

# Physical Science

## GLOSSARY

### A

**absorption** (uhb-SAWRP-shuhn)

The disappearance of a wave into a medium. When a wave is absorbed, the energy transferred by the wave is converted into another form of energy, usually thermal energy. (p. 573)

**acceleration**

The rate at which velocity changes over time. (p. 329)

**acid**

A substance that can donate a proton to another substance and has a pH below 7. (p. 254)

**acoustics** (uh-KOO-stihks)

The scientific study of sound; the behavior of sound waves inside a space. (p. 535)

**air resistance**

The fluid friction due to air. (p. 393)

**alloy**

A solid mixture composed of a metal and one or more other substances. (p. 262)

**alternating current AC**

Electric current that reverses direction at regular intervals. (p. 721)

**ampere amp**

The unit of measurement of electric current, which is equal to one coulomb per second. The number of amps flowing through a circuit equals the circuit's amperage. (p. 653)

**amplification**

The strengthening of an electrical signal, often used to increase the intensity of a sound wave. (p. 535)

**amplitude**

The maximum distance that a disturbance causes a medium to move from its rest position; the distance between a crest or trough of a wave and line through the center of a wave. (p. 497)

**analog**

Represented by a continuous but varying quantity, such as a wave. In electronics, analog information is represented by a continuous but varying electrical signal. (p. 684)

**atom**

The smallest particle of an element that has the chemical properties of that element. (p. 16)

**atomic mass**

The average mass of the atoms of an element. (p. 145)

**atomic mass number**

The total number of protons and neutrons in an atom's nucleus.

**atomic number**

The number of protons in the nucleus of an atom. (p. 140)

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### B

**base**

A substance that can accept a proton from another substance and has a pH above 7. (p. 254)

**Bernoulli's principle**

A statement that describes the effects of movement on fluid pressure. According to this principle, an increase in the speed of the motion of a fluid decreases the pressure within the fluid. (p. 404)

**binary code**

A coding system in which information is represented by two figures, such as 1 and 0. (p. 682)

**bioluminescence**

The production of light by living organisms. (p. 569)

**boiling**

A process by which a substance changes from its liquid state to its gas state. The liquid is heated to a specific temperature at which bubbles of vapor form within the liquid. (p. 54)

**boiling point**

The temperature at which a substance changes from its liquid state to its gas state through boiling. (p. 54)

**bond energy**

The amount of energy in a chemical bond between atoms.

**buoyant force**

The upward force on objects in a fluid; often called buoyancy. (p. 402)

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## C

**calorie**

The amount of energy needed to increase the temperature of one gram of water by one degree Celsius. (p. 112)

**carbohydrate**

A type of carbon-based molecule in living things. Carbohydrates include sugars and starches used for energy or as structural materials, Carbohydrate molecules contain carbon, hydrogen, and oxygen atoms.

**catalyst**

A substance that increases the rate of a chemical reaction but is not consumed in the reaction. (p. 204)

**centripetal force** (sehn-TRIHP-ih-tuhl)

Any force that keeps an object moving in a circle. (p. 358)

**chemical change**

A change of one substance into another substance. (p. 46)

**chemical formula**

An expression that shows the number and types of atoms joined in a compound. (p. 171)

**chemical property**

A characteristic of a substance that describes how it can form a new substance. (p. 46)

**chemical reaction**

The process by which chemical changes occur. In a chemical reaction, atoms are rearranged, and chemical bonds are broken and formed. (p. 197)

**circuit**

A closed path through which charge can flow. (p. 667)

**coefficient**

The number before a chemical formula that indicates how many molecules are involved in a chemical reaction.

**collision**

A situation in which two objects in close contact exchange energy and momentum. (p. 370)

**compound**

A substance made up of two or more different types of atoms bonded together. (p. 23)

**compound machine**

A machine that is made up of two or more simple machines. (p. 468)

**computer**

An electronic device that processes digital information. (p. 685)

**concave**

Curved inward toward the center, like the inside of a spoon. (p. 596)

**concentration**

The amount of solute dissolved in a solvent at a given temperature.

**condensation**

The process by which a gas becomes a liquid. (p. 55)

**conduction**

The process by which energy is transferred from a warmer object to a cooler object by means of physical contact. (p. 117)

**conductor**

1. A material that transfers energy easily. (p.117)
2. A material that transfers electric charge easily. (p. 646)

## convection

A process by which energy is transferred in gases and liquids, occurring when a warmer, less dense area of gas or liquid is pushed up by a cooler, more dense area of the gas or liquid. (p. 118)

## convex

Curved outward, like the underside of a spoon. (p. 596)

## cornea (KAWR-nee-uh)

A transparent membrane that covers the eye. (p. 607)

## covalent bond

A pair of electrons shared by two atoms. (p. 178)

## crest

The highest point, or peak, of a wave. (p. 497)

## cycle

n. A series of events or actions that repeat themselves regularly; a physical and/or chemical process in which one material continually changes locations and/or forms. Examples include the water cycle, the carbon cycle, and the rock cycle.

v. To move through a repeating series of events or actions.

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## D

### data

Information gathered by observation or experimentation that can be used in calculating or reasoning. Data is a plural word; the singular is datum.

