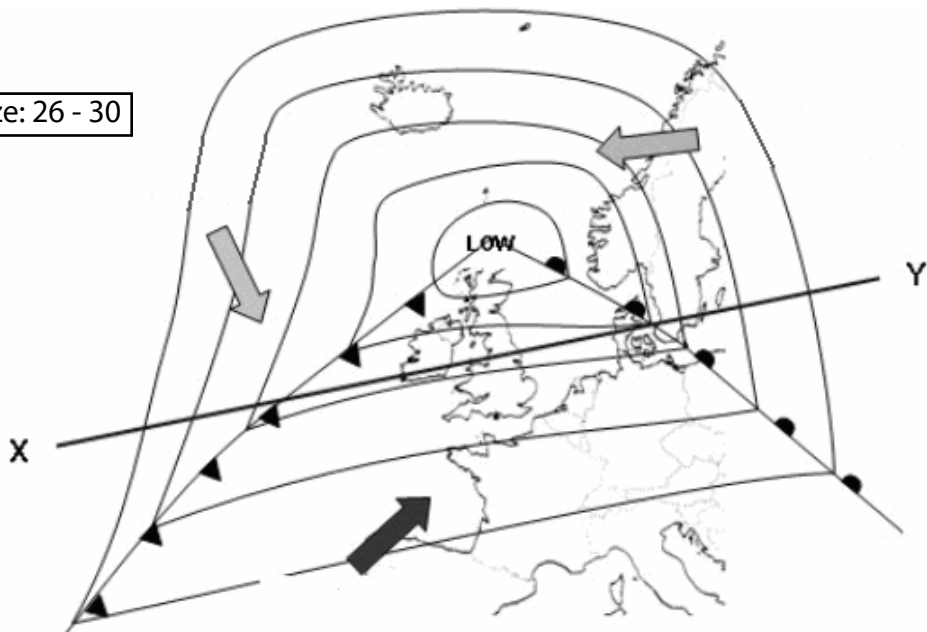


MID-LATITUDE CYCLONE

On the map below, label the warm and cold fronts.

Additionally, write the abbreviations for the three air masses.

Fact(s) to memorize: 26 - 30



X

Y

Hazardous Weather and Safety

Fact(s) to memorize: 31 - 34



Give two other names for hurricanes: _____ and _____

Hurricanes are areas of intense _____ pressure. (H/L)

Which covers a greater geographic area? hurricanes or tornadoes

Name two safety precautions to take for HURRICANES:

- A. _____
- B. _____

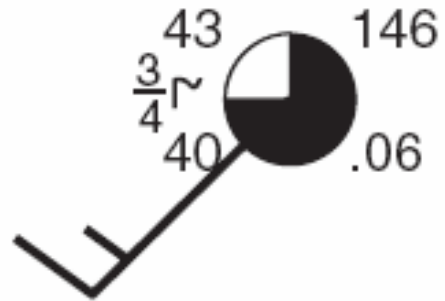
Name two safety precautions to take for TORNADOES:

