

## Meteorology Unit Study Guide

1. Define meteorology

Study of the atmosphere including weather and weather patterns

2. The most abundant gas in the atmosphere by volume is \_\_\_\_\_. This gas comprises 78% of the Earth atmosphere by volume.

- a. Oxygen      b. Argon      c. Carbon Dioxide      **d. Nitrogen**

3. In what part of the atmosphere does the vast majority of our weather take place?

- a. Mesosphere      b. stratosphere      **c. troposphere**      d. thermosphere

4. Name the 3 big weather characteristics

- A. Humidity  
B. Temperature  
C. Air Pressure

5. In terms of pressure, how does air move?

High to Low Pressure

6. In general, High pressure means we will have nice weather. Low pressure means we will have bad weather.

7. When measuring pressure on a weather map, these are the lines that connect areas of equal air pressure.

- A. Isotherms  
B. Isotachs  
**C. Isobars**

8. High wind speeds mean isobars (are closely spaced / are widely spaced).

9. What are the two rules for isobars?

- A. Lines can't cross one another  
B. Lines can't end on the map (you must extend off the map or create a circle)

10. What instrument is used to measure air pressure? Barometer

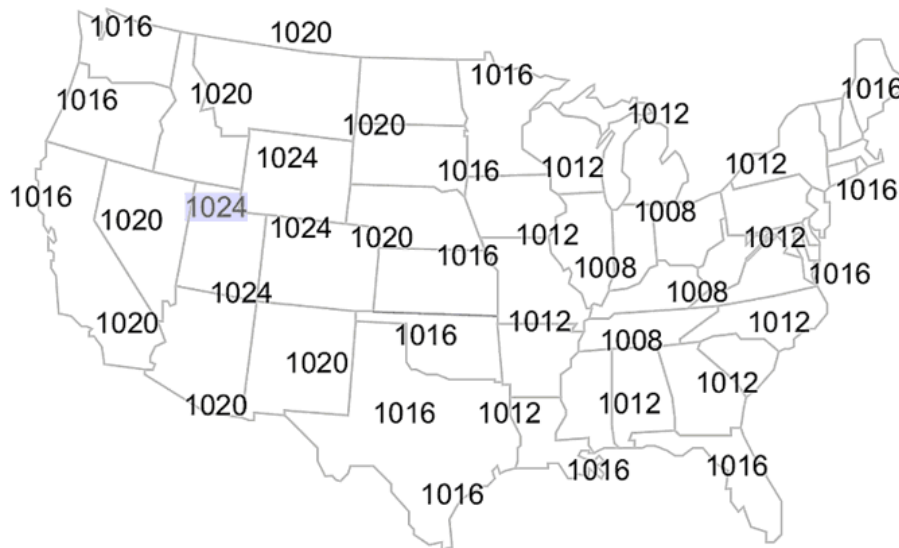
11. In the northern hemisphere, which way does air move/flow near areas of high pressure?

- a. Directly towards low pressure      b. Counter-clockwise      c. Clockwise      d. North to south

12. Match the term with the correct definition

- |                           |  |
|---------------------------|--|
| <u>  B  </u> Temperature  | A. Weight of the atmosphere in a particular place at a particular time |
| <u>  A  </u> Air Pressure | B. Amount of heat in the atmosphere                                    |
| <u>  C  </u> Humidity     | C. Amount of moisture (water vapor) in the atmosphere                  |

13. Use the Air Pressure Map to complete the activities that follow:



13a. Draw in your isobars

13b. Label the center of the high pressure area with a large "H". Should be at 1024

13c. Label the center of the low pressure area with a large "L". Should be at 1008

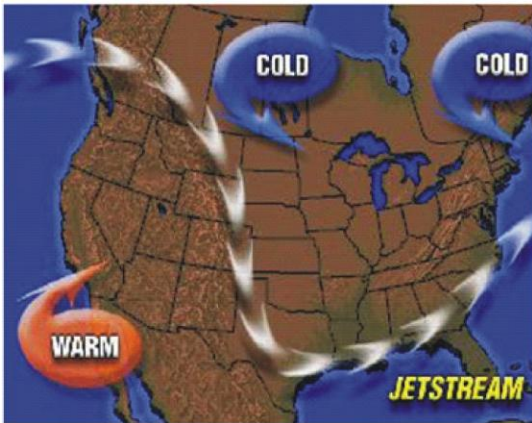
13d. Shade, in green, the state(s) would you expect to see rain or snow. States around 1008

