6th Grade Science

From Simple Studies, https://simplestudies.edublogs.org & @simplestudiesinc on Instagram

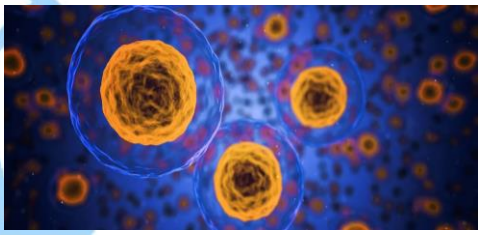
Ecology:

Characteristics of Life:

All living organisms….

- **Need the energy to carry out life processes**

Energy is the ability to do physical work. This work includes everyday processes such as walking, talking, and even thinking. Without energy, you would not be able to complete simple tasks like these. Different organisms get their energy in different ways. Animals obtain energy by eating, plants create their own energy through a process called photosynthesis, and fungi get their energy through other organisms. https://pixabay.com/images/id-1872666/



- **Are composed of one or more cells**

A **cell** is the smallest structure in any organism. Tiny organisms are **unicellular** or made up of only one cell, but organisms like humans are **multicellular** or made up of multiple cells.

- **Respond to their environment**

All living organisms need to be able to respond to **stimuli**, factors that induce a reaction. Different types of stimuli include changes in light, sound, heat, and chemical and mechanical touch all due to the environment.

- **Grow and reproduce**

Organisms must reproduce to keep their species alive through the generations. If there is no reproduction occurring, the species will die out and go extinct. They can either reproduce **asexually**, where an organism creates an exact clone of itself, or **sexually**, where two organisms work together to create unique offspring.

Characteristics of Life (continued):

- **Maintain a stable internal environment**

All organisms must be able to maintain a stable internal environment or a state of **homeostasis**. Homeostasis is a condition where there is a balance inside the body. For example, an organism may be unbalanced internally when it is warm outside. To reach homeostasis, they sweat to get rid of the excess heat.

https://pixabay.com/images/id-1300623/

Abiotic and Biotic Factors:

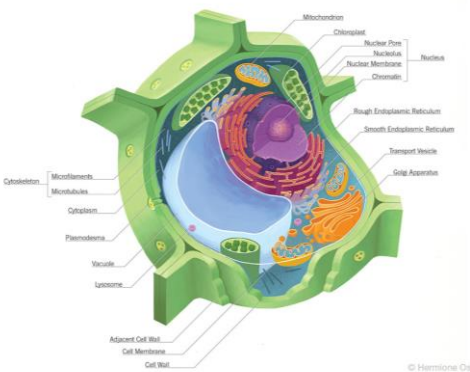
- **Biotic Factors** includes all living parts of an **ecosystem**
  - Material from once-living **organisms**
  - Waste products from living organisms
  - EX: Bacteria, dogs, flowers, fungi
- **Abiotic Factors** include all non-living parts of an ecosystem that influence biotic factors
  - Living organisms rely on these factors in order to survive
  - EX: Rain, rocks, air, temperature

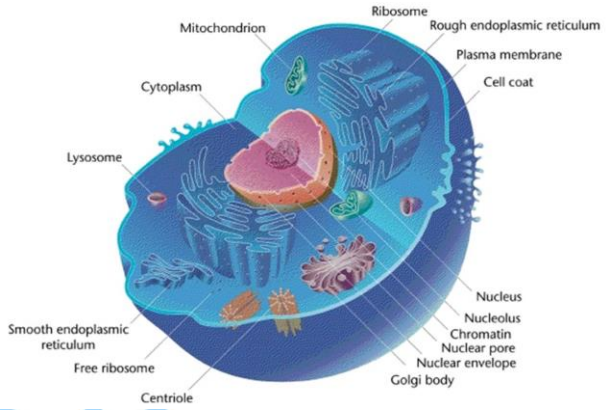
Prokaryotic vs Eukaryotic:

Cells are the basic unit of all living things.

Eukaryotic Cells

- Larger and more complex than Prokaryotic cells
- Have a **nucleus**
- **Multicellular** (more than one cell) or **unicellular** (single-celled)
- **Membrane-bound** organelles
- Ex. Plant and Animal cells





Plant Cell Animal Cell

https://pixy.org/1019390/

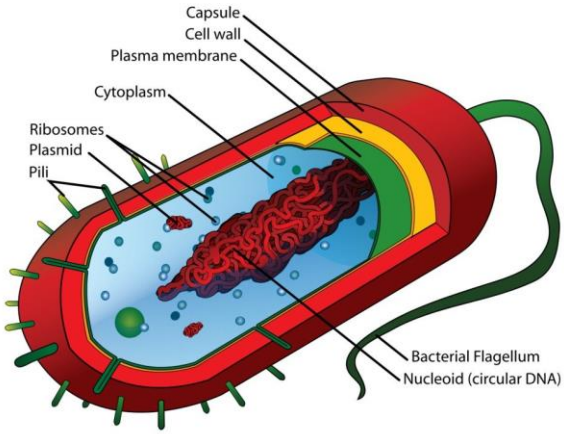
https://commons.wikimedia.org/wiki/File:Eukaryotic_Cell_(animal).jpg