- A. _____
- B. _____

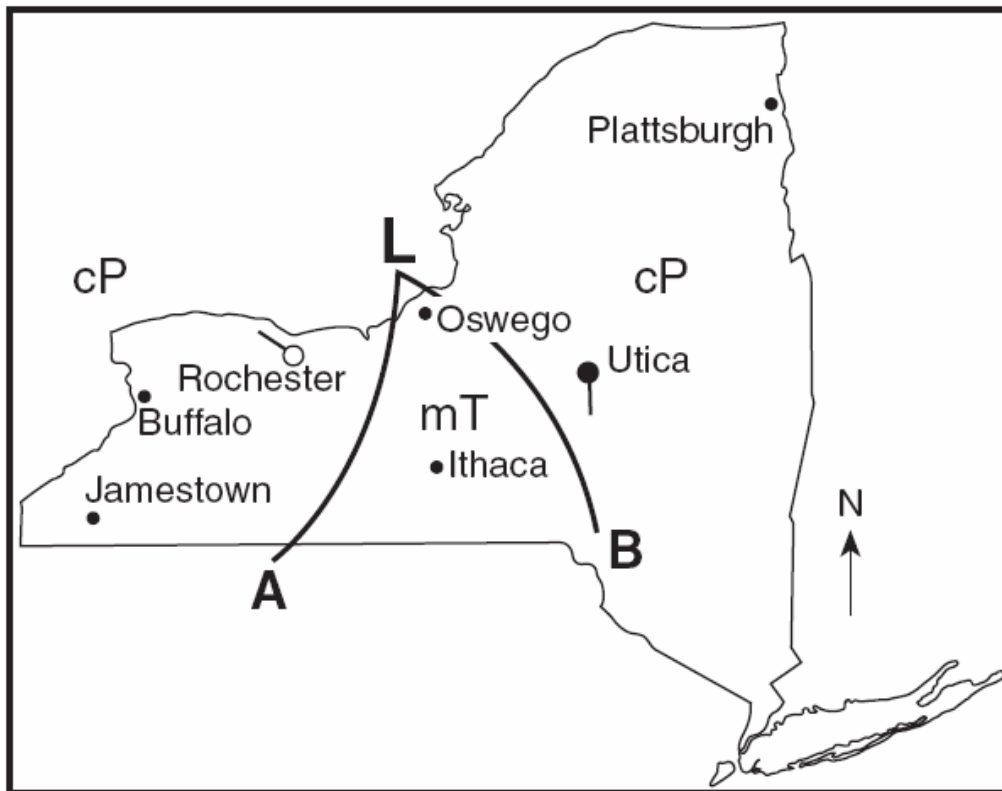
Weather Review

1. Use the station model below to fill in the information.

- Temperature
- Dew Point
- Cloud Cover
- Air Pressure
- Wind Direction
- Wind Speed
- Precipitation
- Visibility
- Current Weather



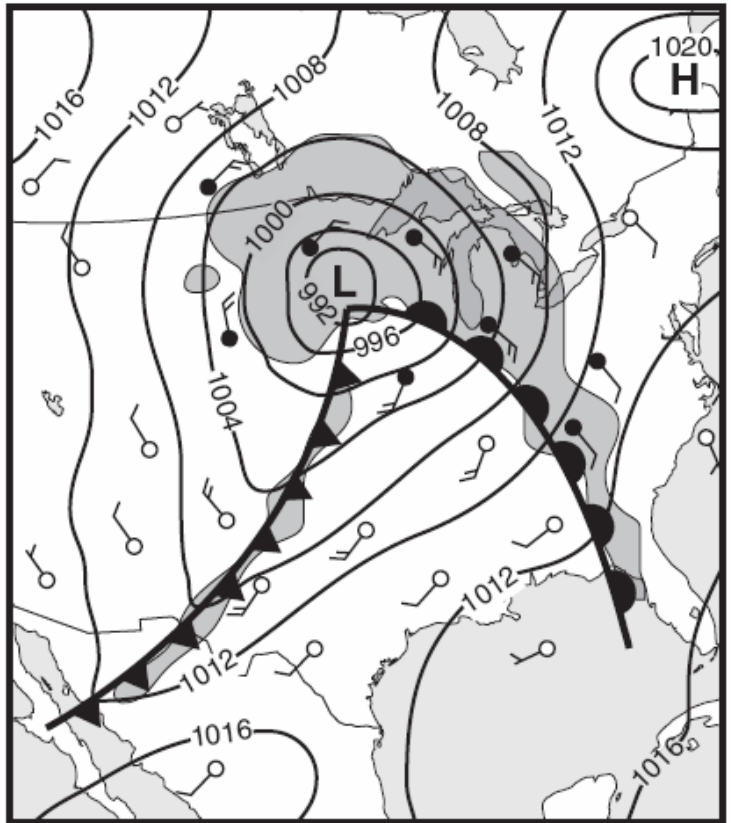
Use the following diagram to answer questions 2-6.



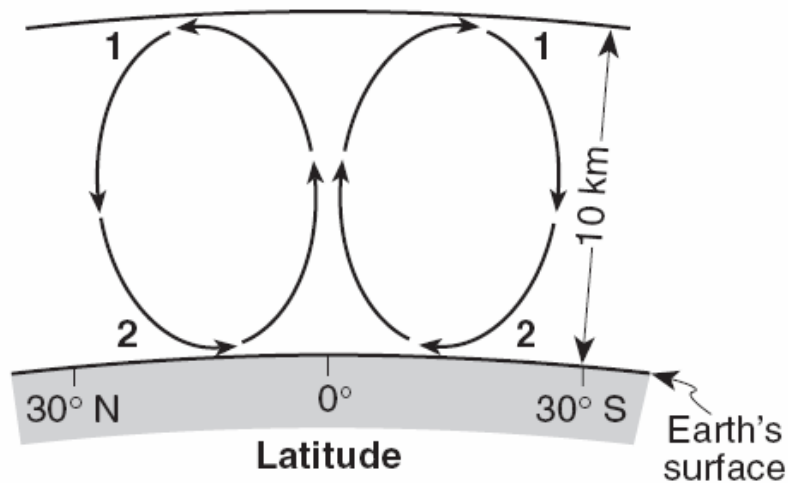
2. Label the lines A and B with the correct frontal symbols.
3. Label the low pressure with the correct wind arrows.
4. Lightly shade the area that is receiving precipitation.
5. What will happen to the temperature in Utica over the next several hours?
6. Where did the air over Buffalo originate?

