



Name \_\_\_\_\_

Per. \_\_\_\_\_ Date \_\_\_\_\_

### Iso-line Lab

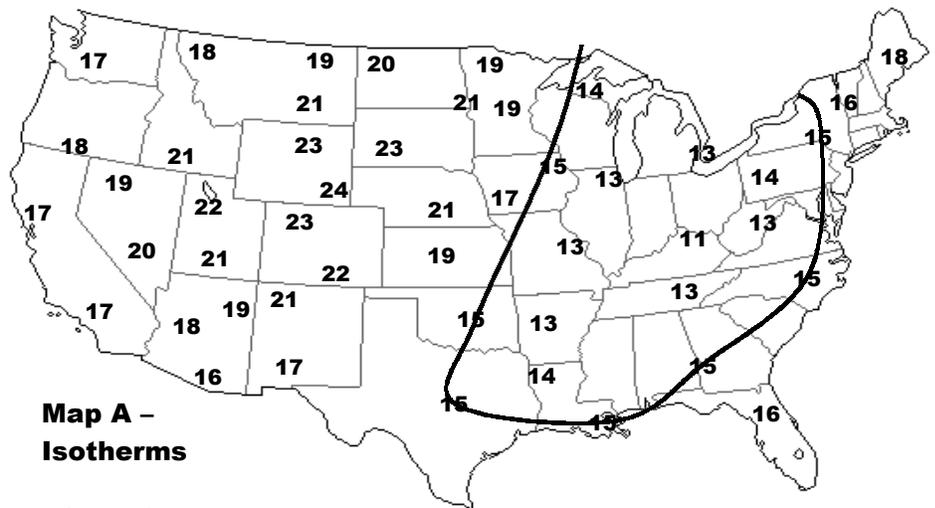
Weather patterns are often difficult to study since the conditions are a part of a large and complex system that you can not see. One of the best ways is to look at the variables such as temperature, pressure and wind. In this lab you will examine a way of understanding some of the variables.

All over the country, meteorologists at weather stations collect data on the weather variables. This tends to be a large amount of information, but it can be

analyzed in a simple and meaningful way. In the past we connected point of equal elevations with contour lines. We can also connect points that have the same temperature or pressure.

**Isotherms** help us to identify both warm and cold air masses. **Isobars** show areas of high and low pressure. In this lab you will practice drawing isotherms and isobars and locating air masses and areas of different pressures.

Study the solid line that has been drawn through all the stations that have a temperature of 15 degrees C. Notice that the line sometimes goes between stations of 14 degrees and 16 degrees. This is because there is a 15 degrees temperature reading about halfway between those readings even though there may not be a reporting station at that point.



### Procedure

On map A, a two-degree interval will work best. Find a station where the temperature is 13 degrees. Starting at that point draw a light line to show where 13-degree locations would be. Remember, if there is not 13-degree location nearby, you will need to draw halfway between the 12 and 14-degree stations. Continue the line until it has gone through all the stations and all locations that are 13. Your line should form a closed loop. Darken your line when you are sure it is correct.

Draw lines for the 17,19, 21 and 23-degree stations. Not all are closed loops.

1. If temperature were available from several stations in Canada near the Great Lakes, Do you think the 15-degree line would form a closed loop? \_\_\_\_\_

- Which isotherms are closed loops? \_\_\_\_\_
- What is the lowest temperature found in the smallest closed loop in the eastern half of the map?  
\_\_\_\_\_
- What is the highest temperature found in the smallest closed loop in the western half of the map?  
\_\_\_\_\_