Prokaryotic Cells

- Very small in size
- **Unicellular** (single-celled)
- No nucleus

  EX: Bacteria and archaea

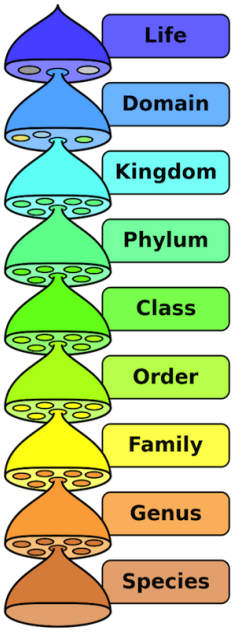
  https://bit.ly/3aBDzxa



Classification of Living Things:

All organisms are classified into several categories, the most commonly-learned about ones being domains and kingdoms. There are three domains of life:

- **Archaea:** ancient microorganisms
- **Bacteria:** advanced prokaryotic microorganisms
- **Eukarya:** all plants and animals



Classifications of Life

Kingdoms are a more specific classification of a domain. There are four kingdoms within Domain Eukarya:

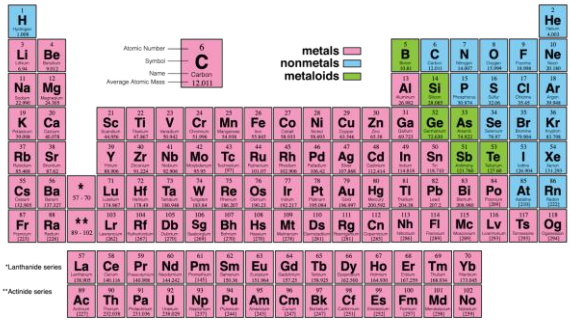
- **Kingdom Protista:** organisms with one eukaryotic cell
- **Kingdom Fungi:** all fungi organisms
- **Kingdom Plantae:** organisms including trees, grass, and flowers
- **Kingdom Animalia:** all animal organisms

https://www.shmoop.com/study-guides/biology/eukaryotes/eukaryote-kingdom

Chemistry

Elements: pure substances that consist of one type of **atom**

- Each element has an atomic number that represents the number of protons in a single atom of an element



The periodic table is ordered by ascending number. Elements are divided into **metals**, **metalloids**, and **nonmetals**.

https://commons.wikimedia.org/wiki/File:Periodic_Table_Of_Elements.svg

Properties of Metals

Metals make up most elements. Examples of metals are tin, osmium, zinc, and mercury. Metals exhibit the following properties:

- High **luster** (shiny)
- Metallic appearance
- Good **conductor** of electricity and heat
- **Malleable** (flexible)

https://stock.adobe.com/search/images?k=osmium

Properties of Nonmetals

The properties of nonmetals are almost exactly opposite to those of metals. Examples of nonmetals are oxygen, hydrogen, and carbon. Nonmetals exhibit the following properties:

- Dull appearance
- Not **malleable**
- Brittle
- Do not conduct heat and electricity well
- Not magnetic https://grist.org/climate-energy/one-failed-project-another-over-budget-hint-at-carbon-capture-challenges-under-epa-rules/

From https://simplestudies.edublogs.org

Properties of Metalloids

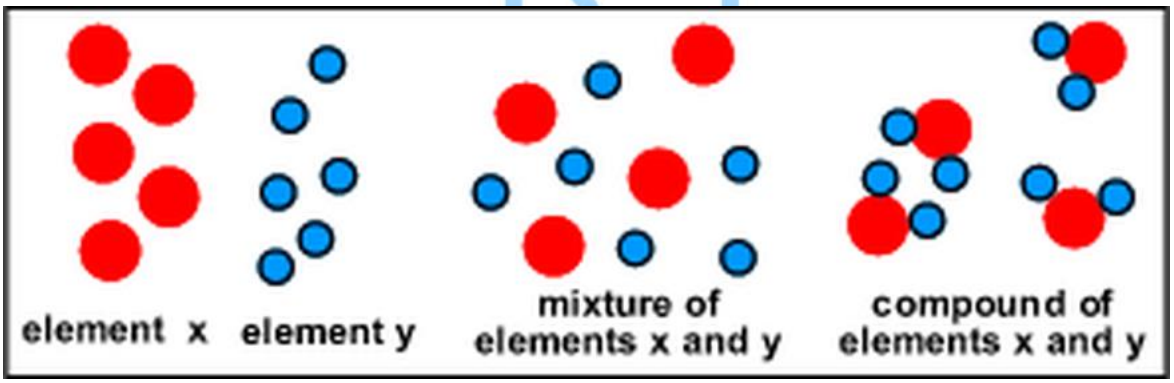
A metalloid has properties of nonmetals and metals. There are very few metalloids on the periodic table. Some common metalloids are boron, silicon, and arsenic. Metalloids exhibit the following properties:

- Dull and/or shiny
- Can conduct heat and electricity however not as well as metals (**semiconductors**)
- Often **ductile** (able to be bent and reshaped) and **malleable**

https://www.stonemania.co.uk/glossary/silicon

Compounds: molecules made of atoms from DIFFERENT elements

- A molecule is any atoms connected by **chemical bonds**



https://sciencewitheberhart.weebly.com/elements-compounds-and-mixtures.html

Physical and Chemical Changes

Physical Change: Changes in the state of matter of a substance. In a physical change, there is no new substance made. The size, shape, and color of the matter might change; however the makeup of the substance will not. An easy way to identify a physical change is by seeing whether or not the change is reversible. If the change can be reversed, then it is physical. Examples of physical changes include:

