

Name:

## Atmosphere Unit Notes

### Atmosphere Basics

#### *Early Earth's Atmosphere:*

Earth's atmosphere has been constantly changing since the planet formed 4.6 billion years ago. The atmosphere is primarily composed of numerous gases, varying in volume, as well as particulates and water. Earth's early atmosphere contained numerous gases, but there are four main gases that made up Earth's early atmosphere. The gases that made up Earth's early atmosphere are \_\_\_\_\_.

Many of the gasses in the atmosphere were released by the process of out-gassing during volcanic eruptions. During Earth's early history, the volcanic eruptions were constant. These eruptions helped form new land and crust. Breathable oxygen did not show up in Earth's atmosphere until the first bacterial microorganisms, known as **cyanobacteria**, used the carbon dioxide in the atmosphere and released oxygen as a by-product as the bacteria underwent photosynthesis. Geologic history shows that the first major presence of oxygen gas in Earth's atmosphere occurred \_\_\_\_\_.

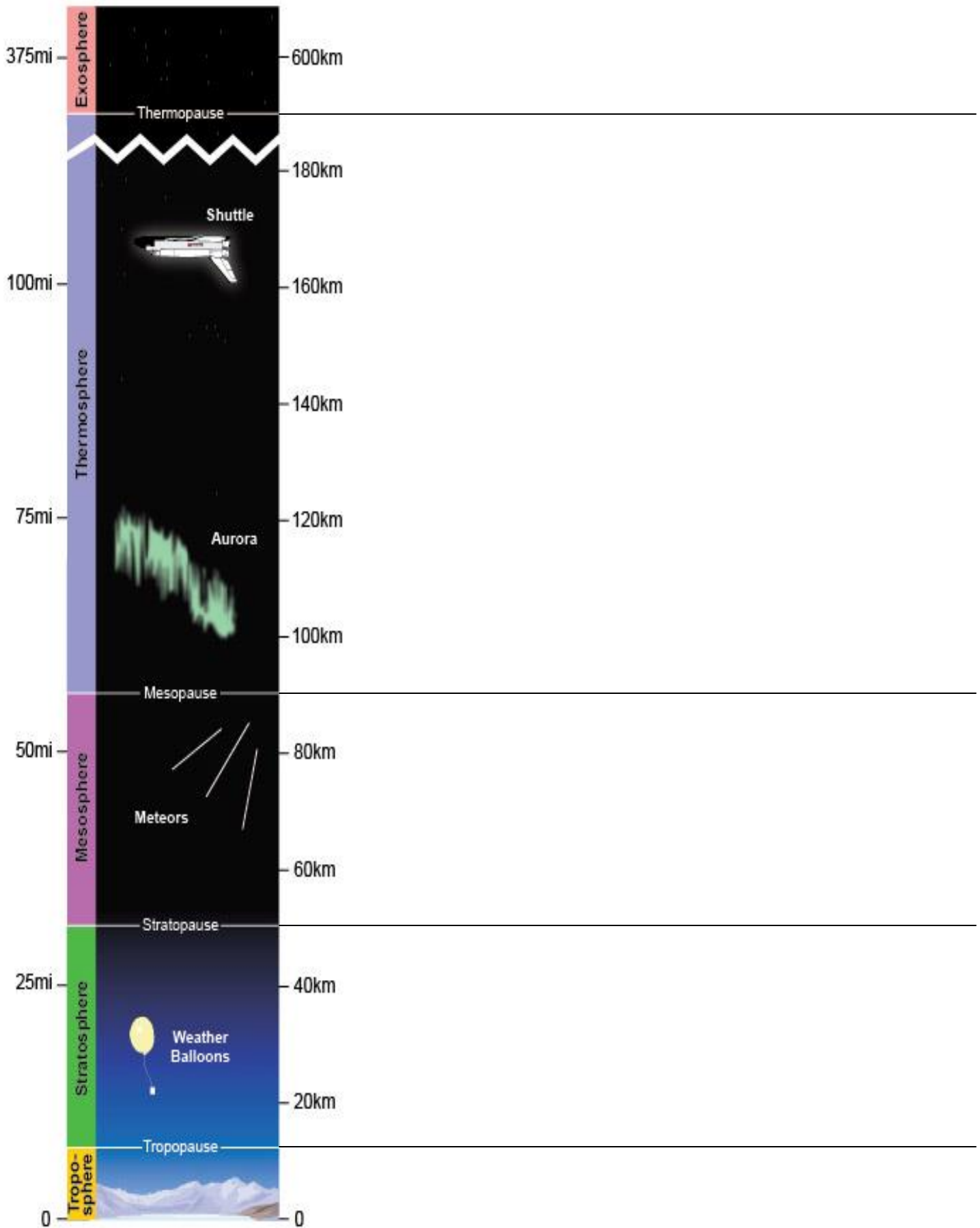
#### *Today's atmosphere:*

Gas	Chemical Abbreviation	Volume/Mass Percentage
Argon	Ar	0.9%
Carbon Dioxide	CO <sub>2</sub>	0.03%
Neon	Ne	Trace (ppm)
Helium	He	Trace (ppm)
Krypton	Kr	Trace (ppm)
Sulfur Dioxide	SO <sub>2</sub>	Trace (ppm)
Methane	CH <sub>4</sub>	Trace (ppm)
Hydrogen Gas	H <sub>2</sub>	Trace (ppm)

#### *Variable Gasses:*

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- Examples:
  - Water Vapor (deserts)
  - Carbon Dioxide (seasons)
  - Ozone (seasons, location in atm, and CFC harm)

*Layers of the Atmosphere:*



## Heat Transfer in the Atmosphere

How is heat transferred in Earth's atmosphere?

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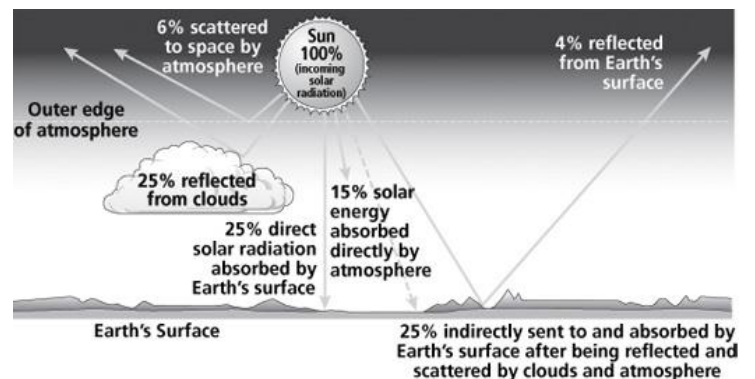
Diagram the heat transfer process in Earth's atmosphere



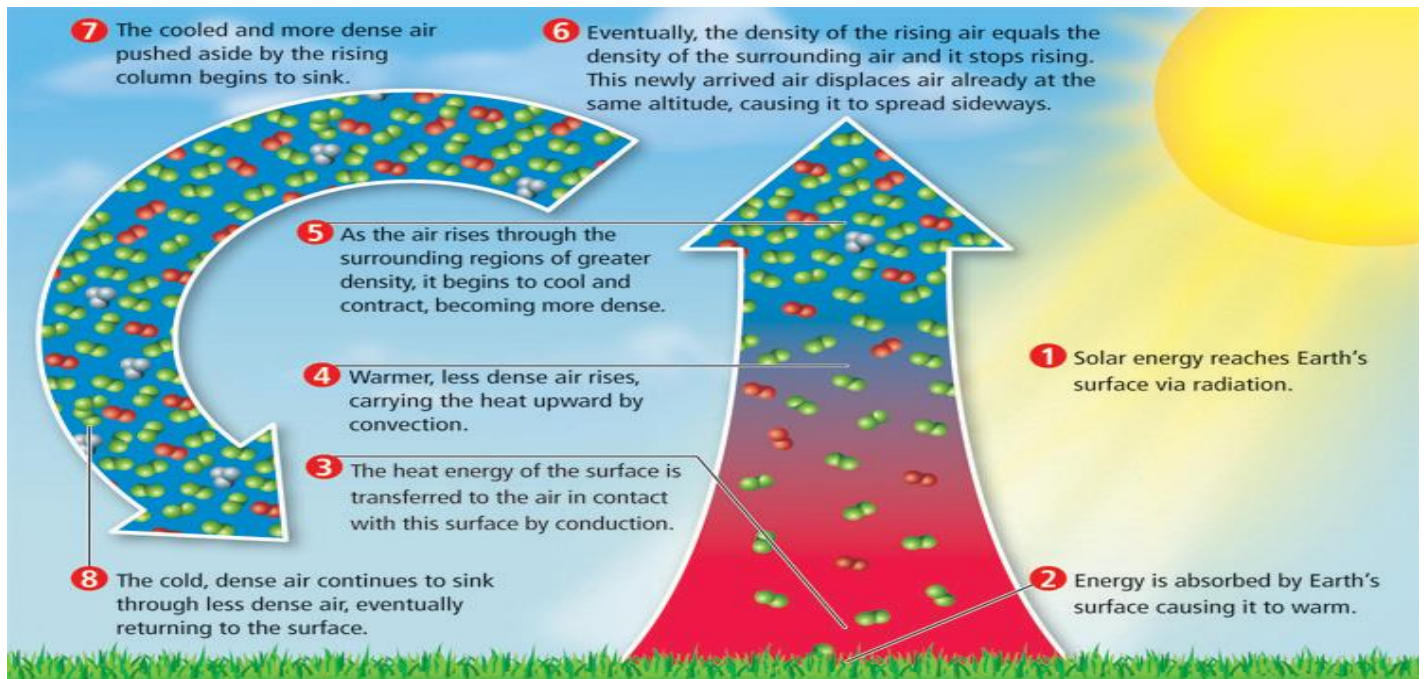
Radiation:

Where does Earth's heat come from?

What is the relationship between cloud cover and temperature at Earth's surface?



## Conduction and convection:



How can heat transfer be used to predict the weather?

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## Properties of the Atmosphere

*Temperature:*

What is temperature?

The Three Temperature Scales of Science:

Fahrenheit	Celsius	Kelvin

## Air Pressure

Yesterday, we discussed what temperature is and compared and contrast the three temperature scale we use today. Temperature has a major impact on the atmosphere. The Sun's light radiates through our atmosphere to heat the surface. Conduction takes to heat the atmosphere and further drives convection to transfer heat around the world. Temperature also impacts how air applies a force down on use too. We might not feel it all the time, but it is there!

What is air pressure?

Does air pressure change? How?

Temperature plays a huge role in air pressure. It affects the particles in the atmosphere so that it increases or decreases due to changes in how cold or hot it is.

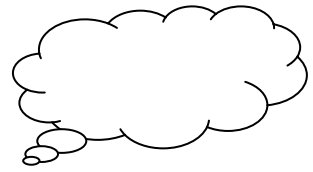
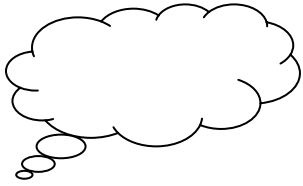
Explain how the 55 gallon can was crushed.

How does temperature affect air pressure?


How did the egg get inside the bottle?

How does density affect air pressure?

Hot Air Balloon Connection with air pressure and relating it to the atmosphere:



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What is temperature inversion and how does it impact us in the valley?

Why do we have wind?

## Humidity

The last couple of days, you have been learning about how the atmospheric gases exert some type of force or pressure on you. Due to fluctuation in temperature and density of the atmosphere, the amount of pressure is variable day to day and even hour to hour.

Today we are going to discuss how about another vital gas in the atmosphere plays a role in weather. Water vapor is the gaseous version of regular drinkable water. Once you heat water to  $100^{\circ}\text{C}$  or  $212^{\circ}\text{F}$  water starts to boil and steam. The steam is the last moment that the water molecules have as a liquid before separating to change phase into a gas. Water vapor takes up space in the atmosphere and dictates different conditions and affects weather.

What is humidity?

How does the atmosphere reach saturation of water vapor?

How saturation does affected relative humidity?

Describe what dew point is.

What device is used to measure relative humidity and dew point? Describe how one can build one to test for these water vapor measurements in the atmosphere

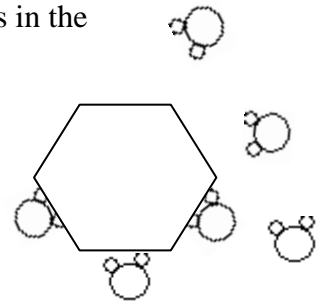
<b>Inside:</b>	<b>Outside:</b>
Dry bulb Temp:	Dry bulb Temp:
Wet bulb Temp:	Wet bulb Temp:
Difference in Temp:	Difference in Temp:
Relative Humidity:	Relative Humidity:
Dew Point:	Dew Point:

## Cloud Formation Notes

Yesterday, we demonstrated and modeled how clouds are formed in the atmosphere. Temperature, air pressure, the smoke, the warm water/water vapor have all significant roles in cloud formation. Another important note about cloud formation is that there are several different types of clouds that float around in our atmosphere. All of these clouds formed differently due to different processes affecting yesterday's demonstration. Altitude or the height in the atmosphere also has another significant role in how different types of clouds are formed.

