

- Any solid material (rock or organic) that settles out from a liquid is known as sediment.
 - Magma movement is called igneous activity (from the Latin *ignis* meaning “fire”).
 - The original supercontinent, Pangaea, broke up into huge land masses called continental plates.
 - A fault is a crack between two rock plates caused by extreme, built-up pressure.
 - An earthquake’s hypocenter is the location beneath the Earth’s surface where a fault rupture begins.
 - The epicenter is the location on the surface that is directly above the hypocenter.
 - The hypocenter and epicenter may be far apart.
 - Tephra describes the matter blasted from a volcano compared to slow-flowing lava.
 - When plates clash along convergent boundaries, one is forced below the other, pulling older lithosphere (crust) to deep mantle depths.
 - A subduction zone is an area where two crustal plates collide and one plate is forced under the other into the mantle.
 - An ocean trench is formed along the convergent boundary of two plates colliding with one another.
 - Along divergent boundaries, plates pull apart and move in opposite directions making room for new lithosphere to form at the lip from outpouring magma.
 - Ridges are formed along divergent boundaries where plates slowly edge apart.
 - Plates slide past each other, parallel to their shared edges, along transform fault boundaries.
 - P waves or longitudinal compression waves travel through rock or buildings, causing squeezing and expanding parallel to the direction of transmission.
 - Love waves produce motion perpendicular to the direction of wave travel in a horizontal orientation *only* causing horizontal shearing, which wipes out building foundations.
 - Rayleigh waves produce a lazy rolling motion, which causes buildings to experience a bobbing motion transverse to or parallel to the wave’s direction of travel.
 - Magnitude measures the size of an earthquake, while intensity measures the shaking strength created by the earthquake at a certain location.
 - The intersection of a fault plane with the earth’s surface, along which a crack occurs, is called the fault line or surface trace.
 - Each logarithmic magnitude rise in the Richter scale represents a tenfold increase in energy.
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- Relative humidity is the connection between air temperature and the amount of water vapor the air contains.
 - Air temperature differences cause the jet stream. The greater the temperature differences, the stronger the pressure differences between warm and cold air. Strong pressure differences create strong winds and the jet stream.
 - Violent tornadoes (F4/F5) account for less than 2% of all tornadoes, but cause nearly 65% of all tornado deaths.
 - The eye of the hurricane is the central point around which the rest of the storm rotates, and where the lowest barometric pressures are found.
 - When temperatures actually increase with altitude, it is called a temperature inversion.
 - The troposphere is where all the temperature, pressure, wind, and precipitation changes we experience takes place.
 - The first phase in the formation of a hurricane is the lowering of barometric pressure, called a tropical depression.
 - The Coriolis Effect is a result of rotation, not gravitation.
 - The name *hurricane* is only given to systems that form over the Atlantic or the eastern Pacific Oceans. In the northwest Pacific Ocean and the Philippines they are called typhoons, while Indian and South Pacific Ocean storms are called cyclones.
 - A meteorologist studies the weather and its atmospheric patterns.
 - Although air is invisible, it still has weight and takes up space.
 - Nitrogen and oxygen make up the majority of Earth’s gases, even in the higher altitudes.
 - ENSO takes place every 2 to 7 years, but can occur yearly.
 - The worst winds and heaviest rainfall are found in a hurricane’s eye wall, not the eye.
 - A solar radiation unit equals 1 langley or 1 calorie/cm² of Earth’s surface or 3.69 Btu/ft² (British thermal units per square foot).
 - Trade winds are caused by solar heating and convection currents.
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- Water shortages affect at least one-third of the world’s population, with regional shortages being an issue.
 - Aquifers are large underground rock formations that store water in reservoirs.
 - Recharge zones allow water to enter aquifers.
 - Water withdrawal refers to the total amount of water taken, while consumption refers to water lost to direct use, evaporation, and ground seepage.
 - Runoff is made up of rainfall or snowmelt that has not had time to evaporate, transpire, or move into groundwater locations.
 - The geographical region from which a stream gets water is called a drainage basin or watershed.
 - Evaporation is water to vapor; condensation is the reverse, vapor to liquid (water).
 - Nearly all (97%) of the Earth’s total water is contained in its oceans.
