

Ecology

Ecology is the scientific study of interactions among organisms and between organisms and their environment or surroundings.

An ecologist is a person who studies the interactions between organisms and the environment.

on test

7 Levels of Organization Studied by Ecologists

The levels of organization studied by ecologists are organisms, species, populations, communities, ecosystems, biomes and finally the biosphere.

7 Levels of organization

- 1) organism - a single living thing
- 2) species - group of organisms so similar to one another that they can breed and produce fertile offspring
- 3) population - group of individuals that belong to the same species and live in the same area (Not a count of every single organism all together)
 ex) Human Populations is separate from Cow Population
- 4) community - a collection of different populations that live together in a defined area
- 5) ecosystem - a collection of all the organisms that live in a particular place together with their nonliving, or physical environment
- 6) Biome - Is a collection of animals and plants in an area
- 7) Biosphere is all parts of and around the planet Earth where life can be found

add to notes

NOTES - Ecological Organization.pdf

4 Spheres of Earth

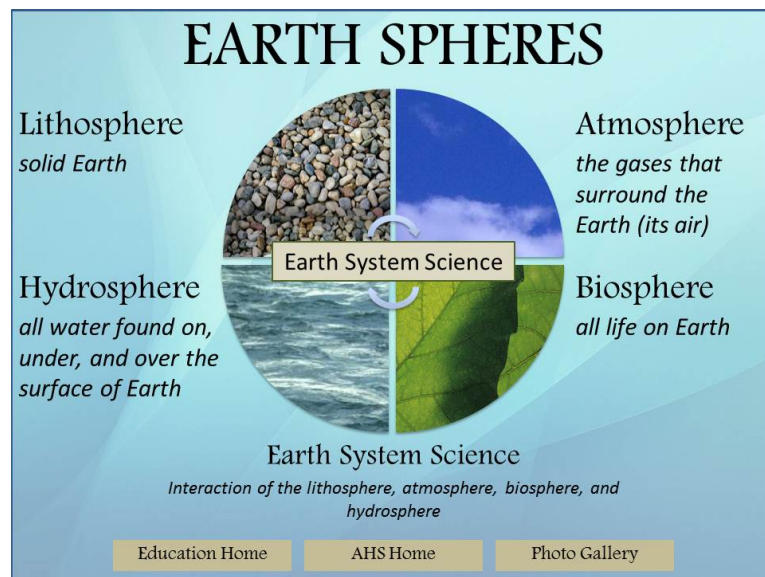
The spheres are the four subsystems that make up the planet Earth. They are called spheres because they are round, just like the Earth.

1) Geosphere - all the rock on Earth

2) Hydrosphere - all the water on Earth

3) Atmosphere - all the gases surrounding Earth

4) Biosphere - all the living things on Earth



Geosphere

Geo means “earth.” The Earth’s geosphere (sometimes called the lithosphere) is the portion of the earth that includes rocks and minerals. It starts at the ground and extends all the way down to Earth’s core.

We rely on the geosphere to provide natural resources and a place to grow food. Volcanos, mountain ranges, and deserts are all part of the geosphere. Put simply, without the geosphere, there would be no Earth!



The Rock Cycle

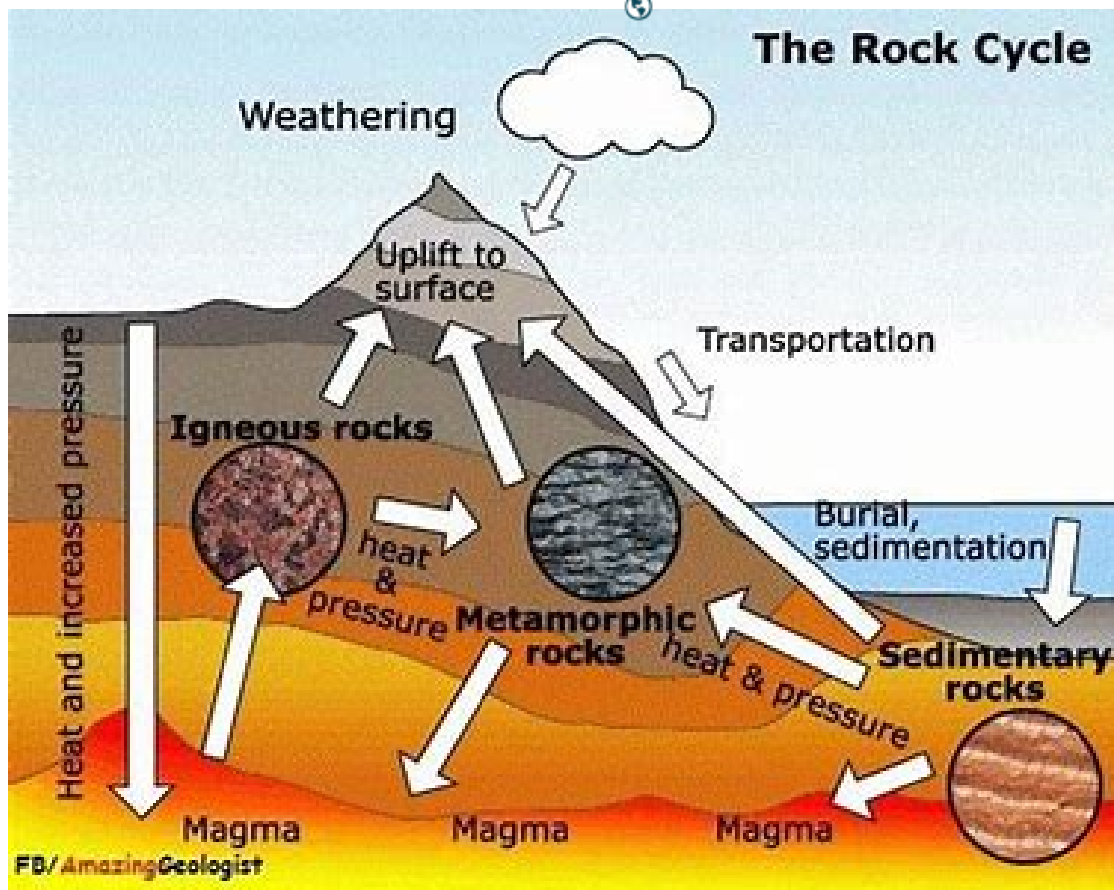
311-2

Weathering: Sediment comes from larger rocks that have broken down or worn away by a natural process called weathering.

This can happen mechanically, chemically or biologically.

