



## Unit 20: The Atmosphere's Layers

- LESSON A: Experiment and Discussion
  - Read the lesson carefully to make sure you have all needed supplies and you understand the content.
  - Observation Record
- ACTIVITY A: Experiment
  - The purpose of this activity is to apply your knowledge about what you learn about air pressure and weather by making a weather instrument that measures air pressure to predict weather.
- ACTIVITY B: Weather Mapping
- ACTIVITY C: Nature Journaling
  - Lay on the ground and draw what you see in the sky. Dictate or write what you observe.
- PARENT NOTES:

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# Lesson A: Atmosphere's Layers

## Objectives:

1. To introduce students to the different layers of the atmosphere.
2. To be familiar with different natural and man-made objects that can be located at different layers of the atmosphere.
3. To create a 2D model of the layers of the atmosphere

## Before the Lesson:

2. Conduct science outside, whenever possible – check the lesson type and the weather.
3. Gather and prep all materials.

## Materials Needed:

- Different construction paper (brown, white, yellow, light blue, dark blue, and gray)
- Writing materials
- Coloring utensils (crayons or colored pencils)
- Scissors
- Glue

## In Class:

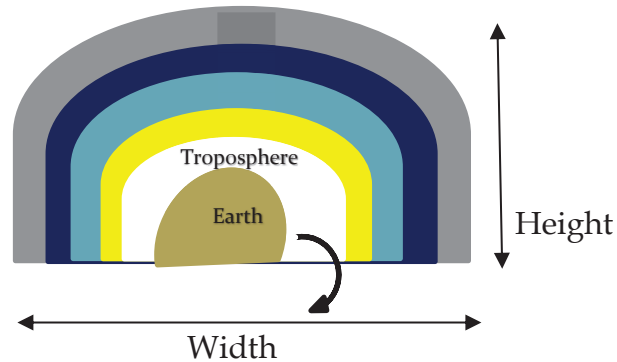
1. Class Observation:
  - Ask students what they think about the sky.
  - Do they look at it each day?
  - Do they consider how large it is? How far it goes away from us?
  - Do they consider what it is made of?
  - Do they take time to watch the clouds float by?
  - Do they take time to watch the stars at night?
  - Do they contemplate the different colors of the sunrise and the sunset?
2. Class Activity:

- a. Tell the students that they will be learning about the different layers of the atmosphere and categorize them based on temperature, pressure and different natural and man-made objects that can be observed at various layers.
- b. Below is a table summarizing the different layers of the atmosphere and some of their characteristics. Source: <https://www.nasa.gov>

| <i>LAYERS OF THE ATMOSPHERE</i> | <i>THICKNESS</i>                 | <i>TEMPERATURE</i>  | <i>SOME FACTS</i>   |
|---------------------------------|----------------------------------|---|---|
| EXOSPHERE                       | 6,200 miles<br>(up to 10,000 km) | The temperature in the exosphere varies from 0°C to 1700°C because this layer is almost a vacuum (very thin air). | -The upper limit of the Earth's atmosphere.<br>-Air is extremely thin in this layer.  |
| THERMOSPHERE                    | 372 miles<br>(600 km)            | The hottest layer of the Earth's atmosphere.  | -Auroras (northern and southern lights) occur in this layer.<br>-Satellites are found in the thermosphere.<br>-Absence of water vapor.  |
| MESOSPHERE                      | 53 miles<br>(85 km)              | This is the coolest part of the Earth's atmosphere.   | -Meteors burn up in this layer.<br>-This layer can only be access by used of rockets.   |
| STRATOSPHERE                    | 31 miles<br>(50 m)               | With an increase in altitude, temperature increases due to the absorption of UV rays by the ozone layer.          | -The ozone layer is found in stratosphere. The ozone helps absorbs and scatter UV rays from the sun.<br>-The highest height that an aircraft can reach.                                   |
| TROPHOSPHERE                    | 5-9 miles<br>(8-14.5 km)         | With an increase in elevation, there is a decrease in temperature.  | -The densest part of the atmosphere. 75% of the Earth's mass is in the troposphere.<br>-Most of the weather happens in this layer since most of the water vapor is present in this layer. |
| Earth                           |                                  |   |   |

