**Earth Science**

**Glossary**

**A**

***ablation*** - the process by which snow and ice is lost from a glacier

***abrasion*** - a form of physical weathering caused by friction between rock particles

***absolute age*** - the age of rock layers in years

**absolute dating** the process of establishing the age of an object, such as a fossil or rock layer, by determining the number of years it has existed

**absolute magnitude** the actual brightness of a star

***absorption*** - the process by which energy is transformed into other kinds

**abyssal** (uh BIS uhl) plain the broad, flat portion of the deep-ocean basin

***accumulation*** - the collection of an object

**acid** precipitation precipitation that contains acids due to air pollution

***acid rain-*** acidic rain, snow , sleet or hail that can form when sulfur dioxide and nitrogen oxide combine with moisture in the air.

***adaptation –*** any structural or behavioral characteristic organisms have developed over time tha help them survive in a particular environment

***advancing glacier*** - a glacier that is growing; moving toward lower elevations and lower latitudes

**aerial photograph** a photograph taken from the air

***aggregate*** - a mass of rock particles

**air mass** a large body of air that has similar temperature and moisture throughout

**air pressure** the measure of the force with which air molecules push on a surface

**alluvial** (uh LOO vee uhl) **fan** fan-shaped deposits of alluvium that form on dry land

**alluvium** (uh LOO vee uhm) **rock** and soil deposited by streams

***alpine glacier*** - a glacier formed at high elevations

***altitude*** - the height of a celestial object above the horizon

**altitude** the height of an object above the Earth's surface; in astronomy, the angle between an object in the sky and the horizon

**amphibian** vertebrate animals that breathe air and live on land but must return to water to reproduce.

***Andes Mountains*** - a mountain chain located along the west coast of South America

**anemometer** (AN uh MAHM uht uhr) a device used to measure wind speed

***angle of insolation*** - the angle at which sunlight strikes Earth's surface

**angular unconformity** a type of unconformity where older, tilted rock layers meet younger, horizontal rock layers; this indicates that layers are missing and there is a gap in the time record.

**annular** (AN yoo Iuhr) **eclipse** a solar eclipse during which the outer ring of the sun can be seen around the moon

**anticline** a bowl-shaped fold in sedimentary rock layers

***anticyclone*** - a high pressure center where air moves outward from the center

***apogee*** - the farthest point of the moon in its orbit around the Earth

**apparent magnitude** how bright a light appears to an observer

***apparent motion***(n) - perceived movement of celestial objects as seen from Earth

**aquifer** (AHK fuhr) a rock layer that stores and allows the flow of ground water

***arc*** (n) - portion of a circle through which the celestial objects rise in the east and set in the west

***arête*** (n) - a narrow ridge of rock formed on a mountain from 2 intersecting circues

***arid*** (adj) – dry

**artesian** (ahr TEE zhuhn) **spring** a spring that forms where cracks occur naturally in the cap rock and the pressurized water in the aquifer flows through the cracks to the surface

**artesian well:** a well in which water under natural pressure rises to the surface without being pumped

**artificial satellite** any human-made object placed in orbit around a body in space

**asteroid** a small, rocky body that revolves around the sun

**asteroid belt** the region of the solar system most asteroids occupy; roughly between the orbits of Mars and Jupiter (559)

***asthenosphere*** (n) - the upper part of the mantle with which crust rests

**astronomical unit** (AU) the average distance between the Earth and the sun, or approximately 150,000,000 km

**astronomy** the study of all physical objects beyond Earth

**atmosphere** a mixture of gases that surrounds a planet, such as Earth

**atom** the smallest part of an element that has all of the properties of that element

**atomic number** equals the number of protons in the nucleus of an atom

**average daily temperature** (n) sum of daily temperatures divided by the quantity of temperatures

**average monthly temperature** (n) sum of monthly temperatures divided by the quantity of temperatures

**axis** an imaginary line around which an object spins

**azimuthal** (Az i MYOOTH uhl) projection a map projection that is made by transferring the features of the globe onto a plane

**B**

***barograph*** (n) - a barometer that records continuous changes in atmospheric pressure

**barometer** an instrument used to measure air pressure

***barometric pressure*** (n) - the weight of the overlying atmosphere pushing down on a given unit of area

***barrier beach*** (n) - a narrow sand ridge rising slightly above high-tide level

**barrier island** a temporary sand deposit that parallels the shore but is separated from the main land by water

***basaltic –*** dark colored igneous rocks that form from magma rich in iron and magnesium.

***Base –*** any substance with a ph above seven

***Basin –***  a low area on earthsurface that contains an ocean

***Batholiths –*** the largest intrusive igneous rock bodies that form when magma cools and solidifies underground and stops rising to the surface

***beach*** (n) - the narrow portion of the shore between the low and high tide lines

**bedrock** the layer of rock beneath soil

**benthos** organisms that live on or in the ocean floor

**big bang theory** the theory that states the universe began with a tremendous explosion

**binary system** a system of two stars orbiting one another

**biomass** organic matter, such as plants, wood. and waste, that contains stored energy

***biome*** (n) - a region that contains a particular vegetation and fauna

**black hole** the final stage in the life cycle of some massive stars; the remnant of a star that is so dense that not even light can escape its gravity field.

**brachiopods**: fan shaped marine invertebrate animals commonly found as fossils in Paleozoic Era rocks.

**breaker** a heightened water wave that begins to tumble downward, or break, upon nearing the shore

**buoyancy:** the lifting effect on an object immersed in water

C

**caldera** (kalDare uh) the large opening formed at the top of a volcano when a crater collapses into the vent following an eruption.

**calendar** as system months organized- time year

***calorie*** (n) - a unit of heat energy defined as the amount of heat needed to raise the temp. of one gram of water one degree Celsius

***calorimeter*** (n) - an instrument used in studies of heat

***capillarity*** (n) - the upward movement of water due to the attractive force between water molecules and sediments

**carbon film** a fossil impression in a rock, consisting only of a thin carbon residue that forms and outline of the original organism

**carbonic acid** a weak acid that forms when water mixes with carbon dioxide from air.

**carrying capacity** the maximum number of individuals of a particular species that an environment can support

**cast** an object created when sediment fills a mold and becomes rock

**catastrophism** a principle that states that all geologic change occurs suddenly

**cave** a large underground opening formed when groundwater gradually dissolves limestone.

**celestiaI equator** imaginary circle created by extending Earth's equator Into space

***celestial body***(n) - a planet, moon, star located in space

**cementation** a sedimentary rock forming process in which large sediments are glued together by minerals deposited between the sediments.

**Cenozoic era –** the most recent era of earths geologic history began about 66 million years ago when dinosaurs became the sediments

**channel** the path a stream follows

**chemical properties** characteristics of an element or compound that determine how it will react with other elements

**chemical weathering** the chemical breakdown of rocks and minerals into new substances

**chemosynthesis (kee mon sihn thuh sihs)** the process used by bacteria along mid-ocean ridges to produce food and oxygen by using dissolved sulfur compound from magma.

**Chlorofluorocarbons** a group of chemicals used as refrigerants and aerosol spray propellants that can cause breakdown of the ozone layer

**chromosphere** (KROH muh SFIR) a thin region of the sun's atmosphere between the corona and the photosphere; too faint to see unless there is a total solar eclipse

**cinder cone volcano** a small, steeply sloped volcano that forms from moderately explosive eruptions of pyroclastic material

***circle***(n) - an ellipse with an eccentricity of 0

**circumpolar stars** stars that can be seen at all times of the year and all t|mes of the

**cirque** (suhrk) a bowl-like depression where glacial ice cuts back into mountain walls

**cirrus** (SIR uhs) clouds thin, feathery white clouds found at high altitudes

***classification***(n) - the organization of objects, ideas or information into groupings

***clastic***(adj) - characteristic of fragments/sediments derived from pre-existing rocks

**clay:** sediment particle less than 0.004 mm in size.

**Clean air act:** this 1990 US law sets a maximum level for major air pollutants.

**Clean Water Act:** this 1987 US law gives money to the states for building sewage and waste water treatment facilities and for controlling runoff from streets, farms, and mines.

**cleavage** (KLEEV H) the tendency of a mineral to break along flat surfaces

**climate** the average weather in an area over a long period of time

**climate ratio**(n) - evaporation divided by potential evaporation

***clinometer***(n) - an instrument used for determining the determining angles and slopes

**cloud** a collection of millions of tiny water droplets or ice crystals

**cloud base**(n) - the height at which the bottom of a cloud forms

**cloud seeding**  the addition of silver iodide or dry ice particles to clouds to produce a change in weather conditions

**coal** a solid fossil fuel formed underground from buried, decomposed plant material

**coastal plain:** a landform that is broad, flat area along a coastline; also called a lowland

**cogeneration:** process in which a power plant uses both eh electrical and thermal energy produced by the plant.

**cold front:** the boundary that develops when a cold air mass pushes under a warm air mass.

***colloid***(n) - a particle with a size of less than 0.00024 mmcombined

**comet** a small body of ice, rock, and cosmic dust loosely packed together that gives off gas and dust the form of a tail as it passes close to the sun

**compaction** a sedimentary rock forming process that occurs when layers of small sediments become compressed by the weight of layers above them

**composite volcano** a type of volcano built of silica rich lava and tephra layers accumulated from repeated alternating cycles of tephra eruptions and lava eruptions.

