

Lab# _____ **Air Pressure and Isobars**

PROBLEM How do we use a barometer to measure air pressure?

- PURPOSE**
1. To name two types of barometers
 2. To tell what barometric readings indicate on a barometer
 3. To tell what an isobar is on a weather map
 4. To tell what barometric readings indicate about the weather
 5. To describe the effects of temperature, humidity and altitude on air pressure
 6. To understand HIGH and a LOW pressure systems

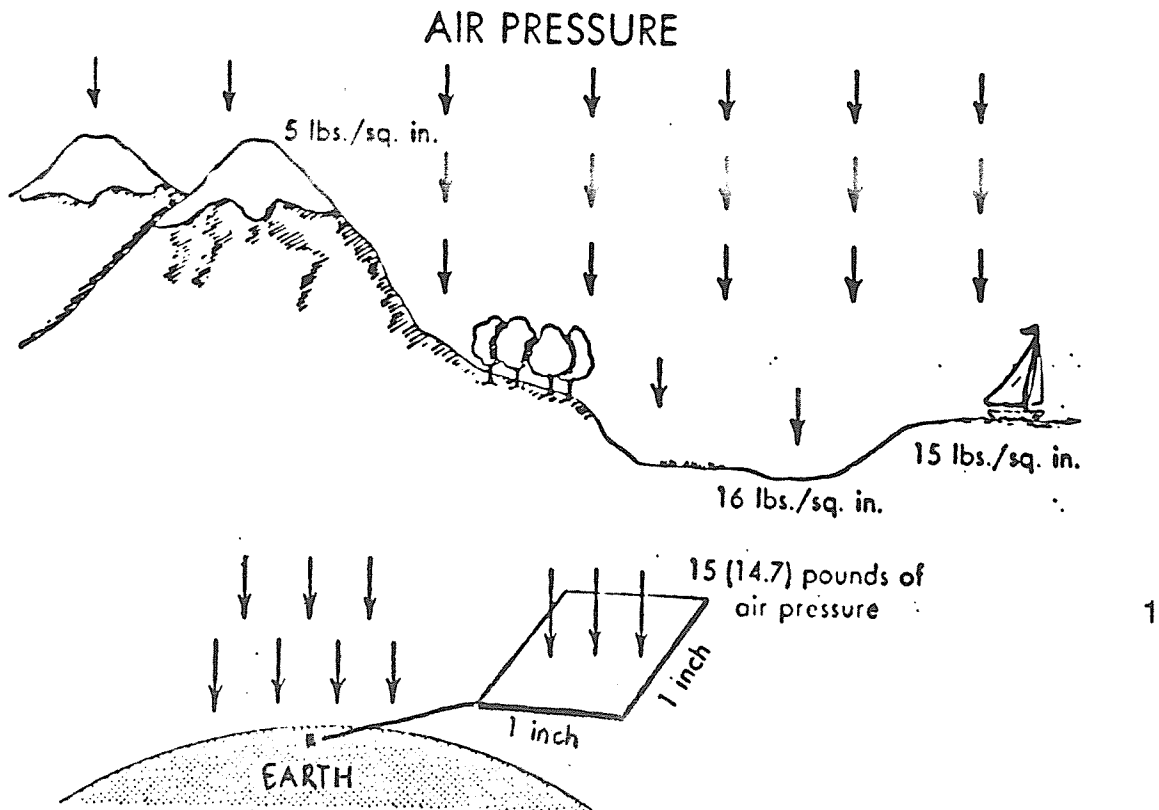
BACKGROUND

An airplane trip to a different country, putting air in a basketball, drinking soda through a straw all relate to air pressure. Air has weight and occupies space. The same as the air inside a basketball pushes out to make the basketball firm, air in the atmosphere pushes down on the Earth's surface.

The diagram below shows the pressure that pushes down on the Earth's surface. An average force of 14.7 pounds of air is pressing on each square inch of surface.

What would be the total force on a surface of 10 square inches?

