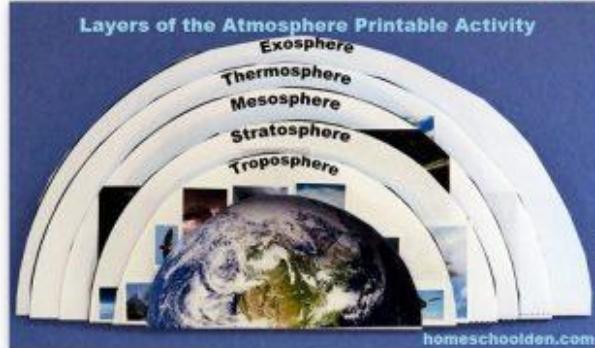


Earth's Atmosphere Packet, 50+ pages



Notes about the Troposphere

The troposphere is the atmospheric layer closest to Earth. It ranges in height from an average of 10 km at the equator to 6 km at the poles. In the troposphere, the air is more dense near the ground than it is at the top of the troposphere in the stratosphere. The temperature decreases as altitude increases. The troposphere responds to the average temperature of the outer layer that lies underneath it.

The troposphere is higher in the summer than in the winter. The air is the lowest in the winter because the air is denser. Just above the troposphere, there are the mesosphere, thermosphere, and exosphere.

Earth's Systems

Earth's Systems Worksheets. Earth has 4 major systems that work together as an integrated system. Each system exists both at the interaction between the Earth's "spheres": - atmosphere, hydrosphere, cryosphere, lithosphere, and biosphere respectively.

Earth's Atmosphere

Earth's atmosphere is the layer of gases that surround our planet Earth. These gases are held in place by Earth's gravity. The atmosphere of Earth is composed of nitrogen (about 78%), oxygen (about 21%), argon (about 0.9%) with carbon dioxide and other gases such as hydrogen and helium in trace amounts. The atmosphere is divided into several layers that extend up from Earth's surface to thousands of miles into space. These layers differ in properties such as composition, temperature and pressure.

Hydrosphere

Water resources are essential to the survival of most living things on Earth. Water is found in all forms and makes up most of our bodies. It is a part of the environment we live in and is essential to life. Water is composed of hydrogen and oxygen. Water is a liquid at room temperature. It is unique among all the substances with the exception of helium, in that it expands as it freezes. For water molecules, the hydrogen bonds in the solid parts of the body.

Earth's Atmosphere as part of the Earth System Printable Activity

Earth's Atmosphere

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Satellites & the GPS System

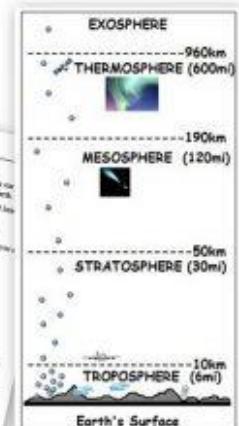
Satellite orbits fall into two basic categories: low Earth orbit (LEO) and geostationary orbit (GEO). Low Earth orbit satellites are in orbits around Earth that are below the International Space Station's orbit. They have shorter orbital periods and are used for communications, Earth observation, and scientific research. Geostationary orbit satellites are in orbits around Earth that are at the same altitude as the International Space Station. They have longer orbital periods and are used for communications, Earth observation, and scientific research.

Geostationary Earth Orbit

Geostationary Operational Environmental Satellites (GOES) are launched into either polar or equatorial orbits. They are used to monitor weather patterns and provide data to weather forecasters. They also provide data to satellite television and radio stations. They are positioned in orbit around Earth at approximately 22,300 miles above the equator.

International Space Station

The International Space Station (ISS) is a large satellite that orbits Earth at an altitude of approximately 240 miles. It is used for scientific research and as a platform for spacewalks. It is also used as a test bed for new technologies and as a platform for space tourism.



The Sun, Light, and Our Atmosphere

Light travels in straight lines from the Sun. The Sun is in the sky, so it is light during the day. Light reflects off surfaces and is scattered by the atmosphere. Light reflects off clouds and water droplets. Light reflects off dust particles. Light reflects off ice crystals. Light reflects off of many different types of surfaces. The light we see is white, but it is actually a blend of many different types of colors. The different colors of light are called wavelengths. Do you know what they are?

