

The Atmosphere

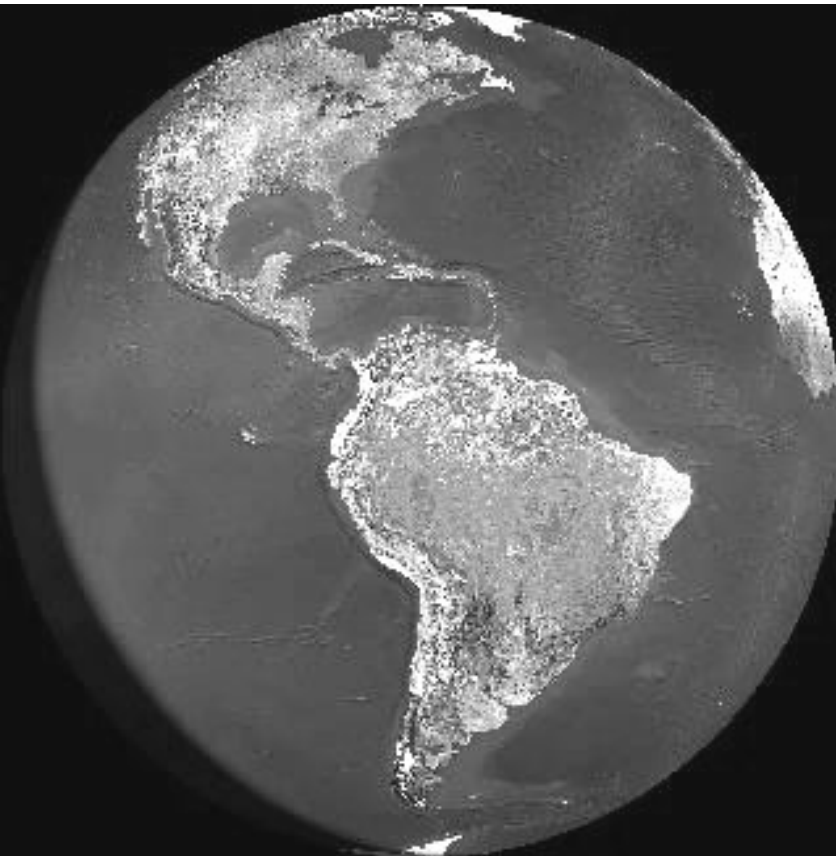
Teacher's Guide Middle School

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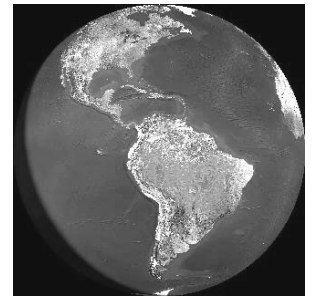
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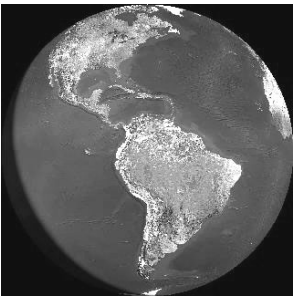
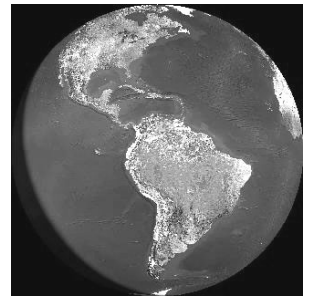


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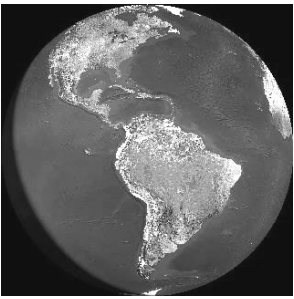
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A Message from our Company ...

Dear Educator:

Thank you for your interest in the educational videos produced by the *Visual Learning Company*. We are a Vermont-based, family owned and operated business specializing in the production of quality educational science videos and materials.

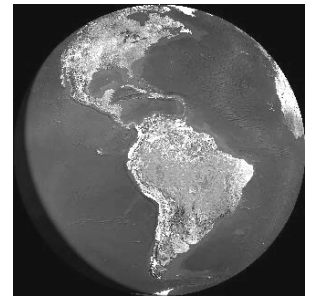
We have a long family tradition of education. Our grandmothers graduated from normal school in the 1920's to become teachers. Brian's mother was an elementary teacher and guidance counselor, and his father was a high school teacher and superintendent. This family tradition inspired Brian to become a science teacher, and to earn a Ph.D. in education, and lead Stephanie to work on science educational programs at NASA.

In developing this video, accompanying teacher's guide, and student activities, our goal is to provide educators with the highest quality materials, thus enabling students to be successful. In this era of more demanding standards and assessment requirements, supplementary materials need to be curricular and standards based - this is what we do!

Our videos and accompanying materials focus on the key concepts and vocabulary required by national and state standards and goals. It is our mission to help students meet these goals and standards, while experiencing the joy and thrill of science.

Sincerely,

Brian and Stephanie Jerome



Standards Correlations

National Science Education Standards

(Content Standards: 5-8, National Academy of Sciences, c. 1996)

Science as Inquiry - Content Standard A:

As a result of activities in grades 5-8, all students should develop:

- Abilities necessary to do scientific inquiry
- Understandings about scientific inquiry

Science as Inquiry - Content Standard D:

As a result of their activities in grades 5-8, all students should develop an understanding that:

- The atmosphere is a mixture of nitrogen, oxygen, and trace gases that include water vapor. The atmosphere has different properties at different elevations.
- Clouds, formed by the condensation of water vapor, affect weather and climate.
- Global patterns of atmospheric movement influence local weather. Oceans have a major effect on climate because water in the oceans holds a large amount of heat.