 - Soil or rock is saturated when no water or other substance can fill the open spaces.
 - Aquifers that form a water table that separates the unsaturated and saturated zones are called unconfined aquifers since they flow right into the saturated zone.
 - Oscillating sprinkler systems lose a lot of water to evaporation and are not particularly efficient.
 - The Gulf Stream current is about 800 times the volume of the Amazon, the world’s largest river.
 - Water table levels fall during times of low rainfall and high evapotranspiration.
 - Aquifer recharge zones, either at the surface or below ground, supply water to an aquifer and/or most of the watershed or drainage basin.
 - Porous media aquifers are made up of combined individual particles such as sand or gravel where groundwater is stored or moves between individual grains.
 - The boundary between two watersheds is called a divide.
 - Scientific concern about increasingly impacted oceans compelled more than 1,600 marine scientists to sign the 1998 *Troubled Waters* statement to raise public awareness.
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- Topography is the mapping of an area’s land contours and physical features.
 - When rock units are stacked vertically, they create a formation in the geological record.
 - The three main rock types are sedimentary, igneous, and metamorphic.

- The pedocal is found in dry or semi-arid climates where there is little organic matter, little to no leaching of minerals, and a high lime content.
 - Lithology is the study of the physical characteristics of a rock through visual recording or with a low-power microscope or handheld magnifying glass.
 - Lithified soil is made up of sand, silt, and organic organisms.
 - Physical weathering occurs when rock gets broken into smaller pieces without a change in its chemical composition.
 - Sedimentary rock is formed from rocks and soils from other locations that are compressed with the remains of dead organisms.
 - Metamorphic rocks are formed when rocks originally of one type are changed into a different type by heat and/or pressure.
 - Diagenesis includes (1) compaction, (2) cementation, (3) recrystallization, and (4) chemical changes (e.g., oxidation/reduction).
 - Igneous rock is formed by the cooling and hardening of molten rock (magma), deep in the earth or blasted out during an eruption.
 - Igneous rock is divided into two main types: felsic and mafic.
 - Felsic rock has high levels of silica-containing minerals (e.g., quartz and granite).
 - Mafic rock has high levels of magnesium and iron (ferric) minerals.
 - An individual band with its own specific characteristics and position is called a rock–stratigraphic unit or rock unit.
 - Grain size and color are the two main ways that geologists describe rock textures.
 - Acid rain is a chemical reaction that speeds up chemical weathering.
 - The most important natural acid is carbonic acid, formed when carbon dioxide dissolves in water ($\text{CO}_2 + \text{H}_2\text{O} \leftrightarrow \text{H}_2\text{CO}_3$). It is a big part of acid rain.
 - Frost wedging happens when rock is pushed apart by the alternate freezing and thawing of water in cracks.
 - Salt wedging, caused by salt crystal growth, is an important rock-breaking force in the desert.
 - Unloading happens when there is a release of internal rock pressure from erosion and the outer layers of a rock are shed.
 - Turning soil over by the plow or tillage often increases soil erosion.
 - Dolomitization happens when limestone turns into dolomite by a mineral substitution of magnesium carbonate for calcium carbonate.
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- Loss of habitat is perhaps the most important factor that affects species.
 - Wetlands are the transitional areas between land and marine areas.
 - Land-based ecosystems, known as biomes, are classified by rainfall and climate.
 - An ecosystem is a complex community of plants, animals, and microorganisms linked by energy and nutrient flows that interact together and with their environment.
 - An animal or plant with a specific relationship to its habitat or other species, filled by it alone, occupies an ecological niche.
 - Sustainable use is the use of resources in a way that protects the numbers and complexity of a species or environment without causing long-term loss.
 - The biosphere includes the hydrosphere, crust, and atmosphere. It is located above the deeper layers of the Earth.
 - The total genetic makeup of a population is called its gene pool.
 - Species reach levels of specialization through adaptation (i.e., changing as the environment changes) and evolution (i.e., genetic changes in species over time).
 - Random DNA protein breaks or other changes are called genetic drift.
 - When the frequency of certain traits is narrowed from the original population, it causes a bottleneck effect.
 - When only a fraction of original genetic material and its diversity is represented in a new group, it is known as a founder effect.
