Atmosphere Notes

U2D2 – Bell Ringer – 10/28

Unit 1 - Hydrology Reflection

Now that we are 2 months into school, you have a better idea of how things are truly going. Take some time to reflect on the past month.

Thought questions:

What are you proud of? What do you want to work on?

How do you feel as a learner? What makes you stressed? What makes you calm?

What are some things in this class that are in your control? In life?

What is not in your control?

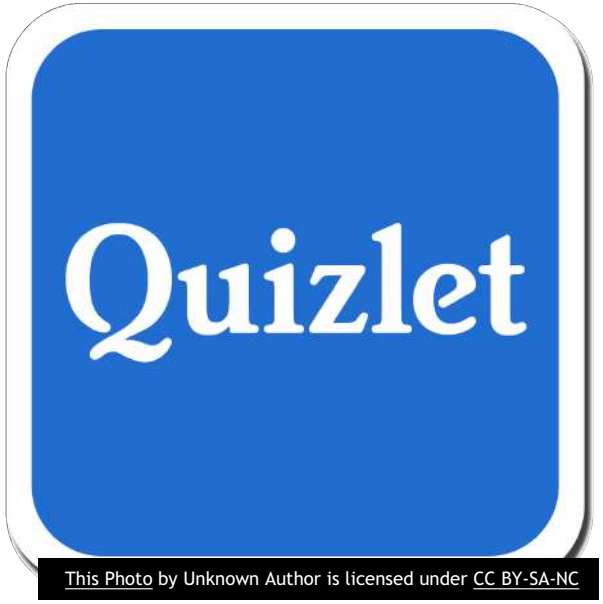
What topics were easy? What topics were hard?

How did you study for this test?

What do you want to try for this unit?

Write here!

Unit 1 Hydrology Exam Review

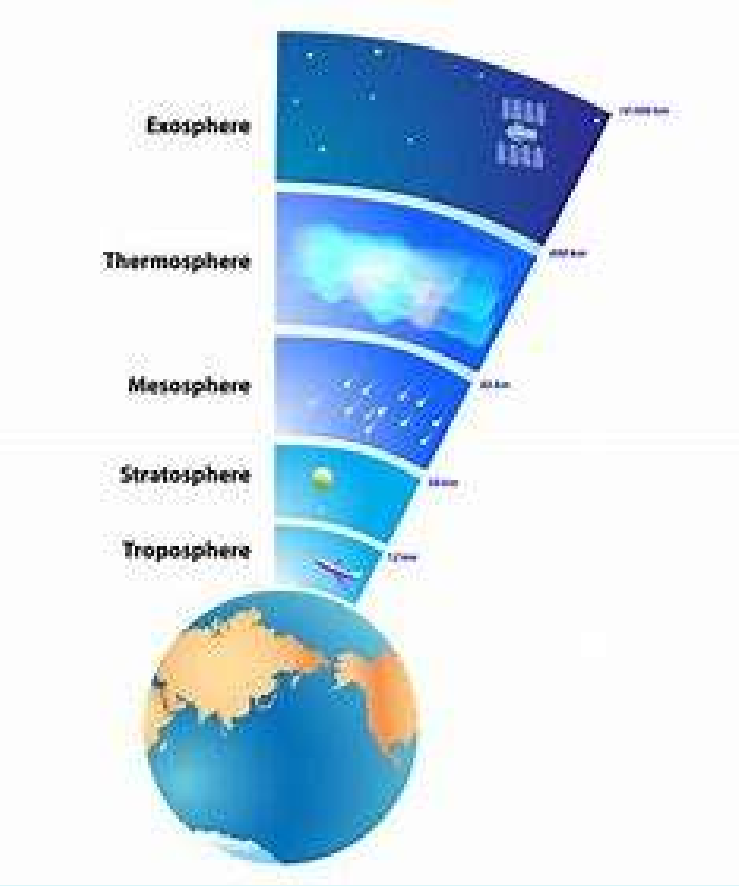


- Overall Average: 82%
- Most missed questions: Vocabulary!
- Log in to Quizlet.com

Objectives

Content Objective: I can differentiate layers of the atmosphere based on temperature and pressure.

Language Objective: I can graphically represent changes in temperature and pressure in layers of the atmosphere.



Layers of the Atmosphere

- Troposphere
- Stratosphere
- Mesosphere
- Thermosphere
- Exosphere

Tour of the Atmosphere
https://www.dailymail.co.uk/sciencetech/article-2220683/Felix-Baumgartner-Now-cleanup-Balloon-lassoed-packed-supersonic-skydiver-Fearless-Felixs-128-000-foot-Red-Bull-jump.html

The Atmosphere

- Atmos = “vapor/air”
  - **Atmosphere = layer of gases that surround earth**
- Where **weather** occurs
- Without it, LIFE WOULD NOT BE POSSIBLE.
  - Effects climate
  - Protects from UV radiation
  - Provides breathable oxygen

Thanks to the ATMOSPHERE, we have a climate and weather!

- **Climate** = how the atmosphere "behaves" over relatively **long periods of time** (Florida's climate is warmer than Maine's)

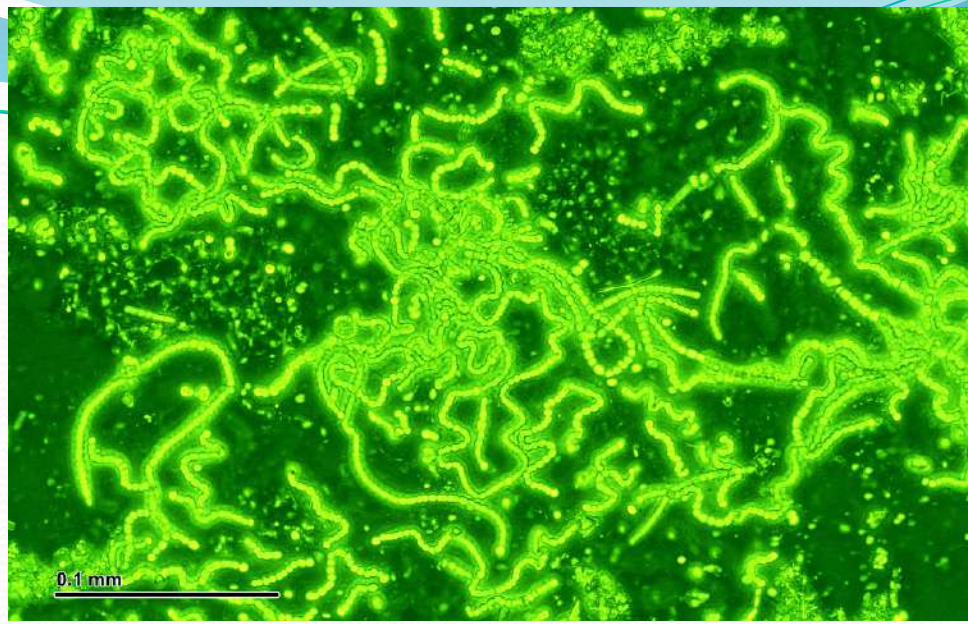
- **Weather** = conditions of the atmosphere are over a **short period of time** (rain, snow, sun, wind)

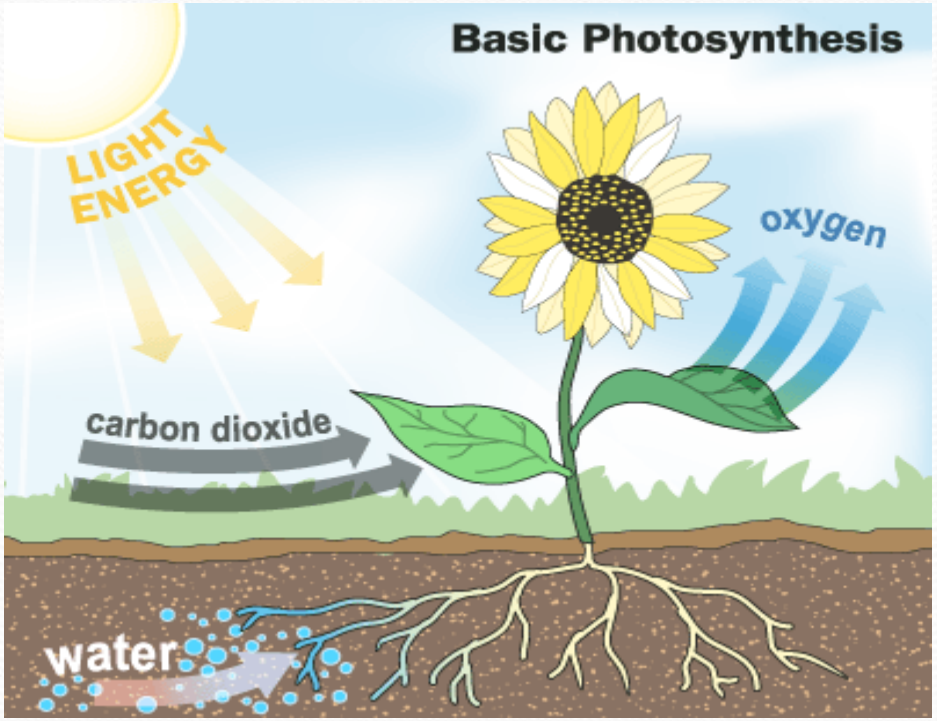
The Composition of the Atmosphere

- Scientists hypothesize that volcanic eruptions played the main role in forming Earth's early atmosphere.
- **Gases released from volcanic eruptions** – primarily carbon dioxide, sulfur dioxide, water vapor, and nitrogen – probably made up nearly all of this early atmosphere.
- What is missing?.....

Oxygen Formation

- The first oxygen appearing in the geologic record dates to 2.8 billion years ago as a result of an early form of bacteria known as Cyanobacteria evolving to undergo Photosynthsis.





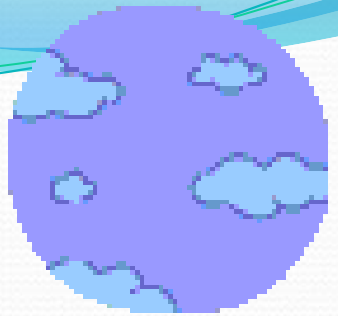
- Oxygen became abundant in the atmosphere during the **Great Oxidation Event** ~ 2.5 billion years ago.

Oxygen Caused Earth's 1st Mass Extinction!

- Photosynthesis removed massive amounts of CO_2 from the atmosphere which had been keeping the Earth warm.
- As a result a Global Ice Age covered the entire Earth with ice (Snow Ball Earth Theory) which almost killed all life on Earth.

https://www.youtube.com/watch?v=qERdL8uHSgI

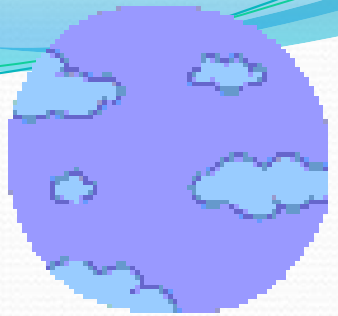
Air



- **Turn and Talk:**

What is "air" made of today?

Air



- "**Air**" is a mixture of many gases in Earth's lower atmosphere.
- The main **permanent gases** in air are nitrogen (78%) and oxygen (21%), which together form about 99% of dry air by volume.
- The remaining 1% is mostly argon. Also present are tiny amounts of trace gases, such as neon, helium, hydrogen, and xenon.