[Bill Nye - The Science Guy - S03 - E04 - Rocks & Soil](https://www.dailymotion.com/video/x3jyuty)

<https://www.dailymotion.com/video/x3jyuty>

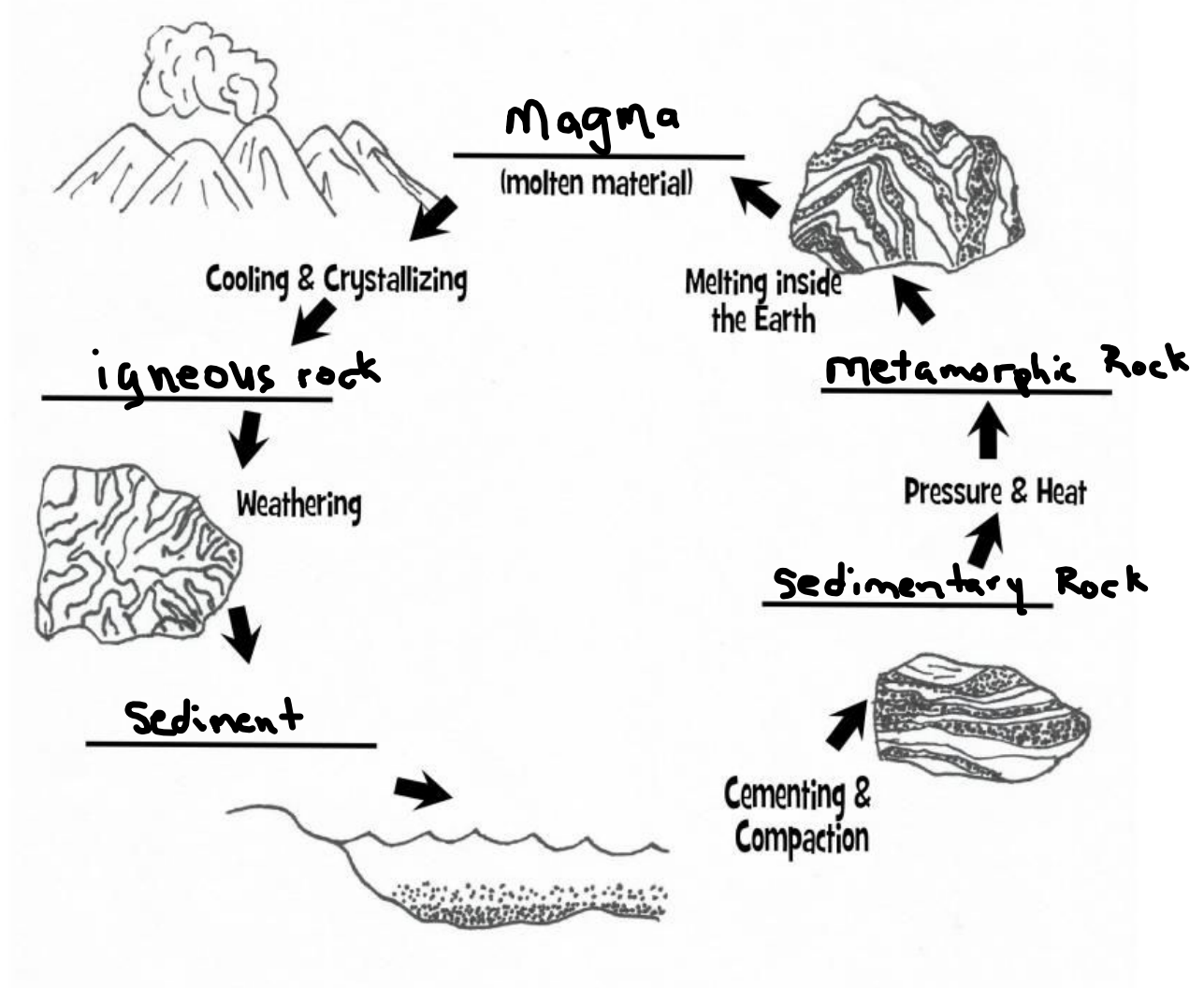


solution

The Rock Cycle

Fill in the blanks to complete the rock cycle using these words:

metamorphic rock	igneous rock	sedimentary rock
	magma	sediment



Layers of Learning

Linking Geosphere to other spheres with climate



As climate changes, the geosphere interacts with various other parts of the Earth system.

Biosphere: The carbon cycle, usually linked with the Earth's biosphere, includes deep storage of carbon in the form of fossil fuels like coal, oil, and gas as well as carbonate rocks like limestone.



Here living things break apart rock.

Cryosphere: Glaciers and ice sheets, parts of the cryosphere, have a large impact on the rocks and sediments below them. They erode rocks on the geosphere and push rocks up and over the land as they melt and move.

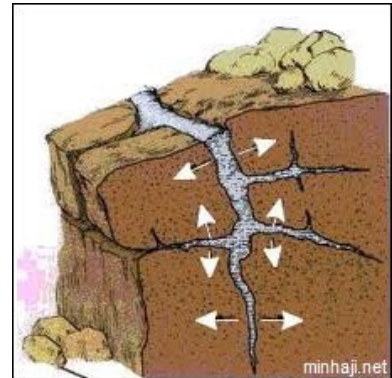
Hydrosphere and Atmosphere: The erosion of rocks, a major part of the rock cycle and change in the geosphere over time. Erosion, transportation, and deposition of sediments wouldn't occur without the hydrosphere's rivers, lakes, and ocean or the atmosphere's winds and precipitation.

Different combinations of sedimentary rocks form in environments with different climate conditions. This allows geologists to reconstruct what an environment was like millions of years ago based on the sedimentary rocks that were deposited.

Mechanical Weathering

This is the physical break up or disintegration of rocks.

Ex: Rocks rolling down a slope or fast moving stream rub and bump against each other.



Climate change can also cause mechanical weathering. During the freeze thaw period we get Frost wedging. (warm in day but temps drop below freezing at night) water seeps into the rocks freezes and expands. This causes cracks and eventually the rocks break apart.

Frost Wedging: Water seeps into rocks and freezes then expands cause rocks to break.

<https://www.youtube.com/watch?v=BxmAJMj5Nk> 7 min.





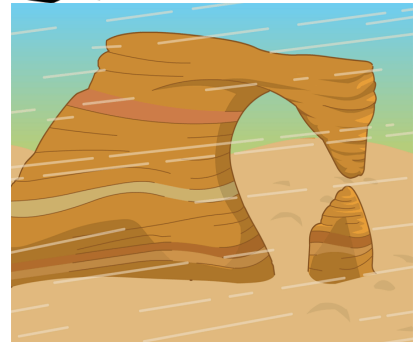
Erosion is another form of mechanical weathering. Erosion is the process of moving soil and rocks from one place to another (wind/water)

[Bill Nye the Science Guy - S05E14 Erosion - YouTube](#)
Bill nye erosion 20 min

[PEI COASTAL EROSION - YouTube](#)

<https://www.youtube.com/watch?v=dm-1FUOL1x4>

<https://www.youtube.com/watch?v=R-Iak3Wvh9c>



Assignment in the computer lab)

Hydrosphere

Jan. 15

Hydro means “water.” The hydrosphere includes the oceans, rivers, lakes, groundwater, and water frozen in glaciers.