 - The Hardy-Weinberg principle states that in a stable population, the frequency of genotypes and alleles (parts of genetic material) will remain constant.
 - A species is a group of intrabreeding organisms unable to interbreed with a different species.
 - Allopatric speciation often results from reproductive isolation in animal and plant species.
 - Sympatric speciation, or the evolution of two different species from a single species, is more common in plants.
 - When two species compete and the stronger, better adapted species wins, the process is called competitive exclusion.
 - When a species has no competitive limitations, it has its fundamental niche.
 - When a species must settle for a smaller niche than it normally would have because of competition, the niche is called a realized niche.
 - Gause's principle explains that no two species can fill the same niche at the same time, and the weaker species will fill a smaller niche, relocate, or die off.
 - When an ecosystem reaches its final stage of balanced species development, it is called a climax community.
 - Predation occurs when one species serves as food for another species.
 - Symbiosis is the close, extended relationship between organisms of different species that may or may not benefit each participant. There are three types of symbiotic relationships:
 - *Mutualism*. Both species benefit.
 - *Commensalism*. One species benefits and one species is fairly unaffected.
 - *Parasitism*. One species benefits and one species is harmed.
 - A related mechanism of passive competition is camouflage and mimicry.
 - Endemic species, naturally occurring in only one area or region, are unique to that specific region.
 - The total area in which a plant, animal, insect, or other organism may travel in its lifetime is considered its range.
 - The first colonizers to a site (e.g., moss or lichens) are called pioneer species.
 - A species around which an entire ecosystem is dependent is known as a keystone or foundational species.
 - Endangered species are those species threatened with extinction (like the Florida panther and California condor).
 - A species that is no longer living, anywhere on Earth, is said to be extinct.
 - The area in which an animal, plant, or microorganism lives and finds nutrients, water, sunlight, shelter, living space, and other essentials is called its habitat.
 - Wetlands are low, soggy places where land is constantly or seasonally soaked, or even partly underwater.
 - An ecological region that has lost more than 70% of its original habitat is known as an environmental hotspot.
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- The change between total carbon released to the atmosphere and the total pulled back down governs whether the land is a supplier or reservoir of atmospheric carbon.

- Known as the building block of life, carbon is the foundational element of all organic substances.
 - The carbon cycle involves the Earth's atmosphere, fossil fuels, oceans, soil, and plant life of terrestrial ecosystems.
 - Precipitation can be rain, snow, sleet, or hail depending on temperature and other atmospheric conditions.
 - Transpiration is another type of evaporation in the hydrologic cycle.
 - When elements move from one Earth storage form to another, it is known as a geochemical cycle.
 - All things that take up space and have mass are known as matter.
 - Conservation of matter states that matter is neither created, nor destroyed, but recycled through natural cycles.
 - Residence time equals the average amount of time a chemical element (e.g., carbon, calcium, or phosphorus) spends in a geological reservoir or cycle.
 - Photosynthesis defines a series of reactions in plants, bacteria, and algae that capture visible light wavelengths (0.4 to 0.7 μm) and transform light energy into chemical energy needed for organic molecules to bond.
 - The biological carbon cycle occurs when plants absorb carbon dioxide and sunlight to make glucose and other sugars (carbohydrates) to build cellular structures.
 - High concentrations of dissolved calcium and/or magnesium in freshwater cause hard water.
 - Water takes a variety of paths and time periods to get back into the atmosphere including:
 - _ Absorption by plants
 - _ Evaporation from the sun's heating
 - _ Storage in the upper levels of soil
 - _ Storage as groundwater deep in the earth
 - _ Storage in glaciers and polar regions
 - _ Storage or transport in springs, streams, rivers, and lakes
 - _ Storage in the oceans
 - Besides geological cycling, sulfur cycles through organisms such as sulfur bacteria that anchor sulfur or release it into the environment.
 - Nitrogen (N_2) makes up 79% of the atmosphere, and all life on Earth requires nitrogen-containing compounds (e.g., proteins) to survive.
 - At the cellular level, phosphorus is important in energy-transfer reactions.
 - The dividing line that separates an area where calcium carbonate dissolves and accumulates is called the lysocline.