Use the following diagram to answer questions 7-11.

7. Label the continental polar air mass with a cP.
8. Label the maritime tropical air mass with mT.
9. Label the area with the calmest wind with an X.
10. What is the highest possible air pressure on the map.
11. Which general direction does the LOW pressure usually travel?

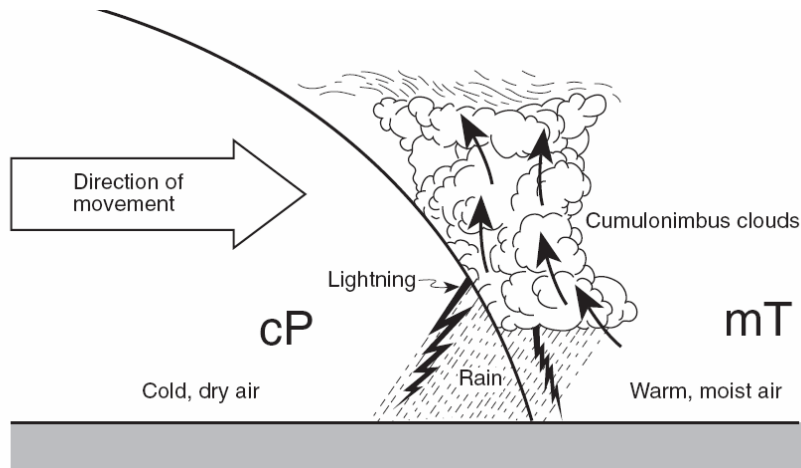


Use the picture below to answer questions 12-14.



12. Which layer of the atmosphere does this picture take place?
13. What happens to the temperature, pressure and water vapor as you move from point 2 to point 1?
14. Label the tropopause.

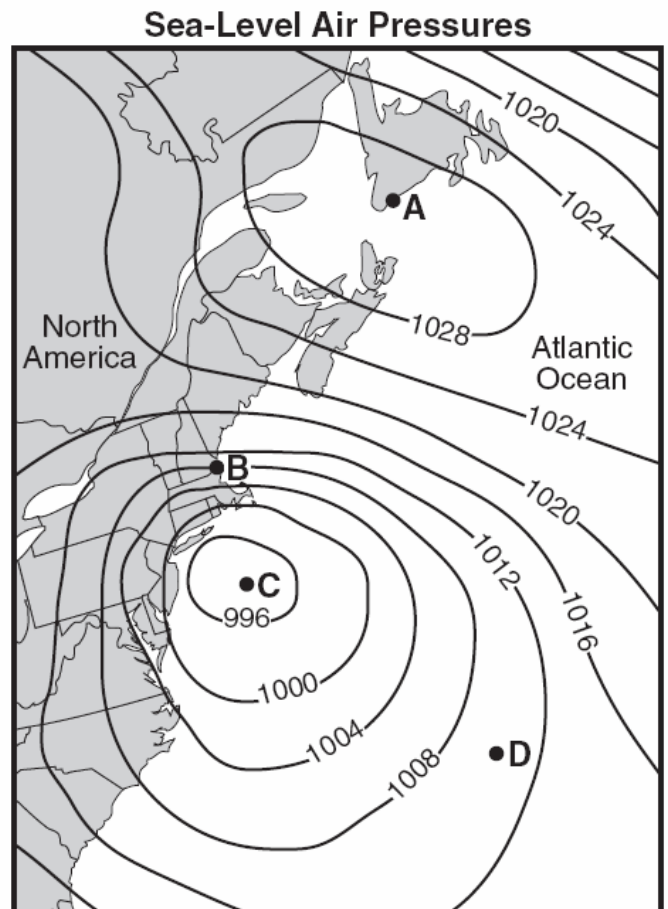
Use the picture below to answer questions 15-17.



15. What kind of front is shown in the above diagram?
16. Describe the process that created the clouds in the diagram?
17. Which direction is this front probably moving?