- Melting or freezing an ice cube
- Origami
- Crumpling a piece of foil
- Boiling water

https://www.britannica.com/science/latent-heat

Chemical Change: Changes where one chemical substance is transformed into a different substance(s). During a chemical change, the atoms and molecules are rearranged to produce completely new substances that were not there before. Some indications of chemical changes are the production of gas (bubbles), odor, or the production of energy such as heat. Examples of chemical changes include:

- Wood burning
- Cooking an egg
- A banana rotting
- Iron rusting

https://www.energy.gov/energysaver/articles/cozy-fire-while-saving-money-and-energy

Energy

Forms of Energy:

There are many types of energy, both **kinetic** and **potential**. Listed below are some of the common types of energy (think C.E.M.E.N.T.):

Chemical Energy: stored within the chemical bonds of an object; potential energy

Electrical Energy: the movement of electrons through electric charges; kinetic energy

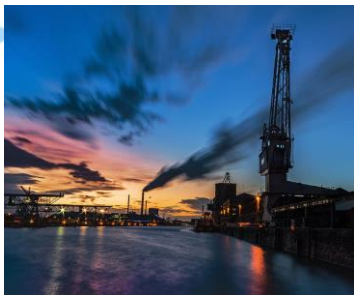
Mechanical Energy: sum of potential energy and kinetic energy

Electromagnetic/Radiant Energy: travels in the form of electromagnetic waves; kinetic energy

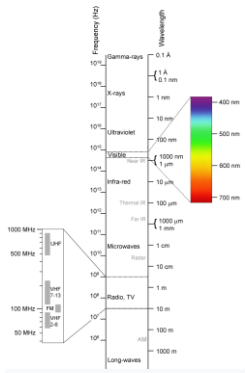
Nuclear Energy: stored within the nucleus of an atom; released through fission or fusion; potential energy

Thermal/Heat Energy: created by quickly-moving atoms inside an object; the faster the atoms move, the more thermal energy is created; kinetic energy

Sources of Energy:

Chemical Energy	fossil fuels	 https://bit.ly/37EY5uN
Electrical Energy	lightning, generators, power outlets	 **https://thenounproject.com/term/electrical-energy/1147958/**

From https://simplestudies.edublogs.org

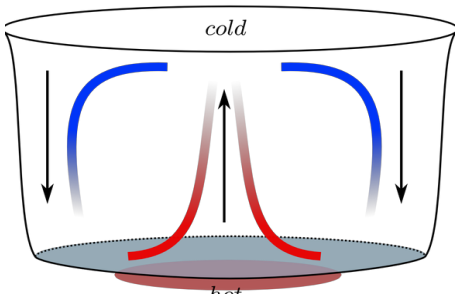
Mechanical Energy	flying plane, wind, flowing water	 https://bit.ly/37KsoAt
Electromagnetic/Radiant Energy	ultraviolet light lamps, x-rays	 English: taken from en.wikipedia en:Image:Electromagnetic-Spectrum.svg and en:Image:Electromagnetic-Spectrum.png (deleted)
Nuclear Energy	sun, stars, nuclear weapons	 https://www.geograph.org.uk/photo/37873
Thermal/Heat Energy	objects melting or freezing	 https://pixabay.com/images/id-64177/

Transfer of Energy:

The **Law of Conservation of Energy** states that energy cannot be created nor destroyed. It says energy can only be transferred from one form to another and that the total amount of energy present before a reaction must equal the amount of energy left over after a reaction.

Thermal/Heat Transfer: Thermal energy travels in three different ways...

- **Conduction:** energy transfer from warmer particles to cooler particles through direct contact
  - ➢ EX: Touching a hot pan, ironing a shirt
- **Convection:** energy transfer through liquids or gases where the cooler particles move downwards and the warmer particles move upwards
  - ➢ EX: water boiling in a pot, a radiator heating a room
- **Radiation:** energy transfer through electromagnetic waves
  - ➢ EX: microwaves, heat lamps



Movement in Convection

https://www.quora.com/Does-convection-take-place-in-all-types-of-fluids

Force and Motion

Potential and Kinetic Energy:

As stated previously, **energy** is the ability to do work. It cannot be created nor destroyed.

Potential Energy: the energy that is stored in an object that is still

- ❖ An object has more (gravitational) potential energy if it is at a higher elevation

Kinetic Energy: the energy that is stored in a moving object

- ❖ An object has more kinetic energy if has a greater mass or it's moving at a greater speed

Forces of Motion:

Balanced forces cause objects to not speed up, slow down, or change directions.

Unbalanced forces speed up, slow down, or change the directions of an object.

The **net force** of an object is the sum of all the forces acting upon it.

Friction also plays a role in the movement of an object. Friction is the resistance an object may or may not experience when moving or being moved. It can cause an object to slow down as it moves.

An Unbalanced Force:

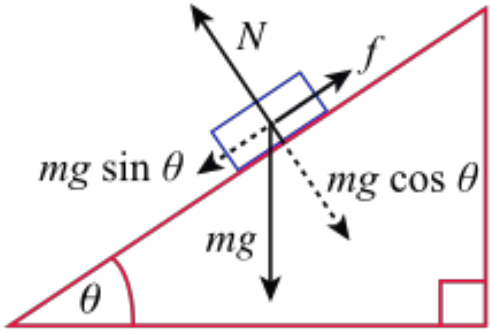
https://quizlet.com/190665314/balanced-and-unbalanced-forces-flash-cards/

Distance, Speed, and Time:

To find the **speed** an object is traveling at, one must divide the **distance** the object moved by the amount of **time** it was traveling.

