

# #9719

## THE ATMOSPHERE

VISUAL LEARNING COMPANY, 2000

Grade Levels: 5-9

20 minutes

5 Instructional Graphics Enclosed

### DESCRIPTION

What is the difference between hydrosphere, lithosphere, and atmosphere? What gases make up the atmosphere? How many layers are in our atmosphere and what are their differences? After answering these and other questions, concludes with a quiz.

### ACADEMIC STANDARDS

#### Subject Area: Science – Earth and Space Sciences

- ★ Standard: Understands atmospheric processes and the water cycle
  - Benchmark: Knows the composition and structure of the Earth's atmosphere (e.g., temperature and pressure in different layers of the atmosphere, circulation of air masses) (See Instructional Goals #1, 3, 4, 6, 8, and 9.)
  - Benchmark: Knows that the Sun is the principle energy source for phenomena on the Earth's surface (e.g., winds, ocean currents, the water cycle, plant growth) (See Instructional Goal #7.)

#### Subject Area: Science – Life Sciences

- ★ Standard: Understands the structure and function of cells and organisms
  - Benchmark: Understands the process of photosynthesis and respiration in plants (e.g., chloroplasts in plant cells use energy from sunlight to combine molecules of carbon dioxide and water into complex, energy-rich organic compounds and release oxygen to the environment) (See Instructional Goal #3.)

### INSTRUCTIONAL GOALS

1. To describe features of the earth and the characteristics of its atmosphere.
2. To differentiate between the hydrosphere and lithosphere.
3. To explain the different types of gases in the earth's atmosphere.
4. To differentiate between layers of the atmosphere according to their differences in temperature.
5. To point out that gravity is the force that pulls gases toward the earth.
6. To describe some of the characteristics of the following layers of atmosphere: troposphere, stratosphere, mesosphere, and thermosphere.
7. To describe how the earth is heated and why mountain tops tend to be cooler than the valleys below.
8. To state the importance of the ozone layer and the effects it has on ultraviolet rays from the sun.
9. To describe the role the magnetosphere plays in the creation of auroras.

## BACKGROUND INFORMATION

The earth's atmosphere is divided into layers according to changes in temperature. The four main layers of the atmosphere are the troposphere, stratosphere, mesosphere, and thermosphere. The thermosphere includes two layers called the ionosphere and the exosphere. The area that extends beyond the earth's atmosphere is called the magnetosphere.

## VOCABULARY

- |                    |                              |
|--------------------|------------------------------|
| 1. argon           | 12. nitrogen                 |
| 2. aurora borealis | 13. oxygen                   |
| 3. carbon dioxide  | 14. ozone                    |
| 4. gravity         | 15. photosynthesis           |
| 5. helium          | 16. solar flares             |
| 6. hydrosphere     | 17. stratopause              |
| 7. ionosphere      | 18. stratosphere             |
| 8. lithosphere     | 19. thermosphere             |
| 9. magnetosphere   | 20. tropopause               |
| 10. mesosphere     | 21. troposphere              |
| 11. neon           | 22. Van Allen radiation belt |

## BEFORE SHOWING

1. Discuss the importance of air. List activities or functions that would not be possible if there were no air.
2. Display a list of the names of the layers of the atmosphere. Point out the prefixes and explain the meaning of each.
3. Complete the "Preliminary Test". (See Instructional Graphics.)

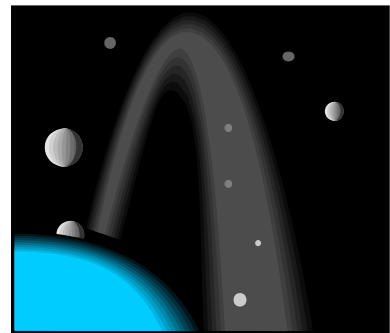
## DURING SHOWING

1. View the video more than once, with one showing uninterrupted.
2. Pause at each "You Decide" section and write the answers on paper or discuss the questions as a group.