Nitrogen + Oxygen = 99%

Air

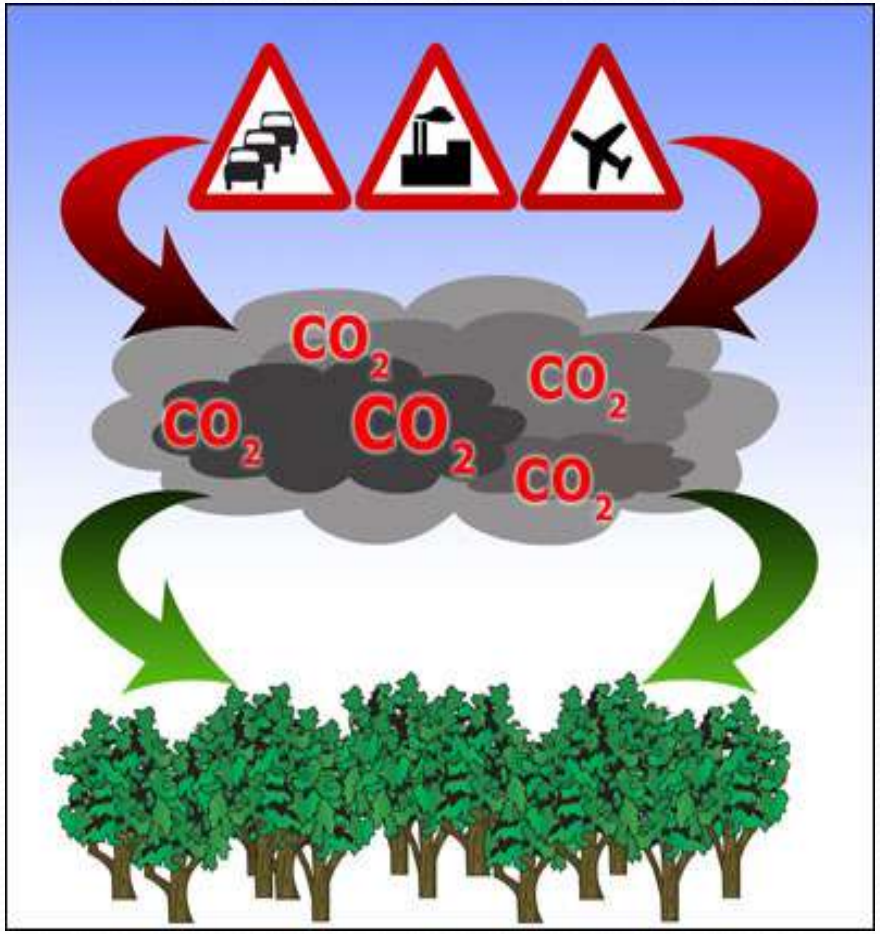
- The **variable gases** that make up the Earth's atmosphere include water vapor, carbon dioxide, methane, ozone, nitrous oxide, and chlorofluorocarbons (CFCs).
- Water vapor can vary from 4% in humid tropical climates near the Earth's equator, to 0.5% in the drier polar regions.
- Why do polar region have less water vapor than desert regions?
- Water vapor content varies with location, season, and time of day. Water vapor concentration is higher near the surface.

Carbon Dioxide

- Carbon dioxide only composes a small portion of the air, about 0.035%. However, levels of this gas are slowly increasing.
- There are both natural and human sources of carbon dioxide emissions. Natural sources include decomposition, volcanoes, wildfires and respiration.

Human Produced Carbon Dioxide

Since the Industrial Revolution, human sources of carbon dioxide emissions have been growing. Human activities such as the burning of oil, coal and gas, as well as deforestation are the primary cause of the increased carbon dioxide concentrations in the atmosphere.

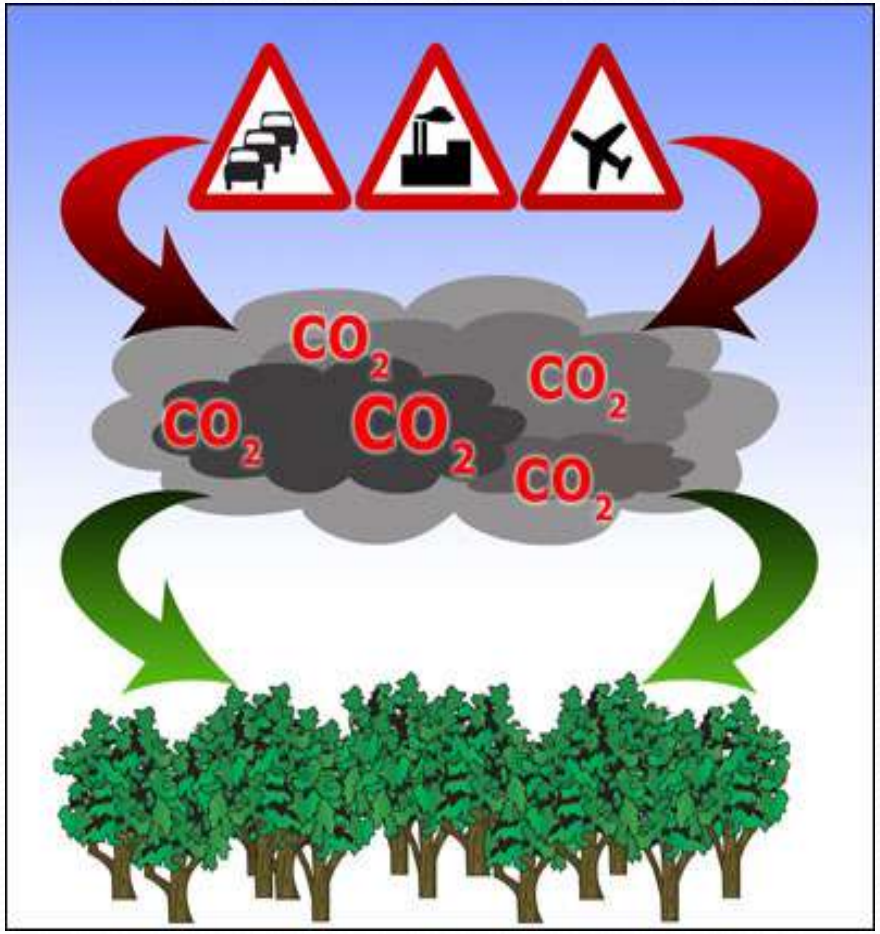


Carbon Cycle Sneak Peak

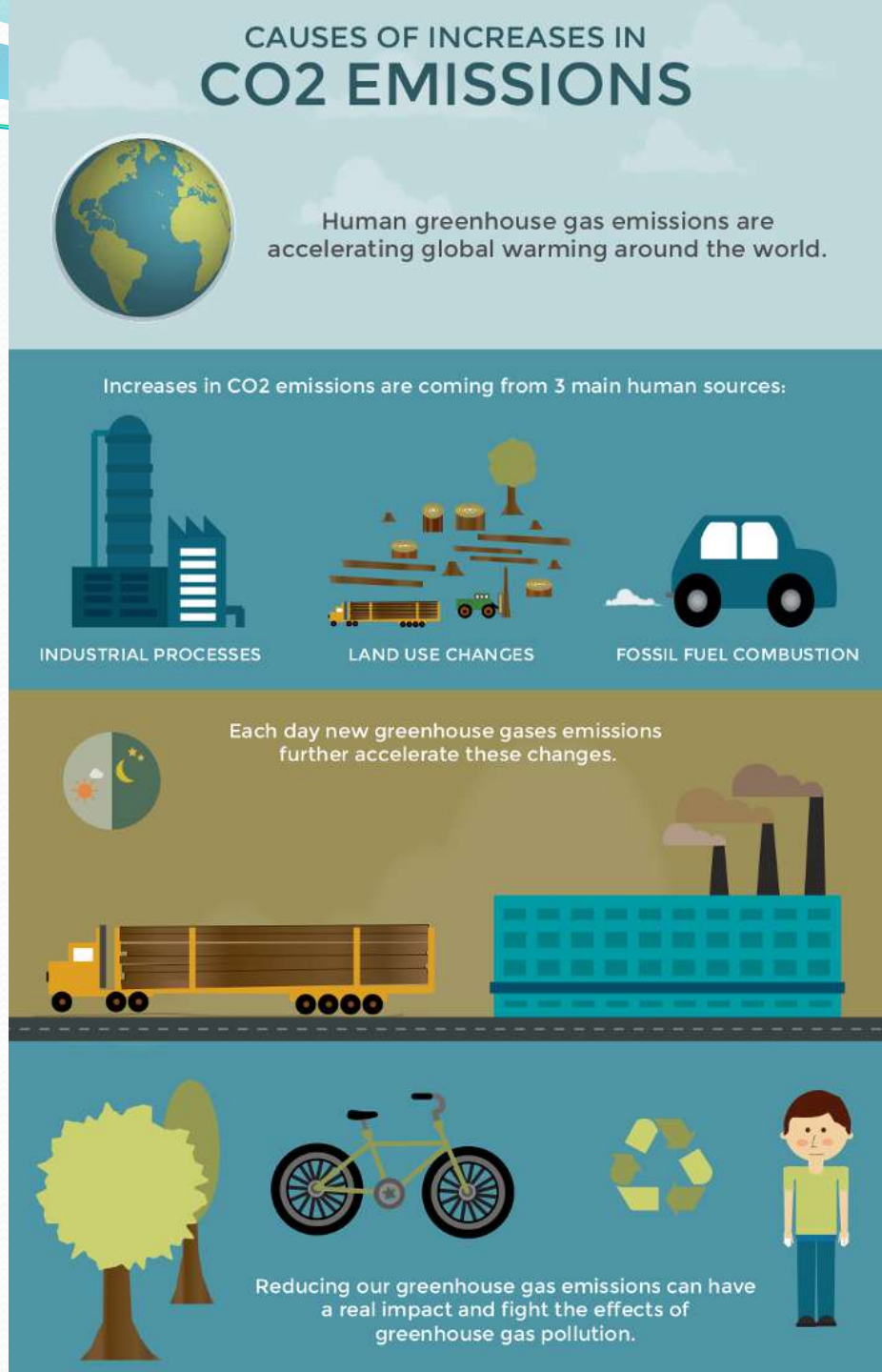
Turn and Talk:

What produces Carbon dioxide?

What consumes it?

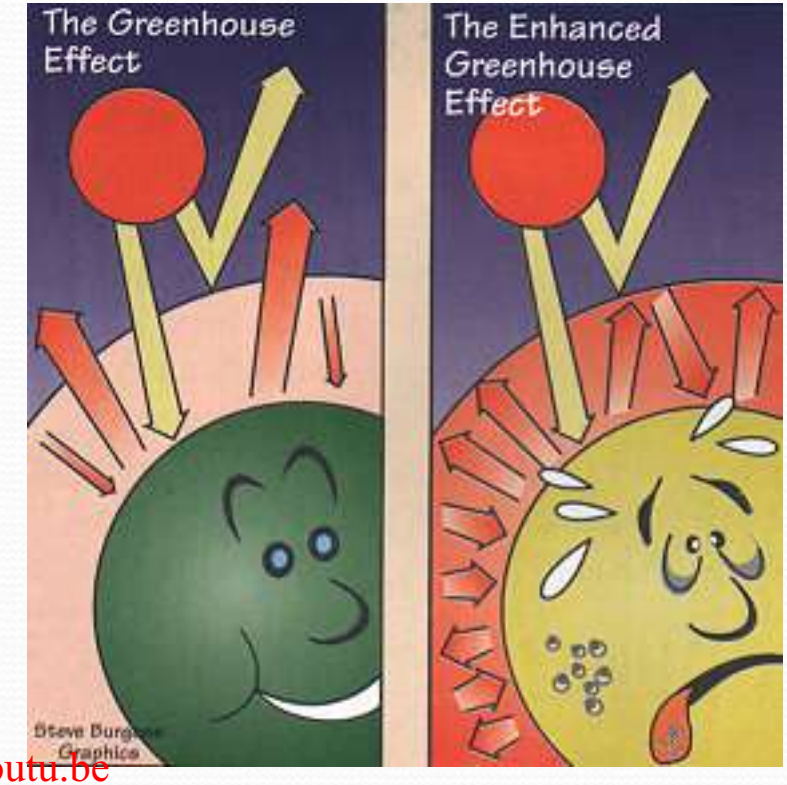


The largest human source of carbon dioxide emissions is from the combustion of fossil fuels. This produces 87% of human carbon dioxide emissions. Burning these fuels releases energy which is most commonly turned into heat, electricity or power for transportation. Some examples of where they are used are in power plants, cars, planes and industrial facilities.