97.5% of water on Earth is found in the oceans (Salt water- cannot drink)

2.5% being fresh water.

FRESH WATER

1st- Most is from glaciers & polar ice caps

2nd trapped underground

3rd liquid form on the surface as lakes and rivers

4th found in the atmosphere

[Why Melting Polar Ice Caps Are Showing Up In Canada | Angry Planet | Earth Stories - YouTube](#)



Water is one of the most important substances needed for life and makes up about 90% of living things. Without water, life would not be possible.



Remember Rain

One important source of fresh water that is often overlooked is rainwater.

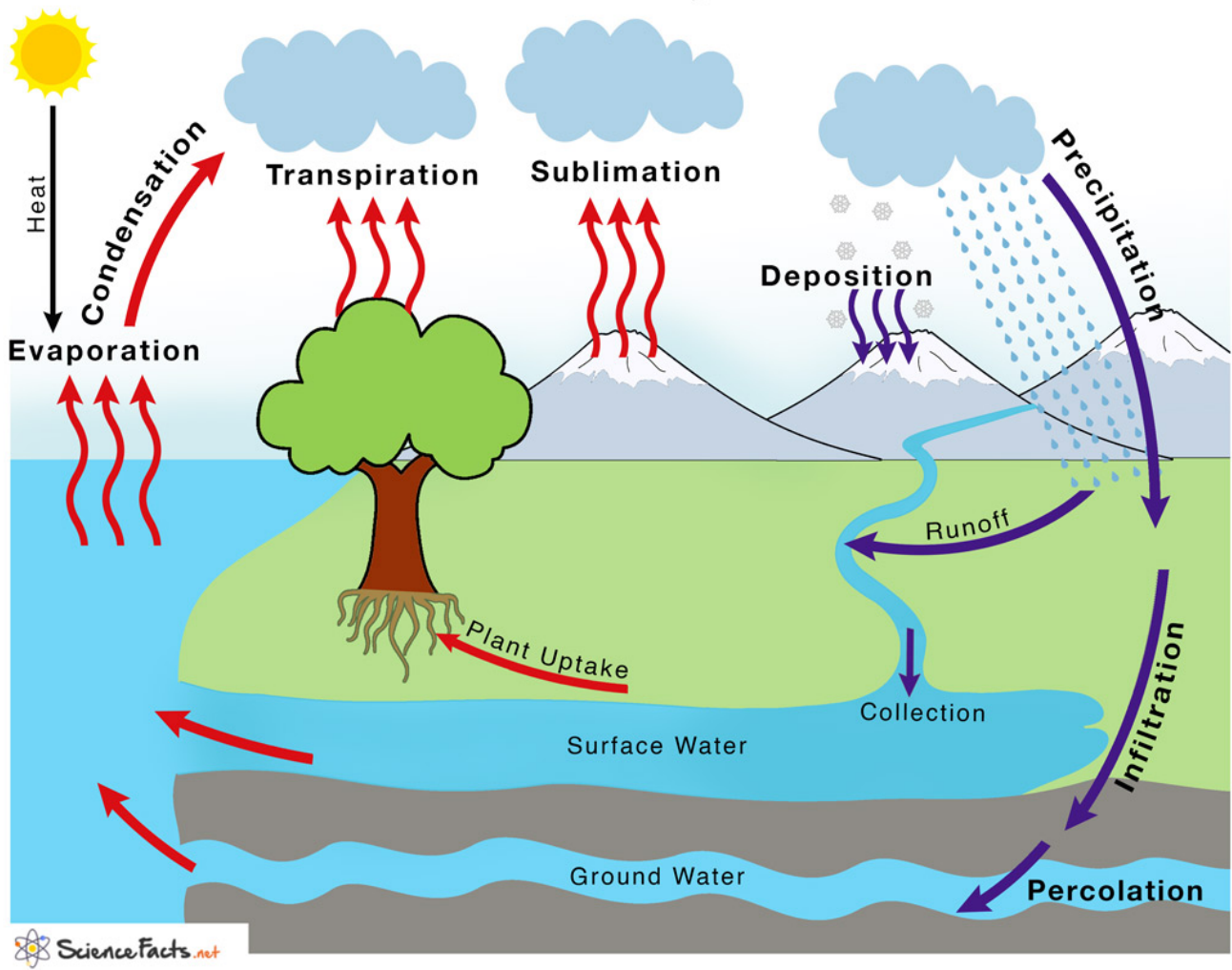
Rainwater is the product of **water from the Earth that has been evaporated into the Earth's atmosphere and is turned into rain (Fresh).** During that

process, the water becomes fresh water and is cultivated in many places throughout the world to be used as a suitable supply of drinking water and water to feed crops. Harvesting rainwater is a technology that has been used by ancient civilizations and is one that is still widely used in many rural areas to make the most out of an endless supply of fresh water that is often taken for granted

[Greenland's rapid ice melt could mean more flooding, climate experts say | Nightline - YouTube](#)



Water Cycle



Evaporation- the process of turning from liquid into vapor using heat

Condensation is the process where water vapor becomes liquid. (Cooling)

Transpiration is the evaporation of water from plants.

Sublimation- is the conversion of a substance from the solid to the gaseous state without its becoming liquid

Deposition- is a change from gaseous state into a solid state without passing through a liquid phase (cooling quick)

Infiltration is the downward movement of water into the top layer of soil

Percolation is the downward movement of water through lower soil layers due to gravity and gaps in soil

Runoff is the excess water that flows over the land surface instead of being absorbed into groundwater or evaporating.

