Weather Patterns and Synoptic Weather Maps

Lab # _____

Name:_____ Period:_____ Partners: _____

**Intro:** The study of energy interactions within the atmospheres leads to the identification of systems that can be mapped as field quantities. A series of composite maps showing these atmospheric variables provides a picture of past & present conditions. Such a composite map is called a synoptic weather map. These are used for forecasting weather.

**Objective**: To construct field maps and learn to identify patterns that can be used to predict weather. You will identify where the frontal boundaries are of using the station model data that is reported to you.

**Vocabulary:** for each of the following **define** the weather related term and where applicable, give **visual examples**

1.) Convergence:

2.) Divergence:

3.) Cyclone:

4.) Anticyclone:

5.) Air Mass

6.) Source Region

7.) Cold Front

8.) Warm Front

**Procedure for Map A:**

1.) **Isotherms:** Use a pencil to lightly **draw isotherms** at **10 degree** intervals staring with 30 degrees and ending with 80 degrees. When you are finished, check your lines and darken them with an **orange colored pencil**.

2.) **Isobars:** Use a pencil to lightly draw the isobars between the points of equal barometric pressure. Draw your isotherms at 4 mb intervals. In order to do this you first must;

   a. Find where the **highest and lowest pressures on the** map are by decoding the pressures. Write a "**H**" in blue over the city with the highest pressure, and a **"L"** in red over the city with the lowest pressure

   b. Starting with the **high pressure city**, draw the isobars at 4 mb intervals starting at 1024 mb. Remember to end your high pressure isobars when you have reached the last isobar before reaching 1013.2 mb which is *average pressure and does not belong to a High.* **Label** each isobar with the correct pressure in mb (not coded)

   c. Now, continue making isobars from the center of your **low pressure city** with 4 mb intervals starting at 1004 mb and working your way out. Remember to end when you have reached the last interval before standard pressure (1013.2 mb) **Label** each isobar with the correct pressure in mb (not coded).

   d. When you have finished and all looks well, go over your lines in **brown** colored pencil.

3.) Winds: **Wind direction is always marked on a station model as the direction its coming from.**

a. At each station model, extend the shaft of the wind barb through the station model to show the direction that the wind is **blowing to.**
b. Draw larger arrows to show the general pattern of air flow around the high and low pressure areas to show how air is exchanged/flows between them. When you have finished doing this, use a **black** colored pencil to show this general pattern.

**Map A discussion Questions:**

1.) How does the temperature change as one moves from North to South on this map?

2.) Describe the relative difference between the shape that isotherms make compared to isobars.

3.) Between which two cities is the temperature gradient the greatest?

4.) Calculate the temperature gradient between Galveston and Kansas City. Show all work and include units!

5.) What is the highest pressure recorded on this map (not in code)? In what city is this?

6.) What is the lowest pressure recorded on this map (not in code)? In what city is this?

7.) As you travel from Salt lake city to Los Angeles, what change in atmospheric pressure would you observe?

8.) Calculated the pressure gradient between Little Rock and Galveston. Remember to decode your pressures first. Show all work with units!