**composition** the makeup or a either the minerals or elements of a rock; describes atoms present in it **composting** the piling up of grass clippings, dead leaves, and other organic matter so they can gradually decompose.

**compound** pure substance made two or more elements that have been chemically combined, or bonded together

**compression** squeezing forces that compress rocks together at convergent plate boundaries, causing them to deform, fold and sometimes break.

**condensation** the change of state from a gas to a liquid

**conduction** the transfer of thermal energy from one maternal to another by direct contact; conduction can also occur within a substance

**conic** (KAHN ik) **projection** a map projection that is made by transforming the features of the globe onto a cone

***conservation of energy***(n) - energy is neither created nor destroyed; it remains in existence

**conservation** the careful use of resources to avoid wasting them and damaging the environment; includes **reusing and recycling resources**

**constellation** a section of the sky that contains a recognizable star pattern continental drift the theory that

**container law:** a waw requiring you to pay a deposit each time you buy a container of beverage.

**continental drift** a hypothesis proposed by Alfred Wegener, which states that continents can drift apart from one another and have done so in the past

***continental climate***(n) - the climate of an inland area where winters are cold and summers are hot

***continental drift***(n) - the idea that continents move over the surface of the Earth

**continental glacier** a glacier of considerable thickness that covers a vast area existing now only in Greenland and Antarctica

**continental margin** the portion of the Earth's surface beneath the ocean that as made of continental crust

**continental rise** the base of the continental slope

**continental shelf** the gradually sloping end of every continent that extends out under the ocean; the flattest

part of continental margin connects continent to continental slope

**continental slope** the steepest part of the continental margin

***contingency***(n) - a chance, accident or possibility

**contour interval** the difference elevation between one contour line and the next

**contour lines** lines that connect points of equal elevation

**control** in an experiment, the standard used for comparison

***convection cell***(n) - the path of heat energy in a fluid

**convection** the transfer of thermal energy by the circulation or movement of a liquid or a gas

**convection current:** the driving force of plate tectonics in which hot, plasticlike material from the mantle rises to the lithosphere, moves horizontally, cools, and sinks back to the mantle.

**convective zone** a region of the sun where gases circulate in convection currents, bringing the sun's energy to the surface

***convergence***(n) - the process by which two plates move together

**convergent boundary** the boundary between two colliding tectonic plates

***converging plate***(n) - the area where two plates are coming together

***coordinate system***(n) - a grid in which each location is defined by the intersecting of 2 lines

**Copernicus, Nicholas:** Polish astronomer who hypothesized a sun-centered solar system.

**coprolites** (KAHP roh LIEIS) preserved feces, or dung, from animals

**core** the central, spherical part of the Earth below the mantle also the center of the sun where the sun's energy is produced

**Coriolis** (KOHR ee OH Ins) **effect** the curving of moving objects from a straight path due to the Earth's rotation

**corona** the sun's outer atmosphere, which can extend outward a distance equal to 10-12 times the diameter of the sun

***correlation***(n) - the act of matching

**cosmic background radiation** radiation left over from the big bang that fills all of space

**cosmology** the study of the origin and future of the universe

**crater** a funnel-shaped pit around the central vent of a volcano

**creep** the extremely slow movement of material down slope

**crest** the highest point of a wave

**crevasse** (kruh VAS) a large crack that forms where a glacier picks up speed or flows over a high point

**crinoids:** marine invertebrate animals that resemble plants, commonly found as fossils in Paleozoic Era rocks and still a living animal group.

**crust** the thin, outermost layer of the Earth, or the uppermost part of the lithosphere

**crystal** the solid, geometric form of a mineral produced by a repeating pattern of atoms

***cutbank***(n) - the steep, overhanging side of a meander or curve

***cutoff***(n) - a new, short channel created when the river cuts through the neck of a horsheshoe bend

**cyanobacteria**  blue green bacteria thought to be one of the earliest life-forms on Earth

***cyclic***(adj) - characteristic of recurring, repeating

***cyclone***(n) - a low pressure center where air moves toward the center

**D**

***daughter isotope***(n) - the happy, stable decay product

**day** the time required for the Earth to rotate once on its axis

**deciduous** (dee SID U uhs) describes trees that lose their leaves when the weather becomes cold

**decimation** a measure of how far north or south an object is from the celestial equator

**deep** current a stream-like movement of ocean water far below the surface

**deep-ocean basin** the portion of the Earth's surface beneath the ocean that is made of oceanic crust

***deficit***(n) - a shortage of water in a water budget

**deflation** the lifting and removal of fine sediment by wind

**deforestation** the removal of forest mostly to clear land for farming, construction, mining and drilling for oil

**deformation** the change in the shape of rock In response to stress

**delta** a fan~shaped deposit of alluvium at the mouth of a stream, where the stream empties into a large body of water

**density** the amount of matter in a given space; mass per unit volume (how highly packed matter is)

**density current** an ocean current that occurs when more dense seawater sinks under an area of less dense sea water.

***dependant variable***(n) - a variable found along the y-axis of a graph

**deposition** the process by which material us dropped or settles

**desalination** the process of evaporating sea water so that the water and the salt separate

***desert***(n) - a region with an arid climate and little precipitation

**desertification** the formation of a desert

**dew point** the temperature to which air must cool to be completely saturated

**dew**(n) - water condensed onto objects near the ground

***dewpoint temperature***(n) - the temperature at which the air becomes saturated with water vapor and relative humidity is 100

**differential weathering** the process by which softer, less weather-resistant rocks wear away, leaving harder, more weather-resistant rocks behind

**dike** an intrusive igneous rock body formed when magma is squeezed into a vertical crack that cuts across rock layers and solidifies underground.

***direct relationship***(n) - an association where for every increase in x, there is an increase in y

**discharge** the amount of water a stream or river carries in a given amount of time

**disconformity** a type of unconformity in which the top rock layer is eroded before the next layer can be deposited, causing a gap in the rock record

***discontinuity***(n) - lack of regularity, a type of unconformity

***displacement***(n) - the relative movement of an object

distance from Earth

***distributary***(n) - an out flowing branch of a river that is located near the mouth

***diurnal***(adj) - daily

***divergence***(n) - the act of moving apart

**divergent boundary** the boundary between two tectonic plates that are moving away from each other

***diverging plate boundary***(n) - the area where plates separate from one another

**divide** an area of higher ground that separates drainage basins

**Doppler shift** the change in wavelength that occurs in any kind of wave energy (light, radio, sound) as the source of the energy moves toward you (the wavelength shortens) or away from ( the wavelength lengthens).

***dormant volcano***(n) - a volcano that is not currently erupting but has in the past and may still erupt in the future

***down cutting***(n) - the process by which running water will weather and erode the floor of the channel making the river deeper

**drainage basin** the land drained a river system, which includes the main river and all of its tributaries

***drumlin***(n) - a teardrop-shaped deposit of sediments re-shaped by a glacier pointing in the direction of glacial movement

**dune** a mound of wind-deposited sand

**dust bowl** name given to the great plains area of the United States in the 1930x, when it was struck by devastating drought and dust

***dwarf star***(n) - a star that has a luminosity less than 1

***dynamic equilibrium***(n) - a condition of the balancing out of opposing forces or actions

**E**

**Earth** in our solar system, the third planet from the sun; the only planet known to support life; appears blue from space because more than 70 % of its surface is covered by liquid water

**Earth science** the study of earth and space; includes geology, meteorology, astronomy, and oceanography

**earthquake** the movement of the ground, caused by waves from energy released as rocks move along faults.

***eccentricity***(n) - the degree of flatness of a celestial object's orbit

**ecliptic** the apparent path the sun takes across the celestial sphere

**ecosystem** a community of organisms and their nonliving environment

**El Nino** a climatic event that occurs when trade winds weaked west of Peru and whose effects can be felt worldwide.

**elastic rebound** the sudden return of elastically deformed rock to its original shape

**electromagnetic spectrum** the classification of electromagnetic radiation (including radio, visible, X-ray, gamma, infrared, and ultra violet) according to their wavelengths

**electron** one of the three subatomic particles; moves around the nucleus of an atom; has a negative electric charge.

**element** a form of matter that contains only one kind of atom; cannot be broken down into simpler substances in normal chemical processes

**elevation** the height of an object above sea level; the height of surface landforms above sea level

**ellipse** a closed curve in which the sum of the distances from the edge of the curve to two points inside the ellipse is always the same

**elliptical galaxy** a spherical or elongated galaxy with a bright center and very little dust and gas

***emergence***(n) - the act of moving upward

**endangered** describes a species that has only a relatively small number of individuals living and thus is in danger of dying out

**energy resource** a natural resource that humans use to produce energy

**eon** the largest division of geologic time

**epicenter**(n) - the point of origin of an earthquake at Earth's surface located directly above the focus

**epoch** (EP uhk) the fourth-largest division of geologic time

**equator**(n) - the parallel on Earth midway between the geographic North and South poles; 0 degrees

**equinox** the two times each year that the sun is directly above earth’s equator and the day and night are of equal length all over the world; the start of spring and fall March and Sept.

