6-4.1 WEATHER STUDENT PACKET

- WEATHER WARM UPS
- WEATHER VOCABULARY
- ATMOSPHERE
- GASES
- CAREERS

6-4.5 Investigating Daily Weather

Table 1: Daily Weather Data

<table>
<thead>
<tr>
<th>Weather Data</th>
<th>Unit of Measurement</th>
<th>Day 1</th>
<th>Day 2</th>
<th>Day 3</th>
<th>Day 4</th>
<th>Day 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
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<td>Temperature</td>
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<td>Precipitation</td>
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<tr>
<td>Air Pressure</td>
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<tr>
<td>Cloud Cover</td>
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<tr>
<td>Wind Direction</td>
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</tr>
<tr>
<td>(direction that the wind is coming from)</td>
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</tr>
<tr>
<td>Wind Speed</td>
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</tr>
</tbody>
</table>

Matching: Weather Careers

1. ___ Meteorologist
2. ___ Atmospheric Scientists
3. ___ Climatologist
4. ___ Hydrologist

A. Scientist who studies earth’s water.
B. Scientist who studies earth’s weather over time.
C. Scientist who studies earth’s atmosphere.
D. Scientist who studies earth’s weather.
Tuesday Warm Up-MATCHING THE LAYERS OF THE ATMOSPHERE

1. ___ mesosphere
2. ___ thermosphere
3. ___ ionosphere
4. ___ troposphere
5. ___ stratosphere
6. ___ exosphere

A. Layer that has the “Aurora Borealis” (The Northern Lights) or ions.
B. Layer that is where all weather happens.
C. Middle layer where meteors burn up.
D. Layer where the Ozone is.
E. The hottest layer.
F. The layer that exits into space.

Wednesday Warm Up-FILL-IN-THE-BLANK THE GASES OF THE ATMOSPHERE

1. Air pressure __________ as molecules of gases get __________ apart.
2. The stratosphere has a layer of this special gas __________.
3. This gas makes up 78% of the atmosphere: __________.
4. This gas makes up 21% of the atmosphere: __________.
5. These gases make up the leftover 1% of gases in the atmosphere: __________.

Thursday Warm Up-Weather Careers

1. __________ Nick Bond is a __________ because he studies Washington State’s climate over a period of 12 months or more.
2. Someone who studies water on the earth and atmosphere is a __________.
3. Someone who studies the atmosphere is an __________.
4. __________ Ed Piotrowski of WPDE is a __________ because he studies daily weather.

Friday Warm Up-Quiz Matching Review

A. Troposphere
B. Stratosphere
C. Mesosphere
D. Thermosphere
E. Ionosphere
F. Exosphere

1. Layer where meteors burn up.
2. Layer where weather balloons are.
3. Layer with Ozone.
4. Layer where you would find a satellite.
5. Layer where you find the Aurora Borealis.
6. The farthest layer out to space.
Weather Vocabulary Standard 6-4.1

Compare the composition and structure of Earth’s atmospheric layers (including the gases and differences in temperature and pressure within the layers).

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>atmosphere</strong></td>
<td>The layer of gases that surrounds the planet and makes conditions on Earth suitable for living things.</td>
</tr>
<tr>
<td><strong>troposphere</strong></td>
<td>The layer of the atmosphere nearest Earth’s surface where all weather occurs, temperature is warmest near the ground and decreases as you go higher, (as altitude increases, temperature decreases).</td>
</tr>
<tr>
<td><strong>stratosphere</strong></td>
<td>The layer above the troposphere, where the ozone layer is contained, the stratosphere is cold except in its upper region where ozone is located (the temperature rises as you move upward)</td>
</tr>
<tr>
<td><strong>mesosphere</strong></td>
<td>The layer above the stratosphere, where meteors burn up, the temperature decreases as you rise (the mesosphere is the coldest layer)</td>
</tr>
<tr>
<td><strong>thermosphere</strong></td>
<td>The layer above the mesosphere, temperature increases as you rise</td>
</tr>
<tr>
<td><strong>ionosphere</strong></td>
<td>Part of the thermosphere, auroras (displays of light in the night sky) are found in this layer, contains electrically charged gas particles</td>
</tr>
<tr>
<td><strong>exosphere</strong></td>
<td>The outermost layer of the atmosphere, where satellites and space shuttles orbit, (the cold regions of outer space extend from the exosphere)</td>
</tr>
<tr>
<td><strong>air pressure</strong></td>
<td>The force exerted by the gases pushing on an object, is greatest near the surface of Earth, in the troposphere. (Air pressure decreases through the layers farther from the surface as Earth’s pull of gravity decreases.)</td>
</tr>
<tr>
<td><strong>atmospheric scientist</strong></td>
<td>A scientist who studies the atmosphere, from the surface of the earth to several hundred km above (They collect and analyze data about current and past conditions.)</td>
</tr>
<tr>
<td><strong>meteorologist</strong></td>
<td>A scientist who studies weather (they measure and record data such as wind speed, air pressure, and precipitation.)</td>
</tr>
<tr>
<td><strong>climatologist</strong></td>
<td>A scientist who study the earth’s climates. (They use temperature and precipitation to describe different climates.)</td>
</tr>
<tr>
<td><strong>hydrologist</strong></td>
<td>A scientist who study the distribution and movement of earth’s water.</td>
</tr>
</tbody>
</table>
Earth is surrounded by a blanket of a gas mixture that we call the atmosphere. The air around you is part of this atmosphere. The most common gas in the air is nitrogen. Nitrogen makes up 78% of atmospheric gas. The most familiar component of our air, oxygen, makes up about 21%, while the remaining 1% is composed of argon, water vapor, carbon dioxide, and other gases. Many of these gases are vital to living things. They protect, support, and do not harm living things. Also in the atmosphere are small particles such as sea salt, smoke, dust, and volcanic ash.