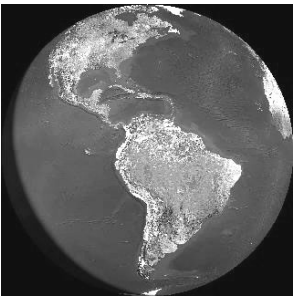
Benchmarks for Science Literacy

(Project 2061 - AAAS, c. 1993)

The Physical setting - The Earth (4B):

By the end of fifth grade, students should know that:

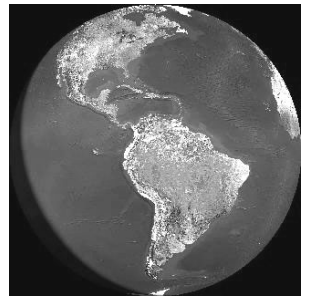
- Things on or near the earth are pulled toward it by the earth's gravity.
- Air is a substance that surrounds us, takes up space, and whose movement we feel as wind.



Student Learning Objectives

Upon viewing the video and completing the enclosed student activities, students should be able to do the following:

- Describe the unique features of planet earth and the characteristics of its atmosphere;
- Differentiate between the hydrosphere and lithosphere;
- Explain the different types of gasses in the earth's atmosphere, including nitrogen, oxygen, and carbon dioxide and describe the importance of each;
- Differentiate between the layers of the atmosphere according to their differences in temperature;
- Understand that gravity is the force that pulls all objects (including gases) toward the earth;
- Briefly describe some of the characteristics of the following layers of atmosphere: troposphere, stratosphere, mesosphere, and thermosphere;
- Describe how the earth is heated and why mountain tops tend to be cooler than the valleys below;
- Describe the role the magnetosphere plays in the creation of auroras.
- State the importance of the ozone layer and the effects it has on ultraviolet rays from the sun.



Assessment

Preliminary Test:

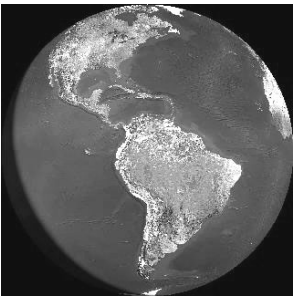
The Preliminary Test, provided in the Student Masters section, is an assessment tool designed to gain an understanding of student preexisting knowledge. It can also be used as a benchmark upon which to assess student progress based on the objectives stated on the previous pages.

Video Review:

The Video Review, provided in the Student Masters section, can be used as an assessment tool or as a student activity. There are two main parts. The first part contains questions titled “You Decide” that can be answered during the video. The second series of ten questions consists of a video quiz to be answered at the conclusion of the video.

Post-Test:

The Post-Test, provided in the Student Masters section, can be utilized as an assessment tool following student completion of the video and student activities. The results of the Post-Test can be compared against the results of the Preliminary Test to assess student progress.



Introducing the Video

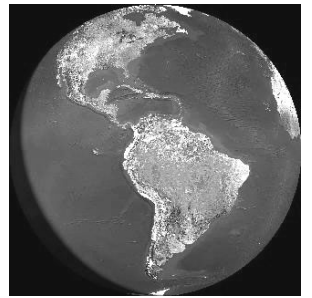
Before showing the video, ask students to describe, in their own words, some characteristics of the atmosphere. Ask them what gases make up our atmosphere. Write their answers on the blackboard. Explain to them some of the features of our “blue planet” which sets it apart from the other planets in our solar system. Ask students to describe the factors which allow life to flourish on our planet. Finally, tell the students to pay close attention to the video to learn about the unique features of earth’s atmosphere that allow life to form and exist.

Video Viewing Suggestions

The Student Master “Video Review” is provided for distribution to students. You may choose to have your students complete this Master while viewing the program or to do so upon its conclusion.

The program is approximately 20-minutes in length and includes a ten-question video quiz. Answers are not provided to the Video Quiz on the video, but are included in this teacher’s guide. You may choose to grade student quizzes as an assessment tool or to review the answers in class.

The video is content-rich with numerous vocabulary words. For this reason you may want to periodically stop the video to review and discuss new terminology and concepts.



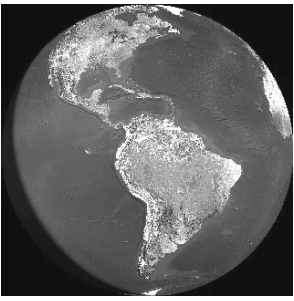
Student Assessments And Activities

Assessment Masters:

- Preliminary Test
- Video Review
- Post-Test

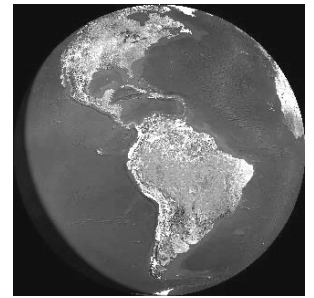
Student Activity Masters:

- Atmospheric Layers
- Magnetosphere
- Atmospheric Gases
- Vocabulary of *The Atmosphere*