CO_2 & Global Warming

- Global warming is part of a natural cycle where the Earth goes through a cycle of heating and cooling. However, many human activities cause large amounts of greenhouse gases to build up in the atmosphere, and have sped up this cycle and are causing the Earth to heat up faster than usual.



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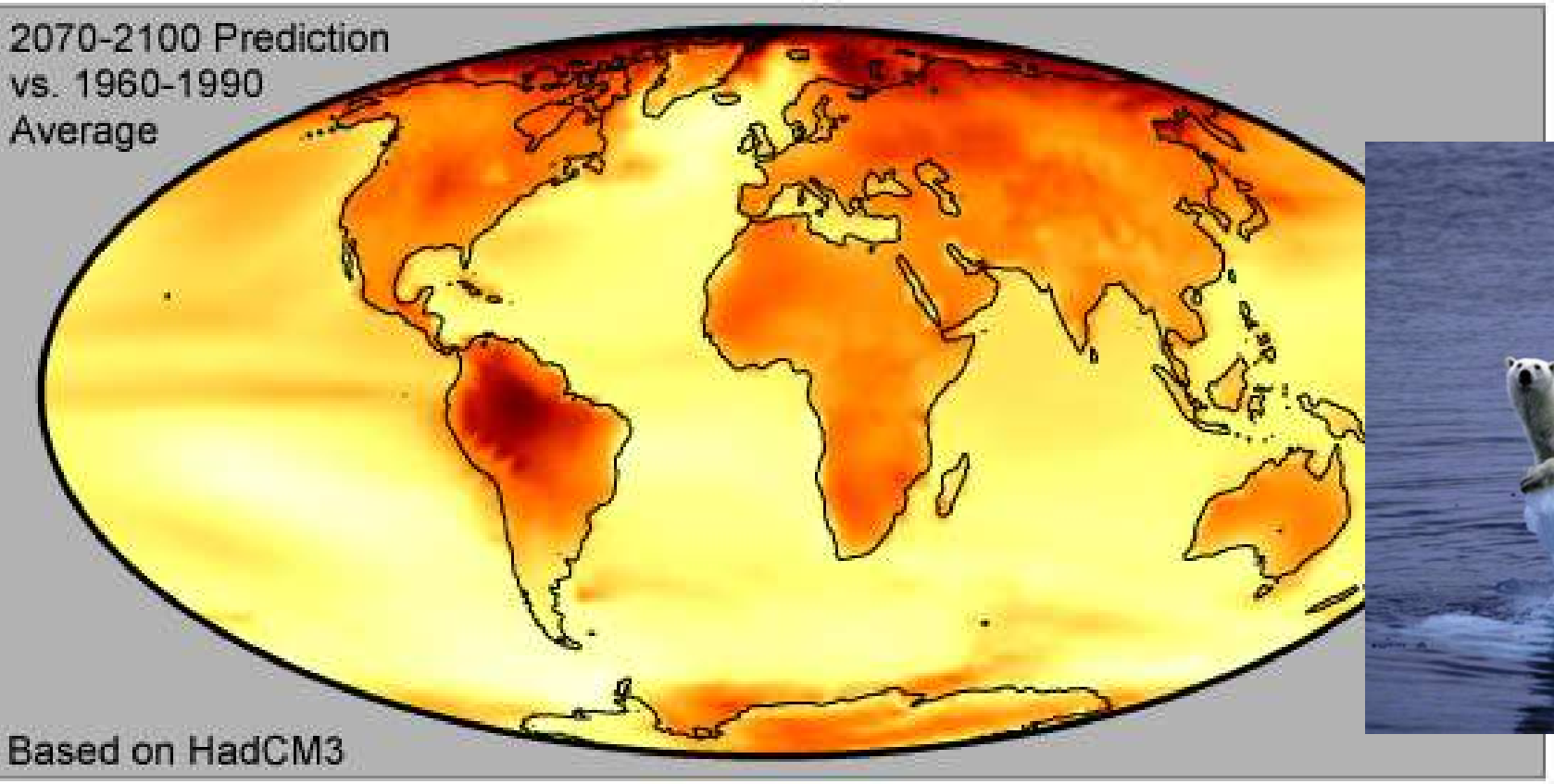
Global Warming Predictions



Air's Particulate Matter

- The atmosphere also contains a wide variety of dust particles.
- Dust includes: tiny grains of rocks, dirt, pollen, salt crystals from sea spray, and soot from fires.

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1) Why is our atmosphere important to life?
2) What is the difference between weather and climate?
3) What produced the “early “ atmosphere?
4) What process added oxygen to the atmosphere?

Objectives

Content Objective: I can differentiate layers of the atmosphere based on temperature and pressure.

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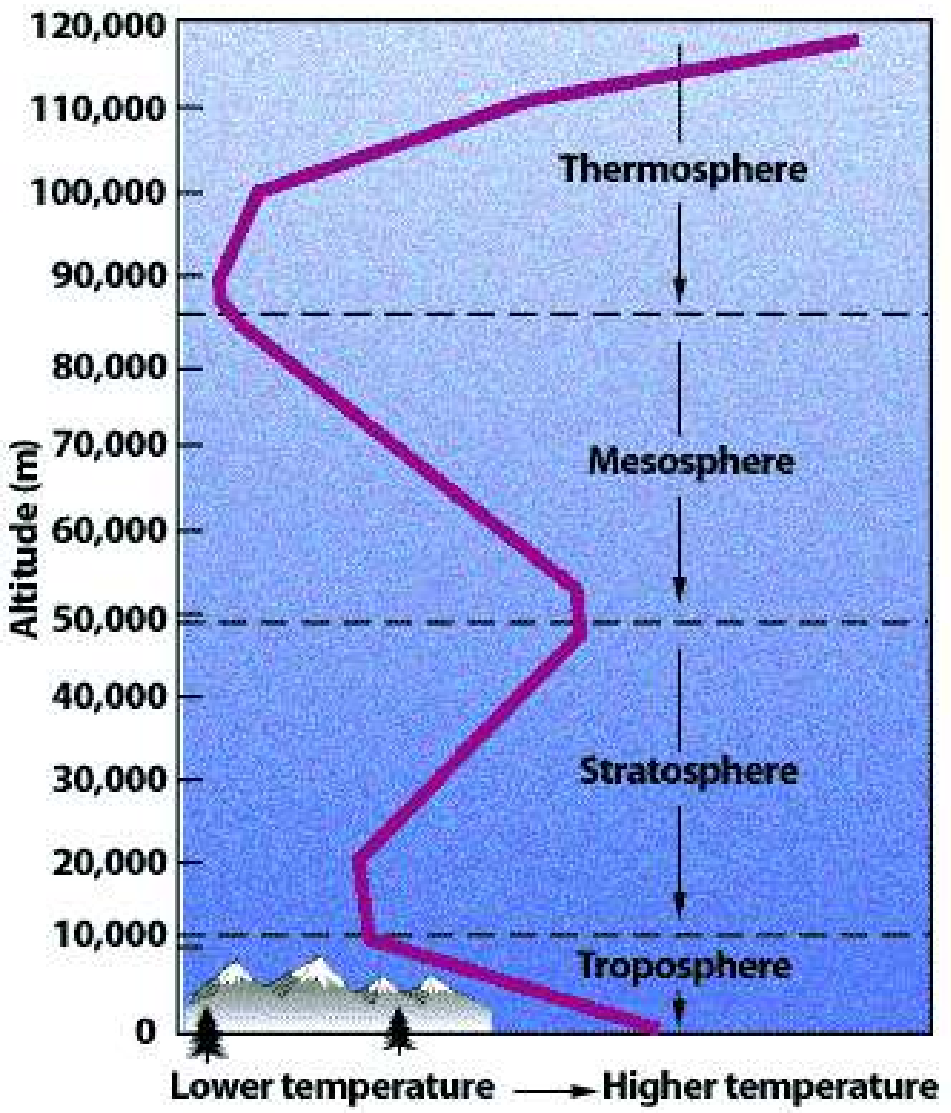
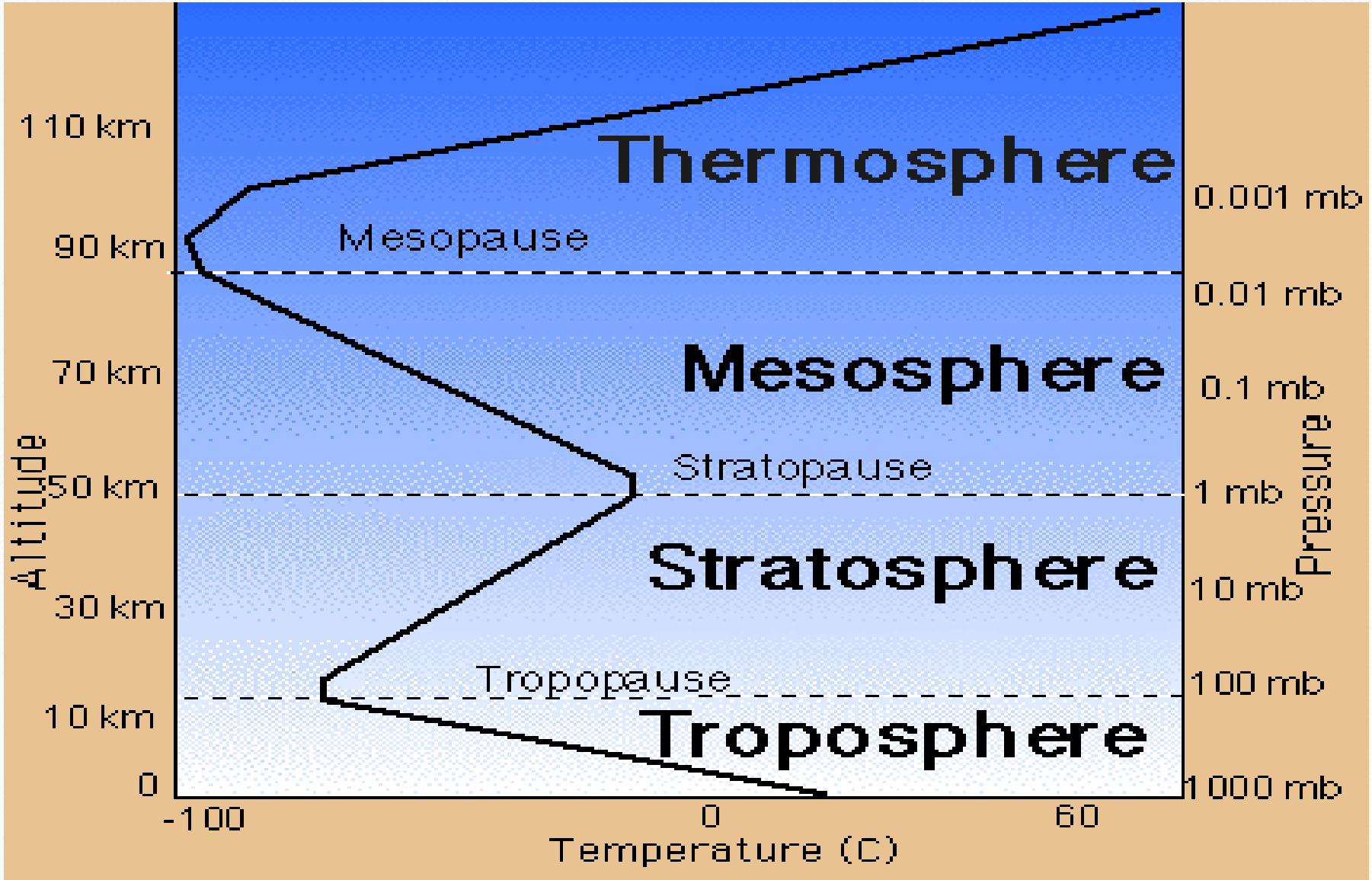
5 Layers of the Atmosphere