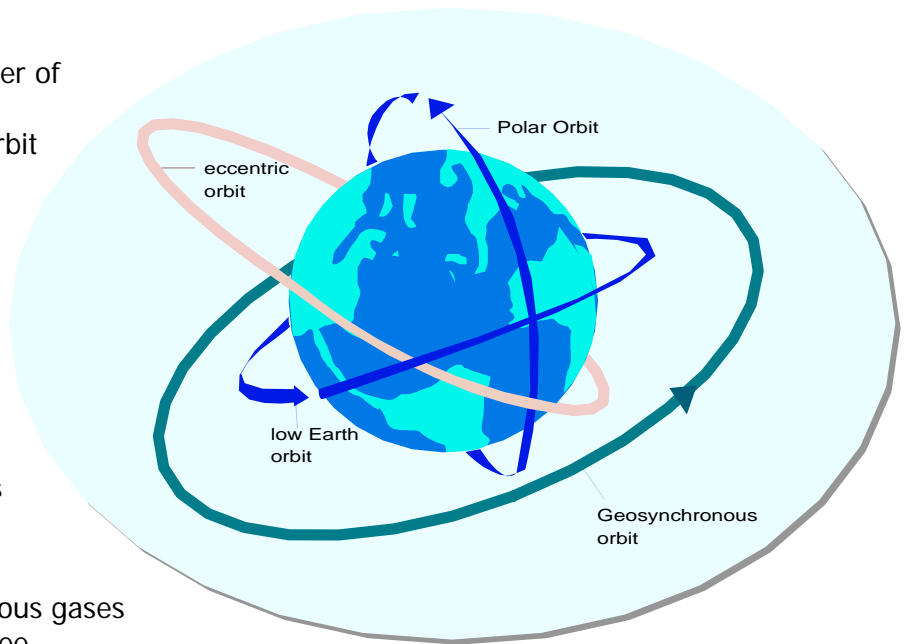
## AFTER SHOWING

### ► Discussion Items and Questions

1. What are some important uses of the atmosphere?
2. What is found in the hydrosphere? The lithosphere?
3. Through what chemical process do plants produce oxygen?
4. What percent of the air is oxygen?
5. What tiny solid particles are found in air?
6. Why do skiers at high-mountain altitudes often become short of breath?
7. Which layer of the atmosphere contains oxygen?
8. At which layer does the jet stream occur?
9. What gas in the stratosphere traps ultraviolet radiation?
10. Which is the coldest layer of the atmosphere?
11. Which layer protects the earth from meteors by burning them up?



12. Which layer is the hottest layer of the atmosphere?
13. In which layer do satellites orbit the earth?
14. What is the area around the earth that extends beyond the atmosphere called?
15. What are the Van Allen radiation belts?
16. What causes the aurora borealis?



► **Applications and Activities**

1. Complete the "Posttest". (See Instructional Graphics.)
2. Graph the percentage of various gases found in the atmosphere. (See Instructional Graphics.)
3. Humans depend on air to breathe. Count the number of breaths per minute. Use that number to calculate the average number of breaths per hour, per day, and per year.
4. Illustrate the oxygen-carbon dioxide cycle on poster board. Briefly outline each step.
5. The temperature of the air decreases as the altitude increases. Research to find the coldest and hottest temperatures ever recorded on Earth. Note the locality.
6. Report on the ozone layer above the earth. List factors that affect its size and its ability to protect Earth's inhabitants from harmful radiation. Include information about ozone alerts.
7. Create a bar graph illustrating the altitude and the temperatures of the layers of the atmosphere. (See Instructional Graphics.)
8. Perform an experiment that explores the shape of the magnetosphere by comparing it to the shape of the magnetic field of a magnet. (See Instructional Graphics.)
9. Convert the metric measurements mentioned in the video to US Customary units by using conversion formulas or online conversion tools.
10. Make a list of vocabulary words used in the video and scramble them. Create a worksheet that matches the scrambled words with their meanings.