Simple Machines:

Simple machines are devices invented to reduce the amount of work one has to do. There are six simple machines...



- The **inclined plane** is used to raise heavy objects
- The **lever** is used to slightly lift a heavy object
- The **wedge** is used to split, lift, and tighten objects
- The **wheel and axle** are used together to raise heavy objects
- The **pulley** is used to lift and transport objects
- The **screw** is used to fasten and tighten objects

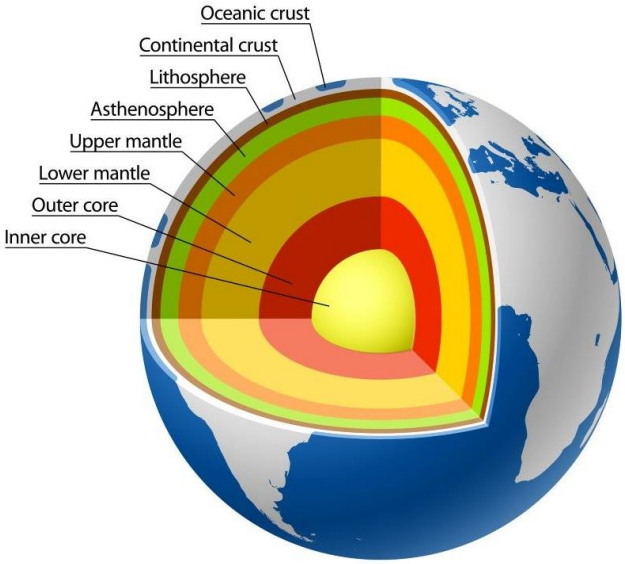
https://en.wikipedia.org/wiki/Inclined_plane

Earth Science

Earth's Interior:

Our planet is made up of multiple layers on the inside. The five main layers are written in order from closest to the exterior to closest to the interior:

- **Crust:** the thinnest, topmost layer of the earth, consists of the continental and oceanic crust
  - **Continental Crust:** made up of granite, roughly 8 kilometers-70 kilometers deep
  - **Oceanic Crust:** made up of basalt, roughly 8 kilometers deep

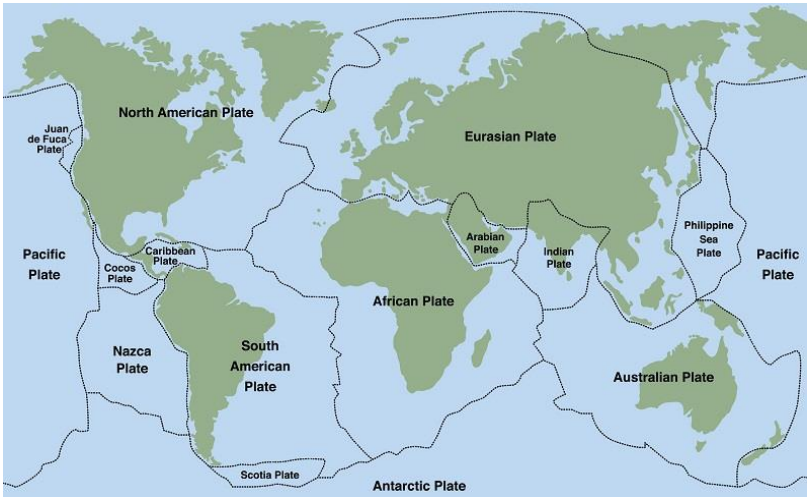


- **Lithosphere:** composed of the crust and a part of the uppermost layer of the mantle, contains the tectonic plates
- **Asthenosphere:** composed of the uppermost layer of the mantle, made up of mostly molten rock that helps the tectonic plates move, roughly 80 kilometers-200 kilometers deep
- **Mantle:** helps the tectonic plates move, roughly 2000 kilometers deep
- **Core:** the hottest, centermost part of the planet, responsible for the magnetic field of our planet, roughly 2900 kilometers deep

https://www.pinterest.com/pin/23643966780398119/

Plate Boundaries/Tectonics:

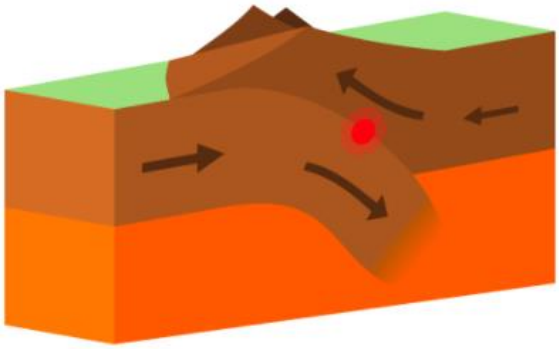
Tectonic plates are portions of the earth that move to create landforms. There are seven large plates and multiple smaller ones. The major plates, shown on the right along with the minor ones, include the African, Antarctic, Eurasian, Indo-Australian (made up of the Indian and Australian plates), North American, Pacific, and South American plates. https://www.worldatlas.com/articles/major-tectonic-plates-on-earth.html



There are three types of plate boundaries: **convergent**, **divergent**, and **transform**.
The two types of crusts, **continental** and **oceanic**, are what move when the plates move. The continental crust is less dense than the oceanic crust, meaning whenever they collide, the continental crust will subduct underneath the oceanic one. **Subduction** is the movement of one plate going below another. Landforms are made based on the movement of tectonic plates.