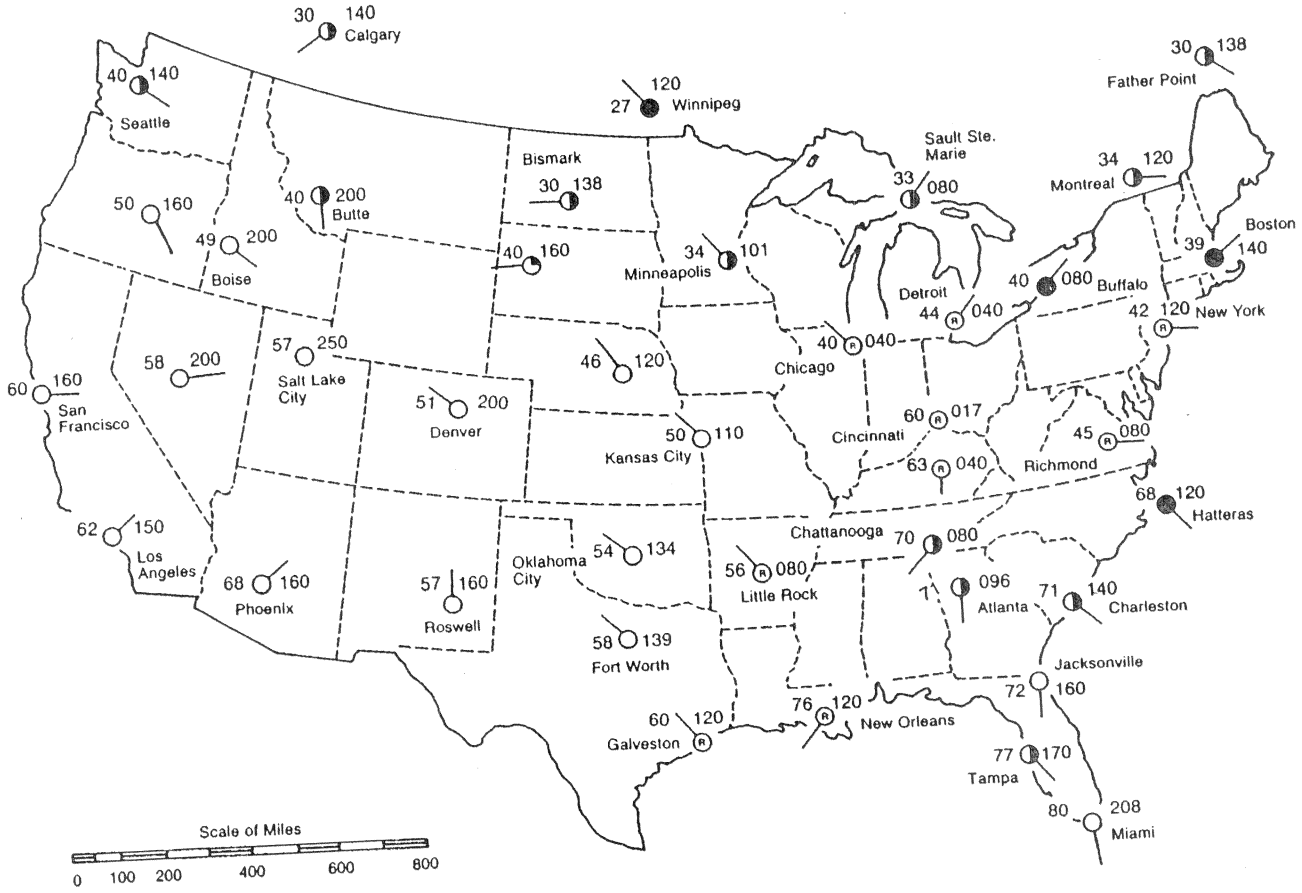
9.) What direction does air flow around the Low pressure center? Are these winds convergent or divergent?

10.) What direction does air flow around the High pressure center? Are these winds convergent or divergent?

11.) Why does the air flow (wind) on this map not flow in a straight path from the high to low pressure center?

MAP A:

## Weather Data Map



Procedure for Map B:

**1.) Rain: The usual symbol for rain on a station model is a "dot" (•) below temperature. On this map, we have put an "R" within the station model to save room.**

a. Locate all the station models with an R and lightly shade them in with a light green colored pencil

b. Using these stations as a visual checkpoint, lightly draw a line in pencil around these areas which connects all of the stations experiencing rain to show a generalized area on the map experiencing precipitation (much like a radar map).

c. Lightly shade in this area in light green.

**2.) Air Masses:**

Using precipitation as a clue, locate the current position (not source region) of where the maritime tropical and continental polar air masses are. Use the appropriate symbols for each and **label** them on the map.

**3.) Locating the Cold and Warm Fronts:** Since all air converges (moves to) areas of low pressure, warm and cool air masses which create warm and cold fronts, respectfully, are usually "connected" to a low pressure center (Connected as in, on a map, but really warm and cold fronts are just the movement of warm and cold air obviously)

a. **Locate the approximate position and draw in the cold front on the map**. Use the information on temperature, pressure, rain, and air masses that you drew in on maps A and B to help you locate the position. **Clues**: Locate positions where the temperatures change drastically from cold to warm between locations with relatively the same latitude, as well as where precipitation is occurring from map B. Remember to draw your cold front in **BLUE**, with the correct symbol, and show the correct direction of movement.

b. **Locate the approximate position and draw in the warm front on the map.** Use the same clues as you did for the cold front, but looking for where temperature changes from warm to cold moving north. Remember to draw your warm front in **RED**, with the correct symbol and to show the correct direction of movement

**Map B Questions:**

12.) Where does precipitation occur relative to the locations of the continental polar and maritime tropical air masses on this map?

13.) How do clouds form over a low pressure center? (step by step)

1.)

2.)

3.)

4.)