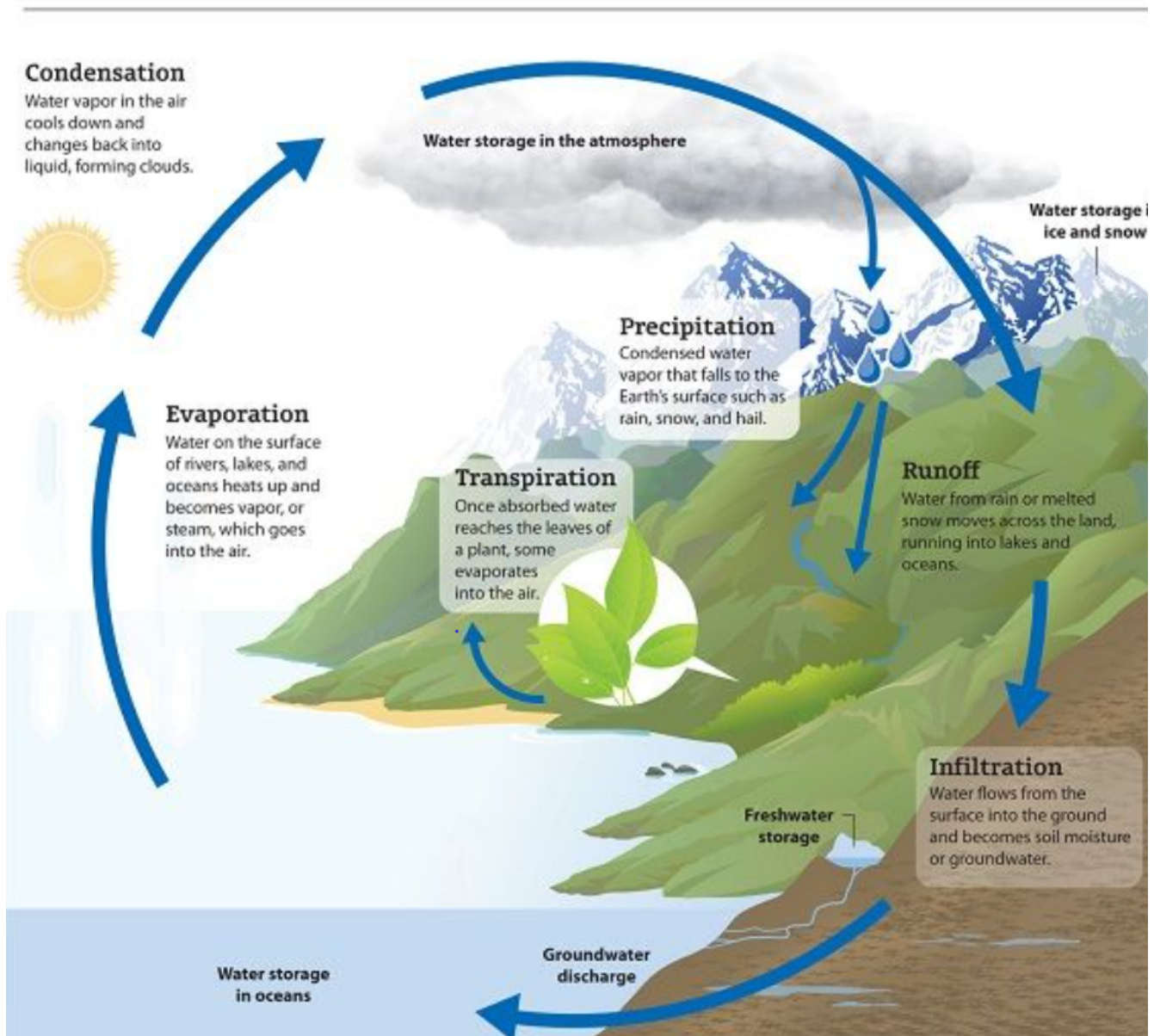
Groundwater is water that occurs below the surface of Earth

Surface water is any body of water above ground, including streams, rivers, lakes, wetlands, reservoirs, and creeks

Plant uptake- are the roots that gather the water and nutrients from the soil

The Water Cycle

The sun plays a big role in the water cycle. The Sun provides thermal energy and heats bodies of water which then evaporates into the atmosphere becoming water vapor.



What Role Does Gravity Play In The Water Cycle?

Gravity causes precipitation to fall from clouds and water to flow downward on the land through watersheds. Energy from the sun and the force of gravity drive the continual cycling of water among these reservoirs. As the water is heated, it changes state from a liquid to a gas.

The Oceans



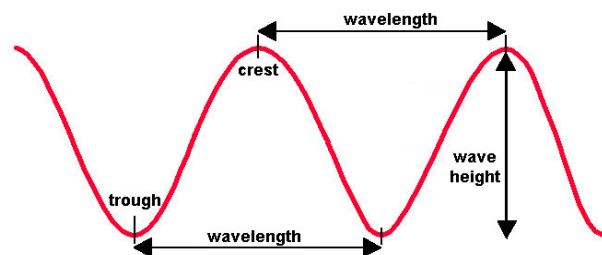
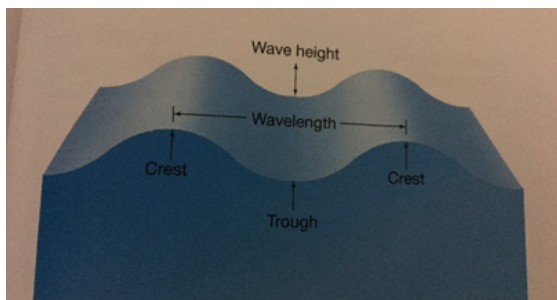
The ocean is never still. You can see it moving in the waves that crash ashore. On the open water, sailors witness broad, slow-flowing "rivers" at the ocean's surface. These movements carry enormous amount of water over hundreds of kilometers from one part of the ocean to another. Huge masses of cold water creep along the ocean floor than rise from the depths to the surface.

What causes waves?



You can find this in a hot bowl of soup! If you blow on the soup to cool it, your breath makes small ripples on the surface of the liquid. Ocean waves are just large ripples, set in motion by steady winds.

Waves begin on the open sea. Their height depends on how fast, how long and how far the wind blows over the water. An increase in one of these variables can cause an increase in wave height. Normal winds produce waves of 2-5m in height. Hurricane winds can create waves 30m high. Even on a calm day, there is usually a steady movement of smooth waves near the shore. These smooth waves are called **swells**.



[Biggest Waves Ever Recorded On Camera - YouTube](https://www.youtube.com/watch?v=5_HefhiwioE)

https://www.youtube.com/watch?v=5_HefhiwioE



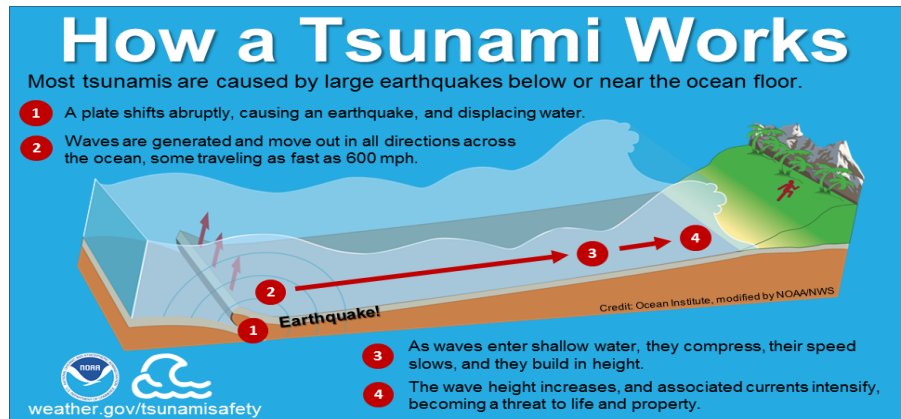
Tsunami

Tsunami - a long high sea wave caused by an earthquake, underwater landslide, or other disturbance