- Farther out from the surface… -> **air is thinner**
- Layers defined by **temperature changes**



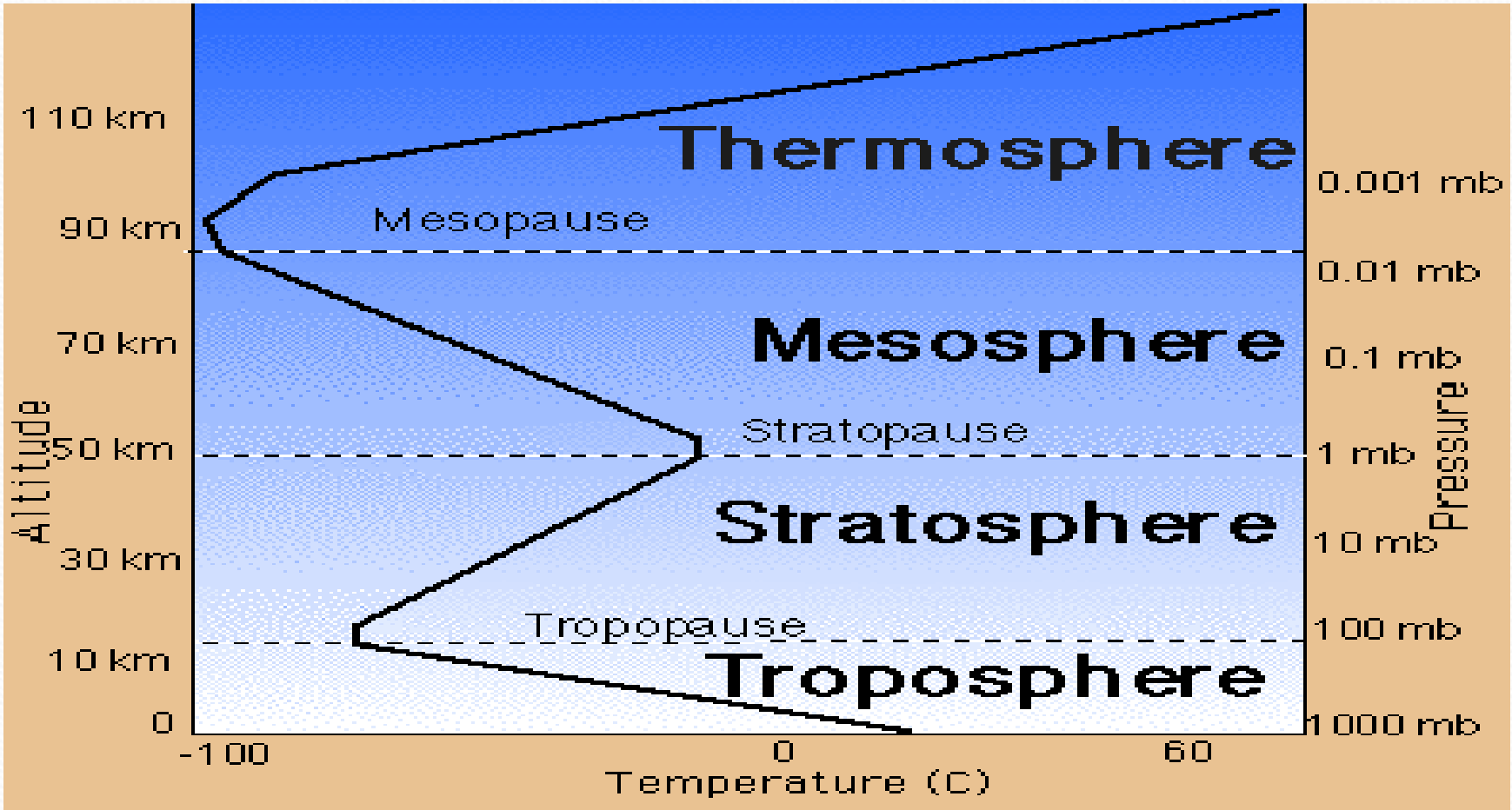
Create Your Own Diagram

Structure of the Atmosphere



Points to Notice:

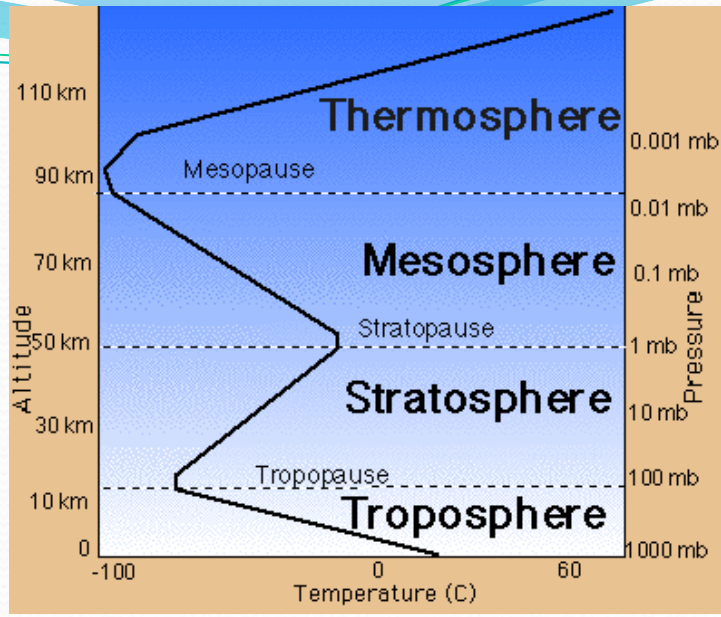
- The temperature of the atmosphere changes dramatically at varying altitudes.
- Temperature differences are used to divide the atmosphere into four layers: troposphere, stratosphere, mesosphere, and thermosphere.



Atmosphere Data Analysis Questions

1. What variables are being being graphed? What units are used to measure each?
2. What is the temperature at the bottom of the stratosphere?
3. Which layer of the atmosphere has the lowest temperature?
4. Which layer of the atmosphere has the lowest pressure?

The Troposphere

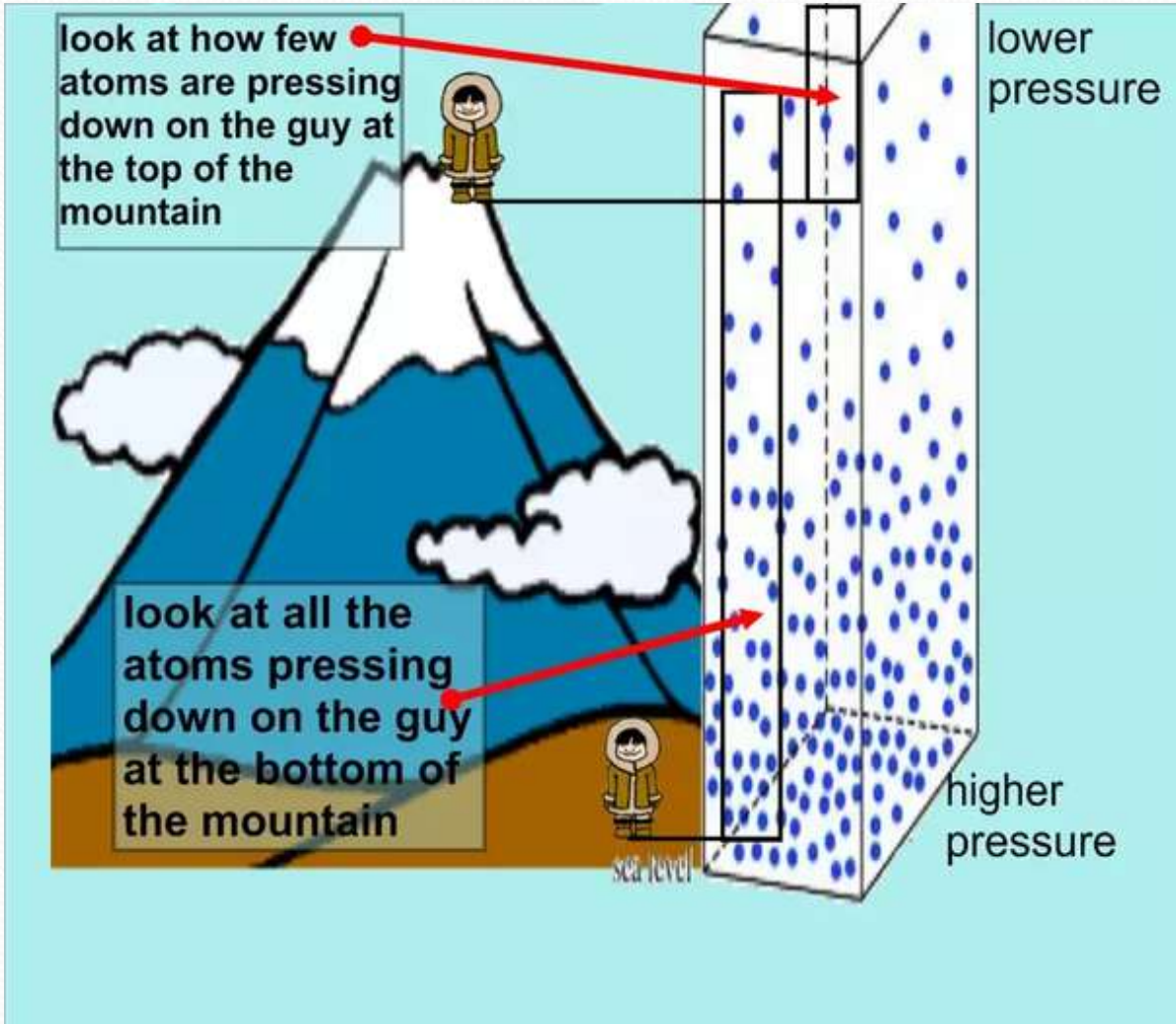


- "Tropo" means turn or change
- The lowest layer of our atmosphere. It is approximately 11 km (7 miles) thick.
- Temperature and pressure decreases with altitude.
- The rate of cooling with altitude is highly variable, but averages about 6.5°C for each kilometer in altitude gain.
- The Troposphere contains more than 90% of the atmosphere's gases.
- All weather on Earth takes place in the Troposphere.

Quick Write: In your notebook

- Why do temperature and pressure decrease as you go higher in the troposphere?