**Composition of the Atmosphere**

<table>
<thead>
<tr>
<th>Nitrogen 78%</th>
<th>Oxygen 21%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Other 1%:</strong></td>
<td>argon 0.9%</td>
</tr>
<tr>
<td>carbon dioxide 0.03%</td>
<td>neon, helium, methane, krypton, nitrous oxide…</td>
</tr>
</tbody>
</table>

**Air Pressure in the Atmosphere**

Air pressure is greater nearer Earth’s surface. At sea level, there are more molecules pushing down from above. In contrast, air pressure decreases as you move upward away from sea level. The air outside an airplane flying high in the sky has fewer molecules in it. So the air pressure in this part of the atmosphere is less than the atmosphere down on the airport runway. Some people find it harder to breathe on high mountains. There are fewer molecules in the atmosphere at high elevations, so there is less oxygen in the air and the air pressure is less.

**Layers of the Atmosphere**

Earth’s atmosphere is divided into layers based on differences of temperature. These differences are a result of the way the sun’s energy is absorbed as it travels through the atmosphere. Some of ozone. This ozone layer, if we take steps to reduce global warming, will continue to help protect the earth from the sun’s ultraviolet radiation. The ozone absorbs the UV radiation, keeping it from getting down to the surface of the Earth where it can harm living organisms. In the stratosphere, temperature increases as altitude increases due to the ozone molecules absorbing ultraviolet radiation from the sun.

The middle layer of the atmosphere is the **mesosphere**. In this layer, radio waves are reflected to Earth. This is the layer where meteors falling to Earth burn up, causing meteor showers to occur. Just like the troposphere, temperatures drop as altitude increases, making this the coldest layer of the atmosphere.

Beyond the mesosphere is the **thermosphere** where the air is very thin. At this layer, the temperatures increase with altitude. One important part of the thermosphere is the **ionosphere**. This layer within the thermosphere is where gas particles are electrically charged due to being hit by the solar energy that is coming from the sun. Found in this layer are auroras which are brilliant displays of colors in the night sky.

The outermost layer of the atmosphere is the **exosphere**. This is where satellites and space shuttles orbit. Beyond the exosphere lies outer space where the air pressure is extremely low because there are so few molecules floating around.

**DISCUSSION QUESTION**

Our atmosphere contains many gases including smog—a type of pollution. Smog contains soot and gases released in car exhaust, as well as those gases caused by burning fossil fuels. Ozone is another chemical found in smog. We hear about ozone being something good. How would you explain to a friend that ozone can be bad?

1. Why do different layers of the atmosphere have different temperatures?
   A. The higher you go up, the colder it gets.
   B. The layers closer to the sun are hotter, and the layers nearer the Earth are colder.
   C. There is no wind in the upper atmosphere.
   D. Some layers contain gases that absorb the sun’s energy, while other layers do not.

2. What two gases are most common in our atmosphere?
   A. argon and oxygen
   B. nitrogen and oxygen
   C. carbon dioxide and oxygen
   D. methane and helium

3. Which layer of the atmosphere do you live in?
   A. exosphere
   B. thermosphere
   C. troposphere
   D. mesosphere

4. What might you find in the exosphere?
   A. space shuttle
   B. jet plane
   C. radio waves
   D. hot air balloon
Temperature Layers

Explore the atmosphere’s temperature layers by riding an imaginary elevator up from the ground.

Thermosphere
Continue through the thermosphere. The air thins out until you reach outer space.

-85°C (-120°F)

Mesosphere
Reach the mesosphere after rising 50 km (31 mi) off the ground. You are now above 99.9% of the molecules of Earth’s air.

50–90 km (31–56 mi)

Stratosphere
Pass through the stratosphere, which includes the ozone layer. The air gets thinner as you move up through the atmosphere.

-60°C (-76°F)

Troposphere
Board the elevator at ground level, which is also the bottom of the troposphere.

15°C (59°F)

How does the temperature change as you move up through the atmosphere?