Answer = _____ lbs. of pressure

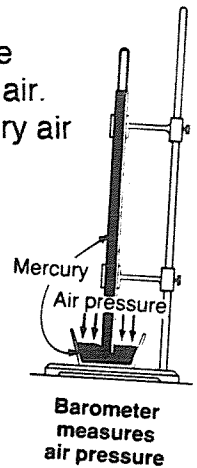


Tell if the air pressure would be (more, less or the same) as that of air pressure at sea level (14.7 lbs / in²) at the following locations:

1. At the top of Mt. Everest _____
2. Atlantic Ocean Seashore _____
3. Dead Sea, Israel _____

In 1643 the Italian physicist, TORRICELLI, discovered that air has weight. He invented the MERCURY BAROMETER. This instrument showed that the atmosphere could support a column of mercury approximately 30 inches high.

In 1656 it was discovered that the height of the mercury in the barometer tube varies with the weather. It was found that moist (humid) air was lighter than dry air. Therefore, the height of the mercury in the barometer RISES in the tube in the dry air and FALLS when the air becomes moist.

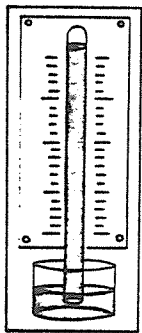


Study the mercury barometers below and answer the following questions:

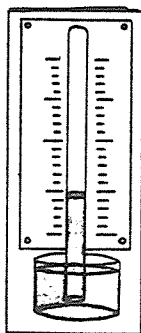
1. At what time was the air pressure highest?

2. At what time was the air pressure lowest?

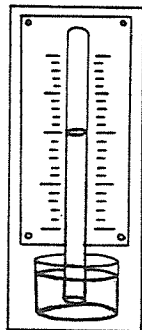
3. At what time was the air temperature the coolest? _____



7:00 A.M.



1:00 P.M.



6:00 P.M.

It was also noted that at low altitudes the height of the mercury column rises in the tube. It gradually falls as the barometer is taken to higher altitudes. At sea level the barometer should read **29.92 inches** of mercury or **1013.2 millibars** of mercury. Sometimes you may see **76 cm** of mercury. They all mean the same thing.

It became clear to scientists that the mercury rises with an increase in atmospheric pressure and falls with a decrease in atmospheric pressure. We know now that a column of mercury falls one inch of every 1000 feet rise in elevation.

The Torricelli mercury barometer is not always convenient to use. Therefore, a new barometer called an **ANEROID BAROMETER** was made. It consists of a small circular disk with all the air inside removed. This makes a small vacuum inside the disk. It contains no liquid to spill. As the air pressure decreases or increases, a spring at the top of the disk moves a needle either up or down. The scale on the outside is calibrated to the mercury barometer.

Use the Earth Science Reference Chart to help you convert the following air pressure readings...

(a) from inches to millibars of mercury:

1. 29.70 inches of mercury = _____ mb

2. 30.14 inches of mercury = _____ mb

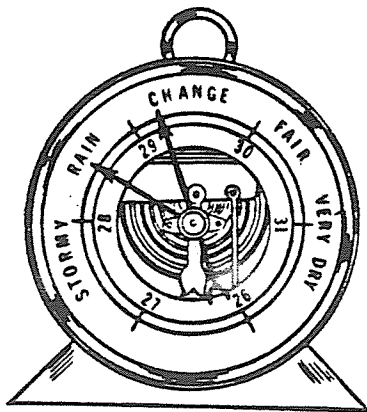
3. 29.37 inches of mercury = _____ mb

(b) from millibars to inches of mercury:

4. 1004.5 mb = _____ inches of mercury

5. 1017.5 mb = _____ inches of mercury

6. 987.6 millibars = _____ inches of mercury



**ANEROID
BAROMETER**

USING A BAROMETER TO FORECAST WEATHER

Reading a barometer can help you forecast the weather of a short period of time. Look at the chart below and then answer the questions that follow:

| BAROMETER READING | WEATHER FORECAST |
|----------------------------------|-----------------------------|
| 30.10 - 30.20 rising rapidly | fair, rain within 48 hrs |
| 30.10 - 30.20 steady | fair, little chance of rain |
| 30.10 - 30.20 falling slowly | rain within 24 hrs |
| 30.10 - 30.20 falling faster | rain within 12 hrs |
| 30.00 or below - rising slowly | clearing |
| 30.00 or below - falling slowly | rain for 24 - 48 hrs |
| 30.00 or below - falling rapidly | rain with winds |
| 29.80 or below - falling rapidly | storm with strong winds |

