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**Layers of the Atmosphere**

Make an annotated graph of ***how atmospheric temperature changes with altitude*** in the space below.

* Show a line that represents the change in temp as altitude increases.
* Label the axes and put a title on the graph.
* Annotate the right side of the graph by including: the name of the layer, how air density changes with altitude, and explain why temp changes the way it does.
* Use Discovery Ed, Atmosphere, Structure of Atmosphere, Explore.

Title:

-100 -80 -60 -40 -20 0 20 40

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**The Composition and Structure of the Atmosphere**  
Science Techbook: The Structure of the Atmosphere (elaborate). Discovery Education. 2013

The Sun warms the planet. How this warming occurs is more

Use complete sentences to summarize 5 key statements that explain how the Earth is heated and how it maintains its temperature.

complex than one might imagine. The [atmosphere](http://app.discoveryeducation.com/techbook2:concept/view/guidConceptId/cc8ce05c-e854-45da-a202-2c60a28ac05c/guidUnitId/14c40ae5-0a19-4648-9321-b92053505b2b) maintains a

range of temperatures that allows life to exist on the planet. The

[ozone](http://app.discoveryeducation.com/techbook2:concept/view/guidConceptId/cc8ce05c-e854-45da-a202-2c60a28ac05c/guidUnitId/ba74485e-7d4e-4a36-8ce8-b888aa213311) absorbs most short-wavelength radiation passing through

the atmosphere. Long-wavelength radiation reaches the planet’s

surface. It is absorbed by rocks and water on the planet’s surface

and is then radiated back into the atmosphere. Trace gases in the

atmosphere absorb this radiation, providing a moderating effect

on temperature at the planet’s surface. If the atmosphere did not

absorb the long wavelength radiation, the planet would heat up

during the day, but the heat would be lost to the upper atmosphere

at night. The rapid transition in temperature during this 24-hour

cycle would affect the ability of life to survive on the planet’s

surface.

The gases in the atmosphere that absorb the radiation emitted

from the planet’s surface are called greenhouse gases. Greenhouse

gases prevent long-wavelength radiation from being lost to space.

The higher the concentration of greenhouse gases in the

atmosphere, the more heat is trapped close to the planet’s surface.

The important greenhouse gases in the atmosphere include water

vapor, carbon dioxide, methane, ozone, nitrogen oxides, and sulfur

dioxide. Most greenhouse gases are found at trace concentrations in

the atmosphere. Without greenhouse gases, the planet would be a

frozen wasteland, no warmer than –18°C. In fact, it might look very

much like Mars. With greenhouse gases in the atmosphere, the

planet maintains an average temperature of 15°C. The warming of

the planet is called the greenhouse effect. Earth’s other neighbor,

Venus, provides an example of what scientists call the runaway

greenhouse effect.

Each [greenhouse gas](http://app.discoveryeducation.com/techbook2:concept/view/guidConceptId/cc8ce05c-e854-45da-a202-2c60a28ac05c/guidUnitId/180691d9-d257-43fb-88df-0b059175fe03) plays an important role in trapping the heat

near the planet’s surface. The most important greenhouse gas is

water vapor. On a clear day, water vapor can account for 60–70%

of the greenhouse effect. The concentration of water vapor in the

atmosphere varies across the planet. It is highest near the equatorial

region and lowest in polar areas.

Carbon dioxide (CO2) is the next most influential greenhouse gas.

It can be found in trace amounts in the atmosphere. In fact, carbon

dioxide makes up only 0.038% of the atmospheric composition.

Carbon dioxide enters the atmosphere naturally when volcanoes

erupt and rocks weather. Metamorphic degassing is another natural

source of carbon dioxide. Organisms remove carbon dioxide from

the atmosphere during photosynthesis. It is also pulled out of the

atmosphere during rock formation.

Although methane is found at very low concentrations in Earth’s

Identify the 3 most significant greenhouse gases and describe how they get into the atmosphere.

atmosphere, it is more effective than carbon dioxide at trapping

heat. Methane is naturally produced in ocean sediments, agricultural

lands, and livestock manure. Methane is also released from waste

treatment facilities like landfills.

1.

Nitrous oxide is also more effective than carbon dioxide at trapping

heat in the atmosphere. The concentration of nitrous oxide, however,

is much lower than the concentration of the other gases. Nitrous oxide

is naturally produced by bacteria in oceans and rainforests as well as

by lightning and forest fires.

Earth inhales and exhales carbon dioxide. The gases move back and

forth between the ocean and atmosphere. Plants on land and

phytoplankton in the ocean absorb atmospheric carbon dioxide during

photosynthesis. Atmospheric gases also diffuse directly into ocean

2.

water. The rate at which the diffusion occurs depends on temperature

and pressure conditions of the water. Gases diffuse more efficiently

in cold water and under higher pressure.

Human activities like the burning of fossil fuels add carbon dioxide

to the atmosphere. Scientists are concerned that the ocean and land

cannot accommodate the increased concentration of atmospheric

carbon dioxide. Scientists use computers to model how carbon dioxide

moves around the planet. These models incorporate the complex

3.

carbon cycle. They allow scientists to evaluate how the planet can

absorb additional carbon dioxide produced by future generations.

Identify 2 ways the amount of CO2 in the atmosphere is increased.

Identify 2 ways the amount of CO2 in the atmosphere is decreased.