**era** the second-largest division of geologic time

**erosion** the removal and transport of maternal by wind. water, glaciers, or gravity

***erosional surface***(n) - the top layer of rock that has been weathered and moved by wind, ice, gravity or running water

***erratic***(n) - a large misplaced boulder whose composition does not match with the composition of the bedrock below it

**escape velocity** the velocity or the speed and direction a rocket must travel order to ‘completely break away from a planets gravitational pull

**esker** a winding ridge of sand and gravel formed by streams flowing beneath a glacier

**evaporation**(n) - the act of a liquid changing into a gas

***event***(n) - the name used to describe the occurrence of a change in the environment

**evergreens** trees that keep their leaves through the winter

**extinct** describes a species that no longer has any living members anywhere on earth for example dinosaurs

***extinct volcano***(n) - a volcano that is no longer active

***extrapolate***(v) - to estimate; infer

**extrusive**(adj) - outside

**extrusive igneous rocks** igneous rocks that form when magma extrudes onto earth’s surface and cools as lava; have a fine grained texture

**F**

**fault block** a block of the Earth's crust on one side of a fault

**fault-block mountain** a mountain that forms when fauiting causes large blocks of the Earth's crust to drop down relative to other blocks

**faults** surfaces along which rocks break and move; rocks on either side of a fault move in different directions relative to the fault surface

**fauna**(n) - the entire animal population of an area

**felsic** (FEL SIK) describes relatively light-colored, light-weight igneous rocks that are rich in silicon, aluminum, sodium, and potassium

***f*elsic**(adj) - having abundant light-colored minerals

***field***(n) - any part of the universe that has some measurable value of a given quantity

***finger lake***(n) - an long, narrow lake occupying a glacial trough damned by morraine

**first quarter** the moon phase halfway between new moon and full moon, when half of the side facing earth is lighted

**fission**  the splitting of the nuclei of atoms of heavy elements to release energy

**flood plain** an area along a river formed from sediments deposited by floods

***flora***(n) - the entire plant population of an area

flows

***fluid***(n) - liquid

***focal depth***(n)- the distance of an earthquake's point of origin below Earth's surface

**focus** the point inside the Earth where an earthquake begins

**fog** a stratus cloud that forms on or near the ground when air is cooled to its dew point and condenses

**folded mountain** a mountain that forms when rock layers are squeezed together and pushed upward

**folding** the bending of rock layers due to stress in the Earth's crust

**foliated** the texture of metamorphic rock in which the mineral grains are aligned like the pages of a book

***foliation***(n) - the segregation of minerals in a metamorphic rock giving it a layered appearance

**footwall** the fault block that is below a fault

form of light and heat

**fossil** any naturally preserved evidence of life

**fossil fuel** a nonrenewable energy resource that forms in the Earth's crust over millions of years from the buried remains of once-living organisms

**fossiliferous**(adj) - containing plenty of fossils

**fracture** the physical property of a mineral that causes it to break with rough or jagged edges

**frame of reference**(n) - a structure of views of which an individual evaluates data

**freezing**(n) - the change in state of a liquid to a solid by removal of heat

**front** in weather systems the boundary that forms between two different air masses

**frost**(n) - a covering of ice produced when air temp. falls below freezing

**full moon** the moon phase when the side facing Earth is completely lighted because Earth is between the sun and the moon

**fusion** the process that powers our sun and the other stars; hydrogen fusion occurs when great temperatures and pressures fuse hydrogen atoms to form helium atoms and energy is released

**G**

**galaxy**  a massive grouping of stars, gas and dust in space, held together by gravity; can be elliptical, spiral, or irregular

**Galilei, Galileo** Italian astronomer (1564-1642) who supported a sun-centered solar system by discovering the Venus has phases similar to the moon

**gamma rays** electromagnetic waves having short wave lengths and high energy.

**Ganymeede:** one of Jupiter’s four largest moons; the largest satellite in the solar system

**gas giants** the large, gaseous planets of the outer solar system

***gas giants***(n) - Jupiter, Saturn, Uranus & Neptune

**gasohol** a mixture of gasoline and alcohol that is burned as a fuel

**gem** a valuable mineral highly prized because it is rare and beautiful

***geocentric model*** (n) - a representation of the solar system with the earth near the center

***geographic pole***(n) - the North or South pole of Earth

**geology** the study of the Earth, its matter, processes and history

**geologic column** an Ideal sequence of rock layers that contains all the known fossils and rock striations on Earth arranged from oldest to youngest

***geologic map***(n) - a map which contains the distribution and nature of rock units

**geologic time scale** a scale that divides Earth's 4.6-bnllion-year into distinct intervals of time

***geomorphology***(n) - the study of the description, nature and origin of landforms

**geosynchronous orbit** an orbit in which a satellite travels at a speed that matches the rotational Speed of the Earth exactly, keeping the satellite positioned above the same spot on Earth at all times

**geothermal energy** energy from magma within the Earth

**geyser** a hot spring of groundwater that erupts periodically, shooting water and steam into the air

**giant** a late stage in a star’s life cycle in which the hydrogen in the core has contracted and grown hotter, causing it outer layers to expand

**glacial drift** all material carried and deposited by glaciers glacier an enormous mass of moving ice

***glacial trough***(n) - a steep, deep-sided u-shaped valley leading from the cirque of a glacier

**glacier** a mass of snow and ice that moves slowly downhill due to its weight.

**global warming** a rise in average global temperatures

**globular cluster** a group of older stars that looks like a ball of stars

***gneissic texture***(n) - the separation of minerals due to density differences in a metamorphic rock

**gradient** a measure of the change in elevation over a certain distance

**granitic** light-colored igneous rocks formed from magma rich in silicon and oxygen

**gravity** an attractive force that exists between all objects with mass.

**Great red spot** a giant, swirling, high-pressure gas storm in Jupiter’s atmosphere.

**greenhouse effect** the natural heating process of a planet, such as the Earth, by which gases in the atmosphere trap thermal energy

***groin***(n) - an artificial structure perpendicular to the shoreline

**ground water**: water that is located within rocks below the Earth's surface

**Gulf Stream** an ocean current that flows out of the Gulf of Mexico, notheward along the east coast of the US, and then toward Europe

**gully erosion** a type of surface water erosion due to runoff, in which water swiftly running down a slope creates large channels in the soil or rock.

***guyot***(n) - a flat-topped seamount

**H**

**habitat** any place where organisms live, grow, and interact with on another and with the environment

***hachured contour line***(n) - a contour line that represents a hole in the ground

**hachures** (ha SHOORZ) lines drawn at right angles to contour lines on a topographic map; they indicate depressions

**half-life** for a particular radioactive sample, the time it takes for one-half of the sample to decay

**hanging** a small glacial valley that the deeper main valley

**hanging wall** the fault block that is above a fault

**hardness** the resistance of a mineral to being scratched

**hazardous waste** waste that is dangerous to organisms because it is poisonous, cancer causing, or radioactive.

***heliocentric model*** (n) - a true model of the solar system with sun near center

**Hertzsprung-Russell** diagram; a graph that shows the relationship between a star's surface temperature and HS absolute magnitude

**Hess, Harry** a Princeton University scientist who proposed the theory of seafloor spreading in the 1960s

**hibernation** a period of inactivity during which an animal’s body temperature drops and it body processes slow down

**high pressure** system an air mass with densely packed air molecules here cold air descends and rotates clockwise (in the northern hemisphere.

***Homo erectus*:** an ancestor of modern *Homo sapiens*, this extinct primate lived in Africa and Asia from 1.6 million to 250,000 years ago

***Homo habilis:*** the earliest species to have fully human characteristics, this extinct primate evolved from *Austraulopithcus,* lived in Africa 1.5 to 2 million years ago, and regularly used tools.

**horizon** the line where the sky and the Earth appear to meet

***horn***(n) - a 3 sided peak on a mountain formed from intersecting cirques

**hot dry rock:** a new technology in which heat from Earth’s mantle that are hotter than neighboring areas, forming melted rock that rises toward the crust.

**hot spot** a place on Earth's surface that is directly above a column of rising magma called a mantle plume diagram

**hot spring** a spring of heated groundwater, caused when the water is warmed by rocks that come into contact with molten material under Earth’s surface

***H-R Diagram***(n) - a classification of stars based on luminosity and temp.

***humid***(adj) - moist

**humidity** the amount of water vapor or moisture the air

**humus** (HYU muhs) very small particles of decayed plant and animal material in soil

**hurricane** a large, rotating tropical weather system with wand speeds of at least 119 km/h

**hydroelectric energy** electricity produced by falling water

**hydrosphere** all the water that occurs at Earth’s surface

**hypothesis** a possible explanation or answer to a question

**I**

**ice age** a period during Which ice collects in high latitudes and moves toward lower latitudes

**ice wedging** the mechanical weathering process in which water seeps into cracks in rock, freezes, then expands, opening the cracks even wider

**iceberg** a large piece of ice that breaks off an ice shelf and drifts into the ocean

**igneous rock** rock that forms from the cooling of magma

***igneous rock***(n) - a rock made of molten material that has solidified

***igneous***(adj) - characteristic of having solidified from magma or lava

**impermeable:** rock or soil that has few pores or small pores, preventing water from passing through

***independant variable***(n) - a variable found along the x-axis of a graph

**index contour** a darker, heavier contour line that as usually every fifth line and is labeled by elevation

**index fossil** a fossll of an organism that lived during a relatively short, well-defined time span; a fossil that is used to date the rock layers in which it is found

***indirect relationship***(n) - an association where for every increase in x, there is a decrease in y; or vice versa

***inference***(n) - something that is thought out but not directly observed; an interpretation

***infiltration***(n) - the process by which water enters a substance

**infrared waves** electromagnetic waves that are the heat waves that we feel.

***inlet***(n) - a short, narrow waterway through a barrier island leading to a bay

**inner core** the solid, dense center of the Earth

**inner planets** the four solid, rocky planets closest to the sun – Mercury, Benus, Earth, and Mars

***inorganic***(adj) - not made by plants, animals or humans

***insolation***(n) - incoming solar radiation; sunlight

***intensity***(n) - strength

***intermittent stream***(n) - a body of water that flows occassionally

**International Date Line** the 180° meridian, on the other side of Earth from the prime meridian; an imaginary line in the Pacific Ocean where we change calendar days.