 - When calcium carbonate is used by marine inhabitants to build shells, it is called biomineralization.
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- Exponential growth happens when populations experience an unrestricted growth overshoot before limited resources and space or disease cause slowing.
 - Logistic growth describes population drop when it overreaches carrying capacity.
 - A group of individuals of the same species located in the same geographic area is known as a population.
 - When a species is isolated long enough, loss of genetic diversity may affect reproduction, adaptability, and species survival. This is known as the founder effect.
 - Fertility is only half the answer to exponential human population growth. The other half comes from the drop in death rates related to (1) mothers dying in childbirth and infant mortality, (2) infectious disease, (3) hazardous work conditions, (4) poor sanitation, (5) clean water supplies, (6) better health care, and (7) better and more available food.
 - Natality (i.e., germination, cloning, birth, or hatching of new individuals in a population) is affected by external factors (e.g., climate, temperature, moisture, and soil), which determine whether a population will grow or shrink.
 - Fecundity is the actual capability to reproduce, while fertility is a measure of the number of offspring produced.
 - Life span describes the longest interval of time that a certain species is estimated to live.
 - Life expectancy is the likely number of years an individual is expected to live based on statistical probability.
 - Mortality is calculated by dividing the number of individuals that die during a specific time period by the number alive at the start of that same time period.
 - Survivorship describes the number of individuals born at or near the same time and living to a specific age.
 - The first species to inhabit an area is called a pioneer species.
 - External growth limitations in the environment include food and habitat accessibility, as well as predator numbers.
 - Mortality or death rate is an internal factor that can be increased or decreased by external conditions such as extreme heat or cold.
 - Movement out of or away from a population is known as emigration.
 - When individuals join a population, it is called immigration.
 - Population limiters, such as drought, early frost, fires, hurricanes, floods, earthquakes, and other environmental happenings, are density independent.
 - Things that lower population density and growth rates are called environmental resistance factors.
 - The r component in $rN = \Delta N/\Delta t$ describes the average contribution of an individual to population growth. This equation finds a species' *biotic potential*.
 - The rule of 70 is used to estimate population doubling. By dividing 70 by the annual percent rate of growth, you get a population's approximate doubling time in years.
 - Logistic growth is described mathematically by $rN(1 - N/K) = \Delta N/\Delta t$, where K is an environment's carrying capacity.
 - Conservation biologists study isolation, genetic drift, and the founder effect to find the minimum viable population size or lowest number of individuals for a species' survival.
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- When a forested area is cut down completely, it is known as clear-cutting.
 - Old-growth forests are those that have never been harvested, with trees between 200 and 2,000 years old.
 - Forest floor leaf litter and fallen logs provide habitat for interdependent animals, birds, amphibians, insects, bacteria, and fungi adapted to each other over geological time.
 - When the forests are cleared, plants, animals, birds, and insects are displaced or destroyed, causing a loss of biodiversity and often extinction.
 - Forests are mainly divided into temperate (moderate climate) or tropical regions.
 - Temperate forests are grouped into conifers (needle-leaf trees) like pine, spruce, redwood, cedar, fir, sequoia, and hemlock, while tropical forests contain flat-leaf trees.

- Old-growth forests contain mostly conifers.
 - Second- and third-growth forests contain trees of the same age and size as some of the younger old-growth trees, but have far fewer plant and animal species.
 - Land overuse can come from economic circumstances, poor land laws, or cultural customs.
 - Some biological species need fire to clear undergrowth, allowing these species to reproduce, and new sprouts to survive.
 - When topsoil is blown or washed away, the remaining land's physical structure and biochemical makeup are changed.
 - Population decrease can cause desertification, since there are less people to take care of the land.
 - Desertification is the downgrading of rich soil and land into dry, barren lands.
 - An economy based on crop sales can cause farmers to ignore the overexploitation of the land.
 - A temperate rain forest is found in only a few special places around the world, such as the Pacific temperate rain forest on the west coast of North America.
 - Intense, rotational grazing like that done by wild herds (e.g., buffalo, zebras) is often better for the land than long-term grazing.
 - Wild species are often more pest resistant, disease resistant, and drought tolerant, and can fend off predators better than domestic cattle, goats, or sheep.