Video Script: *The Atmosphere*

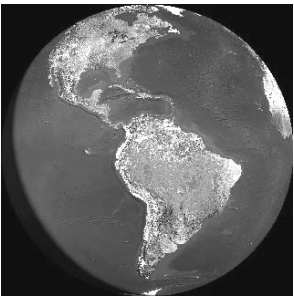
1. What provides us with the air we breathe?
2. And what brings us the weather we experience everyday?
3. What protects us from the potentially harmful rays of the sun?
4. What allows radio waves for television and radio transmission to travel to us?
5. And through what medium do planes, satellites, and meteors travel?
6. The answer is the atmosphere. The atmosphere that surrounds the Earth contains the gases essential for . . .
7. . . . the survival of living things, including humans.
8. The atmosphere of planet Earth is extremely unique, playing a major role in supporting life.
9. No other planet in our solar system has an atmosphere like earth's.
10. During the next few minutes we're going to explore some of the unique features of planet earth . . .
11. . . . with special attention to the characteristics of the atmosphere.
12. **Graphic Transition – The Hydrosphere and Lithosphere**
13. In what ways is the earth similar . . .
14. ...to this apple?
15. The region of earth where life exists is equivalent in thickness . . .
16. . . . to the skin of this apple. It's a very thin zone.
17. What factors contribute to life on earth?
18. One thing that makes earth unique is the abundance of water.
19. Often referred to as the blue planet, over 70% of the earth is covered with water.
20. This photo of the earth taken from space shows the abundance of water.
21. The water on earth makes up the hydrosphere.
22. The hydrosphere consists of the oceans, . . .
23. . . . rivers and streams, . . .
24. ...as well as ponds and lakes.
25. Glaciers and the polar ice caps also can hold a great deal of water, contributing to the hydrosphere.
26. The earth's crust is the solid layer of the planet known as the lithosphere.
27. We live on the visible surface of the earth's crust that we call land.
28. Only about 30% of the earth's surface is land.
29. The remainder of the lithosphere exists underwater, underlying lakes and oceans.
30. The lithosphere under the oceans is largely unexplored, and we're still learning a great deal about it.



Script (cont.)

31. **Graphic Transition – The Atmosphere**

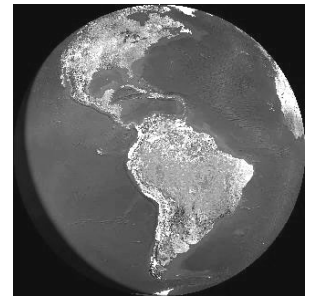
32. Every time you take a breath you are breathing in a part of the atmosphere.
33. During the course of a day you breathe approximately 26,000 times!
34. We need to breathe to survive, as do . . .
35. . . . plants and animals.
36. **You Decide!** What gas in the atmosphere is vital to our existence?
37. Oxygen is an extremely important gas that we breathe in.
38. Our bodies need oxygen to carry out everyday activities.
39. And plants produce oxygen during the process of photosynthesis.
40. But oxygen is just one gas among many gases in the atmosphere. It makes up just 21% of the air around us.
41. The most abundant gas is nitrogen, making up 78% of air.
42. As we just mentioned, we breathe in oxygen, but we exhale a gas called carbon dioxide.
43. Carbon dioxide makes up only 0.03% of air.
44. Water vapor is another gas which can make up from 0 to 4% of air.
45. There are many other gases which make up air including argon, neon, and helium to name just a few.
46. The atmosphere also contains many tiny solid particles.
47. The smog seen here in the Grand Canyon consists of small particles of dust and pollution floating in the air.
48. If you view light at the correct angle you can actually see tiny particles in the air consisting of dirt, smoke, dust, and even ocean salt.
49. **Graphic Transition – Oxygen and Carbon Dioxide**
50. As we just discussed, people and animals breathe in oxygen and breathe out carbon dioxide.
51. But where does the oxygen we breathe come from?
52. Plants play a vital role in supplying earth with a continual supply of oxygen via the process of photosynthesis.
53. Large plants, including trees, take in carbon dioxide and give off oxygen.
54. And microscopic plantlike organisms abundant in the oceans are believed to be responsible for a large amount of the global oxygen supply.
55. Carbon dioxide and oxygen are continually cycled between plants and animals.
56. **Graphic Transition – Layers in the Atmosphere**
57. Skiers at high mountain altitudes often become short of breath, and breathing is more difficult. . .



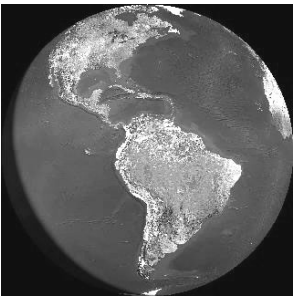
Script (cont.)

58. ...but at lower elevations they find breathing easier. Why?
59. The answer lies in differences in the atmosphere.
60. At higher elevations there is less oxygen in the air than at lower elevations.
61. The atmosphere can be divided into different layers.
62. The different layers are divided according to major differences in temperature.
63. **You Decide!** What force holds the layers of the atmosphere to the earth?
Gravity!
64. Gravity is the force that pulls objects such as these stones toward the earth.
65. Like water in this waterfall, gases in the atmosphere are also pulled toward the earth by gravity.
66. The atmosphere extends hundreds of kilometers above the earth's surface.
67. The weight of the gases aloft pushes down on the air below.
68. This causes the gas below to become compressed and denser.
69. The air closer to the earth is denser than the air further up in the atmosphere.
70. Consequently, as you go higher up in the atmosphere, you experience less air pressure.
71. Temperature also plays an important role in delineating the layers of the atmosphere.
72. Different layers of the atmosphere have different temperatures.
73. Different layers of the atmosphere also possess properties which affect temperature. Let's take closer look at some of these layers.
74. **Graphic Transition – Lower Layers of the Atmosphere**
75. We eat, walk, and . . .
76. ...live in the bottommost layer of the atmosphere called the troposphere.
77. The troposphere contains the oxygen we breathe . . .
78. ...and the weather we experience.
79. The height of the troposphere varies from 6 to 8 kilometers at the poles...
80. ...to as much as 17 kilometers at the equator.
81. The earth's surface is the primary conduit, which heats the troposphere.
82. Therefore, temperatures decrease as distance from the earth increases.
83. The temperature decreases about 6.5 degrees Celsius for every kilometer above the earth's surface.
84. This is one reason why it tends to be colder on mountain tops. . .
85. ...than in valleys below.
86. At about 12 kilometers above the earth's surface the tropopause separates the lower troposphere from the stratosphere above it.
87. If you have ever traveled on a jet plane, chances are you flew through the

Script (cont.)