Pressure decreases with increasing height from the Earth's Surface

- Fold the gray construction paper in half cross-wise and make a half-circle shape from it (dimension of 9in width and 6in height).
- Do the same thing for the other colors having the following dimensions (width x height): Dark blue (8x4.5 in), Light blue (7x4 in), Yellow (6x3.5 in), White (5x3 in), Brown (4x2.5 in)



- You can pre-cut the shapes and the students can staple them together.
- Staple the bottom part together.
- Write the names of the different layers of the atmosphere on the exposed portion of the construction paper. Label the brown construction paper as the Earth, the white construction paper as the troposphere (as shown in the above image) and so on. This will look like a mini-booklet.
- Starting from the troposphere, read and discuss the different characteristics of each layer and some important facts about that layer using the table above or you can also use other reference text book for additional information. Flip the page and write on the exposed page. For older students that can write independently, ask the students to write the information they heard for each layer on as you discuss them.
- For younger students, you can use the information available in Observation Record “Atmosphere’s Layers” by cutting and pasting them in their booklet.
- Ask students to draw objects that are found in each layer and color their picture.

### 3. Class processing:

- Ask the students why astronauts need to wear space suit when they work outside the space station in space? Mention that it has something to do with temperature, pressure and air.
- What happen to the air pressure as we ascend from Earth?

*The air pressure becomes less. On the other hand, air pressure increases as we go underwater.*

Imagine a marshmallow being sent to outer space without a space suit, what do you think will happen to the size of the marshmallow? *It will expand and eventually pop.*

4. Class Discussion:

- What did you learn from this activity?
- How does it help you to understand the layers of the atmosphere?

# Observation Record: The Atmosphere's Layers

## EXOSPHERE

|  |   |  |
|--|---|--|
| Thickness of 6,200 miles (up to 10,000 km) | The temperature in the exosphere varies from 0°C to 1700°C because this layer is almost a vacuum (very thin air). | -The upper limit of the Earth's atmosphere.<br>-Air is extremely thin in this layer. |
|--|---|--|

## THERMOSPHERE

|                    |  |  |
|--------------------|--|--|
| 372 miles (600 km) | The hottest layer of the Earth's atmosphere. | -Auroras (northern and southern lights) occur in this layer.<br>-Satellites are found in the thermosphere.<br>-Absence of water vapor. |
|--------------------|--|--|

## MESOSPHERE

|                  |   |  |
|------------------|---|--|
| 53 miles (85 km) | This is the coolest part of the Earth's atmosphere. | - Meteors burn up in this layer.<br>- This layer can only be accessed by the use of rockets. |
|------------------|---|--|

## STRATOSPHERE

|                  |  |  |
|------------------|--|--|
| 31 miles (50 km) | With an increase in altitude, temperature increases due to the absorption of UV rays by the ozone layer. | -The ozone layer is found in the stratosphere. The ozone helps absorb and scatter UV rays from the sun.<br>-The highest height that an aircraft can reach. |
|------------------|--|--|

## TROPOSPHERE


|                       |  |   |
|-----------------------|--|---|
| 5-9 miles (8-14.5 km) | With an increase in elevation, there is a decrease in temperature. | -The densest part of the atmosphere. 75% of the Earth's mass is in the troposphere.<br>-Most of the weather happens in this layer since most of the water vapor is present in this layer. |
|-----------------------|--|---|

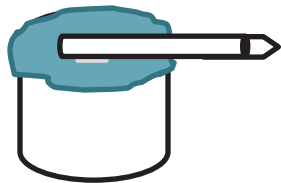
# Activity A: Measuring Air Pressure Using a Barometer