13e. Shade, in yellow, the state(s) would you expect to see clear skies. States around 1024

14. Explain the jet stream

- Fast moving "rivers" of air moving through the upper atmosphere.
- Creates a boundary between air masses

15. Look at the figure below; if the jet stream shifts north what affect will it have on the temperature in the north? The south?



north: temps will rise

south: temps will stay warm

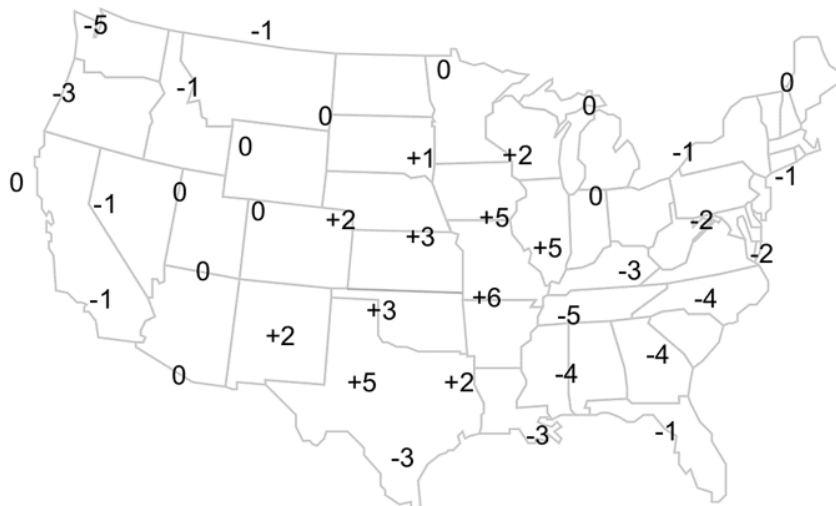
16. What instrument is used to measure humidity? Psychrometer or Tygrometer

17. If moisture stays the same but it gets warmer, does the relative humidity increase or decrease? increase

18. If the air temperature remains constant, evaporating water into the air, will \_\_\_ the dew point and \_\_\_ the relative humidity.

- a. increase; increase
- b. increase; decrease
- c. decrease; increase
- d. decrease; decrease

19. Use the surface pressure change map to complete the activities that follow: (see Miss Fritz for Picture Key!)



19a. Draw in the edge of the cold front

19b. Draw in a black line where the cold and warm front meet

19c. Draw in the edge of the warm front (there are 2 areas!)

20. Bob watched the weather with his parents on Thursday night. He told his dad that he should take an umbrella with him because there is a warm front moving in that will bring warmer temperatures, but also rain to the area. He also told him that it's going to be pretty sticky since humidity would be also be increasing. Is Joe's explanation of the weather correct or incorrect? Explain why!

Correct: Warm front = warm air. As air warms, humidity increases.

21. Joe Calhoun stated that as the low pressure system moves over Pennsylvania the weather will continue to improve bringing sunny skies and nice weather to the region. Is Joe's forecast accurate? Why or Why Not?

Incorrect: Low Pressure generally indicates bad weather

22. Sally was studying her notes for her meteorology test when she noticed she was missing information. She had written down that as temperatures decrease a cold front is approaching and thunderstorms will take place. But, she had nothing about air pressure and humidity. If you were her partner, what would you tell her happens to air pressure and humidity during a cold front? Why?