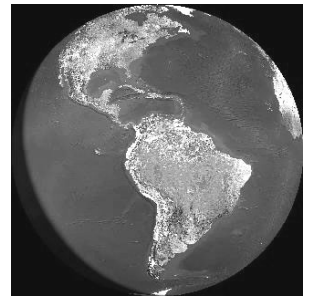


- stratosphere.
88. The stratosphere extends from the troposphere up to about 50 kilometers above the earth.
 89. It's very cold, with temperatures around -60 degrees Celsius.
 90. Bands of strong winds with speeds up 320 kilometers per hour called jet streams blow in an eastward direction.
 91. Jet streams are important forces influencing weather patterns.
 92. The streams also help planes arrive at their destination sooner.
 93. The stratosphere also contains a thin layer of gas called ozone.
 94. Ozone is very important in absorbing ultraviolet radiation from the sun.
 95. Ozone protects plants, animals and humans from receiving too much ultraviolet radiation, which can be harmful.
 96. Harmful pollutants can damage the ozone layer, creating large holes shown here in blue. This increases the risk to life on earth, allowing too much ultraviolet radiation to reach the surface.
 97. Because ozone absorbs heat energy from the sun, temperatures in this layer tend to be warmer, at around 18 degrees Celsius.
 98. **Graphic Transition – Upper Layers of the Atmosphere**
 99. The stratopause separates the stratosphere from the mesosphere.
 100. The earth is continually bombarded with rock fragments from outer space called meteors.
 101. The mesosphere, extending from 50 kilometers to 80 kilometers above the earth's surface, protects earth from meteors by burning them up.
 102. The heat created by friction between the atmosphere and the meteoroid causes the burning.
 103. The mesosphere is very cold, with temperatures around -100 Celsius.
 104. Above the mesosphere is the thermosphere.
 105. "Thermo" means heat, and this layer is extremely hot, with temperatures reaching 2,000 degrees Celsius.
 106. This is hot enough to melt steel!
 107. The thermosphere is divided into two layers: the ionosphere and the exosphere.
 108. **Graphic Transition – The Ionosphere and Exosphere**
 109. The lower part of the thermosphere is referred to as the ionosphere.
 110. It extends 80 to 550 kilometers above the surface of the earth.
 111. Here particles of gas called ions become electrically charged.
 112. These ions play an important role in transmitting radio waves.
-



Script (cont.)

113. AM radio waves bounce off ions in the ionosphere back to earth.
114. At times, disturbances in the sun called solar flares can cause fluctuations in ions in the ionosphere, interfering with radio transmissions.
115. Above the ionosphere is the exosphere - the upper region of our atmosphere.
116. The exosphere extends thousands of kilometers above the surface of the earth.
117. Here the air is very thin.
118. Satellites orbiting the earth travel in the exosphere...
119. ...as does the space shuttle and the space station.
120. **Graphic Transition – The Magnetosphere**
121. **You Decide!** What's the name of these colorful lights in the sky?
122. These brilliant colors are called the northern lights, or aurora borealis.
123. The magnetosphere plays a key role in forming these lights.
124. The earth acts like a giant magnet, . . .
125. ...creating magnetic forces which extend thousands of kilometers into space.
126. As the sun emits a fast moving stream of ions referred to as solar wind, the magnetic field of the earth traps the ions.
127. The belt of charged particles surrounding the earth is referred to as the Van Allen radiation belt.
128. When the sun bombards the earth with large quantities of ions they get trapped in the magnetosphere.
129. Here they come in contact with particles in the ionosphere causing them to give off light, leading to a spectacular display of colors called auroras.
130. **Graphic Transition – Summing Up**
131. During the past few minutes we've taken a look at some of the features of our planet including the hydrosphere, . . .
132. . . . the lithosphere, . . .
133. ...and our atmosphere.
134. We explored the different gases that make up the atmosphere that surrounds us.
135. We considered how temperature and pressure play a role in creating different characteristics in the layers of the atmosphere.
136. And we took a closer look at the different layers of the atmosphere, including the troposphere, stratosphere, mesosphere, and thermosphere.
137. So the next time you take a breath of air, . . .
138. . . . tune in the radio, . . .
139. ...ride on a jet plane,...



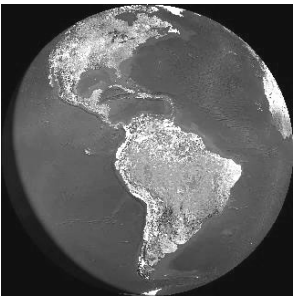
Script (cont.)

140. ...or look up at the sky, think about some of the different characteristics of the atmosphere.
141. You just might look at your world a little differently.

Video Quiz:

Fill in the correct word when you hear this tone _____. Good luck, and let's get started.