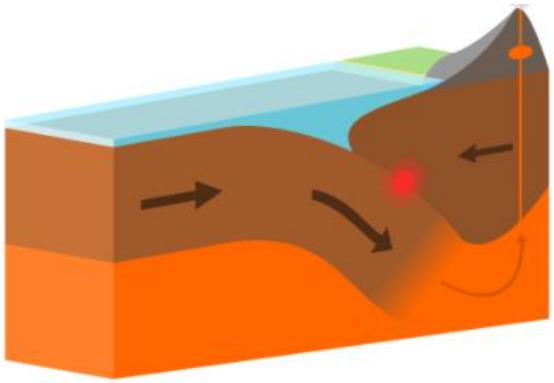
Continental/Continental Convergent:

- Movement: Plates move towards each other and push up against each other.
- Landforms/Natural Disasters Formed:
  - Folded mountains
  - Mountain ranges
  - Earthquakes



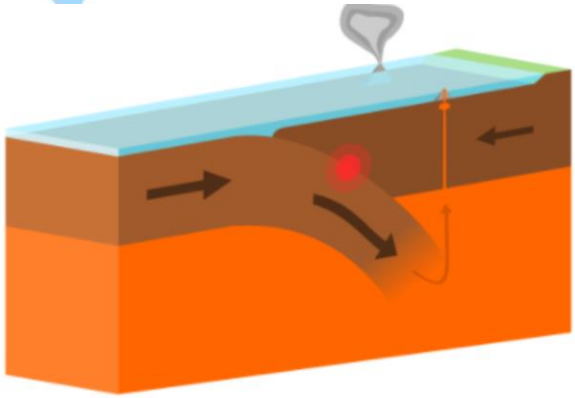
Oceanic/Continental Convergent:

- Movement: Plates move towards each other and the oceanic plate subducts underneath the continental plate.
- Landforms/Natural Disasters Formed:
  - Volcanoes
  - Mountains
  - Trenches
  - Earthquakes



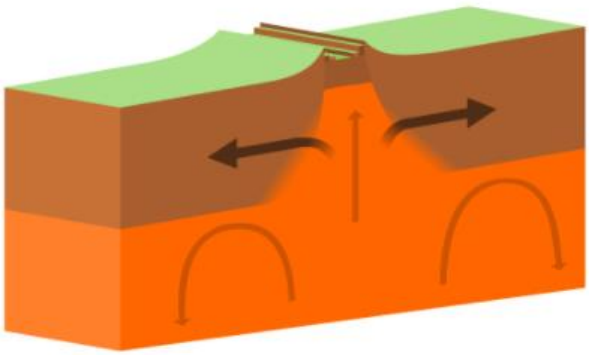
Oceanic/Oceanic Convergent:

- Movement: Plates move towards each other and one oceanic plate subducts underneath the second oceanic plate.
- Landforms/Natural Disasters Formed:
  - Volcanic island arcs
  - Underwater volcanoes
  - Trenches
  - Earthquakes



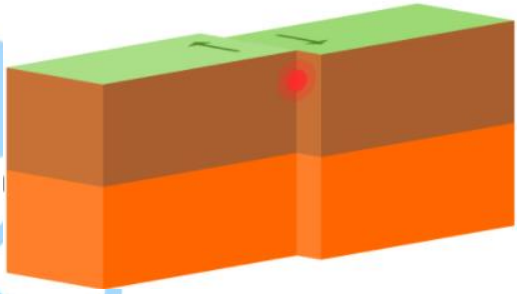
Divergent:

- Movement: Plates pull or move away from each other.
- Landforms/Natural Disasters Formed:
  - Rift valleys (on land)
  - Mid-ocean ridges (in water)
  - Earthquakes (on land and in water)



Transform:

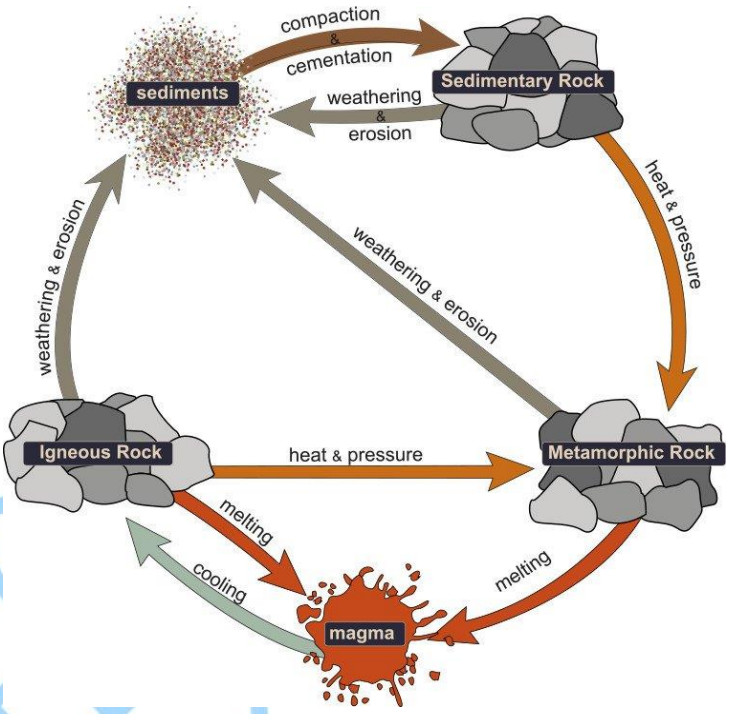
- Movement: Plates slide against each other in a sideways motion.
- Landforms/Natural Disasters Formed:
  - Faults
  - Earthquakes



https://uhlibraries.pressbooks.pub/historicalgeologylab/chapter/chapter01-platetectonics/