1. The TV weather person announces that the barometer reading is 30.10 inches and falling slowly. What does this mean? _____

2. What would be the approximate barometer reading during a severe thunderstorm? _____

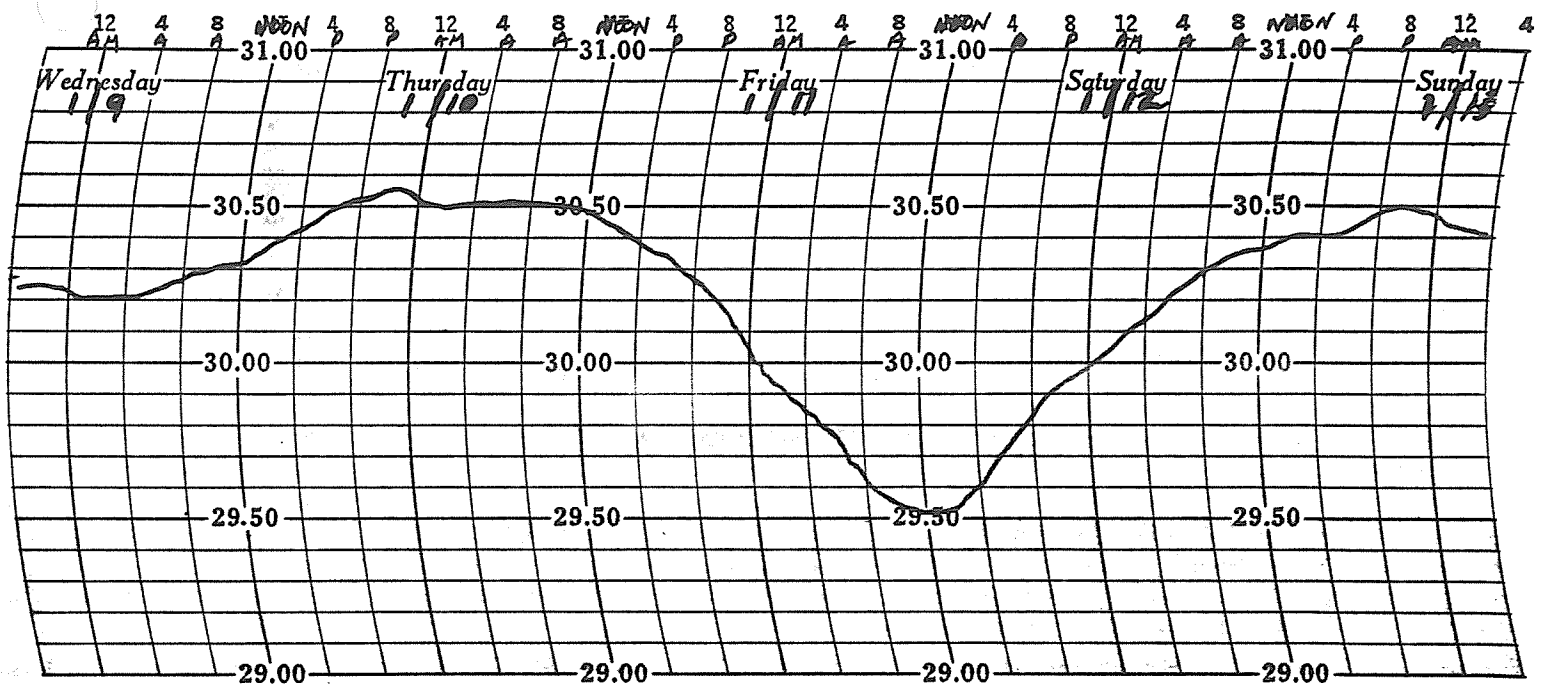
3. What type of weather will generally follow a **rising** barometer reading? _____

READING A BAROGRAPH

A BAROGRAPH is an instrument that measures and records air pressure. A pen in the instrument records the air pressure in inches of mercury on a special sheet of paper for a period of seven days. The sheet of paper with the record on it is called a BAROGRAM.