1. The hydrosphere contains _____.
2. Only about _____ percent of the earth is land.
3. The most abundant gas in the troposphere is _____.
4. Plants are vital in supplying us with _____.
5. Layers of the atmosphere are divided according to differences in _____.
6. Air closer to the earth is _____ than air higher up.
7. Jet streams are located in the _____.
8. _____ plays a key role in absorbing ultraviolet radiation.
9. The _____ is the layer in which meteors burn up.
10. Satellites travel in the _____.



Answers to Student Assessments

Preliminary Test

1. atmosphere
2. water
3. gravity
4. troposphere
5. stratosphere
6. thermosphere
7. temperature
8. weather
9. meteors
10. ionosphere
11. true
12. false
13. false
14. true
15. false
16. true
17. true
18. true
19. false
20. true

Video Review

You Decide:

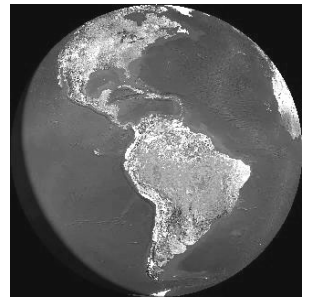
- A. Oxygen is the gas in the atmosphere that is vital to our existence.
- B. Gravity holds the layers of the atmosphere to the earth.
- C. The colorful formations are called aurora borealis, also known as the northern lights.

Video Quiz:

1. water
2. 30
3. nitrogen
4. oxygen
5. temperature
6. denser
7. stratosphere
8. ozone
9. mesosphere
10. exosphere

Post Test

1. true
2. false
3. true
4. true
5. false
6. false
7. false
8. true
9. true
10. true
11. troposphere
12. meteors
13. thermosphere
14. ionosphere
15. water
16. temperature
17. weather
18. atmosphere
19. stratosphere
20. gravity



Answers to Student Activities

Atmospheric Layers

Answers will vary.

Magnetosphere

1. The first drawing should consist of concentric oval shaped rings of filings around the bar magnet. The poles are located at opposite ends of the oval.
2. After blowing on the filings, the oval becomes quite lopsided with more filings concentrated further away from the wind.
3. Solar wind can accentuate the number of ions entering the magnetosphere. This can disrupt radio waves and other types of communications.

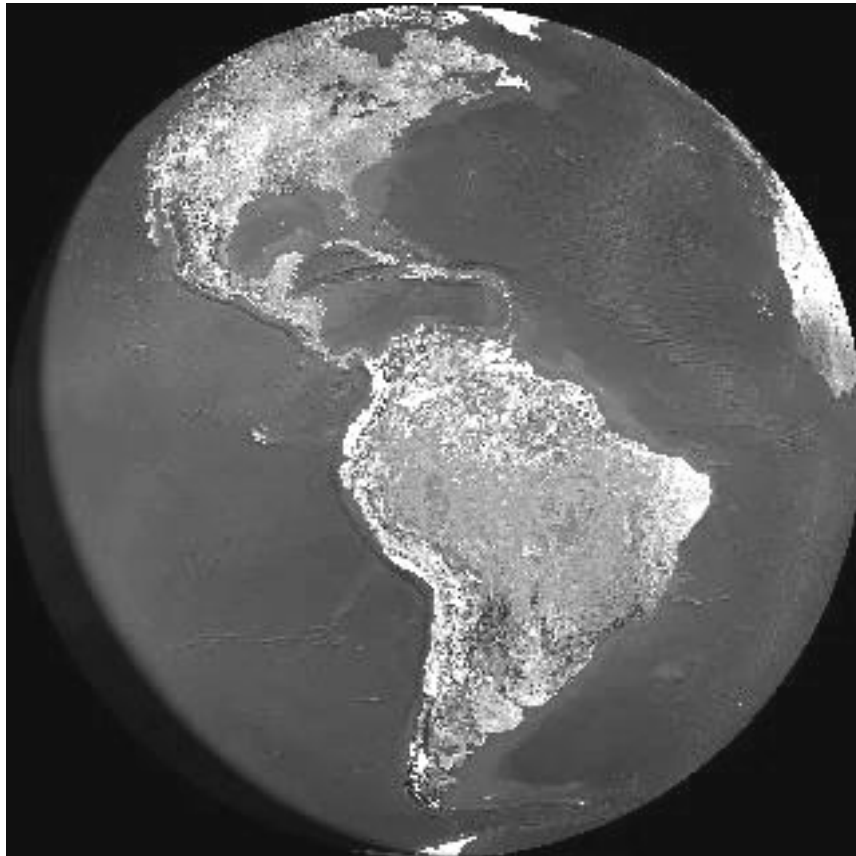
Atmospheric Gases

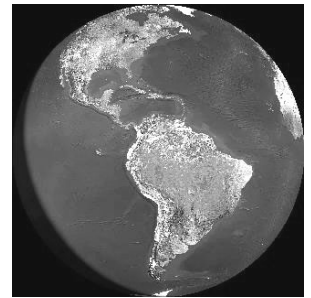
1. Nitrogen is the most abundant gas.
2. Plants breath in carbon dioxide.
3. Humans breathe out oxygen.
4. Ozone plays an important role in absorbing a great deal of ultraviolet radiation from the sun.