**International System of Units (SI)** a modern version of the metric system that is used by most people around the world.

***Intrusive*** (adj) – inside

***Intrusive*** (noun) – rock that formed from magma inside the earth

**intrusive igneous rock**(in TROO siv) the type of igneous rock that forms when magma cools and solidifies beneath the Earth’s surface

**ion**  an atom with an electrical charge

**ionosphere** a layer of Earth’s atomosphere, where ions and free electrons absorb AM radio waves during the day and reflect them back toward Earth at night

**irregular** galaxy a galaxy that dpes not fit into any other category; one with an Irregular shape

***island***(n) - a tract of land smaller than a continent surrounded by water

**isobars** lines that connect points of equal air pressure

***isoline***(n) - a line that connects points of the same value

***isopach***(n) - a line that connects points of the same thickness of sedimentary layers

***isotherm***(n) - a line that connects points of the same temperature

**isotopes** atoms of the same element that have the same number of protons but have different number of neutrons

**J**

***jet stream*** (n) - a concentrated curving band of high speed, easterly winds usually at the top of the Earth's troposphere

**Jupiter** in our solar system, the fifth planert from the sun; it is the largest planet, mostly gas and liquid, and has continuous storms of high-pressure gas.

**K**

***kettle***(n) - a depression in the ground formed by a chunk of the glacier that melted after being buried with sediments

**Kuiper (KIE per) Belt** the region of the solar system outside the orbit of Neptune that is occupied by small, icy, cometlike bodies

**L**

***lagoon***(n) - a shallow body of fresh water cut off from a lake

**land breeze** wind blowing from land to sea at night because the land cools faster and cool air over the land moves over the sea

**landfill** an area of land where waste is deposited

**land forms:** features that make up the shape of the land at Earth’s surface, such as plains, plateaus, and mountains.

**Landsat Satellite** satellite that collects information about Earth’s surface by using a mirror to detect different wavelengths or reflected or emitted energy.

***landscape***(n) - the general shape of Earth's surface

***latent heat***(n) - heat absorbed or radiated during a phase change

***lateral erosion***(n) - the process by which moving water in a river will erode the sides of the channel wall

**latitude** the distance north or south from the equator; measured in degrees

***lava***(n) - molten material that has cooled at Earth's surface

**law** a scientific rule of nature that describes the behavior of something in nature, but doesn’t explain why something will happen in a given situation.

**leaching** the process by which rainwater dissolves and carries away the minerals and nutrients in topsoil

***leeward***(adj) - the side of a hill, etc that is sheltered from the wind

**legend** a list of symbols used on a map that explains their meaning

**light pollution*:*** the glow in the night sky caused by urban lights

***light year***(n) - the distance that light travels in 1 year - 10 trillion km

**light-minute** a unit of equal tzajthe distance light travels in space in 1 minute, or 18,000,000 km

**lightning** the large electrical discharge that occurs between two oppositely charged surfaces

**light-year** a unit of length equal to the distance that light travels through space in 1 year

**lithification**(n) - the process by which sediments are compacted and cemented together

**lithosphere** (LITH oh SFIR) the outermost, rigid layer of the Earth that consists of the crust and the rigid upper part of the mantle

**load** the materials carried in a stream's water

**local group** the cluster of about 25 galaxies that includes our galaxy the Milky Way.

**loess** a thick deposit of fine, wind-eroded sediments

**longitude** the distance east or west from the prime meridian; measured in degrees

**longshore current** the movement of water near and parallel to the shoreline

**low Earth orbit** an orbit located kilometers above the Earth's surf.

**low pressure system** in weather systems, an area where warm air rises and rotates counterclockwise in the northern hemisphere.

***luminosity***(n) - the brightness of a celestial object

**luner eclipse** an eclipse that occurs when earth passes between the sun and moon, and earth’s shadow falls on the moon, preventing sunlight from reaching all or part of the moon

**luster** the physical property of a mineral that describes how light is reflected from it s surface; defined as metallic or non metallic

**M**

**mafic**(adj) - having abundant dark-colored minerals

**magma** hot, melted rock material beneath Earth’s surface

**magnetic declination** the angle of correction for the difference between geographic north and magnetic north

**magnetic reversal** the process by which the Earth's north and south magnetic poles periodically change places

**magnitude** in earthquakes studies, a measure of the energy released by an earthquake; the Richter scale is used to describe earthquake magnitude

**main sequence** a diagonal pattern of stars on the H-R diagram

**major axis**(n) - the longer line of an ellipse containing foci

**mammal** warm-blooded vertebrate

**mantle plume**(n) - the center of vertically rising convection cells in mantle

**mantle** the layer of the Earth between the crust and the core

***mantle***(n) - the semi-solid layer of the Earth between the crust and the outer core

**map** a model or representation of the Earth's surface

**map legend** a list of symbols used on a map that explains their meaning

**map scale** the relationship between distances drawn on a map and actual distances on Earth’s surface

**maria** dark flat regions of ancient lava on the moon; viewed from earth, they resemble oceans, the Latin word for which is *maria*

***marine climate***(n) - a coastal climate moderated by the effects of a large body of water; warm winters and cool summers

**market:** the people or businesses that want to purchase a product.

**Mars** in our solar system, the fourth planet from the sun; known as the red planet due to the iron oxide content of its weathered rocks.

**mascon** the concentration of mass on the moon located under an impact basin

**mass movement** the movement of any material down-slope

**mass number** the sum of the number of protons and neutrons in an atom’s nucleus

**mass** the amount of matter that something is made of; its value does not change with the object's location

***mass***(n) - the amount of matter in an object

**matter** anything that takes up space and has mass; the characteristics of matter are determined by its atoms.

**meanders**(n) bends or curves in a river channel

**mechanical weathering** the breakdown of rock into smaller pieces by physical means

Mediterranean Sea

***melting***(n) - the act of a solid changing to a liquid

**Mercator projection** a map projection method using parallel longitude lines; continent shapes accurate, but their areas are distorted

**Mercury** in our solar system, the first planet from the sun; the second smallest planet that has a createred surface like our moon and cliffs as high as 3 km

***meridian***(n) - an imaginary semicircle drawn around Earth from the North Pole to the South Pole

**Mesosaurus** (mes oh SAR uhs) a fossil reptile found both in South America and Africa, providing evidence that these continents once were joined

**mesosphere** coldest layer of the atmosphere that extends upward from the stratosphere to an altitude of about

**Mesozioc** (mez uh ZOH ihk) **Era** the middle era of Earth’s geologic history; began about 245 million years ago; reptiles and gymnosperms were the dominant land life forms

**metallic luster:** the physical property of any mineral that has a shiny appearance resembling metal.

***metamorphic rock***(n) - a pre-existing rock that has been changed into a new rock in the solid state by heat and pressure

**metamorphism** changing of one type of rock to another by heat, pressure, and chemical processes

**meteor** a bright streak of light caused when a meteoroid burns up in the Earth’s atmosphere

**meteor shower** phenomenon caused by the burning up of large numbers of meteoroids as they enter the Earth’s atmosphere

**meteorite** meteoroid or part of a meteoroid left after it hits the Earth’s surface

**meteoroid** small bit of rock or metal moving through the solar system left by a comet or produced by a collision between asteroids

**meteorologist:**  a scientist who studies weather conditions using radar, satalites, and other instruments to make weather maps and forecasts.