Exosphere

View of the atmosphere in the exosphere. This begins about between 500-1,000 km or so above the Earth's surface and extends outward roughly 44,730 km (40,000 miles), gradually moving away.

In principle, the exosphere covers distances where particles are still bound to Earth by gravity.

Exosphere

This layer is primarily empty. The particles in the exosphere are too far from Earth to be influenced by its gravity, and as a result, the solar winds continue unimpeded.

Thermosphere

This is the first layer of the atmosphere. This is the layer where the International Space Station (ISS) and Hubble Telescope are located.

Mesosphere

Compositions are odd in this layer. They are dry (< 10 ppm).

Stratosphere

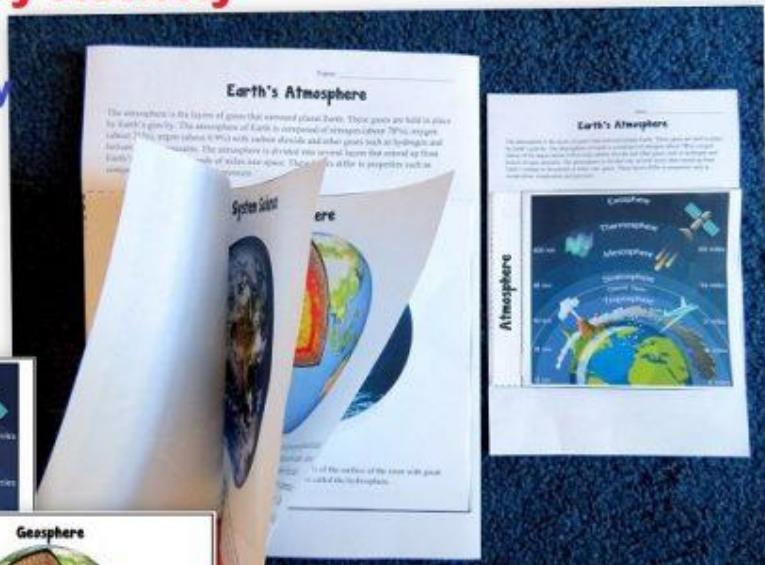
In this layer, light undergoes reflection and refraction by ozone molecules. The ozone layer is located in the stratosphere at an altitude of approximately 10-15 miles. The ozone layer is composed of three thin molecular shells consisting of three different gases: ozone, oxygen, and nitrogen.

Troposphere

At this layer, gas densities and density changes with altitude. The temperature decreases with altitude, reaching a minimum of about -50°C, around the freezing temperature of water. The air here is thin. There is no liquid water here, but there is a lot of vapor. The air here is very dry. This layer is home to the ozone hole.

Earth's Atmosphere Introductory Activity

Notebook Page or Interactive Notebook Page Activity





Introduction to Earth System Science & Earth's Atmosphere Notebook Page Activity

Layers of the Atmosphere Worksheets

Name _____

EARTH SYSTEM SCIENCE

The Earth is often divided into four spheres. The four parts of Earth's system include the:

- 1) geosphere
- 2) hydrosphere
- 3) biosphere
- 4) atmosphere

THE HYDROSPHERE:

This census of the water that exists on, under and over the surface of the Earth's surface, lakes, streams, rivers, oceans, underground tanks. Water covers about $\frac{71}{100}$ of Earth's surface. How much of Earth's water is salt water? _____ %



THE GEOSPHERE:

This census of the densest part of the world and is mostly made of soil, bedrock rock).



Crust
Magma
Upper mantle
Lower mantle
 D° layer
Outer core
Liquid-solid boundary
Inner core

THE BIOSPHERE:

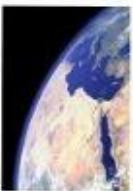
All ecosystems together... All the places on Earth where life dwells. The biosphere is also a member of the spheres including both land and water biomes. This includes all life on the air, on land, and in the water... An estimated $\frac{1}{3}$ of the Earth's surface is covered by the biosphere.



THE ATMOSPHERE:

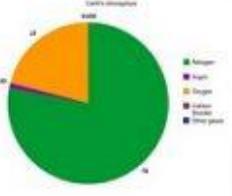
The layer of air that surrounds Earth is called the _____.

The atmosphere looks like a thin blanket surrounding the planet.



The earth is made of billions and billions of _____ particles.