## Materials Needed:

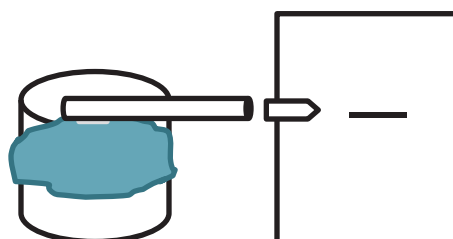
- Wide mouth glass jar
- Balloon
- Rubber band
- Plastic straw
- scissors
- A piece of double-sided tape
- A piece of white paper

## Class Activity:

- Cut the opening of the balloon so that it can fit over the mouth of the glass jar.
- Secure the balloon using rubber band.
- Cut one end of the plastic straw so that it becomes pointy. 
- Place the double-sided tape at the center of the balloon and attach the straw on it having the pointy end hanging out.
- Make sure that the straw is level.



- Place your DIY barometer on a flat stable surface, preferably next to a wall, away from direct sunlight.
- Tape the white paper on the wall and mark on the paper where the point of the straw rest.

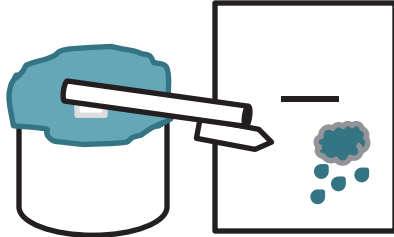


This will be your reference point. At this time, the pressure inside the glass jar is equal to the

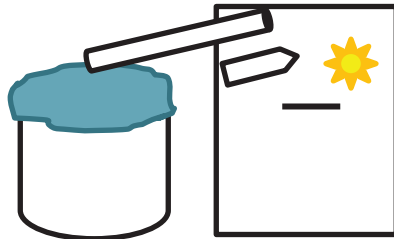
surrounding air pressure outside the jar, hence

the balloon is leveled.

- When the ambient or surrounding pressure drops or becomes lower than the inside of the jar, the balloon will be pushed up making the straw tilt downward below the reference line. This indicates humid or rainy days are coming.



- When the ambient or surrounding pressure increases or becomes higher than the inside of the jar, the balloon will be pushed down making the straw tilt upward below the reference line. This indicates dry and cool weather is coming.



- If the straw hasn't changed its position, it means that there will be no drastic change in the weather pattern for the next day.
- Record your observation and predictions below. Try to see if the prediction the you made the day before based on the barometer reading correspond to the current weather.



| Barometer Reading<br>(Above, Level or Below) | Weather prediction<br>(Dry/cool OR Humid/Rainy) | Actual weather<br>the day after your<br>prediction | Is your prediction<br><i>Similar or Different</i><br>than actual |
|--|---|--|--|
|  |   |  |  |
|  |   |  |  |
|  |   |  |  |
|  |   |  |  |

- 1) What instrument is used to measure air pressure? \_\_\_\_\_
- 2) Rising air pressure means \_\_\_\_\_ and \_\_\_\_\_ weather.
- 3) Falling air pressure means \_\_\_\_\_ and \_\_\_\_\_ weather.
- 4) Explain how a barometer works?

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# Activity B: Weather Map

Label the map of the United States to make a weather map using the instructions and keys that is discussed below. Answer the following questions about the weather map you made.

**LEGEND:**



**COLD FRONT**  
Advancing cold air pushes warm air upwards. Clouds can form unless the air is very dry. Precipitation and thunderstorm can occur followed by a cooler and drier air.