**meteorology** study of the Earth’s atmosphere

**meter** the basuc unit of length in the SI system

**microquake** earthquake with a magnitude less than 2.5 on the Richter

**microwave:** electromagnetic waves that are shorter than radio waves but longer than visible light. We use microwave for radar and transmitting voices, music, video, and data

***mid-Atlantic ridge***(n) - a mountain range found along the bottom of the Atlantic Ocean

**middle-latitude climates** climates with a maximum average temperature of 18°C in the coldest month and a minimum average temperature of 10°C in the warmest month

**middle-latitude desert climate** middle-latitude climate that is very dry, with both a cold winter and a warm to very hot summer

***mid-ocean ridge***: the place where new ocean floor forms; resembles an underwater mountain range; formed when forces within Earth spread the seafloor

**Milankovitch theory** theory that small, regular changes in the Earth’s orbit and in the tilt of the Earth’s axis caused the ice ages

**mineral** natural inorganic, crystalline solid found in the Earth’s crust

***mineral***(n) - an inorganic, naturally-occurring substance

**mineralogist** scientist who specializes in the study of mineralsscalemeteorite a meteoroid that reaches the

**mistral** strong, cold, northern wind that blows down the Alps toward the

**mixture** material that contains two or more substances that are not chemically

***model***(n) - any way of representing the properties of an object, event or system

**Moho** the Mohorovicic discontinuity, boundary between the Earth’s crust and mantle

***Moho***(n) - the boundary between the Earth's crust and the mantle

**Mohs hardness scale** standard against which the hardness of a mineral is tested

**mold** a cavity in the ground or rock where a plant or animal was buried

**molecule** smallest complete unit of a compound

**monadnock** knob of rock that protrudes above a peneplain

**monocline** a fold in rock layers in which both limbs remain horizontal

**monsoon** seasonal wind that blows toward the land in summer, bringing heavy rains, and away from the land in the winter, bringing dry weather

**monsoon**(n) - a seasonal change in winds in eastern and southern Asia

**month** time required for the moon to go through one set of phases as it orbits the Earth, about 29.5 days

**moon** body that is smaller than a planet and orbits the planet

***moraine***(n) - a ridge of unsorted sediments deposited by a glacier

**mountain belt** group of large mountain systems

**mountain range** group of adjacent mountains with the same general shape and structure

**mountain system** group of adjacent mountain ranges

***mountain***(n) - a landscape region with higher elevation & steep slope

moving in opposite directions or in the same direction

**Muav Limestone** rock layer of the Grand Canyon deposited during the Cambrian Period

**Mud:** fine particles of rock combined with water

**mud pot:** weathered rock around a hot spring that mixes with the hot water to form liquid clay that bubbles at the surface

**mudflow:** rapidly moving large mass of mud

**mummification** preservation of a dead organism by drying model a representation of an object or system

**N**

**NASA** National Aeronautics and Space Admimstratlon; founded to COITl|DIl'lE all of the separate rocket-development teams in the UnitedStates

**natural bridge** arch of rock formed by groundwater erosion

**natural gas** a mixture of gases formed as ancient plants and animals decayed; burned as a fossil fuel

**natural levee** raised riverbank that results when a river deposits its load at the river’s edges

**natural resource** any natural substance, organism, or energy form that living things use

**natural selection:** selection: the process by which organisms with traits best suited to an environment survive and reproduce, while others die out because they lack those traits.

**neap tide** tide with minimum daily tidal range that occurs during the first and third quarters of the moon

**nebula** dark cloud of gas and dust in space; first stage in the development of a star

**nebular theory** theory that the Sun and the planets condensed out of a spinning cloud of gas and dust

**nekton** forms of ocean life that swim, such as fish, dolphins, and squid

**Neptune** in our solar system, usually the eighth planet from the sun; it is large, gaseous, and has storm like features

**neritic zone** pelagic environment above the sublittoral zone filled with marine life

**neutron star** collapsed core of a supernova consisting of a small, extremely dense ball of neutrons

**neutron** subatomic particle with no electrical charge

**new moon** phase of the moon during which the side of the moon facing the Earth is unlighted

**nitrogen cycle** process in which nitrogen moves from the air to the soil to animals and back to the air

**nodule** lump of minerals on the ocean floor

**nonconformity** unconformity in which stratified rock rests on un-stratified rock

**nonfoliated** describing a metamorphic rock without parallel bands

**nonmetallic luster**: a physical property of a mineral that has a dull appearance and does not resemble a metal

**nonrenewable resource** substance of limited supply that cannot be replaced

**nonsilicate mineral** mineral that does not contain silicon

**normal fault** fault in which the hanging wall moves down relative to the footwall

**nova** white dwarf star that explodes as it cools, temporarily becoming thousands of times brighter

**nuclear energy:** an alternate energy source produced from atomic reactions.

**nuclear fission** splitting of the nucleus of a large atom into smaller nuclei

**nuclear fusion** combination of the nuclei of small atoms to form a larger nucleus

**nuclear waste** radioactive waste material produce by nuclear power

**nuclear reactor:** a device in which uranium atoms fission to release energy, used to generate electricity.

**nucleus** region in the center of an atom that contains the protons and neutrons

**O**

***oblate spheroid***(n) - the shape of earth where it is slightly flattened at the poles and bulging at the equator

**observation** act of using the senses to gather information

***observation***(n) - information obtained directly from the senses

**observatory** a building that contains an optical telescope for observing objects in space

**occluded front** boundary formed where a fast-moving cold air mass overtakes and lifts a warm air mass, completely cutting it off from the ground

***ocean current***(n) - a continuous horizontal flow of water at or near the ocean's surface driven by prevailing winds

**ocean floor** continental crust and oceanic crust that lie beneath the ocean

**ocean trench** deep valley in the ocean floor that forms along a subduction zone

**oceanic crust** material that makes up the ocean floor

**oceanic zone** pelagic environment that extends seaward beyond the continental shelf

**oceanography** study of the Earth’s oceans

**oil** a liquid formed as ancient plants and animals decay; burned as a fossil fuel and used to make lubricants and plastics

**old stream**: a stream that flows slowly down a gradual slope through a broad floodplain that it has made; often meandering.

**Olympus Mons** the largest known volcano in the solar system; on mars

**Oort cloud** spherical cloud of dust and ice surrounding the solar system that may contain as many as a trillion comets

**ooze** soft organic sediment on the ocean floor

**open cluster** loosely shaped group of hundreds of stars

**orbit period** time required for a planet to make one revolution around the Sun

**orbit** the curved path followed by a satellite as it travels around a star, planet, or other object.

**ordinary spring** natural flow of groundwater to the Earth’s surface

**ordinary well** hole dug below the water table that fills with groundwater

**ore** deposit of minerals from which metals and nonmetals can be profitably removed

**organic evolution** the gradual change in life-forms over time

**organic matter** any material that originated as plant or animal tissue; decaying animals or plants that become sediment and a part of soils

**organic sedimentary rock** rock formed from the remains of organisms

***organic***(adj) - characteristic of living things

***original horizontality***(n) - the formation of rock layers were initially deposited laterally

***orographic effect***(n) - the effect that mountains have on weather and climate; windward side = rainy; leeward side = dry

**outcrop** area of exposed rock

**outer core:** the liquid layer of Earth’s core that surrounds the solid inner core and is comprised of iron and nickel

**outwash** striated material washed out from a glacier by melt water.

**outwash plain** deposit of stratified drift in front of a glacier

**overgrazing**  occurs when too many animals graze too small an area and eat all the vegetation from the land.

**oxbow lake** water remaining in an isolated meander in a floodplain

**oxidation** chemical combination of metallic elements with oxygen

**ozone** form of atmospheric oxygen that has three atoms per molecule

**ozone layer:** a layer of the stratosphere with a high concentration of ozone; protects living things by absorbing ultraviolet radiation from the sun.

**P**

***P (primary) wave***(n) - a compressional wave of energy released by an earthquake that moves side to side

**P wave** primary wave; the fastest wave generated by an earthquake and the first to be recorded by a seismograph

**Pacific Ring of Fire** major earthquake zone that forms a ring around the Pacific Ocean

**pack ice** floating layer of sea ice that completely covers an area of the ocean surface

**pahoehoe** solidified mafic lava with a wrinkled surface

**paleontologist** scientist who studies fossils

**paleontology** study of fossils

**Paleozoic Era** geologic era that followed Precambrian time, lasting from 540 million to 248 million years ago

**Pangaea** single landmass thought to have been the origin of all continents

**Panthalassa** giant ocean surrounding Pangaea

**parallax** method of determining the distance from the Earth to a star based on the shift in the apparent position of the star when viewed from different angles

**parallel** any circle that runs east and west around the Earth parallel to the equator

***parent isotope***(n) - the unhappy, unstable radioactive isotope

**parent rock** rock that is the source of soil

part of the continental margin

**peat** brownish-black material produced by partial decomposition of plant remains

**pebble** a sediment particle measuring 2.0 mm to 64 mm in size

**pelagic environment** major division of ocean environment that includes the two water zones: neritic and oceanic

**peneplain** low, almost level surface of a mountain in its old stage

**penumbra** outer part of the shadow cast by the Earth or the moon in which sunlight is only partially blocked

**perched water table** secondary water table formed by a layer of impermeable rock above the main water table

**perigee** point in the orbit of a satellite at which it is closest to the Earth

**perihelion** point in the orbit of a planet at which it is closest to the Sun

**periods** subdivision of a geologic era

**periodic table** system for classifying the elements

**permeable:** describes rock or soil that has connecting pores that allow water to pass through easily.

**petrification** process in which organic materials are replaced by new materials

**petrochemical** chemical derived from petroleum

**petroleum**  a naturally occurring liquid formed over millions of years from organisms; is refined into fuel such as gasoline

**pH scale** a logarithmic scale used to describe how acidic or how basic a solution is; an abbreviation of potential of Hydrogen

**phase** varying shape of the visible portion of the moon

**phosphorescence** ability to glow during and after exposure to ultraviolet light

**photochemical smog:** a brown-colored air pollution that forms when sunlight chemically changes the pollutants released into the air by burning fossil fuels

**photosphere** innermost layer of the solar atmosphere; light sphere

**physical property** characteristic that is observable in a substance without changing the chemical composition of the substance

**phytoplankton** microscopic ocean plants

**pillow lava** lava that flows out of fissures on the ocean floor and cools rapidly in rounded shapes

**placer deposit** fragments of native metals that are concentrated in layers at the bottom of a stream bed

**plain** a landform that is a large, relatively flat area; interior plains and coastal plains make up one-half the land area in the United States

**planet** any one of the nine major bodies that orbit the Sun

**planetary nebula** expanding shell of gases shed by a dying star

**planetesimal** small body of matter that formed in the outer regions of the solar nebula while the Sun was forming in its center

**plankton** free-floating, microscopic ocean plants and animals

**plate:** in plate tectonics, a section of Earth’s lithosphere (crust and upper mantle) that moves around on the mantle.