**RELATED RESOURCES**



- [Atmosphere: On the Air #3213](#)
- [The Earth's Atmosphere #2170](#)



**World Wide Web**

The following Web sites complement the contents of this guide; they were selected by professionals who have experience in teaching deaf and hard of hearing students. Every effort was made to select accurate, educationally relevant, and "kid safe" sites. However, teachers should preview them before use. The U.S. Department of Education, the National Association of the Deaf, and the Captioned Media Program do not endorse the sites and are not responsible for their content.

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- **AURORAS: PAINTINGS IN THE SKY**

[http://www.exploratorium.edu/learning\\_studio/auroras/selfguide1.html](http://www.exploratorium.edu/learning_studio/auroras/selfguide1.html)

Includes a self-guided tour of auroras. Explains what they look like, how they are created, and where they can be found. Includes links to sites on auroras, the Sun, and the earth's magnetosphere.



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- **EARTH'S ATMOSPHERE**

<http://www.schooltv.com/atmosphere.htm>

This is a Web site developed by a sixth grade class that contains reports about each layer of the atmosphere, fact sheets, tests, answers, and FAQs.

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- **ONLINE METRIC CONVERTER**

<http://www.sciencemadesimple.com/conversions.html>

Serves as a tool to convert metric measurements to US customary units and vice versa. Includes length/height, weight, volume, and temperature.

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- **THE EARTH'S ATMOSPHERE**

<http://csep10.phys.utk.edu/astr161/lect/earth/atmosphere.html>

Contains a graphic showing the layers of the atmosphere and their altitudes in kilometers. Includes information about each layer.

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## INSTRUCTIONAL GRAPHICS

- PRELIMINARY TEST
- POSTTEST
- ATMOSPHERIC GASES
- ATMOSPHERIC LAYERS
- MAGNETOSPHERE

## Preliminary Test

**Directions:** Fill in the blank with the correct word. A list of possible answers is provided below.

1. The \_\_\_\_\_ consists of gases surrounding the earth that are essential for all living organisms.
2. Earth is referred to as the "Blue Planet" because of its abundant \_\_\_\_\_ supply.
3. \_\_\_\_\_ holds the layers of the atmosphere to the earth.
4. The bottommost layer of the atmosphere is called the \_\_\_\_\_.
5. Jet planes travel through the \_\_\_\_\_.
6. The \_\_\_\_\_ is the top layer of the atmosphere which is divided into two parts: ionosphere and exosphere.
7. \_\_\_\_\_ decreases as distance from the earth increases in the troposphere.
8. Jet streams influence \_\_\_\_\_ patterns.
9. \_\_\_\_\_ are rock fragments from outer space that enter the atmosphere.
10. AM radio waves travel up to the \_\_\_\_\_ before bouncing back to the earth.



**Directions:** Decide whether the answer is True (T) or False (F).

11. T F The zone of the earth in which life exists is relatively small.
12. T F The term hydrosphere refers to the part of the earth that lies beneath the water.
13. T F The most abundant gas in the atmosphere is oxygen.
14. T F There is less oxygen at higher elevations.
15. T F The air closest to the earth is less dense than air at higher elevations in the atmosphere.
16. T F The temperature is below freezing in the stratosphere.
17. T F Heat caused by friction in the mesosphere burns up most meteors before they can crash into the earth.
18. T F The troposphere is warm due to the conduction of heat on the earth's surface.
19. T F Jet streams blow in a southerly direction.
20. T F The ozone layer absorbs a great deal of the ultraviolet radiation.

# Posttest

**Directions:** Decide whether the answer is True (T) or False (F).

- 1. T F The troposphere is warm due to the conduction of heat on the earth's surface.
- 2. T F The air closest to the earth is less dense than air at higher elevations in the atmosphere.
- 3. T F The zone of the earth in which life exists is relatively small.
- 4. T F The ozone layer absorbs a great deal of the ultraviolet radiation.
- 5. T F The term hydrosphere refers to the part of the earth that lies beneath the water.
- 6. T F Jet streams blow in a southerly direction.
- 7. T F The most abundant gas in the atmosphere is oxygen.
- 8. T F Heat caused by friction in the mesosphere burns up most meteors before they can crash into the earth.
- 9. T F There is less oxygen at higher elevations.
- 10. T F The temperature is below freezing in the stratosphere.