watch the Impossible - Netflix

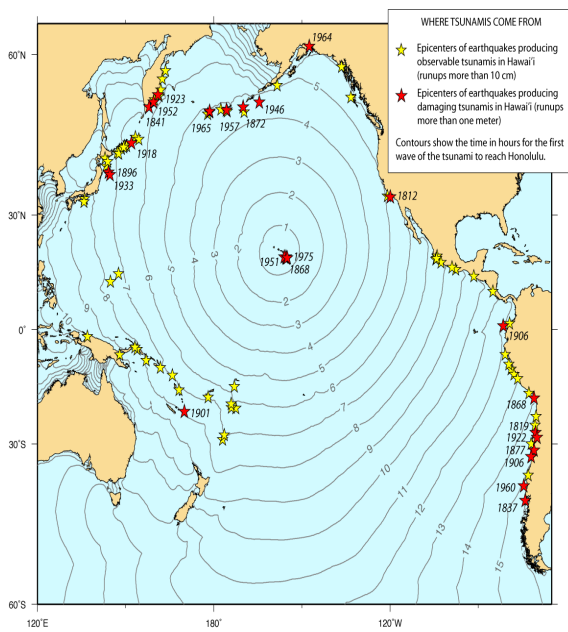
Article



[The Impossible Real Family Now - True Story of Maria Belón Family \(oprahdaily.com\)](https://www.oprahdaily.com)

[Watch a massive tsunami engulf entire towns in Japan \(2011\) \(youtube.com\)](https://www.youtube.com)

[What Happened After Japan's \\$200 BILLION Disaster: Stories from the Tsunami \(Documentary\) \(youtube.com\)](https://www.youtube.com)



Hawaii is the location that experiences the most Tsunamis since it is surrounded by the ring of fire.

Salt Water

Rivers around the world flow down from hills and across the land before finally pouring their water into the ocean basins. Traces of muddy water from the largest rivers, such as the Amazon River in South America, can be detected as far as 1000 km out from the coastline. Ocean water, however, is not the same as river water. If you have ever swam in the sea and accidentally got some water in your mouth, you know the main difference. Ocean water is salty.



On average 1000 g of seawater contain 35 g of dissolved salts. This is usually expressed as 35 parts per thousand (ppt). By far the most common material in this solution is sodium chloride. This is the same chemical substance as the table salt you use to season food. The next most plentiful salts are composed of sulfates, magnesium, calcium, and potassium. **The measure of the amount of salts dissolved in a liquid is known as salinity.**

Salinity- The measure of the amount of salts dissolved in a liquid.

[A journey through the Atmosphere \(youtube.com\)](#)

Atmosphere

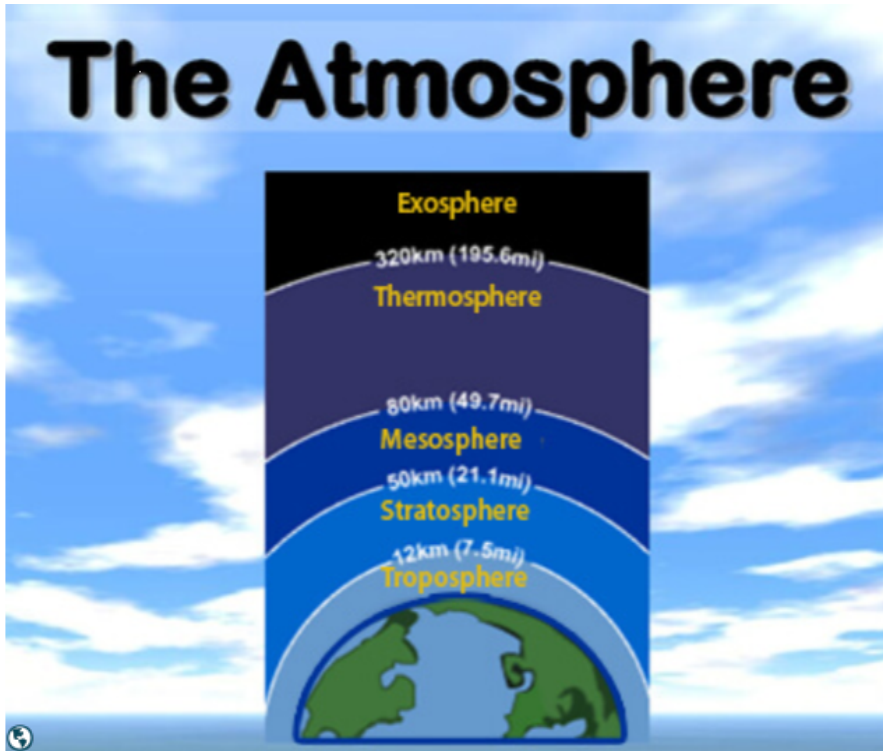
7 min

Atmos means “air.” The atmosphere includes all the gases surrounding the Earth. We often call the atmosphere “air.” All planets have an atmosphere, but Earth is the only planet with the correct combination of gases to support life.

The atmosphere consists of five layers and is responsible for Earth’s weather. Even though it seems like air is made of nothing, it consists of particles too small to be seen. All these particles have weight that push down on Earth. The weight of air above us is called air pressure.



Atmosphere on Earth



[How Do Spacecraft Return To Earth? \(youtube.com\)](https://www.youtube.com/watch?v=...)



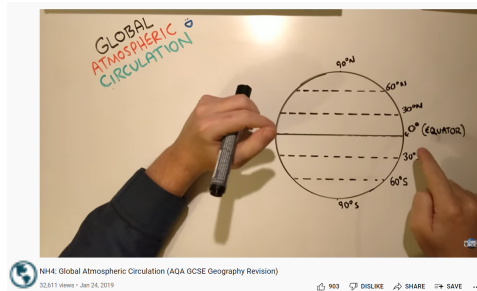
The earth is surrounded by the atmosphere, which protects us from radiation from the sun, falling meteors and toxic gases. It consists of 5 layers:

- 1) Troposphere- starts at the Earth's surface and extends 12 kilometers high. It is the most dense. Almost all weather is in this region and our oxygen that is needed to breathe is found here.
- 2) Stratosphere - starts just above the troposphere and extends to 50 kilometers high. The ozone layer, which absorbs and scatters the solar ultraviolet radiation, is in this layer. Ozone layer is getting thinner due to pollution. Airplanes fly in this layer to avoid turbulence.
- 3) Mesosphere -starts just above the stratosphere and extends to 80 kilometers high. Meteors burn up in this layer. Coldest layer.
- 4) Thermosphere- starts just above the mesosphere and extends to 320 kilometers high. Northern lights and satellites occur in this layer. Warmest layer
- 5) Exosphere- upper limit of our atmosphere. It extends from the top of the thermosphere up to 10,000 km. Hydrogen and helium found there and the air is very thin.

Atmospheric Flow

- is how air moves around on our planet.

The flow of the atmosphere generally moves in a west to east direction. This however can often become interrupted, creating a more north to south or south to north flow.



Water in the Air

Recall

97.5 % of water on earth is salt water and 2.5% is fresh water. Only 0.3% of the fresh is of liquid form.

Nearly all of the water is located in the lowest layer of the atmosphere, the troposphere.