How do clouds form?

What is a condensation nucleus and what materials are used to form clouds? Label the parts in the diagram below.



Different clouds are formed due to different atmospheric stability conditions.

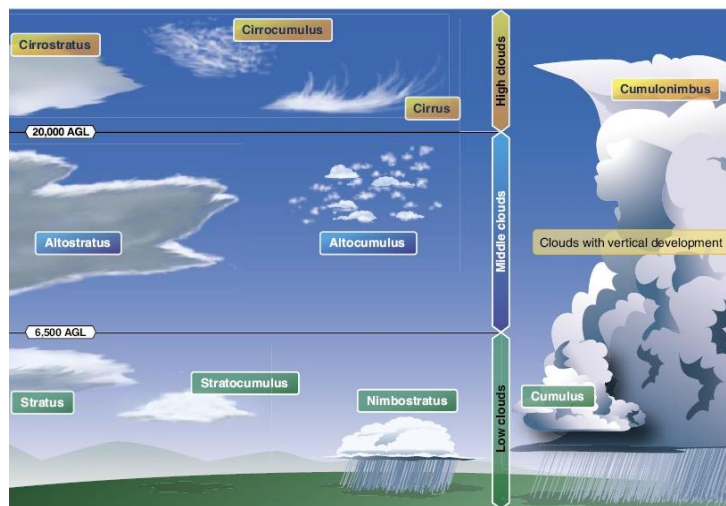
Stable Air	Unstable Air

There are several different types of clouds, but four are more commonly seen. Fill in the blanks to the missing bullets

Cloud Type	Description
<b>Cirrus</b>	<ul style="list-style-type: none"> <li>• meaning 'curl, fringe'</li> <li>• Got there name because of their thin, wispy shape</li> <li>• 6000 meter (20,000 ft) in the air</li> <li>•</li> <li>• Usually represent good weather for the day</li> <li>•</li> </ul>



	<ul style="list-style-type: none"> <li>• the fluffy, cotton wool style clouds</li> <li>•</li> <li>• Least understood cloud type</li> <li>• Can occur in fair weather or big thunderstorms (i.e. thunderheads)</li> </ul>
<b>Stratus</b>	<ul style="list-style-type: none"> <li>• meaning spread over area</li> <li>• no real defined base or top</li> <li>•</li> <li>•</li> <li>•</li> </ul>
	<ul style="list-style-type: none"> <li>• meaning rain-bearing</li> <li>•</li> <li>•</li> </ul>



<b>Good Weather Signs</b>	<b>Warnings of Bad Weather</b>
<ul style="list-style-type: none"> <li>– Fog disappears and is replaced by clear skies by mid-morning, or early afternoon.</li> <li>– The cloud base height is obviously rising, and possibly holes begin to appear in the covering.</li> </ul>	<ul style="list-style-type: none"> <li>– If more cloud is forming, especially at medium or low levels, or the cloud that is present is getting thicker and blacker.</li> <li>–</li> <li>– Clouds are moving in all directions. This indicates extreme instability.</li> <li>–</li> <li>– The cloud base begins to drop.</li> </ul>

## Precipitation and the Effect of the Land and Society

Yesterday, we finished discussing about how clouds form, what they contain, and cloud type and how we can predict impending weather events using type. As we all know through experience, when there is a build-up in cloud mass and they become darker, precipitation is on its way. **Precipitation** is just simple how the water in the clouds falls to the surface. Four types of precipitation exist which greatly depend on temperature and air mass movement. The four types of precipitation are rain, hail, sleet and snow.

How does the water in the clouds build up to get large enough to where it falls as precipitation?

How much precipitation and area gets can depend on the geography of an area. Mountains have a great affect on precipitation.

Diagram and describe how orographic lifting affects amount of precipitation an area gets.

Circle in the areas in the United States that experience orographic lifting.