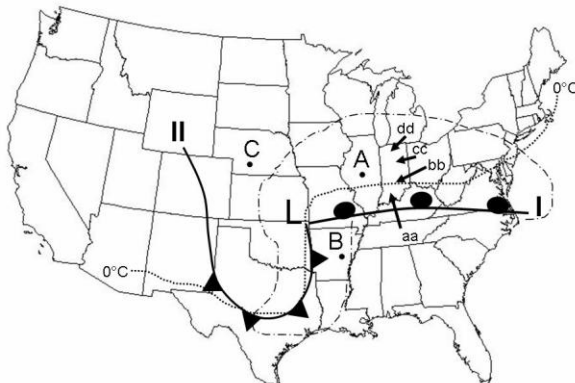
Air Pressure is increasing

Humidity is decreasing

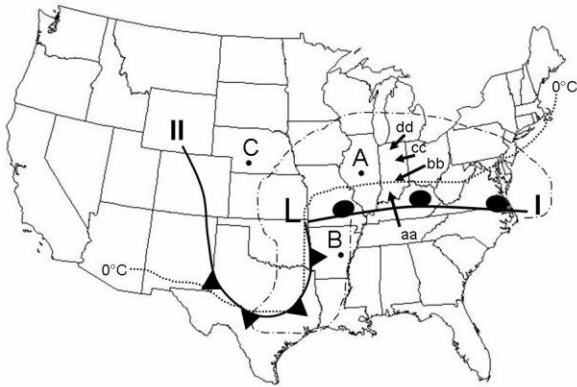
23. The figure below shows a low pressure system over the central plains. In the figure, the fronts are denoted by I and II, the areas with clouds are encircled by the dash-dot line, and the dotted line is the 0°C line.

23a. Identify what types of front is located at "I" warm

23b. Identify what type of front is located at "II" cold



24. You, who are at point A, are talking with your good friends that live at point B and C about the weather. Choose the description that best fits what you or your friends would be experiencing by placing A, B, or C in front of the description.



A 24a. “Well, over here it’s been snowing quite a bit, very slushy. The winds seem to be coming from the East. The TV weather person says that we can expect more snow.”

B 24b. “Over here it was sunny and warm, really nice this morning, but now there are severe weather alerts everywhere!”

C 24c. “Nothing much out here, it’s been cold and windy. I think the winds are coming from the northwest.”

25. An air mass is a body of air with

- a. equal density throughout
- b. similar values of temperature and moisture in the horizontal**
- c. very high pressure everywhere
- d. at least two frontal zones
- e. very low humidity in its lower layers

26. Define “front”

**Leading edge of an air mass**

27. Where are fronts located (i.e. where do you draw them)?

**Around LOW pressures only**

28. Identify the type of front

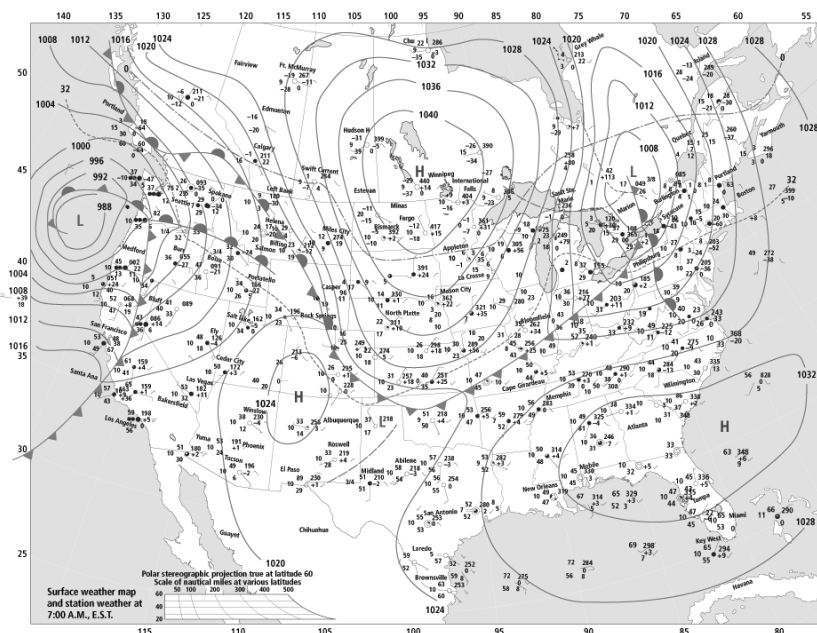
Movement of air masses	Type of front
An advancing warm air mass displaces a cold air mass and glides over the top of it.	a. <b>Warm</b>
Two air masses with similar temperatures and pressures meet, and neither advances into the other's territory.	b. <b>Stationary</b>
A cold, dense air mass displaces a warm air mass and forces the warm air to rise steeply.	c. <b>Cold</b>
A warm air mass is squeezed upward between two cold air masses.	d. <b>Occluded</b>