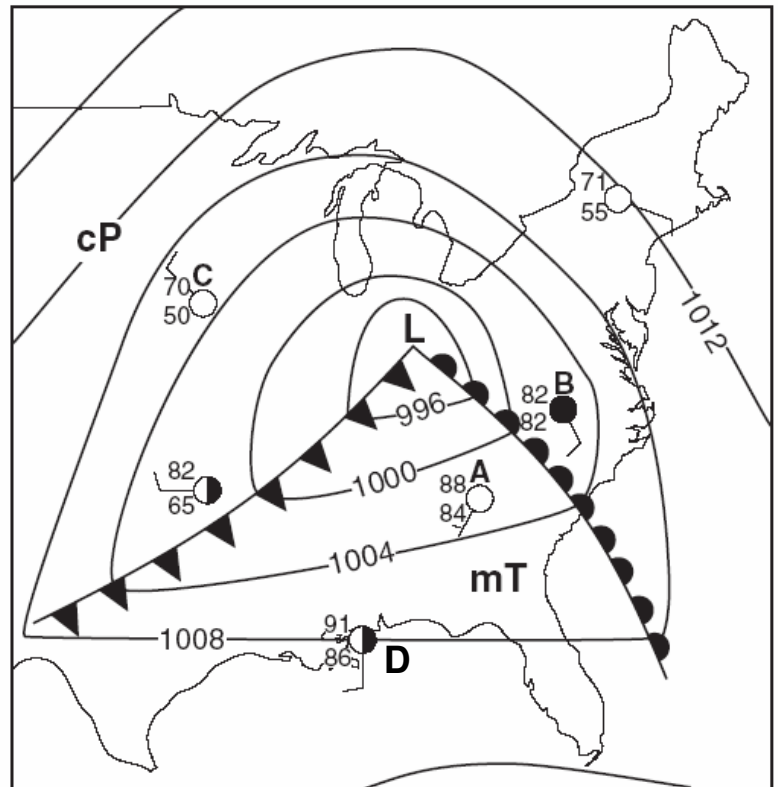
Use the diagram below to answer questions 18-20.

18. What type of pressure system is location A?
19. Which letter has the highest wind speed?
20. What type of pressure system is location C?



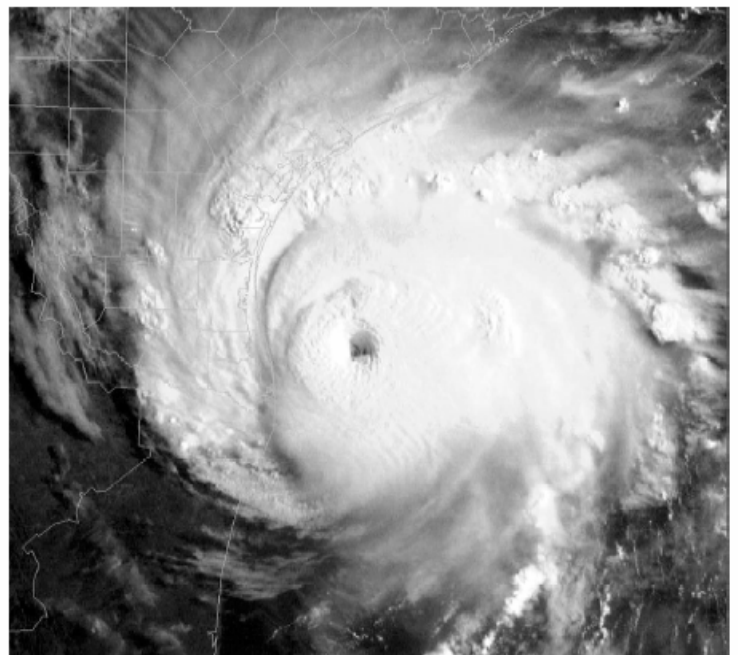
Use the map to the right to answer questions 20-25.

21. What is the temperature at C?
22. What is the cloud cover at A?
23. What is the relative humidity at B?
24. What would the 3 number air pressure code for position D?
25. What will happen to the temperature and The wind direction at location D over the next several hours?



Use the picture to the right to answer questions 26-29.

26. What is the name of this type of storm?
27. Use arrows to show the direction of wind flow around this LOW pressure system.
28. If this storm is in the Gulf of Mexico, name the air mass and describe its characteristics.



29. How can you prepare yourself and your family if this type of storm approaches?

Use the following table to answer questions 30-31.

Air temperature (dry-bulb temperature)	0°C
Relative humidity	81%
Present weather	snow

30. What is the wet-bulb temperature?

31. What is the dew point?

Use the graph below to answer questions 32-35.

32. What is the temperature at 6 pm?

33. What is the relative humidity at 6 am?

34. What is the relationship between temperature and relative humidity?

