School Team _____

Name_____ _____
First Last
Name _____ _____
First Last

Meteorology

Holt Invitational

2016

INSTRUCTIONS:

- **WRITE YOUR SCHOOL TEAM NAME AND STUDENT COMPETITORS FULL NAMES AT THE TOP.**
- **WRITE ALL ANSWERS ON THE ANSWER DOCUMENT.**
- **AN ILLEGIBLE RESPONSE WILL NOT RECEIVE POINTS.**
- **YOU MAY USE NOTES ON AN 8.5 X 11 SHEET OF PAPER.**
- **HAVE FUN.**

Multiple Choice (each worth 1 point)

Identify the choice that best completes the statement or answers the question. Write your choice on the line.

_____ 1. The most abundant gas in the stratosphere is:

a. Oxygen (O_2)
b. Nitrogen (N_2)
c. Ozone (O_3)
d. Carbon Dioxide (CO2)

_____ 2. An isobar is a line of constant _____.

a. Pressure
b. Temperature
c. Density
d. Dew point

_____ 3. The season's winter, spring, summer and fall are a direct result of what phenomenon?

a. Shifting of ocean currents
b. The sun's energy output and the Earth's proximity to the sun
c. The jet stream
d. The 23.5° tilt of the Earth

_____ 4. _____ refers to the horizontal transport of air while _____is the vertical transport of air.

a. Convection, advection
b. Advection, convection
c. Advection, conduction
d. Conduction, advection

_____ 5. When viewed from above the North Pole of the Earth, the Earth rotates _____ and makes a complete turn in 24 hours. This causes low pressure to spin counterclockwise in the Northern Hemisphere.

a. Counterclockwise
b. Clockwise

_____ 6. In a volume of air near the earth's surface, _____ occupies 78% and _____ nearly 21%.

a. Hydrogen, oxygen
b. Hydrogen, helium
c. Nitrogen, oxygen
d. Nitrogen, water vapor

_____ 7. In the stratosphere, the air temperature normally:

a. Both increases and decreases depending on the season
b. Cannot be measured
c. Increases with increasing height
d. Decreases with increasing height

_____ 8. The rate at which temperature decreases with increasing altitude is known as the:

a. Lapse rate
b. Sounding
c. Thermocline
d. Temperature slope

_____ 9. Where cold surface air replaces warm air, the boundary separating the different bodes of air is:

a. A warm front
b. A cold front
c. A tornado
d. A parallel of latitude

_____ 10. Meteorology is the study of:

a. Landforms
b. The oceans
c. The atmosphere
d. Outer space

_____ 11. In July, at middle latitudes in the Northern Hemisphere, the days is _____ long and is _____ with each passing day.

a. Less than 12 hours; getting shorter
b. Less than 12 hours; getting longer
c. More than 12 hours; getting shorter
d. More than 12 hours; getting longer

_____ 12. The atmospheric layer in which we live is called the:

a. Troposphere
b. Stratosphere
c. Thermosphere
d. Exosphere

_____ 13. Suppose last night was clear and calm. Tonight there will be low clouds. From this we can conclude that tonight's minimum temperature will be:

a. Above freezing
b. The same as last night's minimum temperature
c. Lower than last night's minimum temperature
d. Higher than last night's minimum temperature

_____ 14. The term "normal" refers to weather data averaged over:

a. Several months
b. At least a day
c. One year
d. Thirty years

_____ 15. The Coriolis Force is greatest near:

a. The equator
b. The North and South Poles
c. Only near oceans
d. Near the mountains

True and False (each worth 1 point)

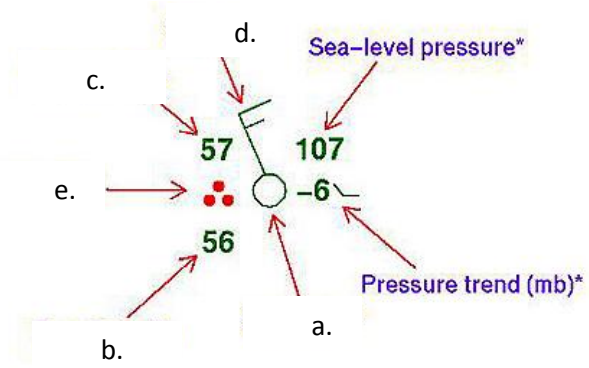
Indicate whether the statement is true or false by writing a T or F on the line.