Vocabulary

1. hydrosphere, f
2. atmosphere, e
3. gravity, i
4. troposphere, a
5. stratosphere, g
6. jet streams, j
7. ozone, b
8. thermosphere, d
9. ionosphere, h
10. lithosphere, c

Assessment and Student Activity Masters





Preliminary Test

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

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 bottom most 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 earth .

gravity

weather

exosphere

water

thermosphere

ionosphere

troposphere

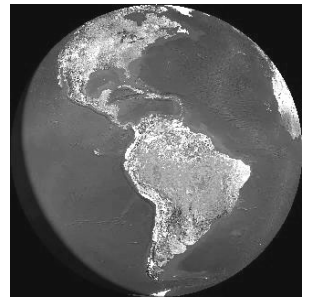
meteors

stratosphere

density

atmosphere

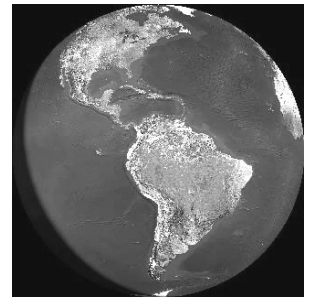
temperature



Preliminary Test

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

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



Video Review

Directions: During the course of the program, answer the “You Decide” questions as they are presented in the video. Answer the Video Quiz questions at the end of the video.

You Decide:

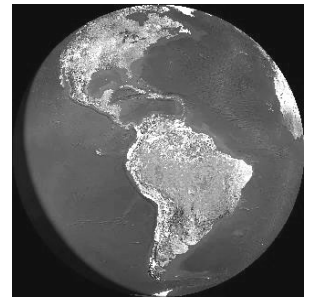
- A. What gas in the atmosphere is vital to our existence? Answer _____

- B. What force holds the layers of the atmosphere to the earth? Answer _____

- C. What is the name of these colorful light formations? Answer _____

Video Quiz:

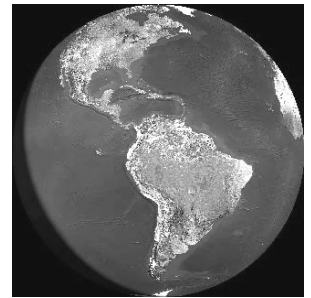
- 1. The hydrosphere contains _____.
- 2. Only about _____ percent of the earth is land.
- 3. The most abundant gas in the troposphere is _____.
- 4. Plants are vital in supplying us with _____.
- 5. Layers of the atmosphere are divided according to differences in _____.
- 6. Air closer to the earth is _____ than air higher up.
- 7. Jet streams are located in the _____.
- 8. _____ plays a key role in absorbing ultraviolet radiation.
- 9. The _____ is the layer in which meteors burn up.
- 10. Satellites travel in the _____.



Post Test

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

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

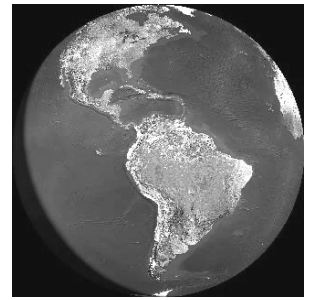


Post Test

Directions: Fill in the blank with the correct word. Choose from the list of possible answers at the bottom of the page.

11. The bottom most 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 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.

- | | |
|--------------|--------------|
| gravity | troposphere |
| weather | meteors |
| exosphere | stratosphere |
| water | density |
| thermosphere | atmosphere |
| ionosphere | temperature |



Atmospheric Layers

Objective: In this activity you will identify the layers of the atmosphere and determine their distance from the earth's surface. You will also learn about the properties of each layer.

Background: 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.

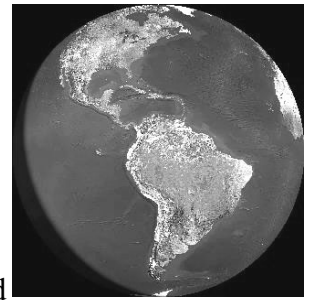
Troposphere: The layer of the atmosphere closest to the earth, in which you live. The layer extends approximately **15 km** above the earth's surface. Almost all weather occurs in this layer. The temperature in the troposphere decreases as the altitude increases, which is the reason why it is colder on mountains than in valleys.

Stratosphere: The stratosphere extends about **50 km** from the earth's surface. Strong, narrow bands of winds occur here called jet streams. Ozone, the gas that traps ultraviolet radiation from the sun, is present in this layer. Heat is given off when ozone and ultraviolet radiation react, which is why the temperature increases in the upper stratosphere. Jet planes travel in the lower part of the stratosphere.

Mesosphere: This layer is the coldest layer. The temperature drops to approximately -100°C . The mesosphere extends from **50 km** to about **80 km** above the earth's surface. Meteors entering the atmosphere are burned up in this layer.