Water is present in variable amounts in the atmosphere, from 0 % to 4 %.

Unlike oxygen and nitrogen, the concentration of oxygen depends on local weather conditions and changes greatly from place to place on Earth.

Clouds form preferentially over dark vegetation and just downwind of mountain ranges.

The water in the atmosphere makes up only a very small percentage of the total water on Earth.

In the atmosphere, water exists as a gas (water vapor from evaporation), as a liquid (droplets of rain and liquid water that coats solid particles), and as a solid (snow and ice). Its structure depends on its state.

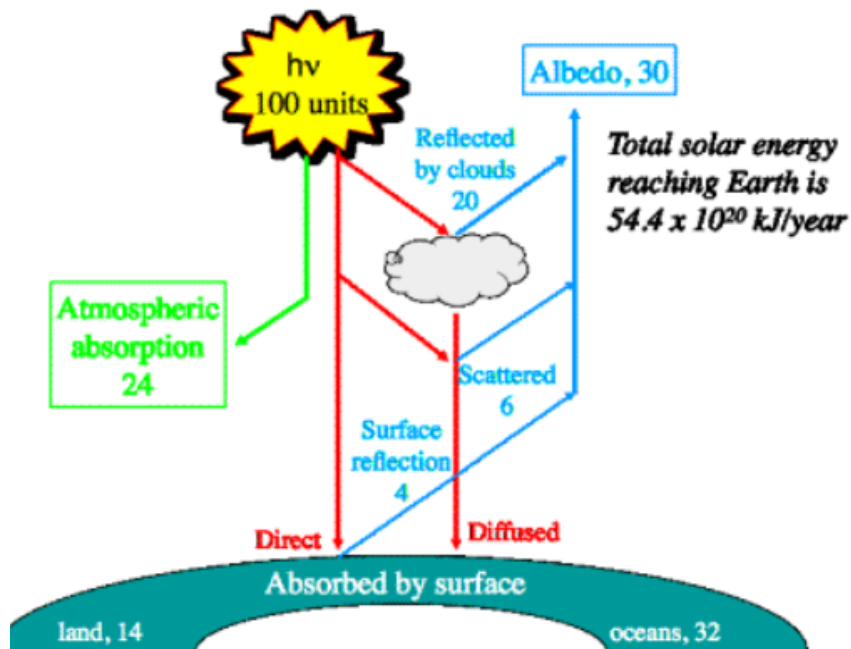
Water and Solar Energy

Water vapor is a clear, colorless gas. It does not absorb visible light so it is unaffected by most of the solar radiation in the troposphere. However, water vapor is a greenhouse gas. It absorbs heat energy from the Earth.

Clouds and fog are not gas-phase water. These consist of particles of liquid and solid water that reflect approximately 20 percent of the incoming solar radiation in the troposphere. This makes the atmosphere and the Earth's surface cooler than it would be otherwise.

Albedo is the amount of solar radiation that is reflected by some surface.

- It can be calculated and represented with a decimal with 1 being a perfect reflector and 0 absorbing all incoming light
- It can also be calculated as a percent

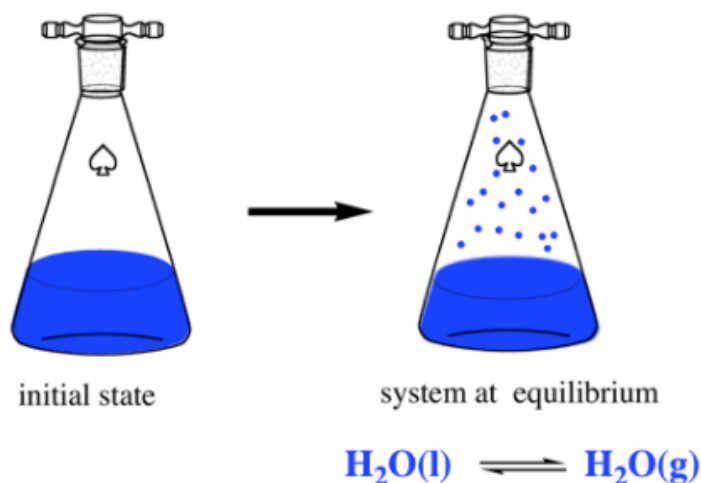


Humidity

Humidity is the concentration of water in the gas phase that is present in air. In central Illinois summertime, the humidity is very high!

Gas concentration relates the amount of gas molecules in a volume. The amount of gas can be expressed in molecules, moles, or grams. The volume can be in liters, cubic meters, or cubic centimeters. **Molar concentration** is the number of moles per liter (mol/L or M).

Imagine that you put some water in an empty container and seal it. After a while, some of the water will evaporate. Water will continually evaporate and condense but, after a while, the net amount of water in the gas phase will remain constant. The water(g)-water(l) system is at **equilibrium**.



The concentration of the water in the gas phase depends on temperature and pressure.

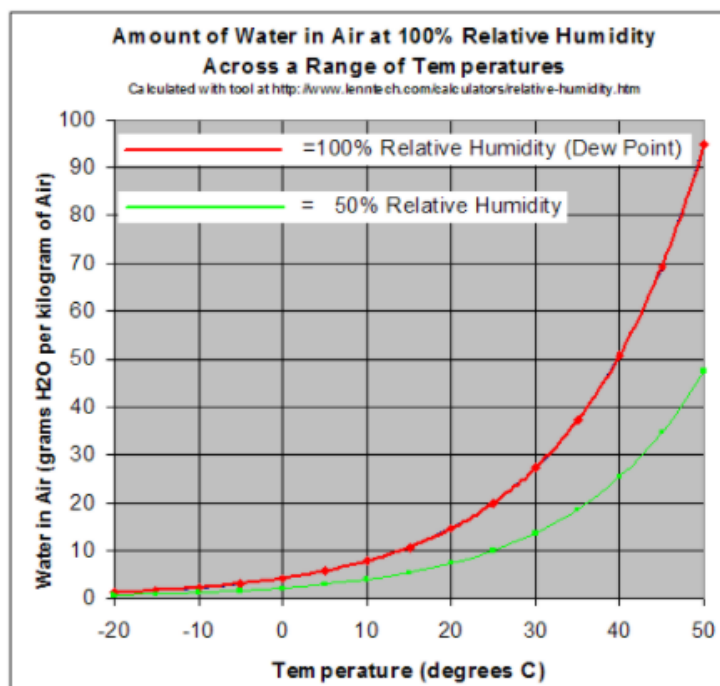
1. Heating the water from room temperature (~20 deg C) to 70 deg C will cause the amount of water in the gas phase to increase to a higher but constant amount.
2. Decreasing the temperature to 5 deg C will cause some water vapor to condense until a new, lower constant concentration is reached.
3. Adding air to the container to increase the pressure will cause some water vapor to condense until a new, lower constant concentration of water(g) is reached.