Earth's air contains many gases. Look at the graph. What percentage of the air is nitrogen? _____ oxygen? _____ argon? _____ carbon dioxide? _____



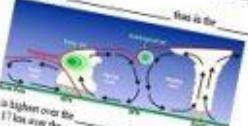
Gas	Percentage
Nitrogen	78%
Oxygen	21%
Argon	1%
Carbon Dioxide	0.03%
Other gases	0.04%

Water vapor in the atmosphere ranges from 0-4%.

Notes about the Troposphere

The troposphere is the atmospheric layer _____ km _____ m (0-10,000 ft) at the poles, to _____ km _____ m (0-16,000 ft) at the equator. At the top of the troposphere is the _____ layer that acts like an invisible ceiling. The troposphere responds to the average temperature of the entire layer that lies beneath it.

The tropopause is higher in the _____ than in the _____.



Because the tropopause is highest over the _____, the atmosphere has at about 17 km over the _____, the stratosphere is usually about as air plane altitude. Most commercial aircraft are flown in the lower stratosphere. Air above the tropopause _____ are usually about as air plane altitude. After the tropopause, the air becomes less dense. The air then rises, leaving an area drier and sinks and replaces the air that has risen. The cool air is called a convection current.

Worm Air Rises

Put a rubber band around the balloon to _____ of a bottle. Put the bottle in the pan and then place the bottle and balloon in the fridge or in a tub of _____.



THE EARTH'S ATMOSPHERE EXPERIMENTS

Air Has Weight!

Tie off a ruler so they are balanced. Are they still balanced or is one side heavier?



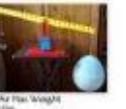
Illustrating that Air Has Weight

Illustrating that Air Has Weight

Worm Air Rises

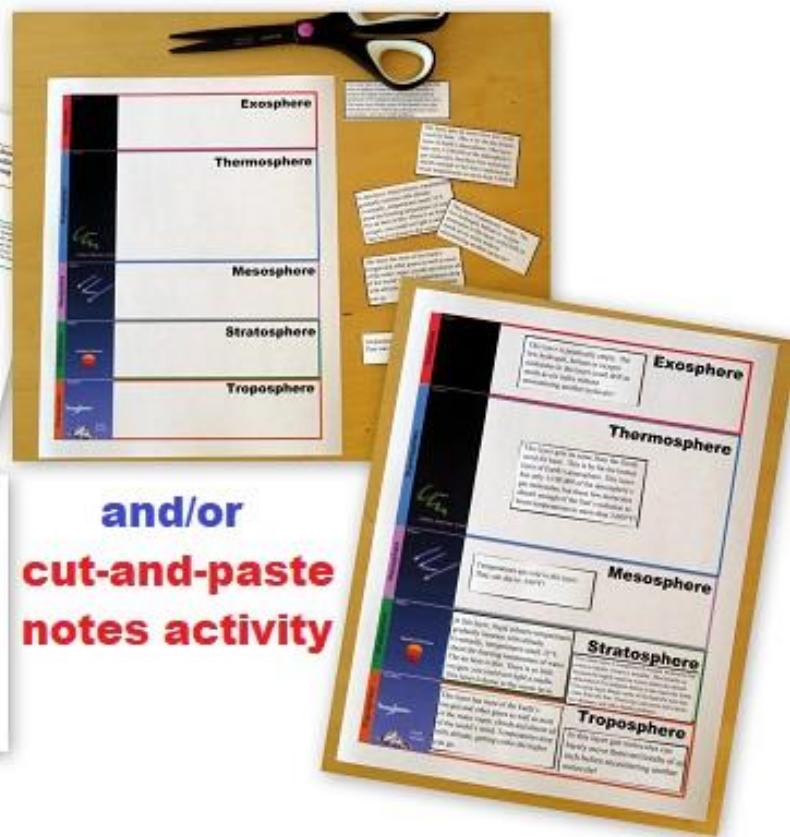
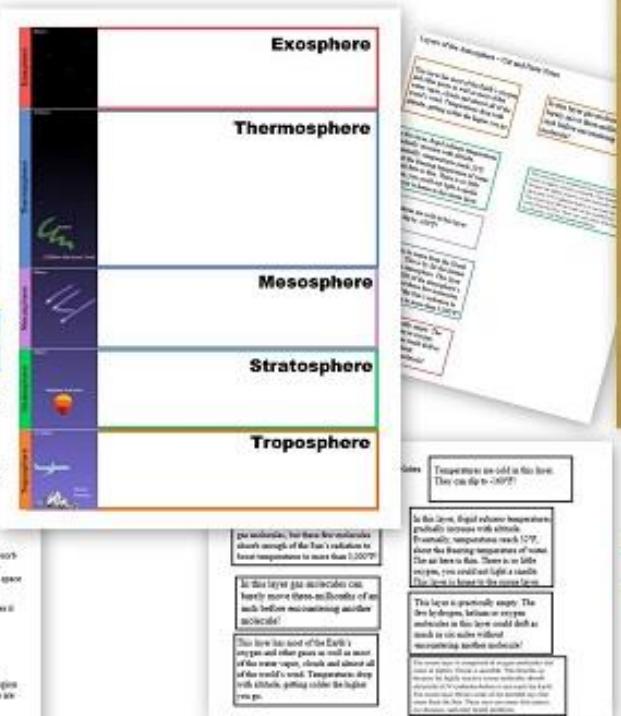
become less dense. The air then rises, leaving an area drier and sinks and replaces the air that has risen. The cool air is called a convection current.