_____ 16. Fog is major hazard to aviation.
_____ 17. On a skew-t, the moist and dry adiabat lines are nearly parallel.
_____ 18. Carbon dioxide is a naturally-occurring component of the atmosphere.
_____ 19. The three energy transfer mechanisms are radiation, conduction, and condensation.
_____ 20. A Chinook wind is formed at the edges of oceans so it is moist and warm.
_____ 21. Cloudy nights are generally cooler than cloudless nights.
_____ 22. The Beaufort Scale measures wind strength.
_____ 23. A sling psychrometer measures wind speed.
_____ 24. An anemometer measures wind speed.

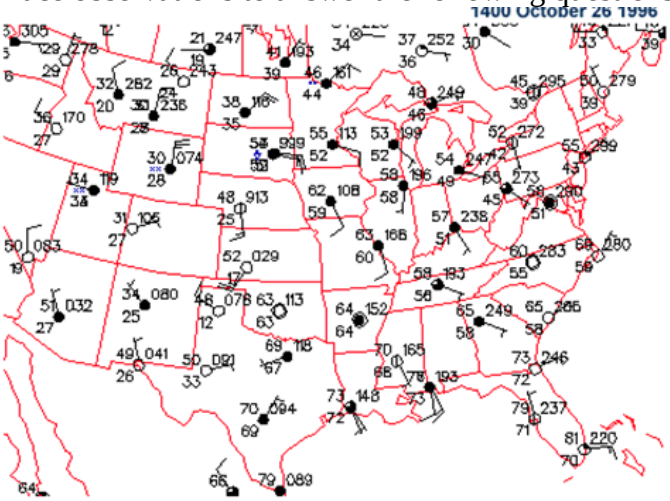
Labeling (each worth 1 point)

Make sure to write very clearly. If your handwriting can not be read it will be marked wrong.
25. Label what type of meteorological data is represented by each letter.

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



26. Use the map of surface observations to answer the following questions.



a. What is the temperature in Des Moines, Iowa? _____

b. What is the dew point temperature in Phoenix, Arizona? _____
c. What is the pressure in Dallas, Texas? _____
d. What is the report of cloud cover in Chicago, Illinois? _____
e. What is the speed and direction of wind in Miami, Florida? _____and _____

27. Read each scenario and determine whether precipitation will be likely or unlikely. *Write likely or unlikely on the line.*

_____ a. A cold front is approaching from the west, but the air both ahead of and behind the front is very dry.

_____ b. A warm front is approaching and the air behind and ahead of the front is very moist.

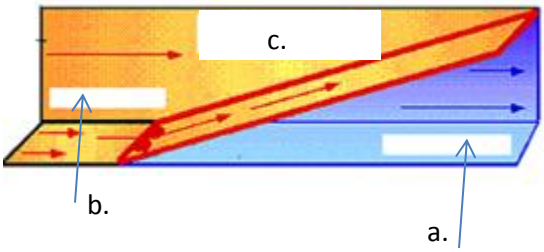
_____ c. Upslope winds are expected in Boulder, Colorado and the air has been very moist for the past couple of days.