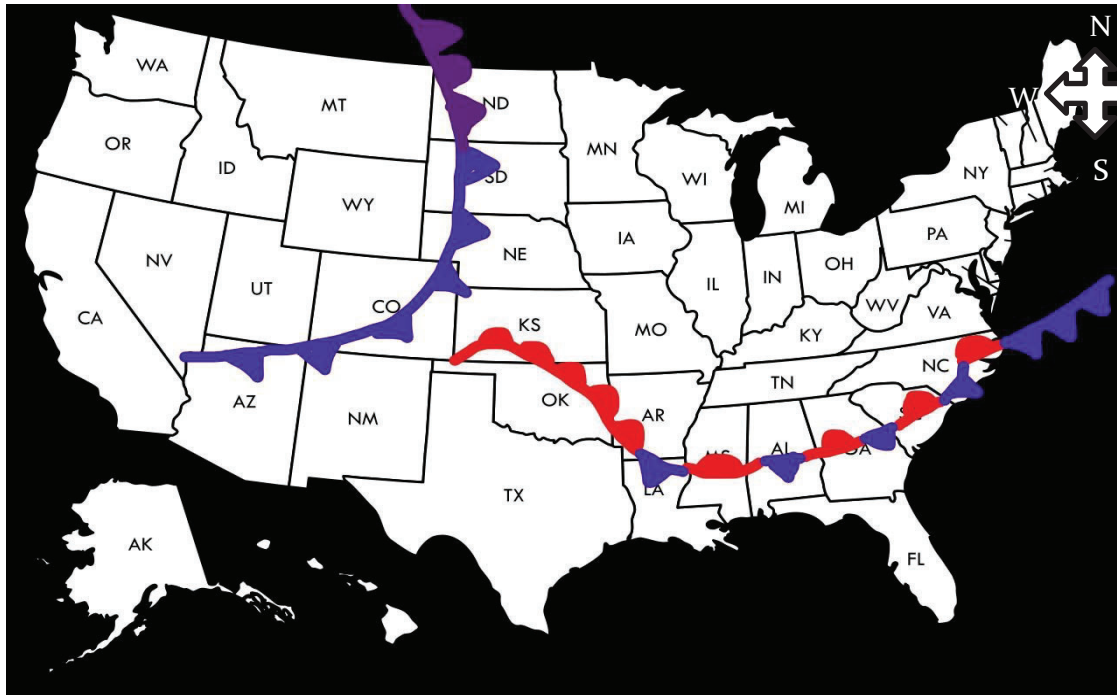
**OCCLUDED FRONT**  
This front happens when a cold front join with a warm front. Cloud and rain form along the front. Eventually the temperature equalizes after the cold and warm air mixes.



**WARM FRONT**  
A mass of warm air advances over a mass of cold air. Columns of clouds form and precipitation follows. Warm air proceeds the warm front.



**STATIONARY FRONT**  
A mass of warm air and cold air are next to each other but neither are strong enough to move or replace one air mass over the other. Results to clouds formation in both sides of the front.



By Kaboom88 - self-made, based on CIA map found at [http://www.lib.utexas.edu/maps/united\\_states/usa\\_refo1.pdf](http://www.lib.utexas.edu/maps/united_states/usa_refo1.pdf), Public Domain, <https://commons.wikimedia.org/w/index.php?curid=2979506>

- 1) Locate the cold fronts in your map and place the symbol H (for High Pressure) on the side of the front where the cold air is coming from. Remember, the symbol of the front is facing towards where it is moving.
- 2) Locate the warm fronts in your map and place the symbol L (for Low Pressure) on the side of the front where the warm air is coming from. Remember, the symbol of the front is facing towards where it is moving.
- 3) If you live in Missouri (MO), what type of weather would you be expecting in a couple of days? Cool and Dry or Warm and Wet? Explain your answer.

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If you live in Arizona (AZ), what type of weather would you be expecting in a couple of days? Cool and Dry or Warm and Wet? Explain your answer.

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Name two states where you would expect NO change in their weather condition for the next couple of days? Explain your answer.

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What is the current weather in North Dakota (ND) when this map was plotted? Explain your answer.

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# Activity C: Nature Journaling

Make a mnemonics to remember the different layers of the atmosphere. Draw a picture of your mnemonics.

## *Expression or Word Mnemonic*

To make an Expression or Word mnemonic, the first letter of each item in a list is arranged to form a phrase or word. Examples:

The order of operations for math is Parentheses, Exponents, Multiply, Divide, Add, and Subtract = Please Excuse My Dear Aunt Sally.

**Troposphere, Stratosphere, Mesosphere, Thermosphere,  
Exosphere**

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