

**tsunami:** An immense swell, or wave of ocean water triggered by an earthquake, volcano, or landslide that can travel long distances across oceans and inundate coasts.

**matter:** All the material in the universe that has mass and occupies space.

**chemistry:** The study of the different types of matter and how they interact.

**law of conservation of matter:** The physical law stating that matter may be transformed from one type of substance into others, but that it cannot be created or destroyed.

**uranium:** The chemical element with 92 protons and 92 neutrons. It is used as a fuel source to produce electricity with nuclear energy.

**element:** A fundamental type of matter: a chemical substance with a given set of properties, which cannot be broken down into substances with other properties.

**atom:** The smallest component of an element that maintains the chemical properties of that element.

**protons:** A positively charged particle in the nucleus of an atom.

**neutrons:** an electrically neutral particle in the nucleus of an atom.

**electrons:** A negatively charged particle that moves about the nucleus of an atom.

**radioisotopes:** A radioactive isotope that emits subatomic particles and high-energy radiation as it “decays” into progressively lighter isotopes until becoming a stable isotope.

**radioactive:** The quality by which some isotopes “decay” changing their chemical identity as they shed atomic particles and emit high-energy radiation.

**half-life:** The amount of time it takes for one-half the atoms of a radioisotope to emit radiation and decay.

**ion:** An electrically charged atom or combination of atoms.

**ionizing radiation:** A high-energy form of radiation that can damage the cells of living things. Sources of this radiation include the sun and radioactive particles from nuclear energy and natural sources.

**molecule:** A combination of two or more atoms.

**compound:** A molecule whose atoms are composed of two or more elements.

**water:** A compound composed of two hydrogen atoms bonded to one oxygen atom.

**carbon dioxide:** A colorless gas used by plants for photosynthesis, given off by respiration, and released by burning fossil fuels. A primary greenhouse gas whose buildup contributes to global climate change.

**covalent bond:** A type of chemical bonding where atoms share electrons in chemical bonds.

**hydrogen bond:** A weakly attractive interaction between molecules due to the attraction of partial positive and partial negative charges.

**ionic bonds:** A type of chemical bonding where electrons are transferred between atoms creating oppositely charged ions that bond due to their differing electrical charges.

**acidic:** The property of a solution in which the concentration of hydrogen ions is greater than the concentration of hydroxide ions.

**basic:** The property of a solution in which the concentration of hydroxide ions is greater than the concentration of hydrogen ions.

**pH:** A measure of the concentration of hydrogen ions in a solution. It is a logarithmic scale. Or,  $\text{pH} = -\log [\text{H}^+]$ .

**organic compounds:** A compound made of carbon atoms (and, generally, hydrogen atoms) joined by covalent bonds and sometimes including other elements, such as nitrogen or oxygen, sulfur, or phosphorus.

**hydrocarbons:** An organic compound consisting solely of hydrogen and carbon atoms.

**plastics:** Synthetic (human-made) polymers used in numerous manufactured products.

**polymers:** A chemical compound or mixture of compounds consisting of long chains of repeated molecules.

**macromolecule:** A very large molecule, such as a protein, nucleic acid, carbohydrate, or lipid.

**protein:** A macromolecule made up of long chains of amino acids.

**nucleic acid:** A macromolecule that directs the production of proteins.

**deoxyribonucleic acid (DNA):** A double-stranded nucleic acid composed of four nucleotides, each of which contains a sugar, a phosphate group, and a nitrogenous base. It carries the hereditary information for living organisms and is responsible for passing traits from parents to offspring.

**ribonucleic acid (RNA):** A usually single-stranded nucleic acid composed for four nucleotides, each of which contains a sugar, a phosphate group, and a nitrogenous base. It carries the hereditary information for living organisms and is responsible for passing traits from parents to offspring.

**gene:** A stretch of DNA that represents a unit of hereditary information.

**carbohydrate:** An organic compound consisting of atoms of carbon, hydrogen, and oxygen.

**lipid:** A class of chemical compounds that do not dissolve in water and are used in organisms for energy storage, for structural support, and as key components of cellular membranes.

**energy:** The capacity to change the position, physical composition, or temperature of matter; a force that can accomplish work.