**plate tectonics** theory that the lithosphere is made up of plates that float on the asthenosphere and that the plates possibly are moved by convection currents

**plateaus:** large area of flat-topped rocks high above sea level

**plucking** a type of glacial erosion in which rock fragments are loosened, broken off, and carried away by the freezing of water in rock cracks.

**Pluto:** in our solar system, usually the ninth and last planet from the sun; it is now considered in a different group called a “Dwarf Planet”.

**polar climates** climates with a maximum average monthly temperature of 10° C

**polar easterlies** weak global winds located north of 65° north latitude and south of 65° south latitude that flow away from the poles

**polar front** boundary at which cold polar air meets the warmer air of the middle latitudes

**polar orbit** orbit that passes over the Earth’s North and South poles

**polar zones**: the zones that receive solar radiation at an angle and are the coldest areas on Earth; extend from the poles to 66.5 ° north and south latitudes.

***Polaris*** (n) - a star located directly above the North Pole; also known as the North star

**Pollutant** a substance that interferes with biochemical processes and causes harmful change to organisms; produced both by human activities and natural processes.

**pollution** contamination of the environment with waste products or impurities

**polyconic projection** map made by fitting together a series of conic projections of adjoining areas

**population:**the total number of individuals of a particular species that exist in a specific area.

**population explosion:** a large increase in the population of a species, due to a rapid increase in the birth-rate, or a sharply reduced death rate, or both.

**pore space** (n) - the amount of space among sediments

**porosity** percentage of open spaces in a rock or sediment

**porphyritic** describing an igneous rock composed of both large and small crystals

**porphyry** (n) - a large mineral surrounded by an abundance of small minerals

**Precambrian time** earliest and longest geologic era, lasting from 4.6 billion to 540 million years ago

**precession** slow circular motion of the Earth’s axis as it turns in space that traces a circle in space every 26 thousand years

**precipitation** process by which water falls from clouds to the earth as rain, snow, sleet, and hail

**primary waves:** waves of energy, released during an earthquake, that travel through Earth by causing particles in rocks to compress and stretch apart in the direction of the wave.

**prime meridian** the meridian that passes through Greenwich, England, designated as 0°

**principle of superposition:** states that in an undisturbed layer of rock, older rocks lie at the bottom and the rocks become younge toward the top.

**principle of uniformitarianism** theory that geologic processes at work in the present were also at work in the past

***probablility*** (n) - the chance of something happening

**prominence** cloud of glowing gases that arches high above the Sun’s surface

***property*** (n) - a characteristic

**proton** subatomic particle with a positive electrical charge

**protoplanet** large body of matter that formed from the coalescence of planetesimals in the solar nebula

**protostar** inside a nebula, the shrinking, spinning center region; the second stage in the development of a star

**psychrometer** instrument used to measure relative humidity

**pulsar** neutron star that emits two beams of radiation that sweep across space

**pyroclastic material** the rock fragments ejected from a volcano

**Q**

***quadrangle*** (n) - the area of land shown by the U.S. Geological Survey

**quasar** starlike object that gives off radio waves and X rays

**R**

**radar** device that can detect objects and weather conditions in the upper atmosphere by sending and receiving radio waves

**radiation fog** condensation of water vapor that results from the cooling of air that is in contact with the ground

**radiation** the transfer of energy through matter or space by electromagnetic waves

***radiative balance*** (n) - the amount of energy that is absorbed is the same as the amount of energy emitted

**radiative zone** region surrounding the core of the Sun in which energy is transferred in the form of electromagnetic waves

**radio telescope**  an instrument that uses a large curved dish to reflect radio waves from space to focal point; used to study space objects and map the universe

**radio waves** electromagnetic waves having long waves; we use them to transmit boices, music, bideo, and data over distances.

***radioactive dating*** (n) - the use of radioactive isotopes to determine the absolute age of rocks and geologic events

**radioactive decay**  the decay of an atom of one element to form another element, occurring when an alpha particle or beta particle is expelled from the original atom

***radioisotope*** (n) - a radioactive isotope of an element

**rain gauge** instrument used to measure the amount of rainfall

***rainshadow effect*** (n) - a very dry region on the leeward side of a mountain

***rate of change*** (n) - how much a measurable aspect of environment is altered over a given time

**ray** streak of displaced rock material radiating from a crater

***real motion*** (n) - the actual motion of Earth rotating at 15 degrees per minute

***recrystallization*** (n) - the process by which old minerals are changed into new minerals by heat and pressure

**recyclable** items that can be processed and used again

**red shift** apparent lengthening of the light waves emitted by a star moving away from the Earth

**Redwall Limestone** rock layer of the Grand Canyon deposited during the Mississippian

**reef** on the continental shelf, a large, rigid underwater colony of coral animals that have become cemented together

**reflecting telescope** an optical magnifying instrument in which light from an object strikes a concave mirror, which then reflects the light to form an image at the focal point.

***reflection*** (n) - the process by which waves leave the surface of a material at the same angle at which they arrived

**reforestation** the planting of a large number of trees

**refracting telescope** an optical magnifying instrument in which light from an object passes through a convex lens and is bent to form an image at the focal point.

**refraction** bending of a light ray as it passes from one substance to another; *also* bending of a wave as it reaches shallow water

**regional metamorphism** metamorphism that affects rocks over large areas during periods of tectonic activity

**regolith** layer of weathered rock fragments covering much of the Earth’s surface

**rejuvenated** describing a river with a gradient that has been made steeper by a movement of the Earth’s crust

**relative age** age of an object compared with the ages of other objects

**relative dating**  determining the order of events and the relative age of rocks (older or younger) by examining the positions of rocks in layers.

**relative humidity** ratio of the amount of water vapor in the air to the amount of water vapor the air can hold when saturated

**relief** difference in elevation between the highest and lowest points of an area

**renewable resource** substance that can be replaced

**reptiles** scaly skinned, vertebrate animals that evolved from the same ancestors as amphibians but do not return to water to reproduce

***re-radiation*** (n) - the emission of energy that was absorbed by an object, transformed and sent back out into the atmosphere

***retreating glacier*** (n) - a glacier that is shrinking or receding

**retrograde motion** apparent periodic reversal in the motion of some planets as viewed from the Earth

**reverse fault** fault in which the hanging wall moves up relative to the footwall

***revolution*** (n) - the movement of an object around another object

**revolution** movement of a planet around the Sun

**richter scale** describes how much energy is released by an earthquake

**rift valley** steep, narrow valley formed as lithospheric plates separate

***rift zone*** (n) - a crevice created when two plates separate

**rill erosion** a type of surface water erosion due to runoff, in which water swiftly running down the slope creates small channels in the soil; these channels can enlarge into gullies.

**rille** long, deep channel that runs through the maria on the moon

**rip current** swift movement of water caused by the return of water to the ocean through channels in underwater sand bars

**robinson projection** a map-projection method using curved longitude lines; continent shapes and land areas are accurate with little distortion

**roche moutonnée** rounded knob of rock produced by glacial erosion

**rock** earth material made of a mixture of one or more minerals, glass, mineraloids, or organic matter.

**rock cycle** series of processes in which rock changes from one type to another and back again

**rockfall** fall of rock from a steep cliff

**rock-forming mineral** any common mineral that forms the rocks of the Earth’s crust

**rotation** spinning of a planet on its axis

rotation the spmning motion of a body on its axis

**runoff** water that flows over the land into streams and rivers salinity a measure of the amount of dissolved salts and other solids in a given amount of liquid

**S**

**S wave** secondary wave; a wave generated by an earthquake and the second to be recorded by a seismograph

**salinity** number of grams of dissolved salt in 1 kg of ocean water

**saltation** movement of sand by short jumps, caused by wind or water

***San Andreas Fault*** (n) - a transform plate boundary along the west coast of California

**sand bar** long ridge of sand deposited offshore

**sanitary landfill** a waste-disposal area that is excavated; lined with plastec, concrete, or clay; and filled with layers of waste and dirt

**satellite** object in orbit around a body with a larger mass

**saturated** describing air that contains all the water vapor it can hold at a specific temperature

**Saturn** in our solar system, the sixth planet from the sun; it is the second-largest planet, is mostly gas and liquid, and has prominent rings.

**scale** relationship between distance shown on a map and actual distance

***schistose foliation*** (n) - a strongly foliated metamorphic rock involving mica minerals in parallel layers

**science** the process of observing , explaining, and understanding thing in our world; means “having knowledge”; divided into four general areas: chemistry, physics, life science, and Earth science.

**scientific law** rule that correctly describes a natural phenomenon

**scientific methods** organized, logical approaches to scientific research

**scrubber** a device that ‘scrubs” the smoke from coal burning power plants with basic compounds to increase the pH to a safe level.

**sea breeze** wind blowing from sea to land during the day when the sun warms the land faster, and cool air from above the water forces the warm air above the land to rise.

**seafloor spreading** movement of the ocean floor away from either side of a mid-ocean ridge

**seamount** submerged volcanic mountains on the ocean floor that are at least 1,000 meters high

**season** a regular, short term period of change in the climate of an area due to changes in the amount of solar radiation the area receives.