Temperature and pressure decrease as you go higher in the troposphere because…



Quick Write: In your notebook

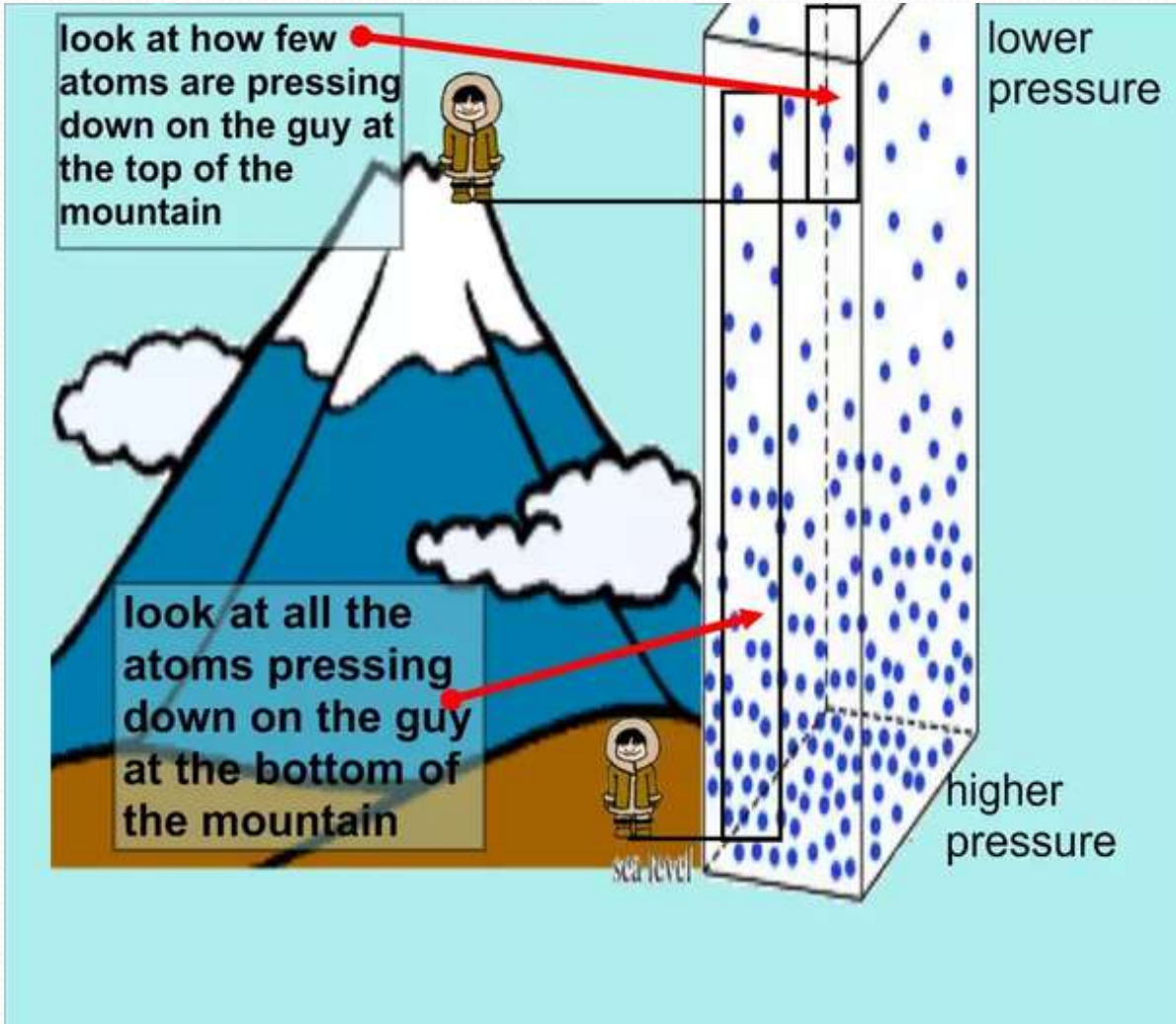
- Why do temperature and pressure decrease as you go higher in the troposphere?

Temperature and pressure decrease as you go higher in the troposphere because…

There is less gas,

so less pressure,

so lower temperature.



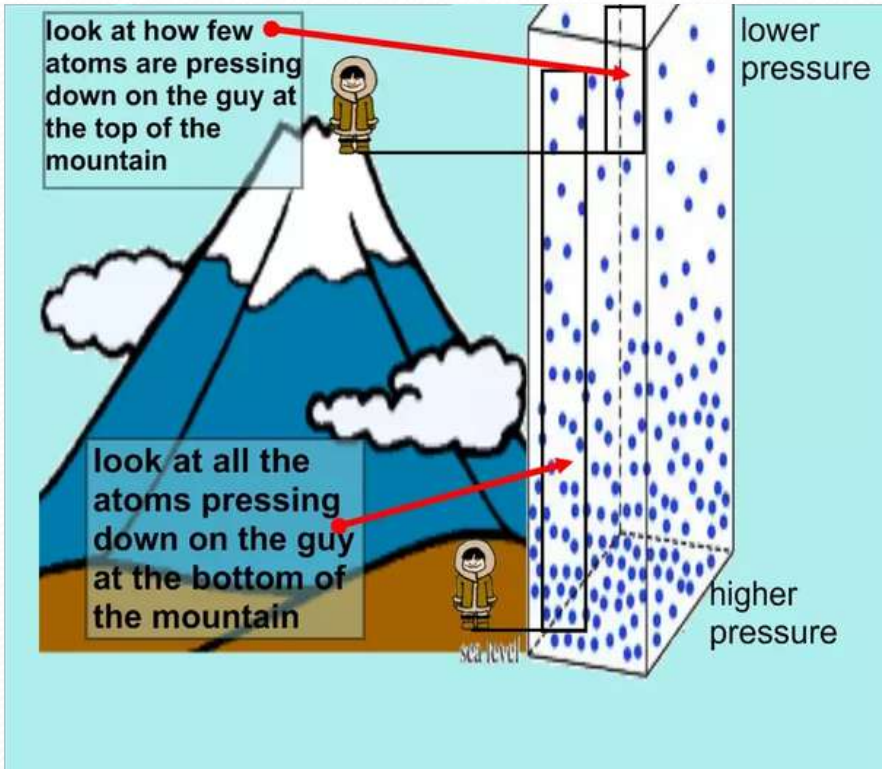
A. Ozone holds the air in the troposphere.

B. Gravity pulls the air down near the Earth's surface.

C. Trees cause more air near the troposphere.

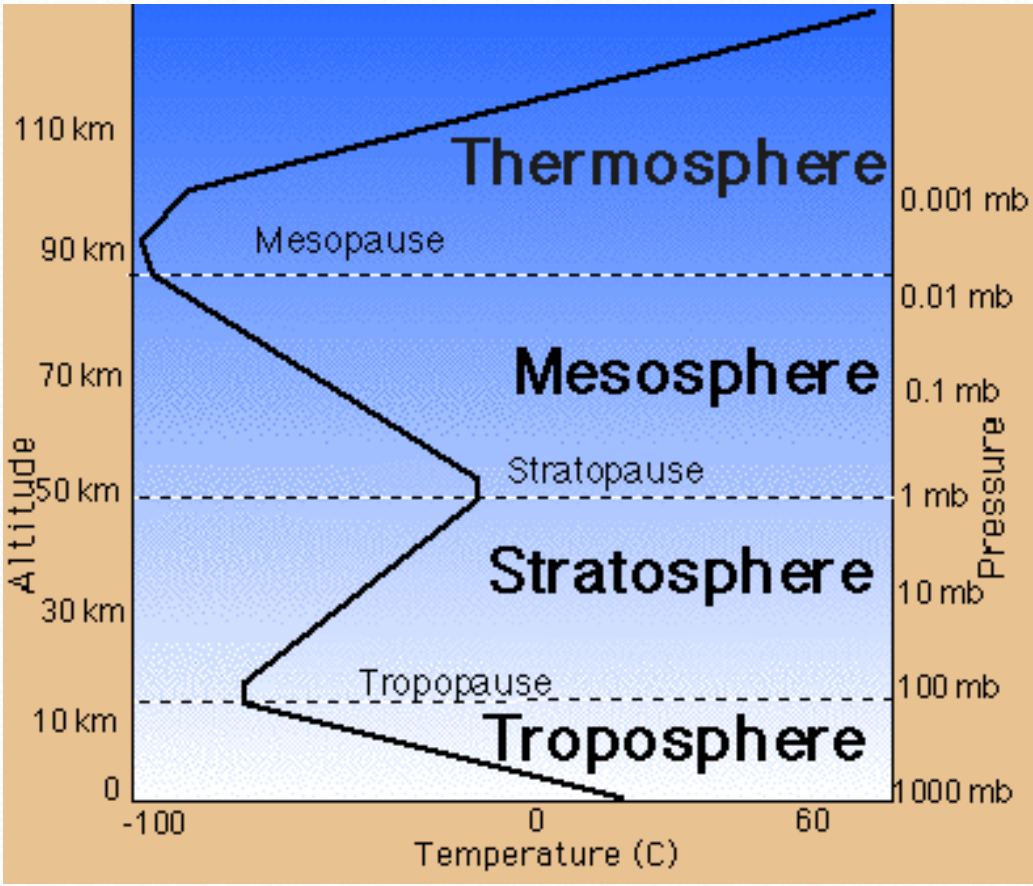
D. Water Vapor from the oceans and other sources adds more mass.

Check for understanding: Why does the troposphere contain most of the atmosphere's air?



The Tropopause

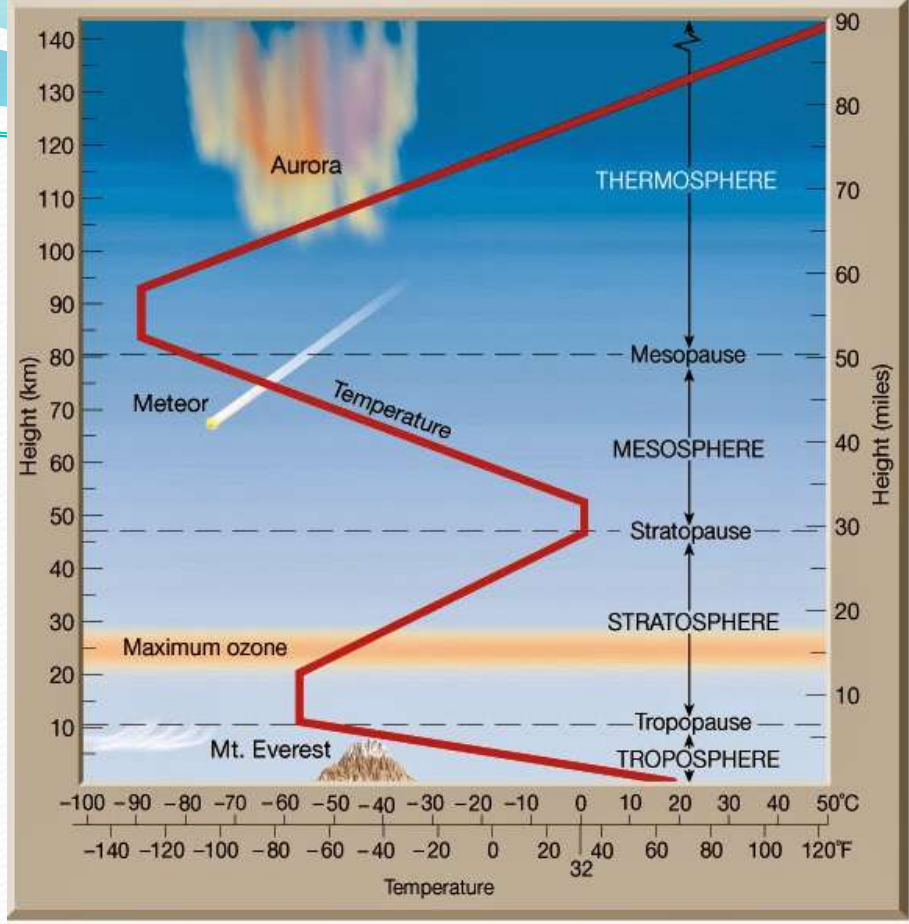
- The area between the Troposphere and the Stratosphere.
- Temperature remains stable as you increase in height.
- The jet stream is located just below the Tropopause.