Rock Processes:

Rocks are everywhere. There are three main types of rocks: **igneous**, **sedimentary**, and **metamorphic**. A rock never stays in one form for it is always changing. The rock cycle is the never-ending process in which a rock transforms from one type to another and how it has an effect on our planet.
https://quizlet.com/470676368/rock-cycle-diagram/



Weathering, Erosion, and Deposition:
Weathering, erosion, and deposition are all processes that play a big role in the rock cycle. **Weathering** is the breaking down of rocks into sediments. This can occur because of water, ice, wind, animals, plants, and other factors. **Erosion** is the movement of the sediment into a different place by water, wind, ice, or gravity. **Deposition** is the last part of the cycle, the dropping of the sediment into a new place. Over time, deposition can cause the formation of landforms such as islands or sand dunes.

Igneous:

Igneous rocks are formed in two different ways. They are formed either when **magma** hardens and cools or when metamorphic or sedimentary rocks are melted and hardened. The cooling of the magma can happen either on the surface of the Earth or underground in a volcano. **Magma** is the hot semi-liquid underneath the surface that turns to lava when it goes above ground.

- EX: granite, obsidian, basalt https://store.schoolspecialty.com/OA_HTML/ibeCCtpItmDspRte.jsp?item=35763&minisite=10206

Sedimentary:

Sedimentary rocks are formed on the surface of the earth by **weathering** and **erosion**. Rain or windbreaks igneous or metamorphic rocks into bits called **sediments** which are washed into bodies of water such as rivers or oceans. Over time, layers of sediment go through **cementation** and **compaction** to create sedimentary rocks. **Cementation** is the process of layers of sediments squeezing together, and **compaction** is the process of the sediment transforming into sedimentary rock.

- EX: limestone, sandstone, shale, clay https://www.amazon.com/Limestone-Chalk-Sedimentary-Rock-Specimen/dp/B083TC9Q6L

Metamorphic:

Metamorphic rocks are formed when plates converge, diverge, and collide. When plates move, they produce high levels of heat and pressure. These factors combined to turn the sedimentary or igneous rocks into metamorphic ones.

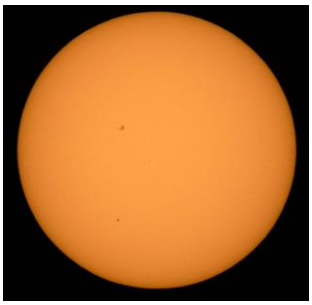
- EX: marble, schist, slate, quartzite https://www.geologysuperstore.com/index.php/mica-schist.html

From https://simplestudies.edublogs.org

Space

Images: https://nasasearch.nasa.gov/

Planets of the Solar System:



Mercury: Mercury is the smallest planet in our solar system and is the nearest to the Sun.

Mercury has a thin **exosphere**. Its exosphere is composed of oxygen, sodium, hydrogen, helium, and potassium.

Mercury's surface resembles that of Earth's moon, scarred by craters as a result of numerous collisions with meteoroids and comets.

Day on Mercury: 59 Earth Days	Year on Mercury: 88 Earth Days

Venus: Venus is the second nearest planet to the Sun.

Venus is known for its extreme temperatures and acidic clouds. These make the planet unstable for life as we know it.

Venus's solid surface is a volcanic landscape covered with extensive plains featuring high volcanic mountains and vast ridged plateaus.

Venus **rotates** slowly in the opposite direction than most planets do. It is just one of the two planets that rotate from east to west rather than from west to east.

Day on Venus: 243 Earth Days (longer than a Venus year)	Year on Venus: 225 Earth Days

Earth: Earth is the third planet from the Sun.
Earth is a terrestrial planet with an **atmosphere** with just the right thickness to support life. The atmosphere of Earth is made up of mainly nitrogen and oxygen. The atmosphere protects our planet from incoming meteors that could harm us and our ecosystems.
Earth has one moon and is the only planet with a number of moons this low.