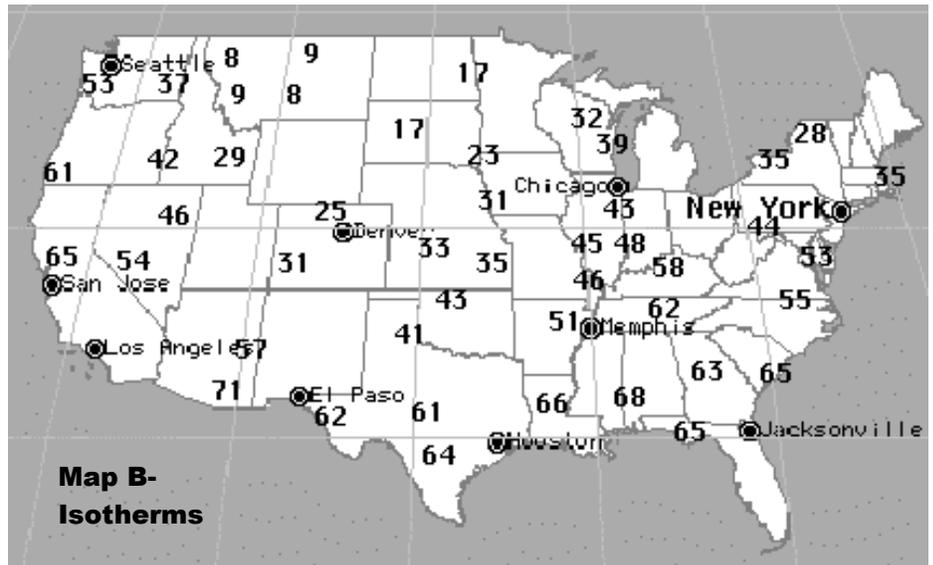
**The closed loops show where the air masses are located. Cold masses have isotherms that decrease in temperature as you move towards the center.**

- Where is the center of the cold air mass? ( name the region of the state near the center)  
\_\_\_\_\_
- Warm air masses have isotherms that increase in temperature as you move towards the center. Where is the center of the warm air mass? ( name the region of the state near the center)  
\_\_\_\_\_

### Map B

Draw in a 10, 20, 30, 40, 50, 60 & 70-degree isotherms on the map B. Note you will have to approximate using the numbers on the map. Label each isotherm.

Isotherms can be used to identify air masses (large areas of the lower atmosphere with similar weather).



- Name a state over which a cold air mass is located? \_\_\_\_\_
- Name a state over which a warm air mass is located? \_\_\_\_\_

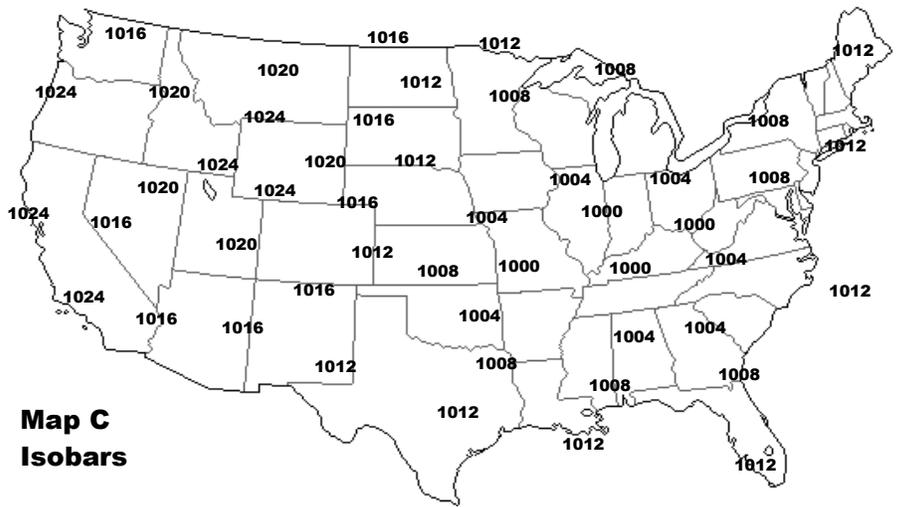
**Air masses are also categorized as dry or humid. Humid air masses develop over ocean waters. Dry air masses come from large land areas. An air mass found over the Gulf of Mexico would be humid and warm. An air mass located in central Canada in winter would be dry and cold.**

- How would you describe the air mass moving into the United States from Canada? \_\_\_\_\_  
\_\_\_\_\_
- How would you describe the air mass moving into the United States from the south? \_\_\_\_\_  
\_\_\_\_\_

### Map C

On map C you will draw isobars on the map. You will use them to locate areas of high and low pressure.

The numbers on the map indicate the atmospheric pressure in millibars. Draw a smooth line connecting all the weather stations that have the same pressure. A four-millibar increment is standard. Draw and label a separate line for 1000, 1004, 1008, 1012, 1016, 1020 & 1024 pressures.