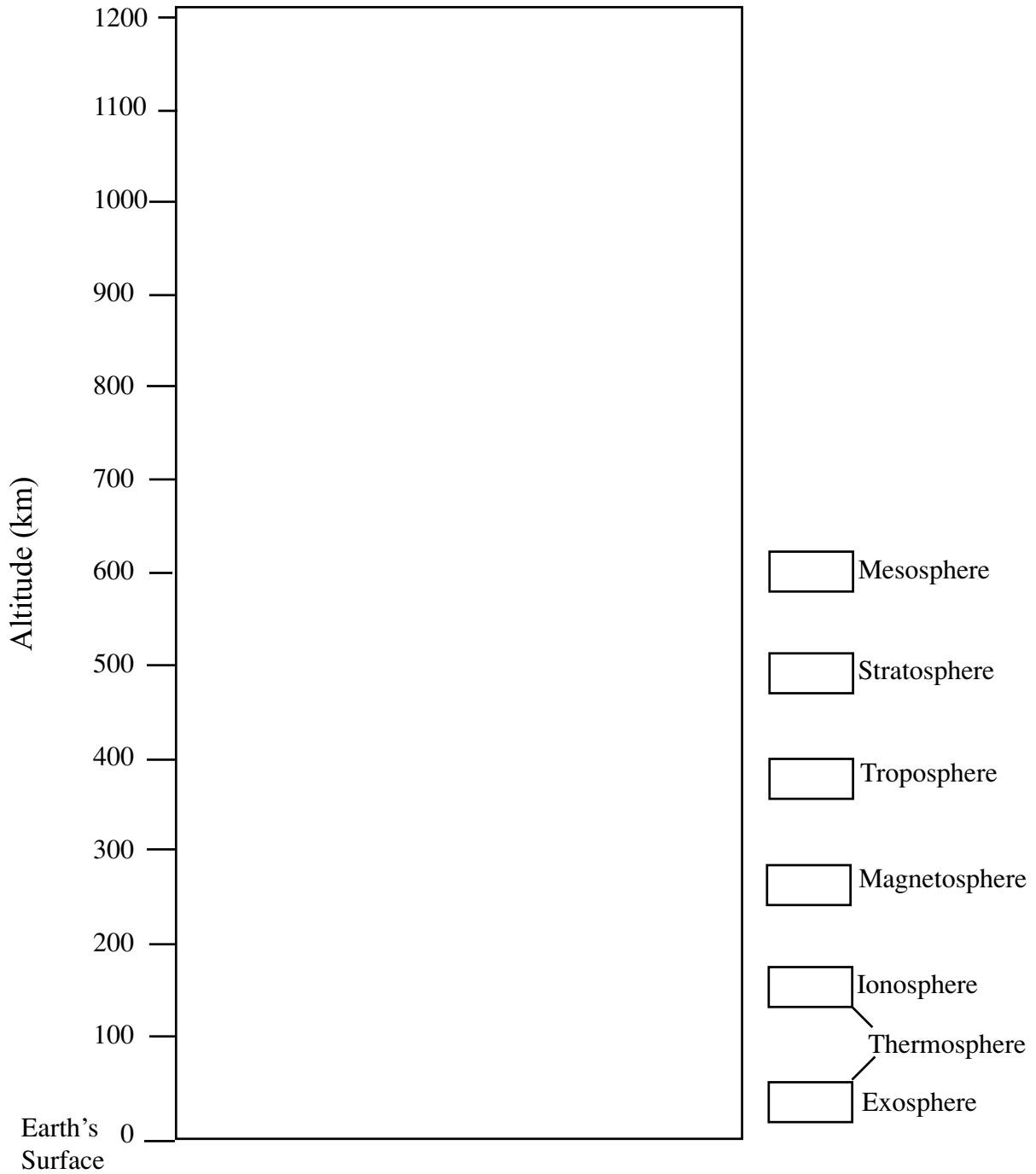
Thermosphere: This layer is the hottest layer. Temperatures may reach 2000°C . The thermosphere begins at approximately **80 km** above the earth's surface and has no defined limit. The lower part of the thermosphere includes the **ionosphere**, which extends to approximately **550 km**. Ions in the Ionosphere reflect radio waves, enabling the transmission of messages at great distances. The region from **550 km** and beyond is the **Exosphere**. Satellites orbit the earth in the exosphere. Satellites are used to watch weather patterns, as well as for telephone and television communication.

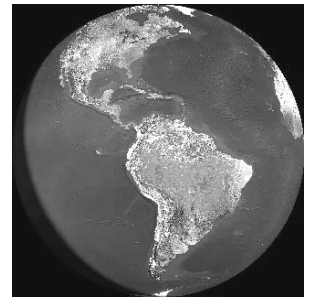
Magnetosphere: The area around the earth that extends beyond the atmosphere is called the Magnetosphere. The magnetosphere begins at approximately **1000 km** and extends thousands of kilometers into space. The sun and the earth's magnetic field create this layer. Ions are trapped in the Van Allen radiation belts. When the particles in the belts collide with particles in the upper atmosphere, visible light known as auroras appear. The visible light we see near the North Pole is called the aurora borealis, also known as northern lights.



Atmospheric Layers (cont).

Directions: Complete the chart below. Color in 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 layers in the diagram. Draw lines to distinguish where the layers begin and end. Draw a picture or note to the right of the layer some events which may occur in the layer (example: meteor burning up in mesosphere).





Magnetosphere

Background:

High above the earth lies a layer of the atmosphere called the thermosphere. The thermosphere begins about 80 kilometers above the surface of the earth. Beyond the thermosphere, starting at 1000 kilometers is a region called the magnetosphere. The magnetosphere consists of a large magnetic field surrounding the earth. This magnetic field is similar to the magnetic field surrounding a bar magnet. A stream of fast moving ions coming from the sun called solar wind alters the shape of the ionosphere. The solar wind pushes the magnetosphere farther out into space on the side of earth farthest from the sun. In this activity you will 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

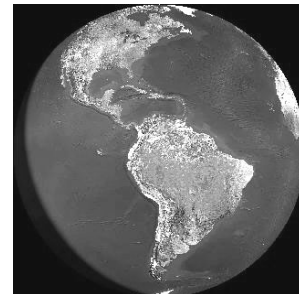
Iron filings (If you do not have iron filings, you can cut up steel wool in to fine pieces)

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.

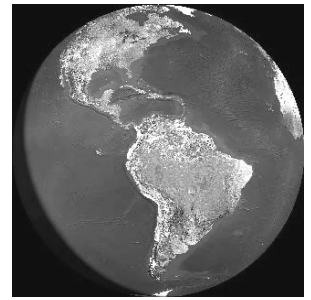


Atmospheric Gases

Objective: In this activity, you will graph the percentage of various gases found in the atmosphere.