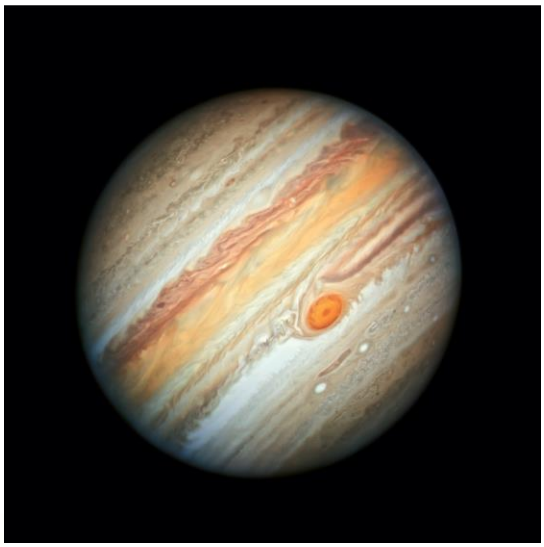
Day on Earth: A little under 24 hours	Day on Earth: 326.25 days (the 0.25 translates to a leap year, which occurs once every four years)

Mars: Mars is the fourth closest planet to the Sun.
Mars's surface is very rocky and has a reddish color. Dust storms are very common. Mars has a thin atmosphere. The winds pick up fine, dry particles of dust, creating large dust storms. These dust storms carry the particles at speeds of 33 to 66 miles per hour.
Mars has two main moons called Phobos and Deimos.

Day on Mars: A bit longer than 24 hours	Year on Mars: 687 Earth Days

The inner planets are much smaller in size than the outer planets. The outer planets include Jupiter, Saturn, Uranus, and Neptune. These are the gas giants of the planets. The inner planets are Mercury, Venus, Earth, and Mars. The asteroid belt is located in between the inner and outer planets.

Jupiter: Jupiter is the fifth planet from the Sun.



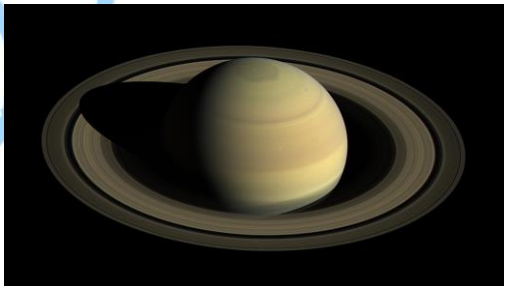
Jupiter is the biggest planet, being twice the size of all the other planets combined.

It is known for its Great Red Spot, a large storm that has been raging on the planet for hundreds of years. The area of the spot is a high-pressure region which is what causes these storms. The spot is made up mostly of hydrogen and helium.

Jupiter has fifty-three confirmed moons and four rings around it. These rings, formed of dust particles, are dark and difficult to see in most images.

Day on Jupiter: About 10 hours	Year on Jupiter: 4,333 Earth Days

Saturn: Saturn is the sixth planet from the Sun.



Saturn is a gas-giant planet with an atmosphere made up of mostly hydrogen and helium.

Saturn is known for its icy ring. It is not the only planet to have rings, but none are as complex as Saturn's rings. These rings are made up of pieces of comets, asteroids, or shattered moons that broke due to Saturn's powerful gravitational force. It is also made up of billions of pieces of ice and rock that have been coated by other materials and particles.

Day on Saturn: 10.7 hours	Year on Saturn: 29 Earth years

Uranus: Uranus is the seventh planet from the Sun.

Uranus is unique in the fact that it rotates on its side. It rotates from east to west.

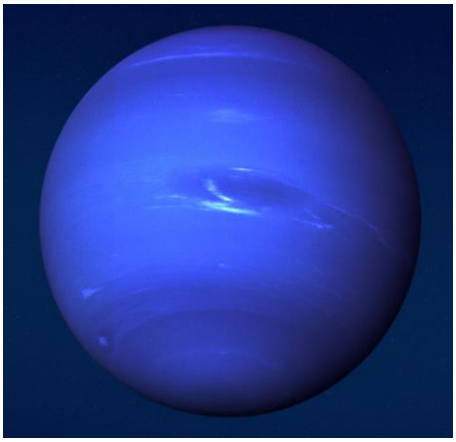
Uranus is an ice giant planet and nearly four times larger than Earth. It has twenty-seven known moons, which are mostly named after literary characters. Just like the other planets in the outer circle, Uranus is a ringed planet. It has thirteen known rings. The inner rings are narrow and dark, and the outer rings, which are more visible, are brightly colored.

The planet's mass is made up of a dense fluid of icy materials (water, methane, and ammonia) and a small rocky core. Uranus has an atmosphere made mostly of hydrogen and atomic helium. It is also made up of small amounts of other gases.

Uranus is the coldest planet in the solar system. The surface temperature is -300° Fahrenheit. There are strong winds and clouds made up of methane ice crystals.

Day on Uranus: 17 hours	Years on Uranus: 84 Earth years

Neptune: Neptune is the final planet and is furthest from the Sun.



Neptune is a gas giant. Its atmosphere is made of hydrogen, helium, and methane. These give the planet its bright blue color. The atmosphere is extremely thick and windy with winds blowing at speeds of more than 1200 miles (2000 kilometers) per hour. Neptune does not have a solid surface.

At the core, Neptune can get extremely hot, especially compared to its surface temperature. However, the surface is about -392° Fahrenheit (200° Celsius).

Day on Neptune: 16 hours	Year on Neptune: 165 Earth years

Celestial Objects:

***Comets*:** Comets are large cosmic snowballs of frozen gases, rock, and dust roughly the size of a small town.

When a comet gets close to the sun, it heats up and spews dust and gases into a giant glowing head larger than some planets. The dust and gases form a tail that stretches from the Sun for millions of kilometers.