- What are these lines called? \_\_\_\_\_
- Some of the lines form closed loops. The center of each loop represents an area of high or low pressure. Write an H in the loop on the map that represents a high-pressure area. Write an L in the low-pressure loop. Give the value of the air pressure in each area? \_\_\_\_\_  
\_\_\_\_\_

Wind blows from areas of high pressure to areas of low pressure. The strength of the wind is determined by changes in the pressure, the pressure gradient. A large change in pressure over a short distance would indicate strong winds. On a weather map, isobars that are close together indicate a strong pressure gradient.

- Indicate on your map with a dark arrow the direction that you expect the winds to blow. (Remember high to low.)

## Map D

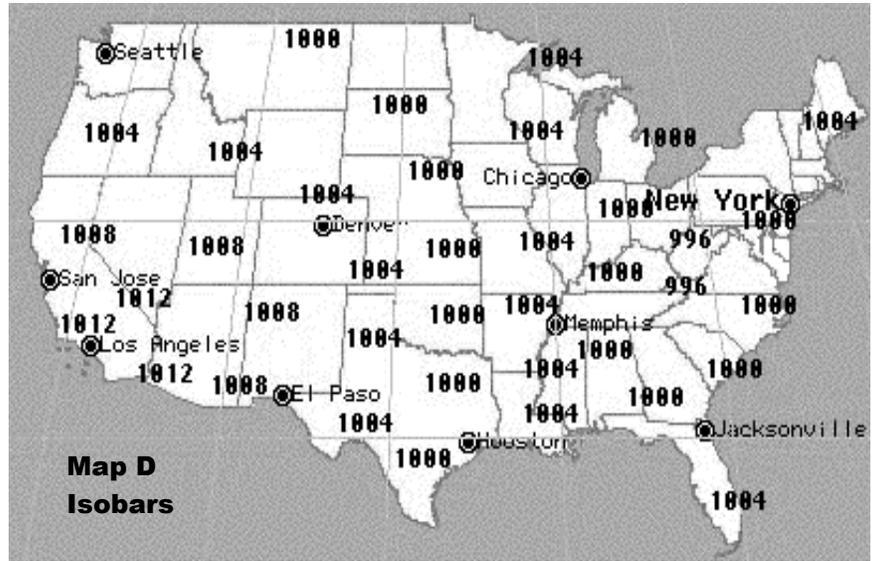
1. Determine which 4-millibar intervals will be necessary to use for this map.

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Draw in the isobars on the map D. Start with smallest line, then increase from their, label each isobar. Note: isobars form sets of curves that do not cross each other.

Isobars can be used to identify "Highs" and "Lows". The pressure in a high is greater than the surrounding air. The pressure in a low is lower than the surrounding air.



2. Label with an "H" the center of a high-pressure area. What state is it over? \_\_\_\_\_
3. Label with an "L" the center of a low-pressure area. What state is it over? \_\_\_\_\_

High-pressure regions are usually associated with dry weather because as the air sinks it warms and the moisture evaporates. Low-pressure regions usually bring precipitation because when the air rises it cools and the water vapor condenses.

4. Over which state would you expect to see rain or snow? \_\_\_\_\_
5. Over which state would you expect to see clear skies? \_\_\_\_\_

## Questions

1. Where do cold air masses form? And how do they move in to the United States?  
\_\_\_\_\_  
\_\_\_\_\_
2. Where do warm air masses form? And how do they move in to the United States?  
\_\_\_\_\_  
\_\_\_\_\_
3. What is the weather in a high-pressure area usually like? In a low?  
\_\_\_\_\_  
\_\_\_\_\_

Study the isobar map you have drawn to answer the following questions.

- 4.
- 5.

The diagram below contains wind direction and atmospheric pressure information for a typical weather station. The weather information is reported according to the following station model.

Atmospheric Pressure: Only the last three digits are plotted. If the first is less than 5, then number 10 is omitted. If it is 5 or higher, the number 9 is omitted. Note : The pressure values are given to tenths of millibars, but the decimal point is not plotted. So, 043 really means 1004.3

Wind Direction: The wind blows toward the center of the station model ( from the east)

The map on the next page shows weather station information from a variety of weather stations. Scientists often connect areas of equal pressure with lines called isobars. Using a pencil, draw the following isobars. It will be best to lightly sketch the lines first. Then draw the isobars as smooth, curved lines. Label each isobar.

- 996 millibars
- 1000 millibars
- 1004 millibars
- 1008 millibars
- 1012 millibars
- 1016 millibars

Now locate the centers of the two pressure systems and label each appropriately as either HIGH or LOW.