**Directions:** Fill in the blank with the correct word. A list of possible answers is provided at the bottom of the page.

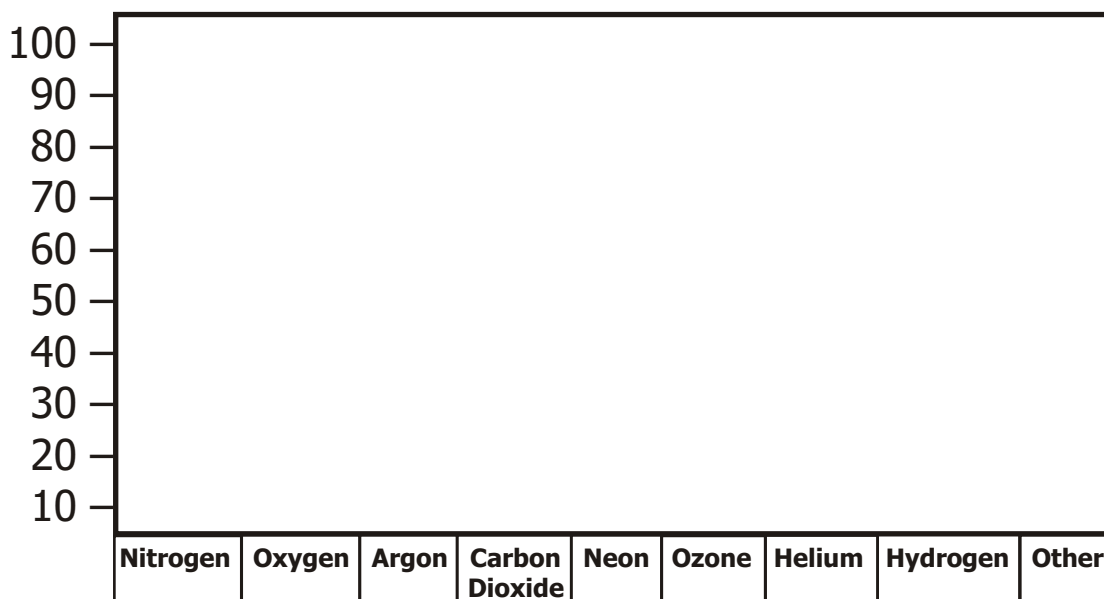
- 11. The bottommost layer of the atmosphere is called the \_\_\_\_\_ .
- 12. \_\_\_\_\_ are rock fragments from outer space that enter the atmosphere.
- 13. The \_\_\_\_\_ is the top layer of the atmosphere which is divided into two parts: ionosphere and exosphere.
- 14. AM radio waves travel up to the \_\_\_\_\_ before bouncing back to the earth.
- 15. Earth is referred to as the "Blue Planet" because of its abundant \_\_\_\_\_ supply.
- 16. \_\_\_\_\_ decreases as distance from the earth increases in the troposphere.
- 17. Jet streams influence \_\_\_\_\_ patterns.
- 18. The \_\_\_\_\_ consists of gases surrounding the earth that are essential for all living organisms.
- 19. Jet planes travel through the \_\_\_\_\_ .
- 20. \_\_\_\_\_ holds the layers of the atmosphere to the earth.