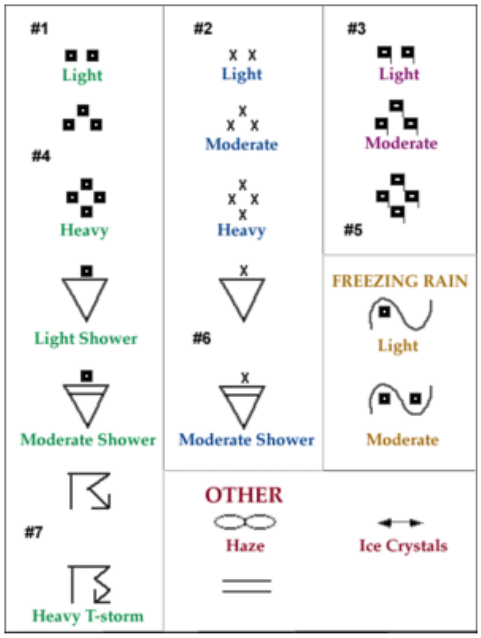
28. The diagram below is a vertical cross-section through two air masses and the frontal boundary separating them. Fill in the missing components (where the letters a, b and c are).

a. _____

b. _____

c. _____





1. _____

2. _____

3. _____

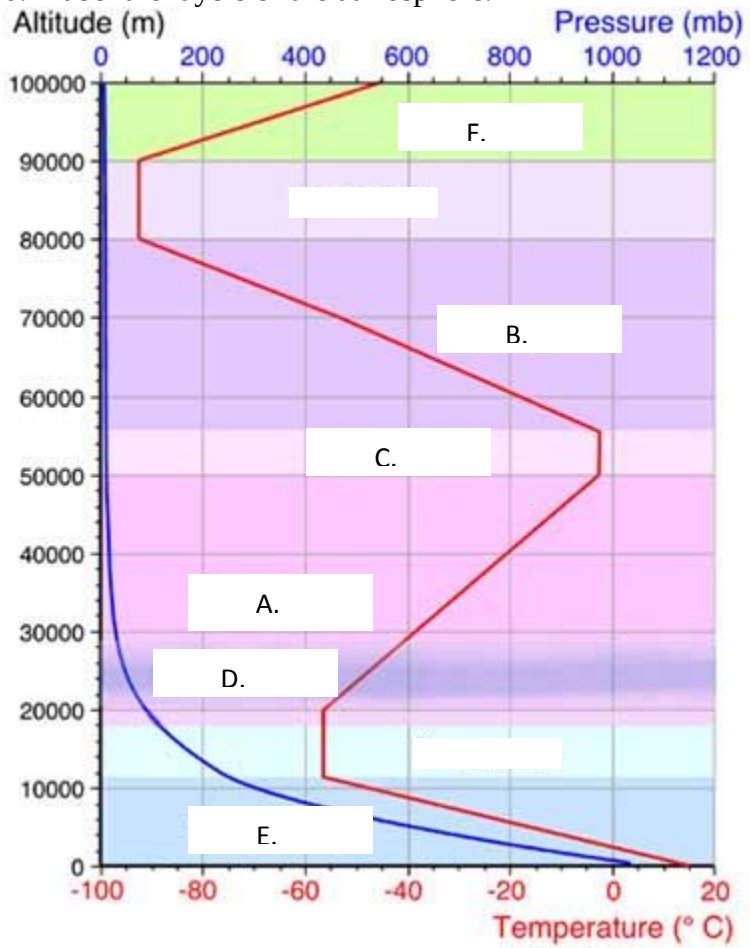
4. _____

5. _____

6. _____

7. _____

30. Label the layers of the atmosphere.



a. _____

b. _____

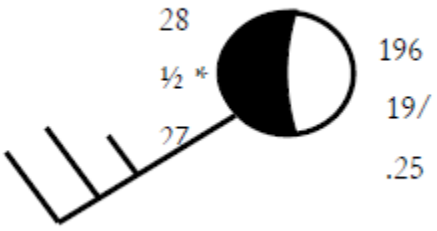
c. _____

d. _____

e. _____

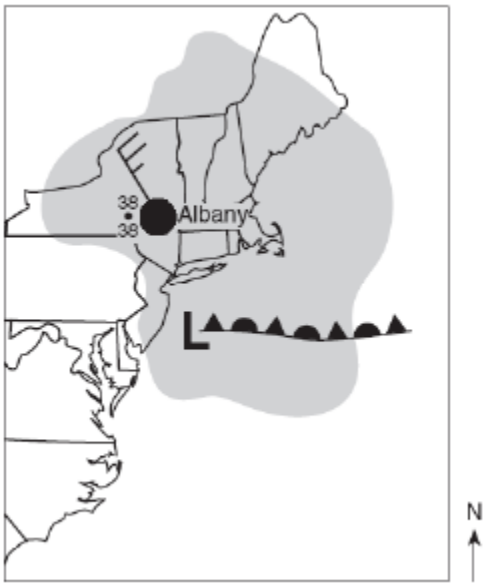
f. _____

31. Using the following weather station, complete the information in the table.



Amount of cloud cover _____
Precipitation (past 6 hours) _____
Temperature (F°) _____
Direction of the wind _____

32. Use the weather map to answer the questions. The L is the center of the low. The shaded portion represents an area of precipitation.