Continue ----->

Study and interpret the barogram shown below by answering the questions that follow.



QUESTIONS:

1. What is the **lowest pressure** shown on the barogram? _____

At what **hour** and on what **day** did this occur?

hour = _____ day = _____

2. Pressure readings below 30 inches are considered low. What type of weather probably occurred when the pressure was low? _____

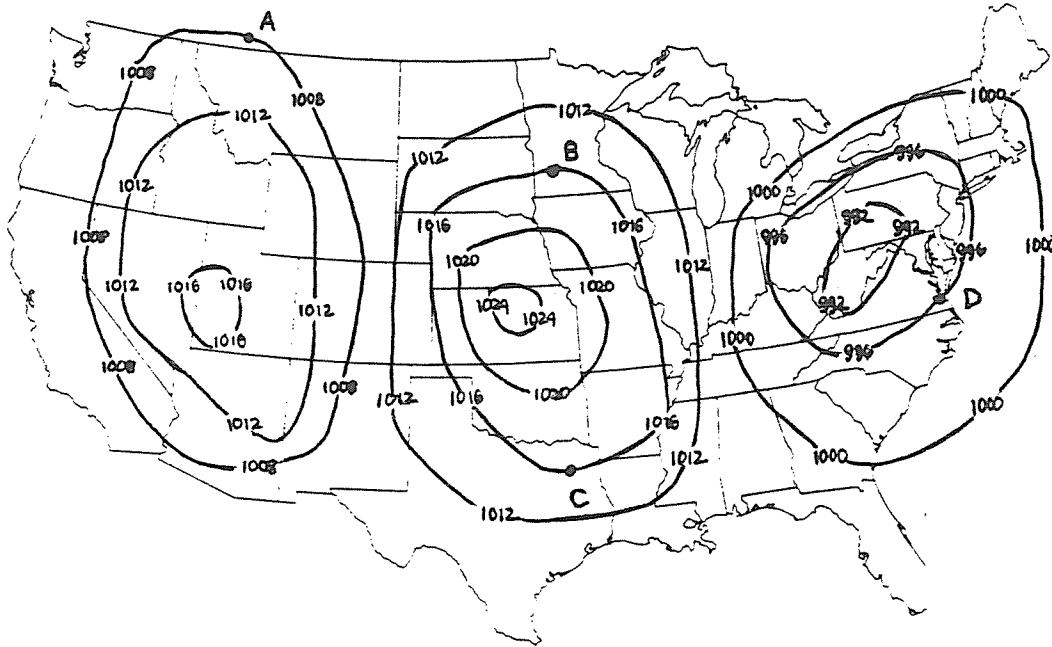
3. What is the **highest pressure** shown on the barogram? _____

4. Pressure readings above 30 inches are considered high. What type of weather probably occurred when the pressure was high? _____

5. Between noon on Thursday and noon on Friday, how much did the pressure drop? _____

INTERPRETING AN AIR PRESSURE MAP OF THE US

Complete the exercises and answer the questions about the map shown below.



- What do the numbers on the map represent? _____
 - In what units are these numbers recorded? _____
- What are the lines called that connect the numbers? _____
 - What do the lines on the map represent? _____
- ANALYZE** Look at each air-pressure system. Label the high-pressure system(s) with an H. Label the low-pressure system(s) with an L.
- Suppose air movement occurred between the air-pressure system on the right and the system in the center. **Draw an arrow on the map to show the direction of the air movement.**
- What is the air pressure at point A? _____
 - What is the air pressure at point B? _____
 - What is the air pressure at point C? _____
 - What is the air pressure at point D? _____