Background: The air in the atmosphere is a mixture of many gases. Two gases make up 99% of the volume of air: nitrogen and oxygen. Nitrogen composes 78% of air and oxygen makes up 21% of air. The other 1% includes gases such as carbon dioxide, argon, water vapor, ozone, neon, helium, hydrogen, carbon monoxide, sulfur dioxide and particles such as soot and dust. The following table provides the composition of air.

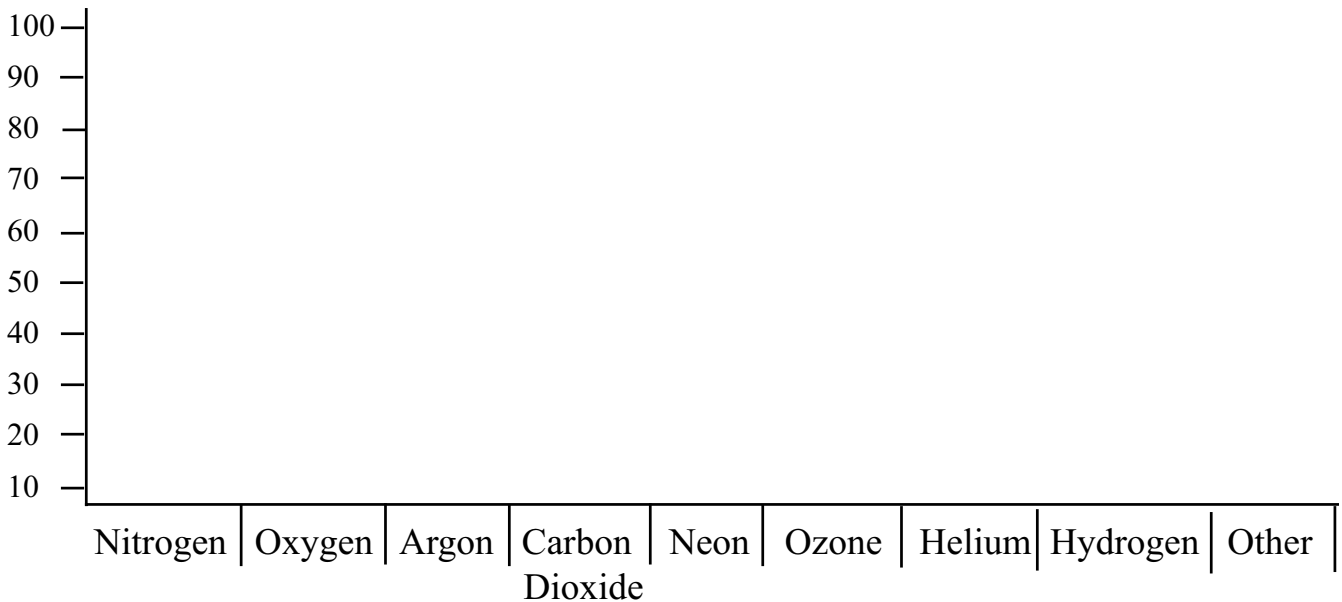
Gas	Percent by Volume
Nitrogen	78
Oxygen	21
Argon	.93
Carbon Dioxide	.03
Ozone	.0006
Neon	.0018
Helium	.0005
Hydrogen	.00005
Other gases	.00005



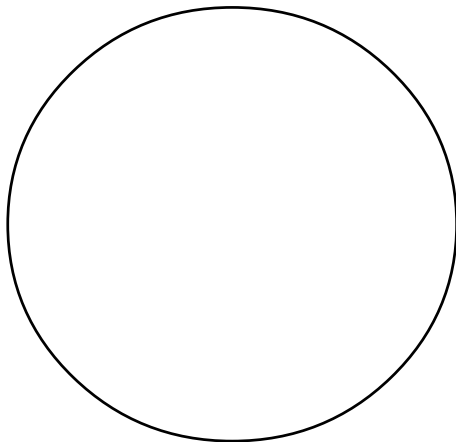
Atmospheric Gases (cont.)

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 color pencils to illustrate the different gases.

Bar Graph:

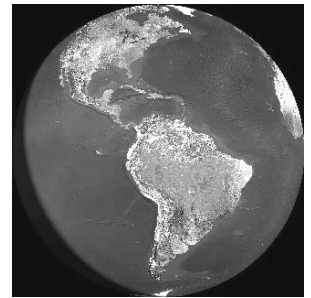


Pie Graph:



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.



Vocabulary of The Atmosphere

_____ 1. porrehydhes

_____ 2. mpasreeoht

_____ 3. tvagyri

_____ 4. prpreoehots

_____ 5. rsoepsrhaett

_____ 6. tje saemrst

_____ 7. onzeo

_____ 8. hepmstehrero

_____ 9. nhorpesieo

_____ 10. sehipreotlh

- a. layer in the atmosphere that contains the oxygen we breathe and the weather we experience
- b. protects earth against ultraviolet radiation from the sun
- c. the solid part of earth's surface
- d. the uppermost layer of the atmosphere and is quite hot
- e. mixture of gases around the earth that is filled with vital gases needed for our existence
- f. the area consisting of water on the surface of the earth
- g. layer of atmosphere where jet planes travel
- h. lower part of the thermosphere important in transmitting radio waves
- i. the force that pulls objects towards the earth
- j. strong, eastward winds that influence weather patterns