A. What type of front extends eastward from the low-pressure center?

B. Complete the weather data for Albany, New York based on the station model shown on the map.

Relative humidity (%) _____
Wind direction from _____
Wind speed (knots) _____
Present weather _____

33. Write what the following weather instruments measure:

a. Thermometer:

b. Anemometer:

c. Barometer:

34. What information do you need in order to calculate:

a. wind chill:

c. Heat index:

35. Draw the following weather symbols:
a. warm front

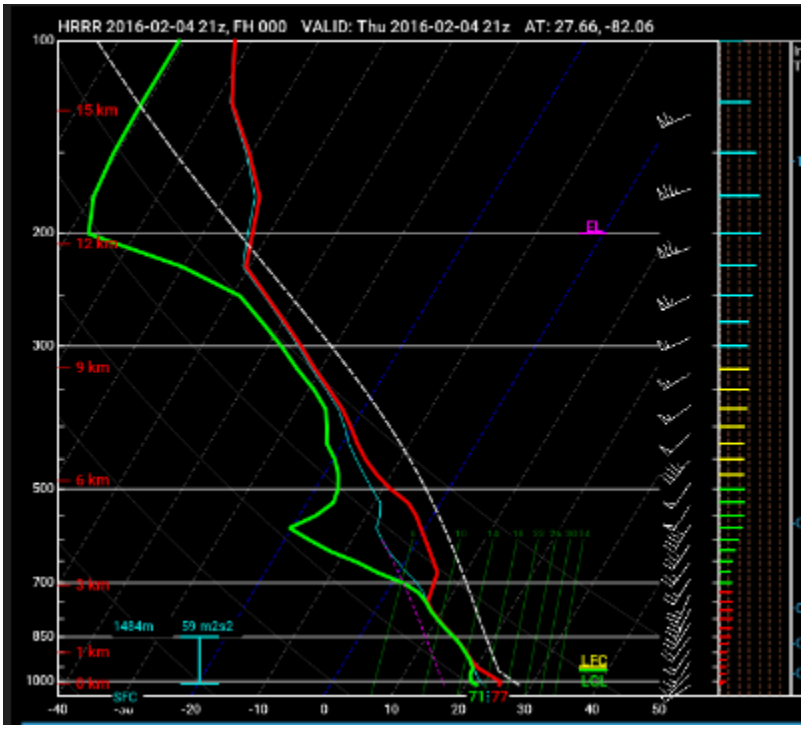
b. cold front

c. stationary front

d. Occluded front

Tie Breakers: Fill out both questions. These will only be used in order to break a tie.

Tie Breaker #1: Looking at the skew-t diagram, is it likely or unlikey this area will have precipitation? Explain how you know.



Tie Breaker #2: IPCC is an abbreviation for what?

Tie Breaker #3: What is a radiosonde?