 - Elk, American bison, and various African species need less care and feeding than cattle or sheep, while bringing a better market price.
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- A population's ecological footprint is the amount of surface area needed to provide for its needs and dispose of its waste.
 - Urban populations increase naturally by more births than deaths and by immigration.
 - Immigration is affected by different characteristics or push and pull factors.
 - In Mexico City, roughly 50% of the population lives in shantytowns built on undeveloped land from scavenged materials.
 - In densely populated cities such as Jakarta, Indonesia, a worker spends around three to four hours traveling to and from work each way due to traffic jams.
 - Millions of vehicles carrying one person cause traffic jams and increase air pollution.
 - Bus systems, subways, and monorail transportation have eased congestion and pollution, but not all cities can afford modern transportation.
 - The world's land area covers around 133 million km² (56 million mi²), or nearly 30% of the planet. Grassland, agriculture, and forests cover around 65% of this area.
 - Over half the world's population lives within 60 km of coastal waters, and this population is expected to double within the next three to four decades.
 - Yosemite was the first area in the United States set aside by President Abraham Lincoln during the Civil War to protect nature.
 - Developed countries use nearly 80% of global while developing countries produce over half the world's wood, but only use about 20%.
 - President Theodore Roosevelt established 51 national wildlife refuges in the United States. There are now 540, which surround nearly 40 million hectares of land.
 - Ninety percent of all reefs are threatened by sea temperature change, coral mining, sediment runoff, ocean dumping, and destructive fishing methods. Researchers predict living coral reefs will be gone by 2060.
 - The International Union for the Conservation of Nature created a world conservation strategy to (1) maintain critical ecological processes, (2) preserve genetic diversity, and (3) ensure sustainability of wild species and ecosystems.
 - The Man and Biosphere program calls for the division of protected areas into different use zones, with a core area reserved for crucial ecosystems and endangered wildlife.
 - Depending on the deposit depth, minerals are extracted through open-pit mines, strip mining, or deep underground mines.
 - A mineral is a naturally found, inorganic solid with a specific crystalline structure and chemical composition.
 - A mineral's internal structure determines its physical and optical properties, shape, hardness, cleavage, fracture lines, specific gravity, refractive index, and optical axes.
 - The 1977 Surface Mining Control and Reclamation Act mandated restoration of strip-mined land.
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- The first law of thermodynamics explains that energy can be neither created nor destroyed.
 - The second law of thermodynamics describes how the universe tends toward entropy (chaos, disorder, or randomness).
 - In 1956, Shell Oil geophysicist M. King Hubbert calculated that the oil well extraction rate in the United States (lower 48 states) would peak around 1970.
 - Fossil fuels are solids, liquids, and gases created through the compression of ancient organic plant and animal material in the Earth's crust.
 - Currently, oil production in the United States from all sources is around 8 million barrels a day from over a half million wells.
 - Fossil fuels produce around 85% of U.S. energy, with oil making up about 40% of that.
 - Fossil fuel burning is the biggest single source of human-created air pollution in the industrialized world.
 - Getting additional oil from a drilled deposit is known as secondary recovery.
 - Canada is the biggest supplier of oil to the United States.
 - In 1839, Abraham Gesner, a governmental geologist in Nova Scotia discovered albertite, a coal-like material. Later he discovered a process to manufacture kerosene.
 - Kerosene, or "coal oil," was cheap and smelled better than animal fat when burned.
 - When coal is used to produce electricity, nearly 65% of the original energy is lost in thermal conversion at the plant.
 - One calorie unit equals the amount of energy needed to heat 1 gram of water to 1 degree Celsius.
 - The *International Energy Outlook 2008* projects that global energy consumption will increase by 50% from 2005 to 2030.
 - Coal is often contaminated with sulfur, sometimes as much as 10% by weight.
 - The *International Energy Outlook 2008* estimates that coal will account for 29% of total world energy consumption in 2030.
 - Coal burning creates a lot of atmospheric pollution and particulates, and increasing its use will worsen the global greenhouse problem.
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- Uranium's most stable isotope, ²³⁸U, has a half-life of nearly 4.5 billion years.
 - Uranium oxide, found in granite and other volcanic rocks, is known as pitchblende.