**sediment** fragments that result from the breaking of rocks, minerals, and organic matter

**sedimentary rock** rock formed from hardened deposits of sediment

***sedimentation*** (n) - the process by which rocks are weathered, eroded and deposited as sediments in layers

**seismic gap** zone of rock in which a fault is locked and unable to move and in which no major earthquake has occurred for a long period of time

**seismic wave** vibration that travels through the Earth

***seismogram*** (n) - a sheet of paper that a seismograph records the information onto

**seismograph** instrument used to detect and record seismic waves

**seismologist** a scientist who studies earthquakes and seismic waves

**shadow zone** location on the Earth’s surface where no seismic waves or only P waves can be detected

**shearing** stress that pushes rocks in opposite horizontal directions

**sheet erosion** process in which parallel layers of topsoil are stripped away, exposing the surface of the underlying subsoil or partially weathered bedrock

**shield volcano** has a cone of hardened lava that forms a broad base and gentle slopes

**shoreline** place where the ocean and the land meet

**short-period comet** comet with a period of up to 100 years

**silicate** mineral that contains atoms of silicon and oxygen

**siliceous ooze** type of ooze that is mostly silicon dioxide

**silicon-oxygen tetrahedron** four oxygen atoms arranged in a pyramid with one silicon atom in the center

**sill** sheet of hardened magma that forms between and parallel to layers of rock

**silt** a sediment particle measuring 0.004 mm to 0.06 mm

**sinkhole** circular depression caused when the roof of a cavern collapses

***slaty foliation*** (n) - a parallel foliation of fine-grained minerals in a metamorphic rock

**sleet** ice pellets that form when rain falls through a layer of freezing air

**slump** downhill movement of a large block of soil under the influence of gravity

**smog** air pollution formed from a mixture of dust and chemicals

**snowfield** almost motionless mass of permanent snow and ice

**snowline** elevation above which ice and snow remain throughout the year

**soft water** water that contains few dissolved minerals

**soil** a mixture of weathered rock, decaying organic matter, mineral fragments, water and air

**soil profile** cross section of soil layers and bedrock

**solar collector** device for capturing solar energy

**solar eclipse** passing of the moon between the Earth and the Sun during which the shadow of the moon falls on the Earth

**solar flare** sudden, violent eruption of electrically charged atomic particles from the Sun’s surface

**solar nebula** cloud of gas and dust that developed into the solar system

**solar system** the Sun and the bodies that revolve around it

**solar wind** electrically charged atomic particles that stream out into space through holes in the Sun’s corona

**solar year** time required for the Earth to make one orbit around the Sun, about 365.24 days

**solid** physical form of matter with a definite shape and volume

**solifluction** slow down-slope flow of wet, muddy topsoil over frozen or clay-rich subsoil

**solstice** the two times each year that Earth’s tilt makdes the sun reach its greatest angle north or south of the equator, making the start of summer or winter

***soluble*** (adj) - characteristic of being dissolved

**solution** mixture in which one substance is uniformly dispersed in another substance

**sonar** acronym for sound navigation and ranging, method of mapping the ocean floor using reflected sound waves

**sorting** uniformity in the size of the particles of a rock or sediment

***source region*** (n) - the area where an object comes from

**space probe** an instrument that travels out into the solar system, gathers information, and transmits it back to Earth.

**space shuttle** a reusable spacecraft that transports astronauts, satellites, and other material to and from space.

**space station** a facility in space with living quarters, work and exercise space, and the support systems needed for people to live and work.

**Species** a group of individuals that normally breed only among themselves

***specific gravity*** (n) - the ratio of a substance's density to the density of water

**specific heat** amount of heat needed to raise the temperature of 1g of a substance 1° C

**specific humidity** actual amount of moisture in the air

**spectroscope** instrument that splits white light into a band of colors

***spectrum*** (n) - see electromagnetic spectrum

**spectrum** band of the various colors of light

**sphere** a round, three-dimensional object whose surface at all points is the same distance from its center; Earth is a sphere that is slightly flattened at its poles

**spiral galaxy** type of galaxy with a nucleus of bright stars and flattened arms that swirl around the nucleus

**spit** long, narrow deposit of sand connected at one end to the shore

**spring** the point at which the water table meets Earth’s surface, causing water to flow from the ground

**spring tide** tide with maximum daily tidal range that occurs during the new and full moons

**squall line** long line of heavy thunderstorms that may occur just ahead of a fast-moving cold front

**stalactite** cone-shaped calcite deposit suspended from the ceiling of a cavern

**stalagmite** an upward-pointing, cone-shaped calcite deposit built up from the floor of a cavern

**standard atmospheric pressure** the atmospheric pressure measured at sea level; 760 mm of mercury

**standard time zone** one of 24 regions of the Earth in which noon is set as the time when the Sun is highest over the center of the region

**star** body of gases that gives off a tremendous amount of radiant energy in the

**station model** cluster of weather symbols plotted on a map indicating the weather conditions at a particular reporting station

**stationary front** boundary formed where two air masses meet and neither is displaced

**steam fog** condensation of water vapor that results when cool air moves over warm water

**stock** igneous intrusion with an area less than 100 square kilometers

**stony meteorite** most common type of meteorite, similar in composition to rocks found on the surface of the Earth

**stony-iron meteorite** rare type of meteorite that contains both iron and stone

**storm surge** (n) - an abnormal rise in sea level along a coast due to a storm approaching

**storm track** (n) - the general path storms take due to planetary/prevailing winds

**strain** change in shape and volume of rocks that occurs due to stress

**stratification** layering of sedimentary rock

**stratified drift** glacial deposit that has been sorted and layered by the action of streams or meltwater

**stratopause** high-temperature zone that marks the upper boundary of the stratosphere

stratosphere

**stratosphere** layer of the atmosphere that extends upward from the troposphere to an altitude of 50 km; contains most atmospheric ozone

**stratovolcano** also called *composite volcano,* steep-sloped volcanic deposit with alternating layers of hardened lava flows and pyroclastic material

**stratus cloud** cloud with a sheet-like or layered form that is the lowest cloud in the sky

**streak** (n) - the color of a mineral's powder when scratched on a streak plate

***stream drainage patterns*** (n) - the shape of the stream courses in an area as viewed from sky

**stream load** sediments carried by a stream

**stream piracy** capture of a stream in one watershed by a stream in another watershed

**stress** the amount of force per unit area that is placed on a given material

**striations** long parallel scares in rocks, caused by rock fragments being dragged across them by a glacier.

**strike-slip fault** fault in which the rock on either side of a fault plane slides horizontally

**subarctic climate** type of polar climate that occurs in areas between 55° and 65° north latitude, with little precipitation and a large yearly temperature range

***subduction*** (n) - the process by which one plate moves under another plate at a converging boundary

**subduction zone** region where one lithospheric plate moves under another

**sublimation** process in which a solid changes directly into a gas, or a gas changes directly into a solid

**sublittoral zone** shallow benthic environment that is continuously submerged and that contains the largest number of benthos

**submarine canyon** deep valley in the continental slope and shelf

***submergence*** (n) - the act of moving downward

**submergent coastline** coast along which sea level rises or the land sinks

**submersible** underwater research vessel

**subpolar low** belt of low air pressure at about 60° north and 60° south latitude

***subsidence*** (n) - the downward settling of the Earth's crust

**sulfurous smog:** a gray-colored air pollution created when power plants and home furnaces burn fossil fuels, releasing sulfur compounds and smoke particles into the air

**summer solstice** the beginning of summer

**sunspot** cool, dark area of gas within the photosphere caused by powerful magnetic fields

**sunspot cycle** periodic variation in the number of sunspots that occurs approximately every 11 years

**Supai Group** rock layers of the Grand Canyon deposited during the Pennsylvanian Period

**supercooling** process in which water droplets are induced to remain liquid at temperatures below 0° C

**supergiant** extremely large, giant star

**supernova** star that blows apart with a tremendous explosion

***superposition*** (n) - the principle that the bottom rock layer is the oldest

**surface current** stream-like movement of water on or near the surface of the ocean

**surface wave** the slowest moving seismic wave generated by an earthquake and the last to be recorded by a seismograph

***surplus*** (n) - excess water in a water budget

**swell** one of a group of long, rolling waves that are all the same size

**syncline** down-curved fold in rock layers in which the youngest layer is in the center

***synoptic weather map*** (n) - a map that shows summary of the total weather picture

**T**

**talus** pile of rock fragments that accumulates at the base of a slope

**Tapeats Sandstone** rock layer of the Grand Canyon deposited during the Cambrian Period

***tarn*** (n) - a small, deep glacial lake located in a cirque and fed by runoff from the surrounding slopes

**Technology** the application of scientific discoveries; can both contribute to problems and solve problems

**Temperate zones** the two zones of moderate, seasonal weather that exist between the tropics and the polar regions

**temperature inversion** atmospheric condition in which warm air traps cooler air near the Earth’s surface

**temperature range** difference between the highest and lowest temperatures of a particular time period

**tension** stress that pulls rocks apart

***terminal moraine*** (n) - a ridge of unsorted sediments deposited by a glacier along its front

**terrane** piece of land with a geologic history distinct from that of the surrounding land

***terrestrial*** (adj) - relating to rocks and soil

**terrestrial planet** any one of the four planets closest to the Sun—Mercury, Venus, Earth, and Mars—with properties similar to those of the Earth