Pour hot water in the pan. Place the bottle in the pan and then place the bottle and balloon in the fridge or in a tub of _____.



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Layers of the Atmosphere Note-Taking Page



**and/or
cut-and-paste
notes activity**

Layers of the Atmosphere Sorting Cards



Exosphere

Thermosphere

Mesosphere

Stratosphere

Troposphere

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Layers of the Atmosphere Printable Activity



Layers of the Atmosphere Activity



Atmosphere Worksheets:

Sun, Light & Our Atmosphere

Name: _____

The Sun, Light, and Our Atmosphere

Natural light here on Earth comes from the Sun. The Sun is so hot that it can light up our planet from millions of miles away! Light from the Sun takes only eight minutes to reach Earth.

Light is a form of energy. Light energy travels in waves. Light waves move in straight lines until they hit an object.

The light given off by the Sun and stars is a blend of many different types of radiation.

The light we see looks white, but it is actually a mix of various colors. When light is bent you can see the different colors. Do you know what they are?



It took centuries hundreds of years to figure out what light is. Light is a form of energy called electromagnetic radiation (or EM). Light travels in waves, like all forms of EM. Light is made of tiny particles called photons.

The light that is visible to us makes up a rather small portion of the EM spectrum. There are kinds of waves that travel through the atmosphere, but just the visible light we see.



Electromagnetic waves have different wavelengths. Some are shorter than others.



The Atmosphere as a Shield

Name: _____

Atmosphere as a Shield

The atmosphere acts as a passive shield. It absorbs lots of radiation including a lot of the harmful rays. Most wavelengths of light never reach the ground. They are absorbed by our atmosphere.

Water vapor, ozone, oxygen, carbon dioxide, all decrease transmission at certain wavelengths creating atmospheric absorption bands. When radiation strikes matter, some or all of its energy may be transferred to the matter as heat. The collision dissipates the radiation.

Gamma rays, x-rays and some of the infrared portions of the spectrum are absorbed in our atmosphere.

Visible light, some infrared, ultraviolet, and radio radiation make it all the way to the surface.

These are the safest portions of the Sun's radiation, although too much exposure to UV rays can lead to skin cancer. Ultraviolet (UV) radiation is absorbed as it passes through the atmosphere, especially near the ozone layer.



The Exosphere

Name: _____

The Exosphere

The final _____ layer of the atmosphere is the exosphere. This begins about between 100-1,200 km or so above the Earth's surface and extends outward roughly 14,370 km (40,000 miles), probably everything.

In principle, the exosphere is dimension where particles are still bound to Earth.

Here is an image of some of the satellites that orbit the Earth. Note how close the International Space Station (ISS) and Hubble Telescope are compared to some other satellites!



Satellites & the GPS System

Name: _____

Satellites & the GPS System

Many artificial satellites orbit the Earth. These include one-orbit Earth

satellites or go into Earth's orbit and crash back down again in a few short months.

Others are in low Earth orbit for a few years. They remain in space.

Others are in high Earth orbit for many years. They remain in space.

Others are in geosynchronous orbit for many years. They remain in space.

Others are in the exosphere for many years. They remain in space.

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