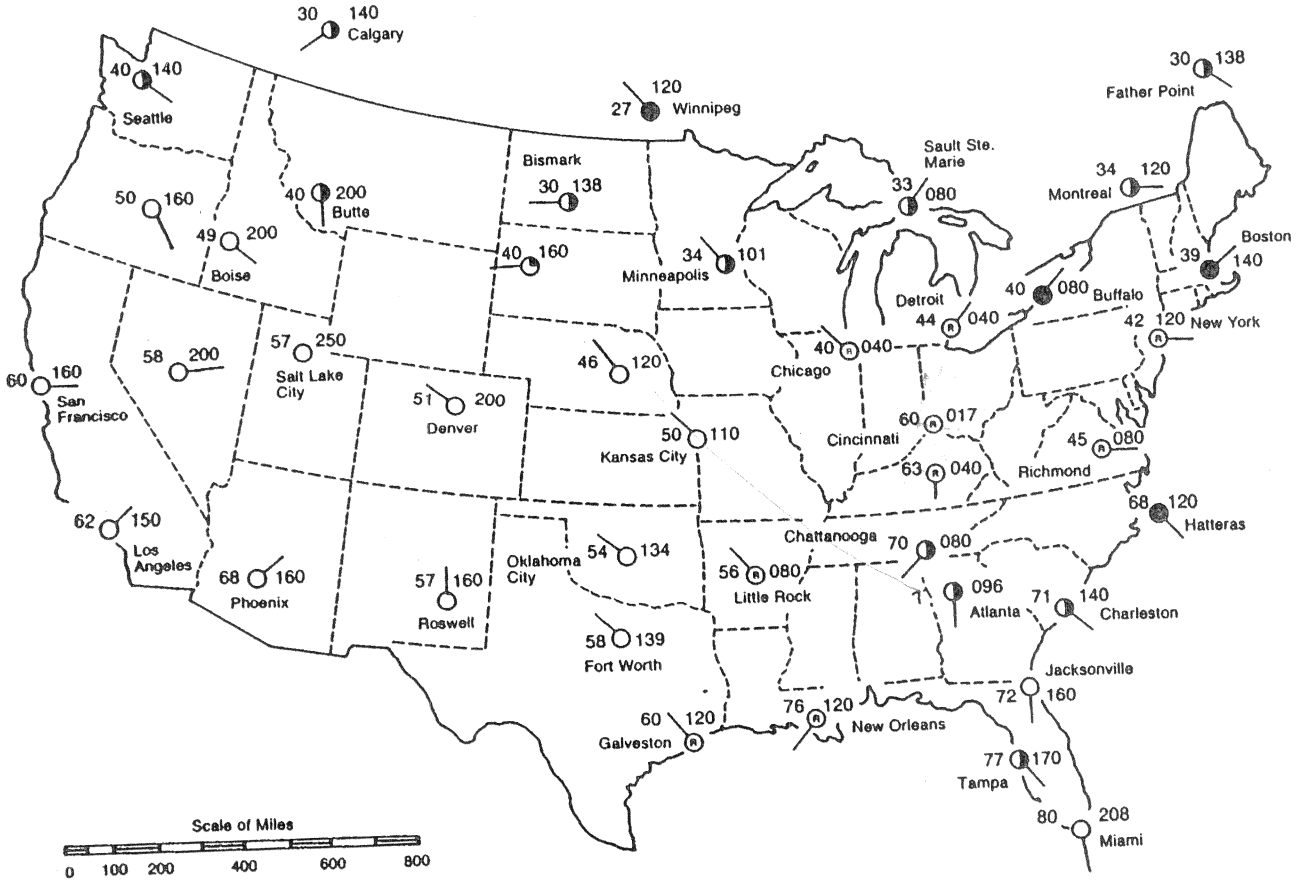
14.) Compared to areas of low pressure, why do areas of high pressure have fewer clouds? (you must include how temperature, dp, relative humidity changes and whether air is contracting or expanding in your answer)

15.) Where does precipitation occur with respect to the following fronts (ahead, along, behind- can use multiple)

a. Warm Front:

b. Cold Front:

## Weather Data Map



## Final Conclusion Questions

**16.) Describe the general weather associated with areas of high pressure. For the first set, options have been given to you.**

a. Temperature (cooler or warmer)

b. Wind Patterns (slow or fast, counter clockwise or clockwise?)

c. Cloud Cover (clear to partly cloudy, or cloudy to overcast)

d. Precipitation (none, little, rainy, heavy at times)

**17.) Describe the general weather associated with areas of low pressure.**

a. Temperature

b. Wind Patterns

c. Cloud Cover

d. Precipitation

**Conclusion #1: Referring back to map B, forecast the changes in weather for the following cities in the next 24 hours based upon the location you drew your fronts. Include information on temperature, cloud cover, precipitation, and any pressure.**

a. New York City, NY:

b. Chattanooga, TN:

**Conclusion #2: Storm tracks are highly influenced by surrounding pressure systems and prevailing wind patterns. Which general direction would you predict this very typical mid-latitude cyclonic storm system to move? Explain.**