<b>gravity</b>	<b>thermosphere</b>	<b>stratosphere</b>
<b>weather</b>	<b>ionosphere</b>	<b>density</b>
<b>exosphere</b>	<b>troposphere</b>	<b>atmosphere</b>
<b>water</b>	<b>meteors</b>	<b>temperature</b>

## Atmospheric Gases

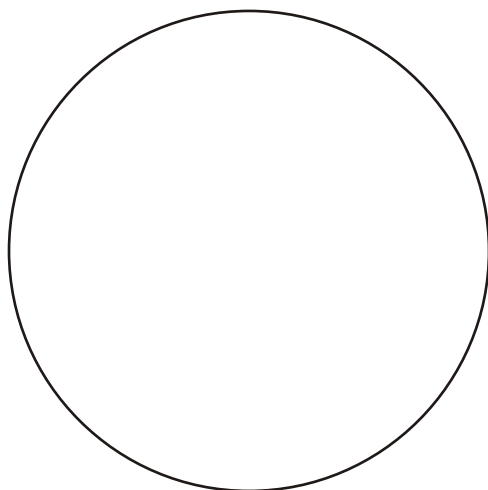
**Directions:** Make two different graphs illustrating the makeup of gases in our atmosphere. The first graph is a bar graph, and the second is a pie graph. Use colored pencils to illustrate the different gases. Information needed for the graphs is included.

### Bar Graph:



### Pie Graph:

(can be drawn or computer-generated.)



### Questions:

1. Which gas makes up the greatest percentage of gas in the atmosphere?  
\_\_\_\_\_
2. Which gas do plants breathe in?  
\_\_\_\_\_
3. What gas do we breathe in?  
\_\_\_\_\_
4. Describe the role ozone plays in the atmosphere?  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

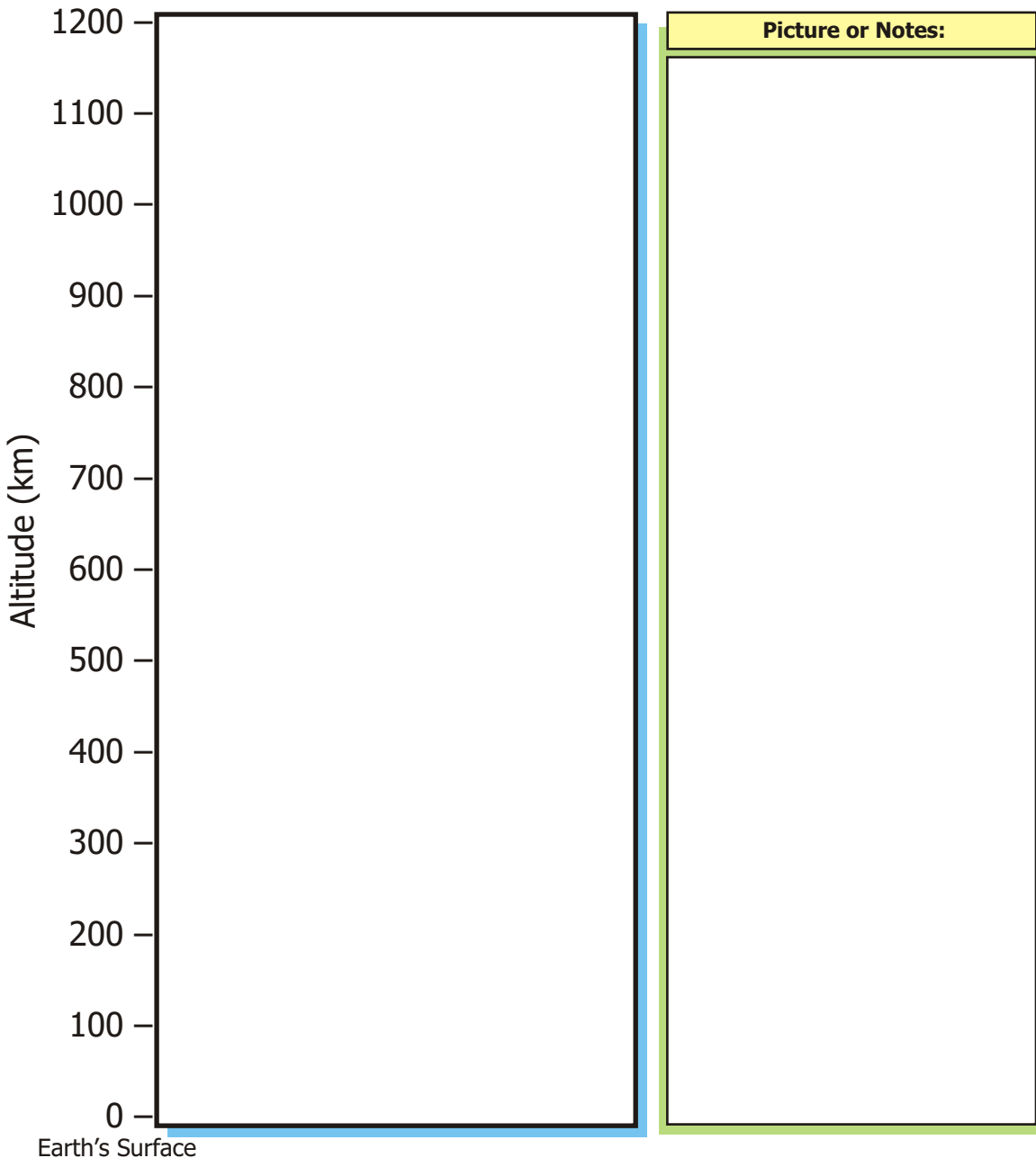
GAS:	Nitrogen	Oxygen	Argon	Carbon Dioxide	Ozone	Neon	Helium	Hydrogen	Other Gases
PERCENT by VOLUME:	78	21	.93	.03	.0006	.0018	.0005	.00005	.00005