29. Complete the chart on Fronts

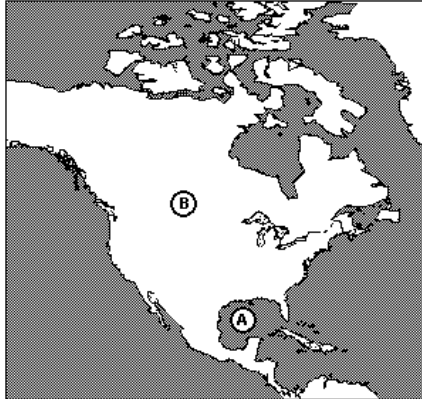
Name of Front	How it moves (quickly, slowly, etc)	Summer Weather	Winter Weather	Symbol on a map
Occluded	Slow moving	Rain	Wintery Mix With possibility of extended snow, freezing rain, sleet	
Warm	May take a day or more to move through	Rain	Snow	
Cold	Quickly	Thunderstorm	Snow	
Stationary	Not Moving	Extended Rain	Extended periods of snow	

30. In the figure, what type of front is coming through Canada and into Colorado?

- a. Warm      b. cold      c. stationary      d. occluded

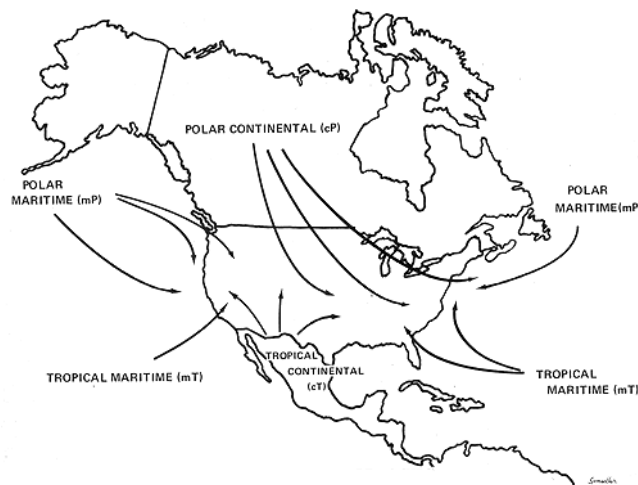


31. In the diagram, locations *A* and *B* on the map of North America are source regions for air masses. Compared to the air mass formed at location *B*, the air mass formed at location *A* will normally be?



- a. cooler and drier
- b. warmer and drier
- c. cooler and wetter
- d. warmer and wetter**

32. Meteorologists classify air masses according to the general temperature and moisture of the region where they form. The terms ‘maritime’ and ‘continental’ refer to the amount of moisture in the region while the terms ‘arctic’ and ‘tropical’ refer to the general temperature of the region. The map below shows the general location of the typical air masses we see over North America. **Match the air mass name with the best description of its temperature and moisture.**



- A. Cold and Dry
- B. Warm and Moist
- C. Cool and Moist
- D. Warm and Dry

- C   Maritime Polar Air mass
- A   Continental Polar or Arctic Air mass
- B   Maritime Tropical Air mass
- D   Continental Tropical Air mass

33. Explain the 3 factors in cloud / fog formation.

**Temperature Change:** when a warmer body of air mixes with a cooler body of air causing it to drop below the Dew Point Temp

**Advection Cooling:** When a warm body of air moves across a cooler surface causing it to cool to the Dew Point Temp (removed heat)

**Adiabatic Cooling:** as air rises it expands and cools and eventually reaches the Dew Point Temperature (no energy is added or removed from system) - **Cloud formation**

34. These “wispy” clouds are formed from ice crystals and are found in higher altitudes.

Cirrus

35. What type of clouds are towering clouds with anvil heads that bring thunderstorms?

- a. Nimbostratus      b. cirrocumulus      c. cumulonimbus      d. cirrus

36. A cumulus cloud is recognized mainly by its

- a. obvious vertical dimension  
b. darkness or color  
c. precipitation  
d. layered structure

37. The temperature scale where 0 degrees represents freezing and 100 degrees boiling is called:

- a. Fahrenheit  
b. Celsius  
c. Kelvin  
d. Absolute.

38. What types of precipitation are associated with temperature inversion (pick 2)?

- a. sleet      b. freezing rain      c. hail      d. snow

39. What type of precipitation is associated with being a solid when it leaves a cloud and a solid when it hits the ground?

- a. Sleet      b. rain      c. snow      d. hail

40. Explain the following types of precipitation.

Rain: liquid or solid when it leaves the cloud, liquid when it hits the ground

Hail: only during thunderstorms

Freezing Rain: liquid when it leaves the cloud and becomes a solid immediately upon touching the ground (supercooled water)

41. How do clouds impact temperature?

**Cloudy Nights:** warmer because heat is trapped at the surface

**Clear Nights:** cooler because heat can escape