Atmospheric Layers Foldable Project

<table>
<thead>
<tr>
<th>Requirement</th>
<th>Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labeled layers of the atmosphere, including the ozone, ionosphere, and exosphere.</td>
<td>20</td>
</tr>
<tr>
<td>Illustrated what happens in each layer.</td>
<td>20</td>
</tr>
<tr>
<td>Diagramed types of gases found in each layer.</td>
<td>20</td>
</tr>
<tr>
<td>Listed at least 3 facts about each layer using information from graphic organizer on atmospheric layers.</td>
<td>30</td>
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<tr>
<td>Neat and colorful</td>
<td>10</td>
</tr>
<tr>
<td>Total score</td>
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</tbody>
</table>
Earth’s atmosphere is held in place by gravity. The atmosphere protects life on the planet by absorbing ultraviolet radiation and by regulating temperature.

There is no exact place where Earth’s atmosphere ends. Instead, it just gets gradually thinner and thinner (less dense) until it merges with outer space where it consists mostly of interplanetary gases such as hydrogen and helium.

The troposphere is the atmospheric layer closest to the earth. It is often referred to as the “lower atmosphere.” This layer holds the most dense composition of gases and molecules. Almost all of our weather is created within the troposphere.

The stratosphere is just above the troposphere, starting at an average altitude of about 7 miles above sea level. The air here is more dry and less dense. Only the highest clouds can be found in this layer. Aircraft often fly in the lower stratosphere to escape the turbulence present in the troposphere. Near the top of the stratosphere lies the ozone layer.

The mesosphere lies just above the stratosphere, ranging from about 30 to 50 miles above sea level. This layer contains chemicals which absorb energy from the sun. Together, the stratosphere and the mesosphere are often called the “middle atmosphere.”

The thermosphere lies above the mesosphere, starting at about 50 miles above sea level. This layer is often called the “upper atmosphere.” Any person traveling at an altitude of more than 50 miles above sea level is considered an astronaut. Space shuttles and some satellites orbit the Earth within this layer. The thermosphere also is the layer in which auroras take place.

The ionosphere is a name often given to the combination of the mesosphere and the thermosphere. In both these layers, free ionic particles can be found. The ionosphere is important because it reflects radio waves, enabling much of our long-distance communication.

The exosphere is the outermost atmospheric layer. It has no definite outer limit, as it merges with space. Many satellites orbit the Earth within the exosphere, usually at altitudes of from 300 to 800 miles above sea level.
Atmosphere Study Guide

List three (3) important functions of the atmosphere:

1. ______________________________________________________________________
2. ______________________________________________________________________
3. ______________________________________________________________________
4. ______________________________________________________________________
5. ______________________________________________________________________

Name the layers of the atmosphere in order from Earth to space and one thing you remember about it:

1. ______________________________________________________________
2. ______________________________________________________________
3. ______________________________________________________________
4. ______________________________________________________________
5. ______________________________________________________________
6. ______________________________________________________________

What are the two most abundant gases in the atmosphere and what are their percentages?

1. __________ % __________________________
2. __________ % __________________________

What does the ozone layer absorb? ____________________________________________________________

The layers of the atmosphere are classified according to ___________________________________________

In which layer are the important gases that are necessary for weather conditions found? __________

How does the temperature change as you move upward through each layer of the atmosphere?

1. Layer: ___________ change: _______________________________________________
2. Layer: ___________ change: _______________________________________________
3. Layer: ___________ change: _______________________________________________
4. Layer: ___________ change: _______________________________________________
5. Layer: ___________ change: _______________________________________________

When does the temperature change from one extreme to the other in the stratosphere? Why?

_____________________________________________________________________________________

The ozone layer is found in the ________________________________.

What is an atmospheric scientist? ___________________________________________________________

What is a hydrologist? ___________________________________________________________________

What is a meteorologist? __________________________________________________________________

What is a climatologist? __________________________________________________________________

Part of 4
Layers & Gases of the Atmosphere

Match each layer with its description.

____ exosphere  A. closest to Earth, where almost all weather is created
____ ionosphere  B. mesosphere plus thermosphere; reflects radio waves
____ mesosphere  C. furthest from Earth; hosts the most satellites
____ stratosphere  D. too high for aircraft, but too low for satellites
____ thermosphere  E. hosts a few clouds and the ozone layer
____ troposphere  F. hosts the space shuttle and some satellites

The Puzzling Atmosphere

How well do you know your atmosphere? Use the clues below to help fill in the puzzle.

ACROSS
5. This gas makes up close to one-fourth of the air surrounding Earth.
8. There is a high concentration of this and other metals in the mesosphere.
9. This is the third most abundant gas in the atmosphere.
11. The rushing air in the troposphere helps determine the ______ of a place.
12. The atmosphere is composed of five ______
13. The ______ layer is near the top of the stratosphere.

DOWN
1. This force holds Earth's atmosphere in its place.
2. This layer holds almost all of the water vapor in the atmosphere, as well as almost 3/4 of its mass.
3. The air in the stratosphere is less dense and more _____ than in the troposphere.
4. One way in which the atmosphere helps us is by absorbing solar _____
6. This is the most abundant gas in air.
7. These are seen in the thermosphere.
10. This type of wave is reflected by particles in the ionosphere.