# Atmospheric Layers

**Directions:** Color the boxes in the key with colored pencils. Choose colors according to the temperature of each layer. Now use the colors chosen in the key to draw the atmospheric layers in the diagram. Draw lines to distinguish where the layers begin and end. To the right of the layer, draw a picture or note some events which may occur in the layer (example: meteor burning up in mesosphere).

**Key**

Mesosphere	Stratosphere	Troposphere	Magnetosphere	Ionosphere	Thermosphere	Exosphere



## Magnetosphere

### Objective:

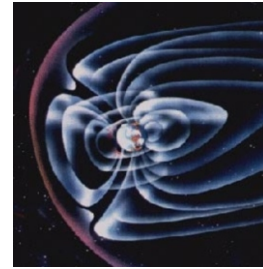
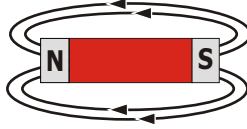
To explore the shape of the magnetosphere by comparing it to the shape of the magnetic field of a magnet.

### Materials:

Bar magnet

Piece of thin paper

Iron filings (If you do not have iron filings, you can cut up steel wool into fine pieces.)



### Activity:

1. Obtain from your teacher a bar magnet, a piece of paper, and a small amount of iron filings.
2. **Caution:** Do not touch the magnet directly to the iron filings! They are very difficult to scrape off the magnet.
3. Place a small amount of iron filings on a piece of thin paper while the paper is lying flat on a table.
4. Carefully slide the bar magnet under the piece of paper so that it directly lines up with the iron filings.
5. Slowly move the paper back and forth over the magnet until a pattern forms. Draw the shape of the pattern of iron filings on the back of this page. This is the general shape of the magnetosphere around the earth in the absence of solar wind.
6. You will now model the effect that solar wind has on the shape of the magnetosphere. Carefully blow on the iron filings from paper level, placing your chin on the table. Observe what happens.
7. Draw the new shape of the iron filings on the back of this page.

### Questions:

1. Describe the general shape of your model magnetosphere in your first drawing. Where are the poles located?
2. Describe the general shape of the magnetosphere in your second drawing. What caused the change in the shape? How is this similar to solar wind?
3. The average speed of the solar wind is 400 kilometers per second. However, during periods of high solar activity (sunspots and solar flares), the solar wind is denser and faster. Describe the effect this might have on the magnetosphere.