***texture*** (n) - the size, shape and arrangement of the minerals in a rock

**theory** hypothesis or set of hypotheses supported by the results of experimentation and observation

**theory of evolution** theory that organisms change over time and that new organisms are derived from ancestral types

**theory of microplate terranes** theory that continents are a patchwork of pieces of land that have individual geologic histories

**thermocline** zone of rapid temperature change that begins just below the surface of the ocean

***thermograph*** (n) - a self-registering thermometer

**thermograph** instrument that measures temperature changes by recording the movement of the bar of a bimetal thermometer

**thermosphere** the atmospheric layer above the mesosphere

**third quarter**  the moon phase halfway between full moon and new moon, when half of the side facing Earth is lighted

**thrust fault** type of reverse fault in which the fault plane is nearly horizontal rather than vertical

**thunderstorm** storm accompanied by thunder, lightning, and strong winds

**tidal bore** surge of water that rushes upstream in a river as the tide rises

**tidal current** movement of water toward and away from the coast due to the rise and fall of the tides

**tidal flat** muddy or sandy part of a lagoon that is visible at low tide

**tidal oscillation** slow, rocking motion of ocean water that occurs as tidal bulges move around the Earth

**tidal range** difference between the levels of the high and low tides at a specific location

**tide** daily change in the level of the ocean surface

***till*** (n) - an ridge of unsorted sediments deposited by a glacier

**till** unsorted rock material deposited by a glacier

***time scale*** (n) - a graduated line marked by events

**Titan** Saturn’s largest moon

**Titanium** durable, lightweight metal obtained from minerals such as ilmenite or rutile

***tombolo*** (n) - a bar of sand that connects an island with the mainland

**tombolo** ridge of sand that connects an island to the mainland

**topex-Posieidom satellite** satellite that collects information about Earth’s oceans by using radar.

**topographic map** map that shows the surface features of the Earth

***topographic profile*** (n) - a side view of the land surface

**topography** surface features of the Earth

**tornado** whirling, funnel-shaped cyclone

**Toroweap Formation** rock layers of the Grand Canyon deposited during the Permian Period

**trace fossil** fossil trace left by an ancient organism, such as a track, footprint, boring, or burrow

**trade winds** global winds flowing toward the equator between 30° and 0° latitude

**transform boundary (fault)** boundary formed where two lithospheric plates slide past each other

***transfrom plate boundary*** (n) - the area where 2 plates are shifting alongside one

**travertine** form of calcite that is deposited in terraces around the mouths of hot springs

**trench** deep valley in the ocean floor

**tributary** feeder stream that flows into a main stream

**trilobites** shield shaped marine invertebrate animals commonly found as fossils in Paleozoic Era rocks; they are now extinct

**Trojan asteroid** asteroid that orbits the Sun just ahead of or behind the planet Jupiter

**tropical climates** climates with a minimum average monthly temperature of 18°C

**tropical desert climate** dry, warm climate that occurs in regions about 20° to 30° north and south of the equator

**tropical rain forest climate** warm, humid climate that occurs within 5° to 10° on either side of the equator

**tropical savanna climate** tropical climate located between tropical rain forest and tropical desert climates, producing very wet summers and very dry winters

**tropics** the region that receives the most solar radiation; extends between latitudes 23.5 north and 23.5 south of the equator

**tropopause** upper boundary of the troposphere in which the temperature remains almost constant

**troposphere** atmospheric layer closest to the Earth’s surface where nearly all weather occurs

**trough** lowest point between two wave crests

**true north** direction of the geographic North Pole

**tsunami** giant ocean wave that often occurs after a major earthquake with an epicenter on the ocean floor

**tundra climate** polar climate that occurs in areas near the ocean at the latitude of the Arctic Circle, with a small yearly temperature range and very little precipitation

**turbidity current** dense current that carries large amounts of sediment down the continental slopes

**typhoon** hurricane that forms over the Pacific Ocean

**U**

**Ultraviolet radiation** a type of energy that comes to Earth from the sun and is mostly absorbed by ozone layer; rays can damage skin and cause cancer and other health problems **umbra** inner, cone-shaped part of the shadow cast by the Earth or the moon in which sunlight is completely blocked

**unconformity** break in the geologic record created when rock layers are removed by erosion

**undertow** irregular current that pulls water from a beach back to the ocean

***uniformitarianism*** (n) - the principle that the processes that acted on the Earth in the past continue to do so today

***uplift*** (n) - the upward movement of the Earth's crust

**upslope fog** condensation of water vapor that results from the lifting and adiabatic cooling of air rising up a slope of land

**upwarped mountains**  mountains formed when Earth’s crust is pushed up and eroded, forming sharp peaks and ridges.

**upwelling** process in which surface water moves farther out into the ocean and deep water moves upward to replace the surface water

**Uranus** in our solar system, the seventh planet from the sun; it is large, gaseous, and is the only planet that lays on its side in orbit

**V**

**Valles Marineris** a huge rift on Mars that is more than 4000 km long

**valley glacier** long, narrow, wedge-shaped mass of ice that usually moves through a mountain valley

***vaporization*** (n) - the act of changing a liquid to gas

**variable** factor in an experiment that can be changed

**varve** annual layer of sedimentary deposit on a lake bed

**vein** narrow band of mineral deposits in rock

***veneer*** (n) - a thin covering

vent

**vent** opening through which molten rock flows onto the Earth’s surface

**ventifact** any stone smoothed by wind abrasion

**Venus** in our solar system, the second planet from the sun; it is similar in size and mass to Earth, is blanketed by a dense atmosphere of carbon dioxide and sulfuric acid, and is hot

**vernal equinox** the beginning of spring

**vertebrate** animal with a backbone

***vertical sorting*** (n) - the process by which the largest, roundest and densest sediments are deposited first

***vesicular*** (adj) - characteristic of containing cavities or pore spaces

**Vishnu Schist** the bottommost and oldest rock layer of the Grand Canyon

**volcanic ash** pyroclastic particles between 0.25 mm and 2 mm in diameter

**volcanic block** the largest possible pyroclastic material that is formed from solid rock blasted from a volcanic fissure

**volcanic bomb** large, spindle-shaped clot of lava thrown out of a volcano

**volcanic dust** pyroclastic particles less than 0.25 mm in diameter

**volcanic mountain** mountain formed when molten rock erupts onto the Earth’s surface

**volcanic neck** solidified central vent of a volcano

**volcanism** any activity that includes the movement of magma toward or onto the Earth’s surface

**volcano** lava and pyroclastic material built up on the Earth’s surface around a

***volume*** (n) - the amount of space that an object occupies

**W**

**waning** describing the phase of the moon during which the size of its visible portion is decreasing

**warm front** boundary formed where a warm air mass overtakes and rises over a cold air mass

**waste coal** large piles of poor-quality coal lying near abandoned coal mines; can generate acid runoff

**water budget** gains and losses of water from a region

**water cycle** continuous movement of water from the air to the Earth and back again

**water gap** deep notch left where a stream erodes through a mountain as it is uplifted

***water retained*** (n) - the amount of water held back by the sediments

**water table** upper surface of the zone of saturation

***water vapor*** (n) - the gaseous state of water

**watershed** land from which water runs off into a stream

**waterspout** tornado that occurs over the ocean

**wave cyclone** large storm that develops along cold or stationary fronts, with winds that spiral in toward a central region of low air pressure

**wave height** vertical distance between the crest and the trough of a wave

**wave period** time required for a complete wavelength to pass a given point

**wave** periodic up-and-down movement of water

**wave-built terrace** extension of a wave-cut terrace that results from deposition of eroded material offshore

**wave-cut terrace** nearly level platform of rock left beneath the water after the erosion of a sea cliff

***wavelength*** (n) - the length of a wave from crest to crest or trough to trough

**waxing** describing the phase of the moon during which the size of its visible portion is increasing

**weather** general condition of the atmosphere at a particular time and

***weathering*** (n) - the process by which a rock is broken into smaller pieces

**weathering** change in the physical form or chemical composition of rock materials exposed at the Earth’s surface

**Wegener Alfred** a germon scientist who proposed the idea of continental drift in 1912

**Weight** a measure of the force of gravity on an object

**westerlies** global winds located between 40° and 60° latitude that flow from the southwest in the Northern Hemisphere and from the northwest in the Southern Hemisphere

**wet bulb depression** (n) - the change in temperature of the wet bulb thermometer

**white dwarf** small, hot, dim star

**whitecap** crest of a wave that is blown off by high winds

**wind** (n) - the movement of air horizontally due to differences in air pressure

***wind (weather) vane*** (n) - an instrument used to illustrate direction of wind flow

**wind gap** water-eroded notch in a mountain through which water no longer

**wind vane** instrument used to determine the direction of the wind

***windward*** (n) - the side of a hill, etc subjected to wind

**winter solstice** the beginning of winter

**Y**

**young stream** a stream that flows swiftly down a steep slope or a valley with steep sides, causing rapid erosion

**Z**

***zenith*** (n) - a point directly overhead

**zone of aeration** upper region of groundwater between the water table and the Earth’s surface

**zone of saturation** lower region of groundwater where all the pore spaces in a rock or sediment are filled with water

**zooplankton** microscopic ocean animals