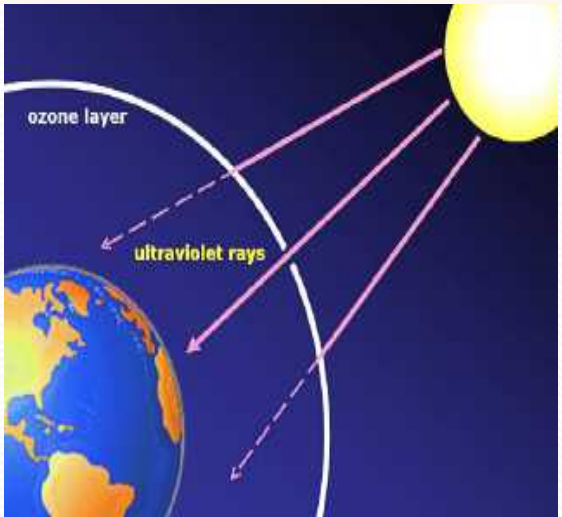


PAUSE = NO TEMP. CHANGE

The Stratosphere

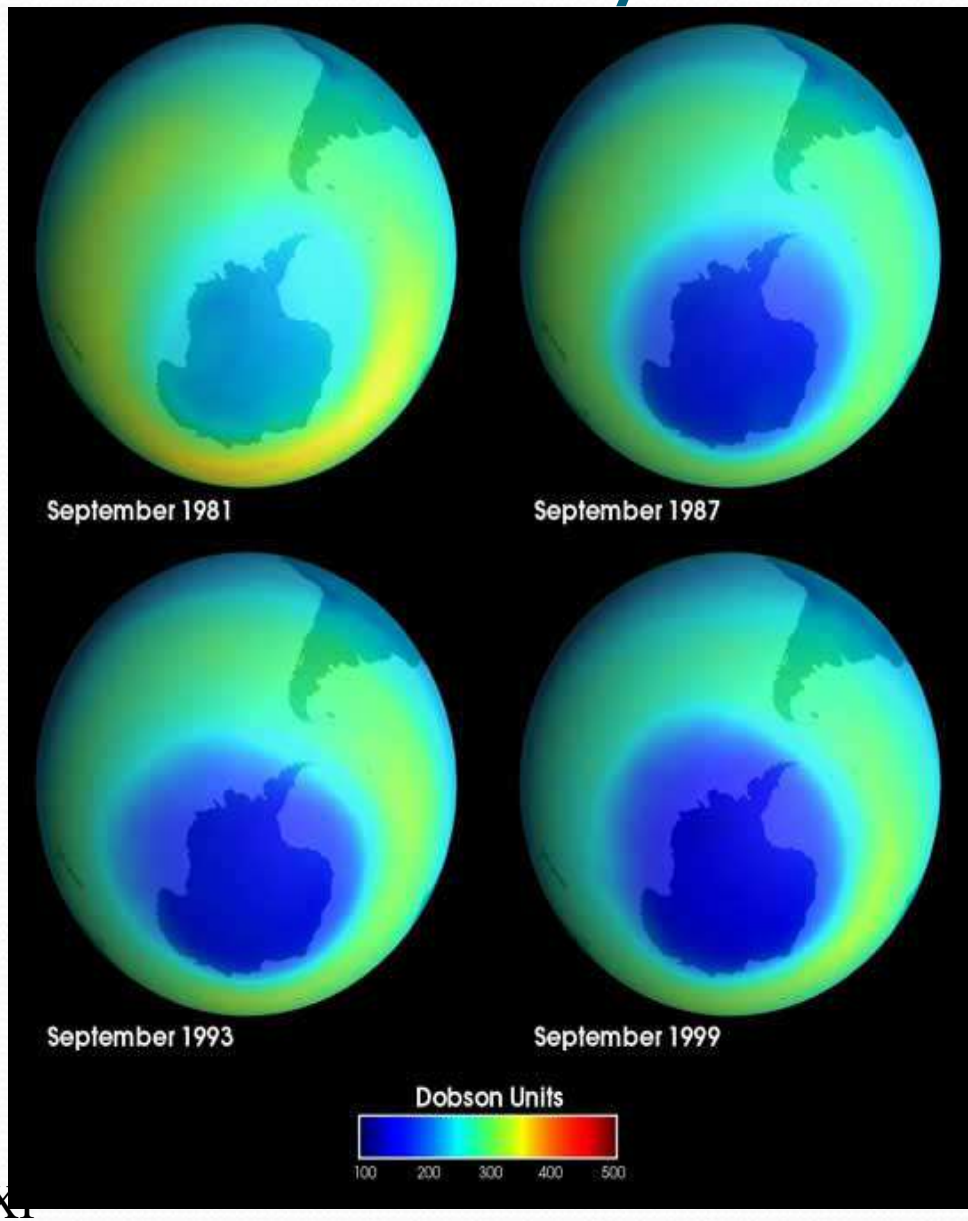
- "Strato" means spreading out.
- A clear, dry layer of the atmosphere.
- Temperature increase in the Stratosphere is caused by the presence of the Ozone Layer.
- Ozone absorbs ultraviolet rays from the sun and then releases some of this energy in the form of heat.





Ozone layer

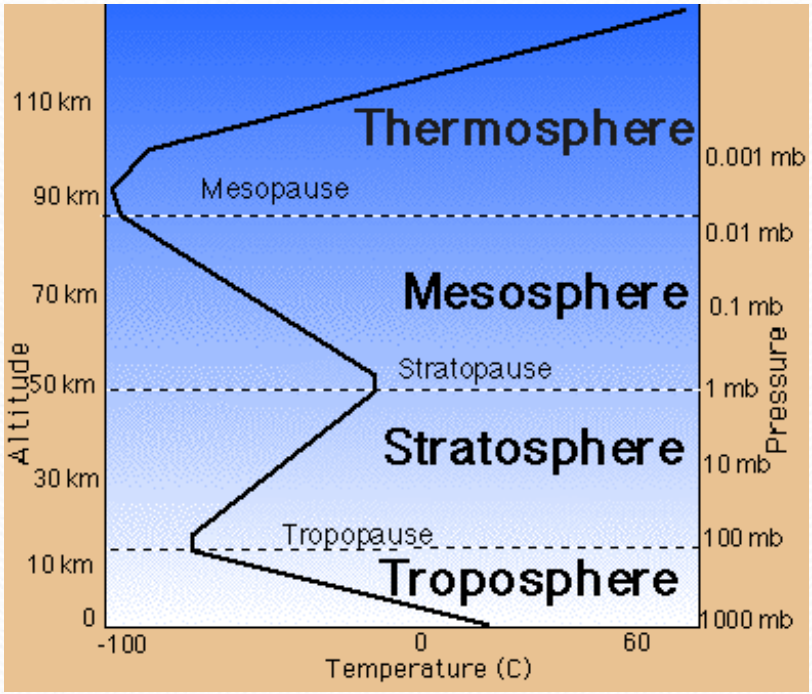
During the 70's and 80's and large hole was discovered in the ozone layer. This was a big concern because large amounts of very harmful ultraviolet rays were being let into Earths lower atmosphere. It was determined that the cause was the presence of chlorofluorocarbon(CFC) compounds, commonly called freons, which were release into the atmosphere by human activities. Now most countries ban the use of CFC's.



https://www.youtube.com/watch?v=0ZfBgjUnX

The Stratopause

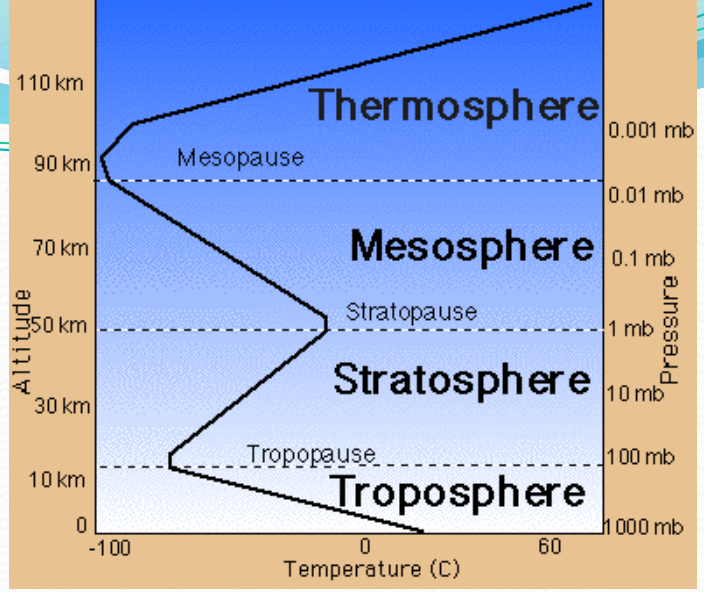
- The area between the Stratosphere and the Mesosphere.
- Located at approximately 50 kilometers above Earth's surface.



PAUSE = NO TEMP. CHANGE

The Mesosphere

- "Meso" means middle.
- Contains very little ozone, so temperatures again drop with increasing altitude.
- It is in this layer that foreign bodies (such as meteors and spacecraft) entering the atmosphere start to warm up. We know them as "shooting stars".



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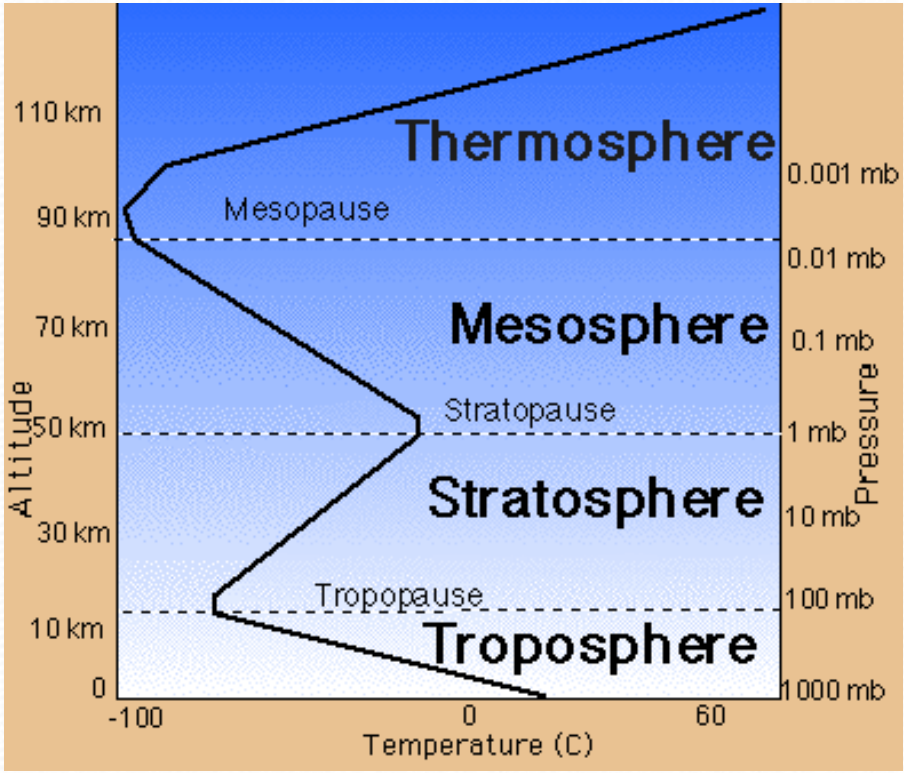
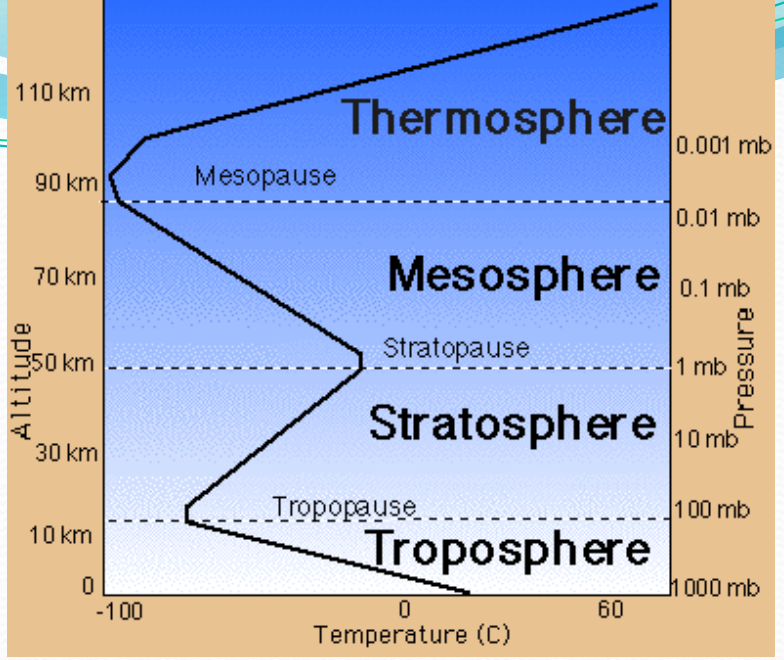
The Mesopause

- The area between the Mesosphere and the Thermosphere.
- Located approximately 90 kilometers above Earth's surface.