 - Nuclear power is created by fission (splitting) of uranium, plutonium, or thorium atoms; and fusion (merging) of two smaller atoms into a larger atom with a combined nucleus.
 - Nuclear energy, using ²³⁵U, has the capability to provide energy for several hundred years.

- Most nuclear reactors contain a core with a large number of fuel rods loaded with uranium oxide pellets.
 - Breeder reactors produce more energy than they use.
 - The most common breeder reaction is that of plutonium (^{239}Pu), a by-product of nonfissionable ^{238}U .
 - Fires, poor containment design, operator mistakes, and a power surge led to the catastrophic accident in Chernobyl, Ukraine.
 - The Chernobyl plant, a graphite-regulated reactor, did not have the concrete containment dome mandatory on all American nuclear plants.
 - The China Syndrome is a hypothetical concept that refers to what might happen if nuclear core temperatures escalated out of control, causing the core to melt through Earth's crust all the way to the other side of the world (to China).
 - Boiling water and pressurized water reactors are two types of similar nuclear reactors with hot reactor cores that heat water to steam, spin turbines, and generate electricity.
 - Tons of nuclear waste will be buried in tunnels 302 meters below Yucca Mountain's peak and 274 meters above the water table.
 - The INPO established guidelines for excellence in nuclear plant operations and increased communication within the nuclear industry.
 - The Curies found that radioactive particles were emitted as electrically negative beta (β) particles or positive alpha (α) particles.
 - At Three Mile Island, the reactor lost cooling water, overheated, and the fuel rods melted and ruptured; in addition radioactive gases were released into the atmosphere.
 - When a radioactive element decays, different nuclear particles (e.g., alpha, beta, and gamma) can be separated by a magnetic field.
 - Gamma (γ) particles have no overall charge, but a shorter wavelength.
 - Transportation of nuclear waste by rail or truck is an issue because of possible radiation release from rail or highway accidents and terrorism.
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- The Staebler-Wronski effect describes solar cell degradation (i.e., the thinnest layers increase the electric field strength across the material, but reduce light absorption and cell efficiency).
 - Geothermal reservoirs can reach temperatures of 370°C.
 - Impoundment and diversion or run-of-river are types of hydroelectric dams.
 - Ethanol is used in the United States as a fuel additive to reduce incomplete combustion, allow the fuel to burn cleanly, and reduce greenhouse gases.
 - Flowing water (*hydro*) creates energy and can be turned into electricity.
 - Turbines catch the wind with two to three propeller-like blades mounted on a shaft to form a rotor attached to a power generator.
 - Forty percent of the world's population uses wood or charcoal as a main energy source.
 - Deep underground heat, transferred by thermal conduction through water to the surface, is called geothermal (Earth's heat) energy.
 - Airplane-like propeller blades are used to generate electricity from wind turbines.
 - Because of location, 10% of U.S. energy comes from geothermal power.
 - A Power Scorecard Rating System categorizes environmental aspects of verified clean power blocks from new renewable energy sources.
 - Tidal energy taps incoming and outgoing water flow during high and low tides.
 - Industrial greenhouse gas emission profiles are products of the GHG Registry.
 - Diffusing phosphorus onto boron-coated silicon wafers produces semiconductor connections.
 - Coasts, plains, mountains, and open oceans are good for wind turbines, but forests tend to block or disperse the wind.
 - The problem with ethanol is its ability to increase benzene and toluene's time in the environment before they break down.
 - Hydrogen is released as a result of hydrolysis.
 - Because it burns cleanly, methanol provides race cars with superior performance and safety.
 - The Earth gets more energy from the sun in an hour than the planet uses in a year (i.e., roughly 10,000 times all the commercial energy produced yearly).
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- In general, four main categories of contaminants exist: organic, inorganic, radioactive, and acid-base.
 - Green and carbon taxes are being assessed on fossil fuels, mining, energy, forestry, fishing and hunting licensing, garbage, effluent, emissions, and hazardous wastes.
 - Thermal pollution, the release of liquid or gas that increases heat in a surrounding area, has far-reaching and damaging ecological effects by impacting aquatic organisms and animal populations.