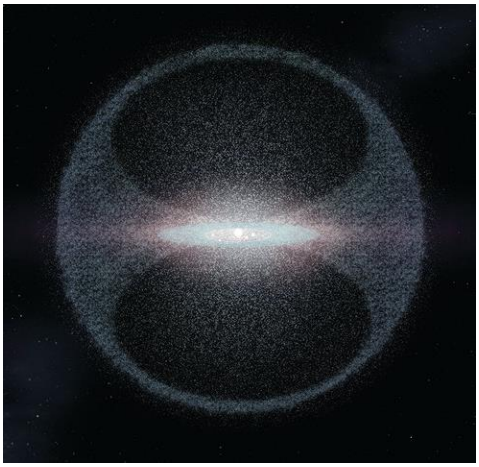
There are two main types of comets: short-period comets and long-period comets.

- **Short-period comets** are found beyond Neptune in an icy belt of dark comets that orbit the Sun near Pluto, a **dwarf planet**. Occasionally, comets are pushed by gravity into other orbits that bring them closer to the Sun. When the comet gets close enough to the Sun, it becomes a short-period comet.
- **Long-period comets** are found in a region about 100,000 Astronomical Units away from the Sun called the **Oort Cloud**.

Most comets stay a safe distance away from the Sun, but in some cases, comets called **sungrazers** crash into the Sun or come so near to the Sun that they evaporate into space.

https://www.dkfindout.com/us/space/solar-system/comets/

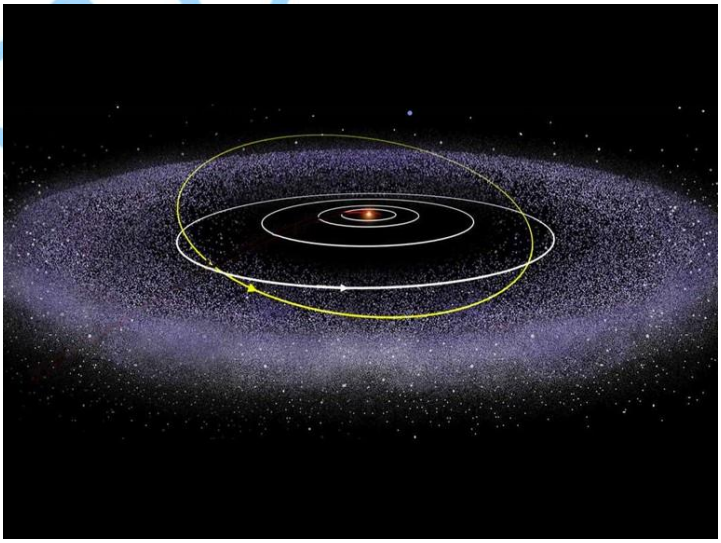
The **Oort Cloud** is a theoretical spherical cloud of billions of pieces of icy space debris three light years away first detailed by Dutch astronomer Jan Oort. It is located beyond Pluto and past the edges of the **Kuiper Belt**, surrounding the Sun, all eight of our planets, and the Kuiper Belt. Although scientists have not been able to actually observe it yet, there are enough logical predictions that have been made for us to know the basics of the Oort Cloud.



The Voyager 1, a space probe launched in 1977, is said to reach the Oort Cloud, but that will not happen for at least 300 years. Scientists don't know if they will have contact with the Voyager 1 by then, but as technology advances and new ideas and inventions take shape, it is hoped by astrophysicists, astronomers, and all other members of the space science community that we will be able to have solid information about the Oort Cloud in the future.

https://www.skyatnightmagazine.com/space-science/what-is-the-oort-cloud/

The **Kuiper Belt** is similar to the **Oort Cloud** in the sense that it is made up of space debris and we do not know much about it. It is often compared to the **Asteroid Belt**, but the Kuiper Belt is tens of hundreds times larger than the asteroid belt. It is said to be composed of mainly comets, asteroids, and other icy space debris. Extremely far from Earth, the disc-shaped Kuiper Belt is predicted to be located about 30 Astronomical Units to 55 Astronomical Units away from our planet. This goes to show how large space really is and how much there is still left to experience and discover. https://www.skyatnightmagazine.com/space-science/what-is-kuiper-belt-outer-solar-system/



From https://simplestudies.edublogs.org

Asteroids: Asteroids are large rocky, airless objects that orbit our Sun, too small to be called planets. Tens of thousands of these minor planets are gathered in the main **Asteroid Belt**. The Asteroid Belt is located between the orbits of Mars and Jupiter. Asteroids that pass close to Earth are called near-Earth objects. Asteroids are able to have moons with them. So far, there are one hundred and fifty asteroids that are accompanied by either one or two moons. Asteroids are classified by where they are located in space. Those that are in orbit of larger planets are called Trojans. https://www.cnet.com/how-to/watch-live-as-an-asteroid-the-size-of-a-school-bus-flies-close-to-earth/

Meteors and Meteorites: Relatively small chunks of rock and debris in space are called **meteoroids**. They become **meteors**, or shooting stars when they fall through a planet's atmosphere. This event is called a meteor shower. About thirty meteor showers occur each year. When this happens, they leave a bright trail as they are heated by the friction of the atmosphere. Pieces that survived the journey and hit the ground are called **meteorites**.

Most meteorites found on Earth are pebbles to fist size, but on occasion they can be larger than buildings. Meteorites are made of silicon, oxygen, and heavier metals like nickel and iron.

https://www.nhm.ac.uk/discover/types-of-meteorites.html