The troposphere is like a very large container. It can take a long time for the equilibrium condition to become established, but the maximum amount of water(g) present in the will depend on temperature and pressure.

The **relative humidity** is the ratio of the actual water vapor pressure to the saturation water vapor pressure (equilibrium value) at the prevailing temperature and is expressed as a percentage. At 100% relative humidity, the water(l)-water(g) system is at equilibrium.

The **dew point** is the temperature to which the air must be cooled before water condenses from it.

Note that the values in the graph at right are not true concentration values but relate the mass of water per mass of all gas molecules.



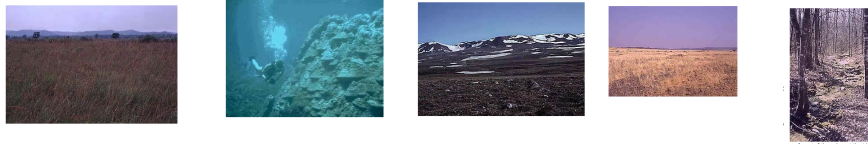
Biosphere

Bio means “life.” The biosphere is made up of all the living things on Earth and it includes fish, birds, plants, and even people.

The living portion of the Earth interacts with all the other spheres. Living things need water (hydrosphere), chemicals from the atmosphere, and nutrients gained by eating things in the biosphere.



biome - a group of terrestrial communities that covers a large area and is characterized by certain soil and climate conditions and particular plants and animals



Five Major Types of Biomes

Aquatic
Deserts
Forests
Grasslands
Tundra



Add to notes

To understand a world biome, you need to know:

- What the climate of the region is like.
- Where each biome is found and what its geography is like.
- The special adaptations of the vegetation.
- The types of animals found in the biome and their physical and behavioral adaptations to their environment.



biosphere - contains all living things on portions of earth & the combined, including land, water, and air, or atmosphere.
- extends from about 8 km above Earth's surface to as far as 11 km below the surface of the ocean

Biosphere 2 Jayne Pointer



Some terms we use with trees ^{Apr. 9}



Coniferous Forest

vs

Deciduous Forest

Deciduous = the dropping of a part that is no longer needed, in this case leaves

Coniferous = bearing pinecones, most of which are evergreen

Evergreen = retaining leaves year round, therefore remaining “forever green”

Broadleaf = a thin, broad leaf structure with a good deal of surface area

Needle = a thin, long modified leaf typical of conifers

Hardwood = another commonly used word for deciduous, broadleaf trees

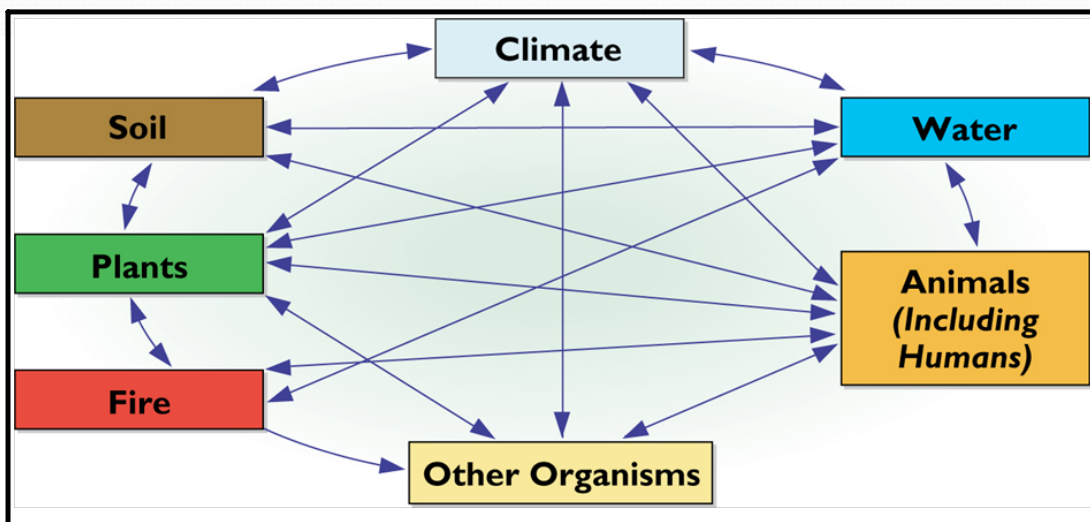
Softwood = usually refers to coniferous trees

Ecosystems

- All of the organisms living in an area together with their physical environment.
- There can be great variation from one ecosystem to another.
- However, ecosystems overlap.
- Requirements include energy, mineral nutrients, water, oxygen, and living organisms.

Apr. 11

An ecosystem is made up of all of the living and nonliving things in an area. This includes all of the plants, animals, and other living things that make up the communities of life in an area. An ecosystem also includes nonliving materials—for example, water, rocks, soil, and sand.



Factors in Ecosystems

Biotic (living) factors include:

- Plants } organisms
- Animals }
- Dead organisms & Waste Products
(came from living at one time)

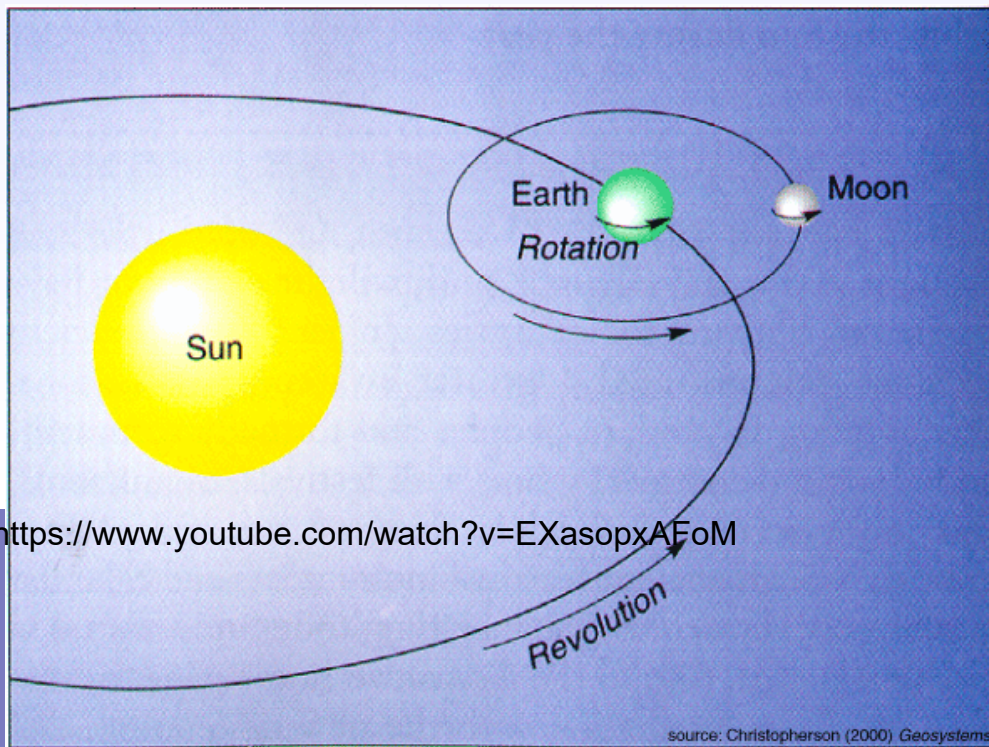
Abiotic (nonliving) factors include:

- Air
- Water
- Soil
- Rocks
- Light
- Temperature
- Climate

Revolution -The movement of
an object around another.

earth (goes around sun)
↳ Earth takes 1 year = 365 days

↳ counter clockwise



<https://www.youtube.com/watch?v=EXasopxAFoM>

source: Christopherson (2000) Geosystems

The diagram illustrates the concept of Earth's axis tilt through three analogies and a child's observation:

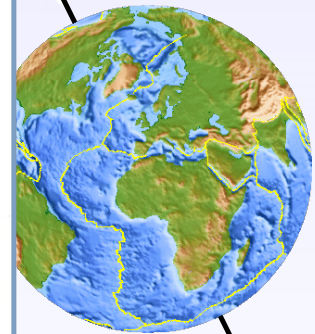
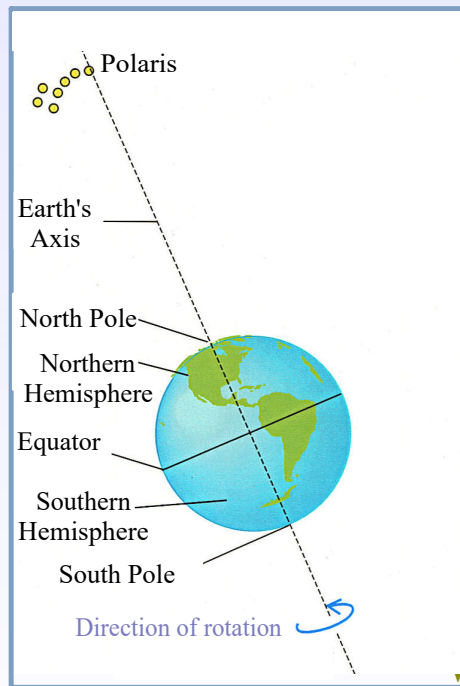
- SKATER:** A figure skater is shown spinning on ice with her arms raised. A vertical line passing through her center is labeled "Vertical Axis".
- EARTH:** A globe of Earth is shown tilted. A line passing through its center is labeled "Axis". The angle between this axis and a horizontal line labeled "Ecliptic" (with an arrow pointing "To the Sun") is labeled "23.5° Angle".
- LOG:** A log is shown floating in water, spinning around a horizontal line passing through its center, labeled "Horizontal Axis".
- Child's Observation:** A child's face is shown with a speech bubble that says "Look!!! The Earth is tilted on its axis". A dashed arrow points from the speech bubble to the Earth's axis.

A purple-bordered box on the right contains the definition: **Axis- An imaginary line from the north pole to the south pole.**

(Spinning)
Rotation -
The
movement
of
an object
around its
axis.



f



What about the other planets?
[Click Here](#)

6

Earth rotates Counter clockwise

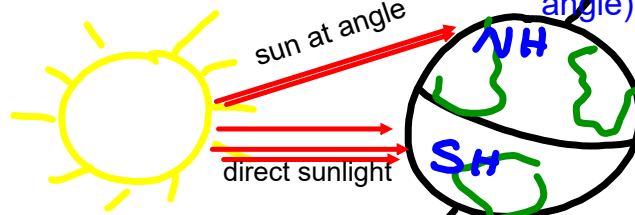
→ 24 hours

Cycles of Earth

Summer in NH because it is tilted towards the sun, so you get direct sunlight



Winter in SH because it is tilted away from sun, so you get indirect sunlight (light at an angle)



Winter in NH because it is tilted away from sun, so you get indirect sunlight (light at an angle)

Summer in SH because it is tilted towards the sun, so you get direct sunlight

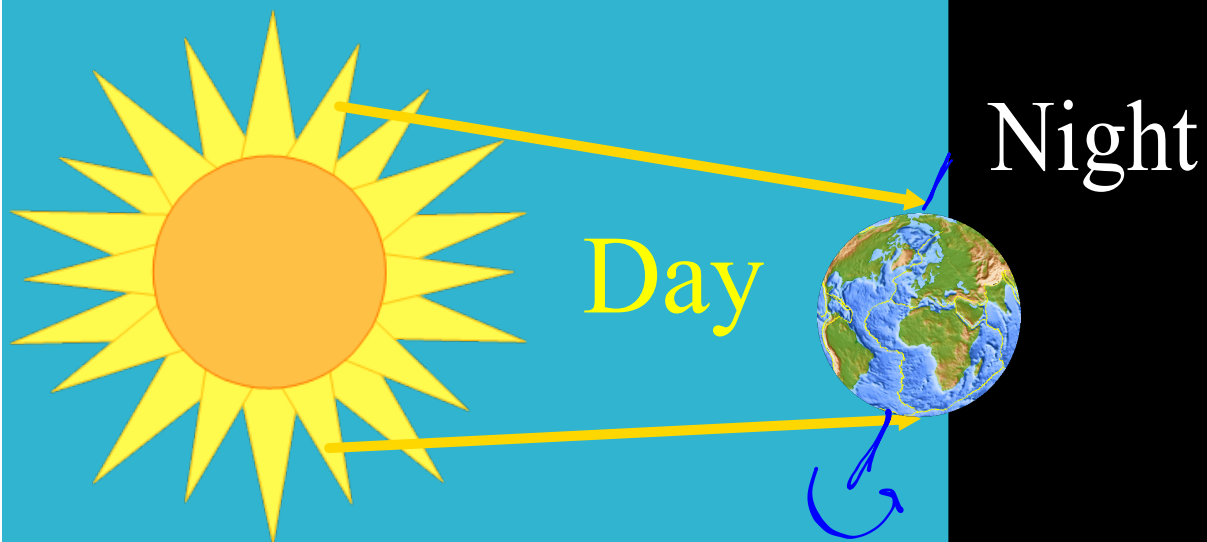
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The Revolution of the Earth and the tilt of the Earth both cause the Earth to have Seasons.

* Study

[Earth's Tilt 1: The Reason for the Seasons \(youtube.com\)](https://www.youtube.com/watch?v=...)

As the Earth rotates on its axis, the part of the Earth facing the Sun is experiencing day, and the part away from the Sun is experiencing night. **One rotation of Earth takes 24 hours.**



Rotation is the Reason for Day & Night



As the Earth spins, the side facing the sun is in the daylight.

The side away from the sun is night.



Attachments

NOTES - Ecological Organization.pdf

TEXT - Water and Nitrogen Cycles.pdf

Science 7 Rock Assignment 1.docx