**work:** When a force acts on an object, causing it to be displaced (to move in space).

**potential energy:** Energy of position.

**kinetic energy:** Energy of motion.

**first law of thermodynamics:** The physical law stating that energy can change from one form to another, but cannot be created or lost. The total energy in the universe remains constant and is said to be conserved.

**second law of thermodynamics:** The physical law stating that the nature of energy tends to change from a more-ordered state to a less-ordered state; that is, entropy increases.

**energy conversion efficiency:** The ratio of the useful output of energy to the amount that needs to be input.

**autotrophs:** An organism that can use the energy from sunlight to produce its own food. Includes green plants, algae, and cyanobacteria.

**photosynthesis:** Sunlight powers a series of chemical reactions that convert carbon dioxide and water into sugar (glucose), thus transforming low-quality energy from the sun into high-quality energy the organism can use.

**cellular respiration:** The process by which a cell uses the chemical reactivity of oxygen to split glucose into its constituent parts, water and carbon dioxide, and thereby release chemical energy that can be used to form chemical bonds or to perform other tasks within the cell.

**heterotrophs:** An organism that consumes other organisms. Includes most animals, as well as fungi and microbes that decompose organic matter.

**magma:** Molten, liquid rock.

**hydrothermal vents:** A location in the deep ocean where heated water spurts from the seafloor carrying minerals that precipitate to form rocky structures.

**chemosynthesis:** The process by which bacteria in hydrothermal vents use the chemical energy of hydrogen sulfide to transform inorganic carbon into organic compounds.

**geology:** The scientific study of Earth's physical features, processes, and history.

**core:** The innermost part of Earth, made up mostly of iron.

**mantle:** The malleable layer of rock that lies beneath Earth's crust and surrounds the core.

**asthenosphere:** A layer of the upper mantle just below the lithosphere, consisting of especially soft rock.

**lithosphere:** The solid part of the Earth, including the rocks, sediment, and soil at the surface and extending down many miles underground.

**crust:** The lightweight outer layer of the Earth, consisting of rock that floats atop the malleable mantle.

**plate tectonics:** The process by which Earth's surface is shaped by the extremely slow movement of tectonic plates, or sections of crust.

**divergent plate boundaries:** The area where tectonic plates push apart from one another as magma rises upward to the surface, creating new lithosphere as it cools and spreads.

**transform plate boundary:** The area where two tectonic plates meet and slip and grind alongside one another, creating earthquakes.

**convergent plate boundaries:** The area where tectonic plates converge or come together. Can result in subduction or continental collision.

**subduction:** The plate tectonic process by which denser crust slides beneath lighter crust at a convergent plate boundary. Often results in volcanism.

**continental collision:** The meeting of two tectonic plates of continental lithosphere at a convergent plate boundary, where in the continental crust on both sides crush together bending, buckling, and deforming layers of rock and forcing portions of the buckled crust upward, often creating mountain ranges.

**rock cycle:** The very slow process in which rocks and the minerals that make them up are heated, melted, cooled, broken, and reassembled, forming igneous, sedimentary, and metamorphic rocks.

**rock:** A solid aggregation of minerals.

**mineral:** A naturally occurring solid element or inorganic compound with a crystal structure, a specific chemical composition, and distinct physical properties.

**lava:** Magma is released from the lithosphere and flows or spatters across Earth's surface.

**igneous rock:** One of the three main categories of rock. Formed from cooling magma. Granite and basalt are examples.

**sediment:** The eroded remains of rocks.

**sedimentary rock:** One of the three main categories of rock. Formed when dissolved minerals seep through sediment layers and act as a kind of glue, crystallizing and binding sediment particles together. Sandstone and shale are examples.

**metamorphic rock:** One of the three main categories of rock. Formed by great heat and/or pressure that reshapes crystals within the rock and changes its appearance and physical properties. Examples include marble and slate.

**earthquake:** A release of energy that occurs as Earth relieves accumulated pressure between masses of lithosphere and that results in shaking at the surface.

**volcano:** A site where molten rock, hot gas, or ash erupts through Earth's surface, often creating a mountain over time as cooled lava accumulates.

**landslide:** The collapse and downhill flow of large amounts of rock or soil. A severe and sudden form of mass wasting.

**mass wasting:** The downslope movement of soil and rock due to gravity.