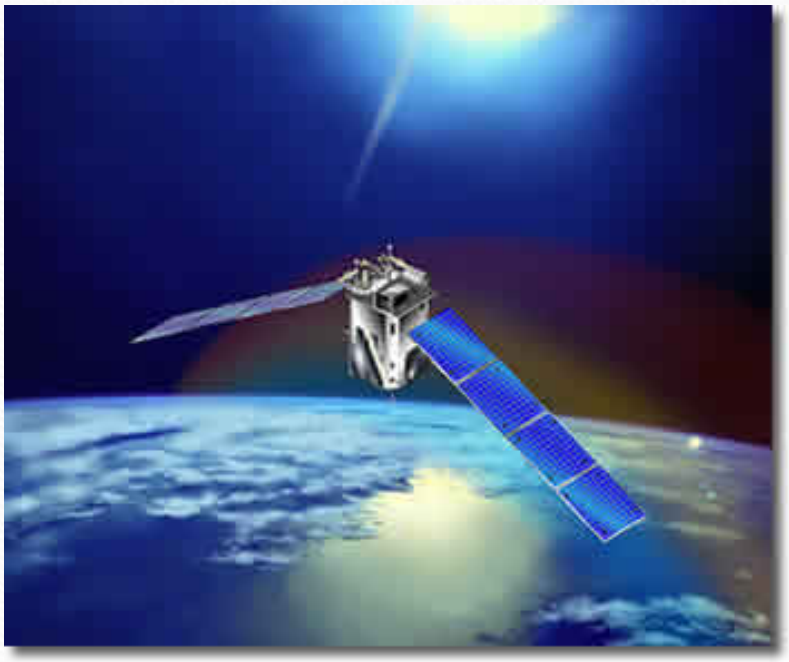


PAUSE = NO TEMP. CHANGE

The Thermosphere



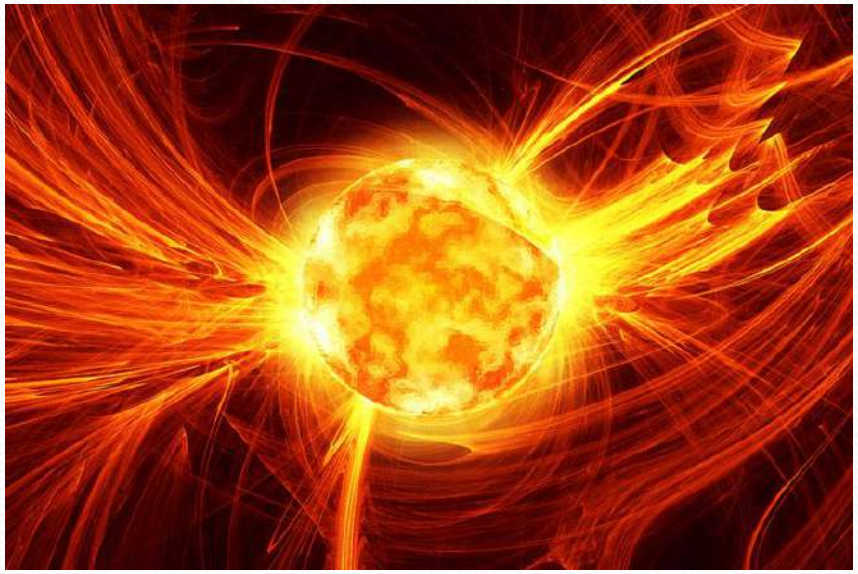
- The outermost layer of Earth's atmosphere.
- Where satellites orbit.
- The atmosphere at this great altitude is extremely thin, but the few molecules and atoms present receive such intense solar radiation that temperatures can rise above 1000°C.
- Contains the "Ionosphere"

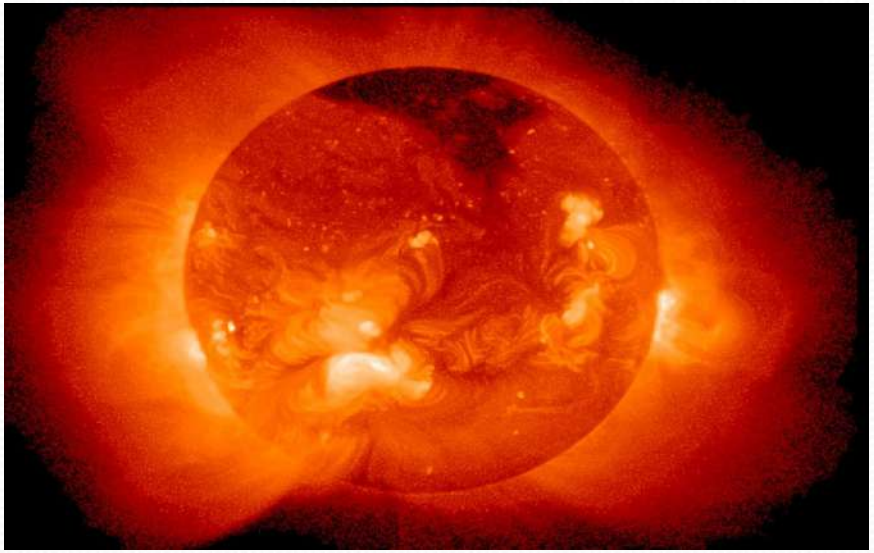


https://www.youtube.com/watch?v=JktgH0oSa1Q

The Ionosphere

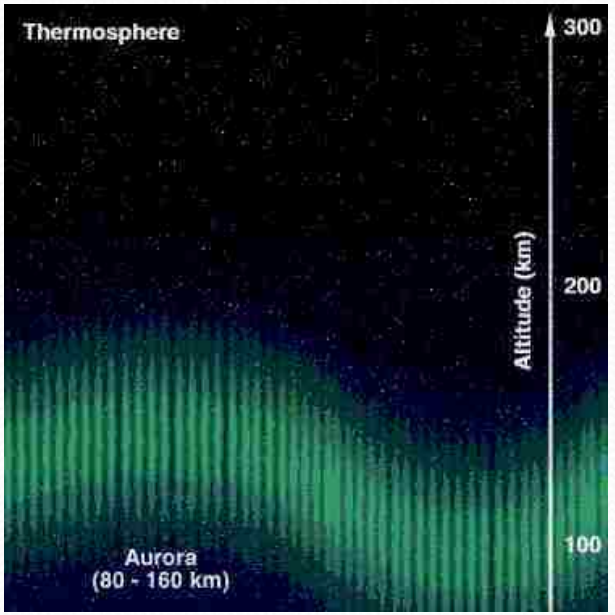
- The Ionosphere is affected by solar events.
- The Sun gives off charged particles called ions. They travel out into space super fast. The cloud or gas of these ions, or charged particles is called a Plasma.
- The stream of plasma coming from the sun is known as solar wind, and the intensity of it depends on storms occuring on the sun, called sunspots.





The Ionosphere

- Huge eruptions associated with sunspots send out large amounts of radiation and ionized particles.
- Because the sun's particles are electrically charged, they are deflected by Earth's magnetic field to the North and South poles.
- The ionized particles sometimes interact with air molecules to form **auroras**, sometimes called "**Northern Lights**"



Aurora Borealis "Northern Lights“ Aurora Australis “Southern Lights”

As the electrons enter the earth's upper atmosphere, they will encounter atoms of oxygen and nitrogen at altitudes from 20 to 200 miles above the earth's surface. The color of the aurora depends on which atom is struck, and the altitude of the meeting.

- Green - oxygen, up to 150 miles in altitude
- Red - oxygen, above 150 miles in altitude
- Blue - nitrogen, up to 60 miles in altitude
- Purple/violet - nitrogen, above 60 miles in altitude

The Northern Lights

Northern Lights Videos

- https://www.youtube.com/watch?v=1MI3YDGgtN4
- https://www.youtube.com/watch?v=hsMW7zbzsUs

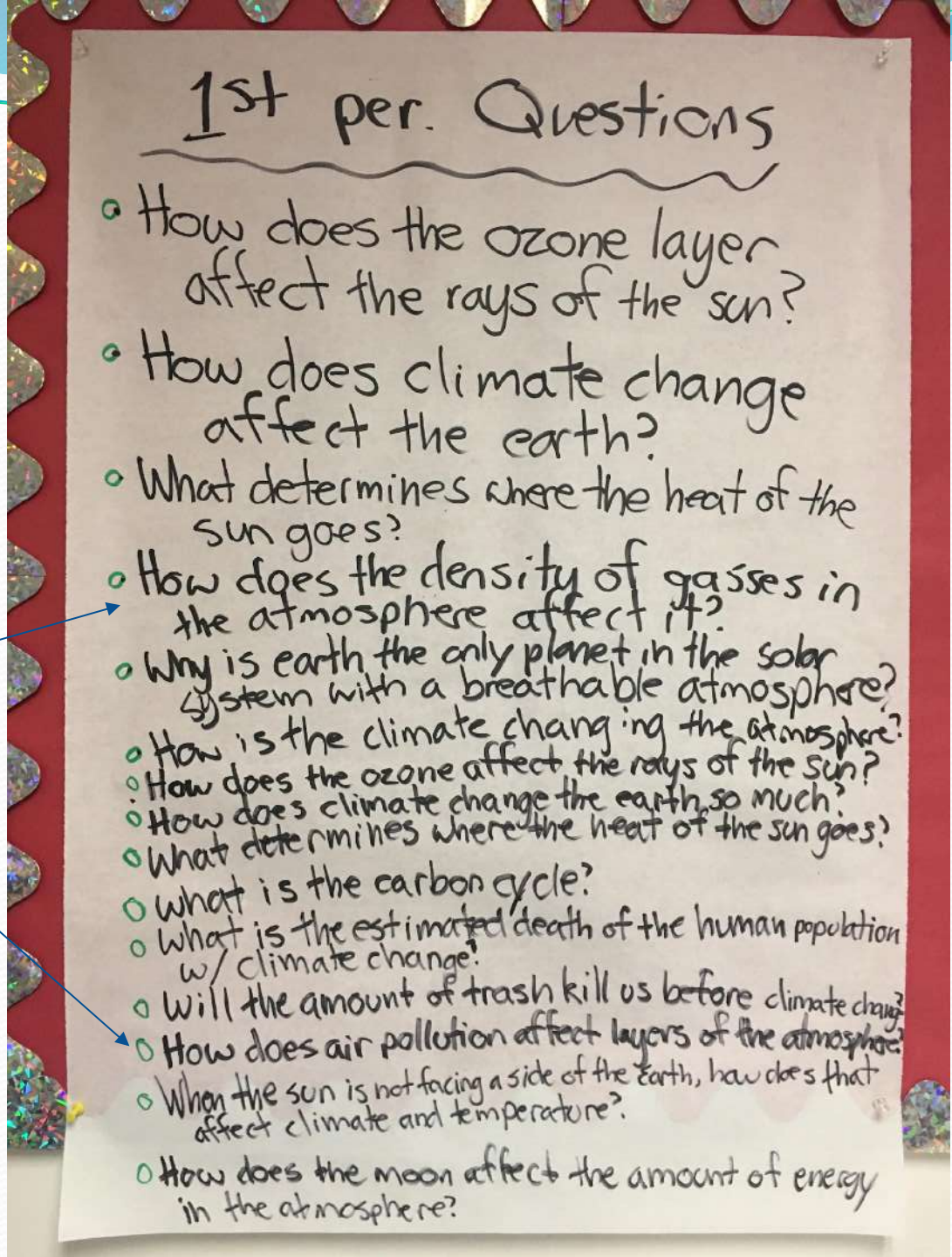
The last layer of the atmosphere is the…

EXOSPHERE

- *The exosphere is the outermost layer of the atmosphere.*
- *The temperature in the exosphere goes up with altitude.*
- *Satellites orbit earth in the exosphere.*

Exit Ticket:
In your Notebook

- Choose 1 of the questions from our question list that has to do with layers of the atmosphere and answer it.