 - Cold-blooded organisms adapted to specific temperature ranges. If water temperatures change too much, metabolic processes break down. Unlike humans, who can adapt to wide temperature ranges, most organisms live in narrow temperature niches.
 - In the workplace, sick building syndrome has caused workers to suffer headaches, allergies, fatigue, nausea, and respiratory problems.
 - City heat islands collect pollutants so that areas downwind have much less visibility and greater rainfall due to condensation than their neighbors with cleaner air.
 - Total organic carbon (TOC) levels are used by hydrologists to check the health of freshwater as it affects biogeochemical processes, nutrient cycling, biological availability, chemical transport and interactions.
 - The amount of dissolved oxygen in water depends on temperature (the colder the water, the more oxygen that can be dissolved), water flow volume and velocity, and the number of organisms using oxygen for respiration.
 - Microscopic pathogens (e.g., bacteria, viruses, and protozoa) enter waterways through untreated urban sewage, storm drains, pet waste, septic tanks, farm runoff, and bilge water causing sickness and/or death.
 - Water turbidity, caused by suspended matter such as clay, silt, and organic matter, can also result from microscopic organisms blocking light through water and provide a medium for their growth.
 - Ozone oxidation is a good water disinfectant method, but unlike chlorine, ozone doesn't stay in water after it leaves the treatment plant.
 - Ultraviolet light is used to treat wastewater by killing microorganisms, but like oxidation, it is a one-time treatment at the plant.
 - During coagulation, aluminum sulfate is added to raw sewage water, forming sticky blobs that snag small particles of bacteria, silt, and other impurities.
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- Greenhouse gases (e.g., roughly 79.1% nitrogen, 20.9% oxygen, 0.03% carbon dioxide, and trace amounts of others) are a natural part of the atmosphere.
 - The term *greenhouse effect* describes how atmospheric gases prevent heat from being released back into space, allowing it to build up in the Earth's atmosphere.

- Greenhouse gases also include water vapor, methane, nitrous oxide, halogenated fluorocarbons, ozone, perfluorinated carbons, and hydrofluorocarbons.
- Water vapor is the most important greenhouse gas, but human activity doesn't have much direct impact on its natural atmospheric level.
- Global warming is caused by an increase in greenhouse gas levels.
- The greatest impact on the greenhouse effect has come from industrialization and increases in the amounts of carbon dioxide, methane, nitrous oxide, soot, and aerosols.
- Carbon dioxide (CO₂) is a natural greenhouse gas and the biggest human-supplied contributor to the greenhouse effect (about 70%).
- The 34 million acres of tropical forests destroyed annually release between 20% and 25% of total global CO₂ emissions.
- Nitrous oxide is a stable atmospheric pollutant produced by combustion.
- Nitrogen and atmospheric moisture form nitric acid, which comes down as acid rain and acidifies lakes and soils, kills fish and animals, and damages forests.
- Ozone, an atmospheric bodyguard, has a crucial role in protecting life on Earth by absorbing the sun's ultraviolet (UV) radiation.
- Ultraviolet radiation breaks down the body's DNA and causes skin cancer and cataracts.
- The enhanced greenhouse effect caused by the burning of oil, coal, and natural gas increases global warming and changes the environment.
- Drifting on ocean currents, plankton use photosynthesis to produce energy and draw carbon out of the atmosphere. While building intricate calcium carbonate shells, they bind carbon as well.
- Major climatic change greatly affects local weather through the frequency and intensity of storms.
- Carbon sequestration removes and stores atmospheric carbon in carbon sinks (e.g., oceans, forests) through physical and biological processes like photosynthesis.
- If oceans become less effective in serving as a sink for human-produced carbon dioxide, atmospheric carbon dioxide buildup will accelerate.
- Global warming is causing shifts in species habitat and migrations averaging 6.1 kilometers per decade toward the poles.
- The EPA atmospheric inventory estimates, documents, and evaluates greenhouse gas emissions and sinks for all source categories.
- If business-as-usual industrial output doesn't change, global CO₂ levels will double by the end of the 21st century.
- Roughly 84% of stratospheric chlorine comes from human-made sources, while only 16% comes from natural sources.
- Ozone reduction allows harmful UV radiation through the atmosphere, causing skin cancer, eye damage, and other harmful effects.