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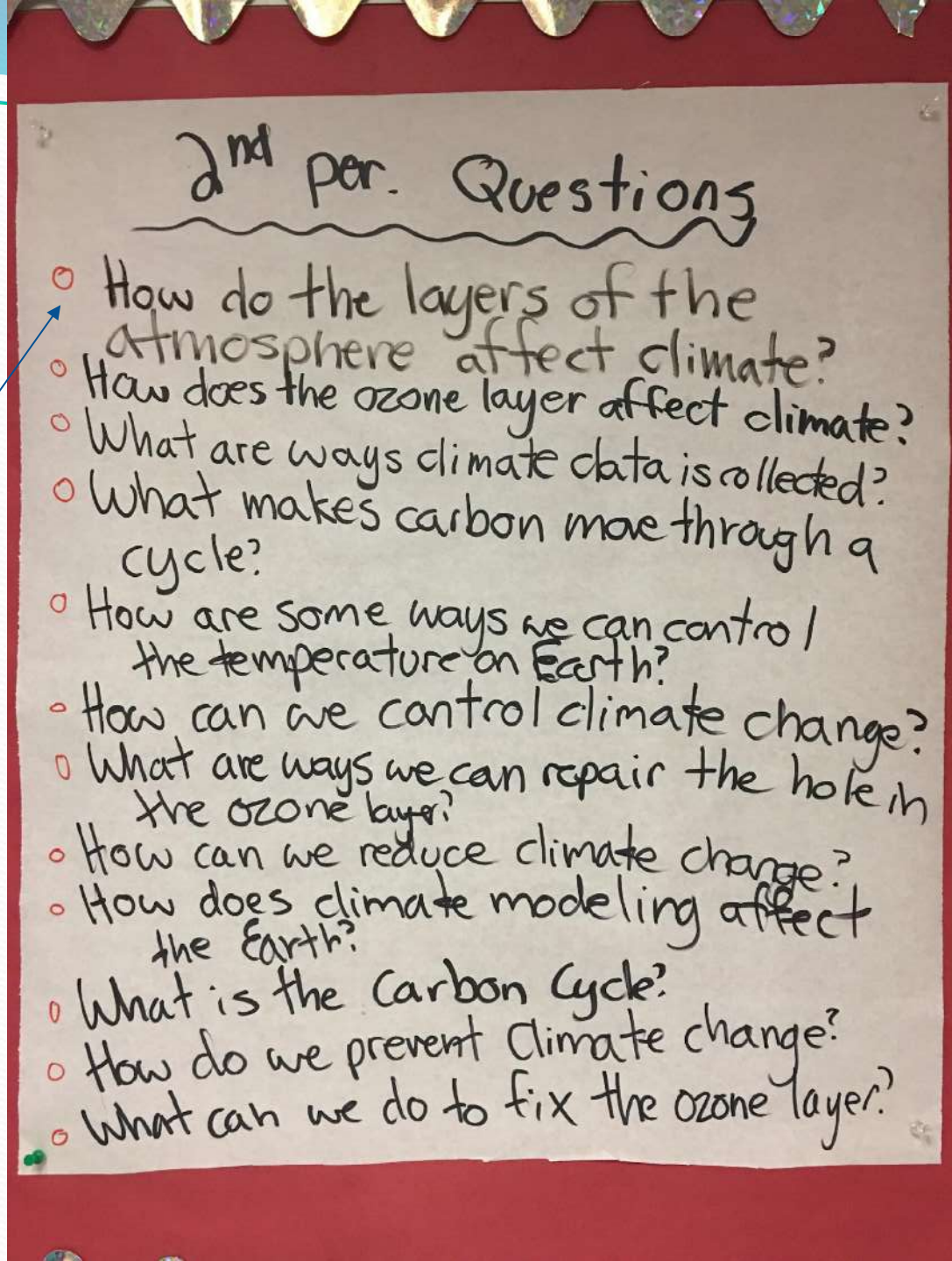

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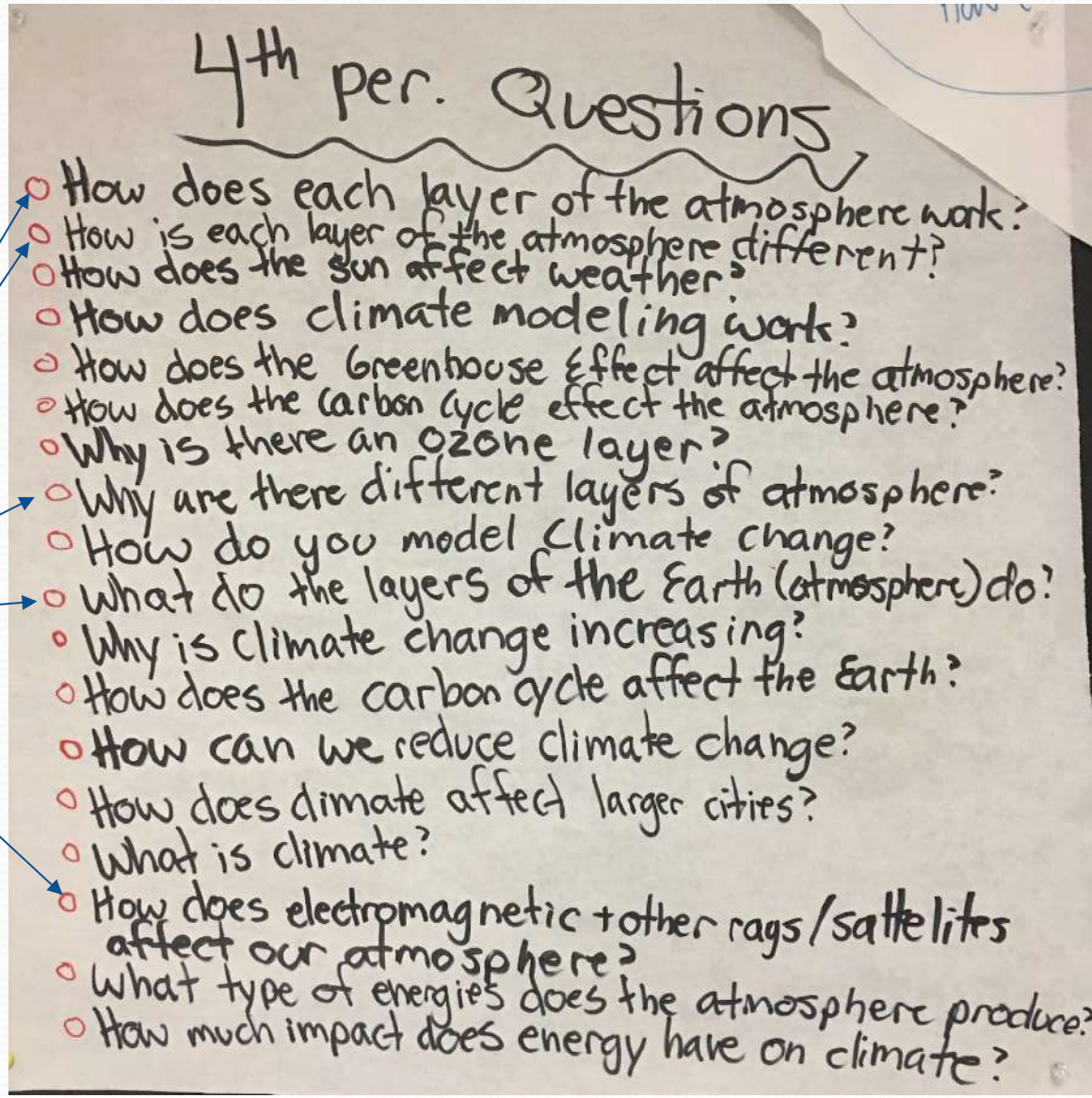

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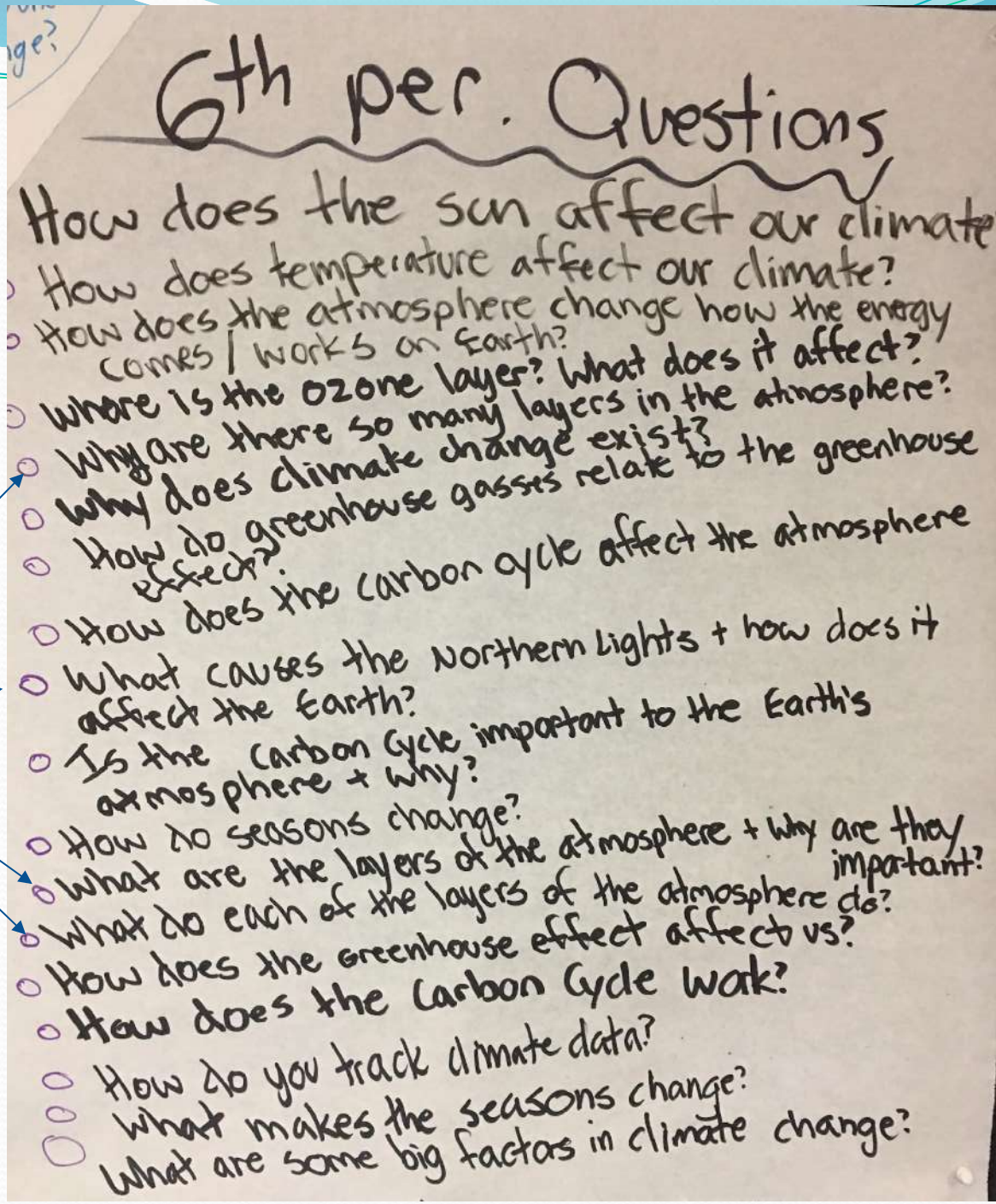

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