### decibel dB

The unit used to measure the intensity of a sound wave. (p. 532)

### degree

Evenly divided units of a temperature scale. (p. 106)

### density

A property of matter representing the mass per unit volume. (pp. 43, 403)

### diffraction

The spreading out of waves as they pass through an opening or around the edges of an obstacle. (p. 506)

## diffuse reflection

The reflection of parallel light rays in many different directions. (p. 594)

## digital

Represented by numbers. In electronics, digital information is represented by the numbers 1 and 0, signaled by a circuit that is either on or off. (p. 682)

## dilute

adj. Having a low concentration of solute. (p. 246)  
v. To add solvent in order to decrease the concentration of a solution.

## direct current DC

Electric current that flows in one direction only. (p. 721)

## Doppler effect

The change in perceived pitch that occurs when the source or the one who hears the sound is moving. (p. 530)

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## E

### echolocation

The sending out of high-pitched sound waves and the interpretation of the returning echoes. (p. 539)

### efficiency

The percentage of the input work done on a machine that the machine can return in output work. A machine's output work divided by its input work and multiplied by 100. (p. 454)

### electric cell

A device that produces electric current using the chemical or physical properties of different materials.

### A battery

consists of two or more cells linked together. (p. 655)

### electric charge

A property that allows one object to exert an electric force on another object without touching it. Electric charge can be positive or negative: positive charge is a property of the proton, while negative charge is a property of the electron. (p. 634)

### electric current

A continuous flow of electric charge, which is measured in amperes. (p. 652)

### **electric field**

An area surrounding a charged object, within which the object can exert an electric force on another object without touching it. (p. 634)

### **electric potential**

The amount of potential energy per unit charge that a static charge or electric current has. Electric potential is measured in volts and is often called voltage. (p. 643)

### **electric power**

The rate at which electrical energy is generated from, or converted into, another source of energy, such as kinetic energy. (p. 726)

### **electromagnet**

A magnet that consists of a piece of iron or steel inside a coil of current-carrying wire. (p. 714)

### **electromagnetic spectrum EM spectrum**

The range of all electromagnetic frequencies, including the following types (from lowest to highest frequency): radio waves, microwaves, infrared light, visible light, ultraviolet light, x-rays, and gamma rays. (p. 560)

### **electromagnetic wave EM wave**

A type of wave, such as a light wave or radio wave, that does not require a medium to travel; a disturbance that transfers energy through a field. (p. 553)

### **electromagnetism**

Magnetism that results from the flow of electric charge. (p.713)

### **electron**

A negatively charged particle located outside an atom's nucleus. An electron is about 2000 times smaller than either a proton or neutron. (p. 139)

### **electronic**

adj. Operating by means of an electrical signal. An electronic device is a device that uses electric current to represent coded information. (p. 681)  
n. An electronic device or system, such as a computer, calculator, CD player, or game system.

### **element**

A substance that cannot be broken down into a simpler substance by ordinary chemical changes. An element consists of atoms of only one type. (p. 22)

### **endothermic reaction**

A chemical reaction that absorbs energy. (p. 215)  
reacción endotérmica Una reacción química que absorbe energía.

### **energy**

The ability to do work or to cause a change. For example, the energy of a moving bowling ball knocks over pins; energy from food allows animals to move and to grow; and energy from the Sun heats Earth's surface and atmosphere, which causes air to move. (p. 72)

### **energy efficiency**

A measurement of usable energy after an energy conversion; the ratio of usable energy to the total energy after an energy conversion. (p. 83)

### **enzyme**

A type of protein that is a catalyst for chemical reactions in living things. (p. 287)

### **evaporation**

A process by which a substance changes from its liquid state to its gas state by random particle movement. Evaporation usually occurs at the surface of a liquid over a wide range of temperatures. (p. 53)

### **exothermic reaction**

A chemical reaction that releases energy. (p. 215)

### **experiment**

An organized procedure to study something under controlled conditions. (p. xi)

## **F**

### **fiber optics**

Technology based on the use of laser light to send signals through transparent wires called optical fibers. This technology is often used in communications. (p. 617)

## field

An area around an object where the object can apply a force—such as gravitational force, magnetic force, or electrical force—on another object without touching it.

## fluid

A substance that can flow easily, such as a gas or a liquid. (p. 392)

## fluorescence (flu-REHS-uhns)

A phenomenon in which a material absorbs electromagnetic radiation of one wavelength and gives off

## electromagnetic

radiation of a different wavelength. (p. 571)

## focal length

The distance from the center of a convex lens to its focal point. (p. 603)

## focal point

The point at which parallel light rays reflected from a concave mirror come together; the point at which parallel light rays refracted by a convex lens come together. (p. 597)

## force

A push or a pull; something that changes the motion of an object. (p. 345)

## freezing

The process by which a substance changes from its liquid state into its solid state. (p. 52)

## freezing point

The temperature at which a substance changes from its liquid state to its solid state through freezing. (p. 52)

## frequency

The number of waves that pass a fixed point in a given amount of time, usually one second; the number of cycles per unit time. (p. 497)

## friction

A force that resists the motion between two surfaces in contact. (p. 389)

## fulcrum

A fixed point around which a lever rotates. (p. 459)

# G

## gamma rays

Part of the electromagnetic spectrum that consists of waves with the highest frequencies; electromagnetic waves with frequencies ranging from more than 10<sup>19</sup> hertz to more than 10<sup>24</sup> hertz. (p. 566)

## gas

Matter with no definite volume and no definite shape. The molecules in a gas are very far apart, and the amount of space between them can change easily. (p. 28)

## generator

A device that converts kinetic energy, or the energy of motion, into electrical energy. Generators produce electric current by rotating a magnet within a coil of wire or rotating a coil of wire within a magnetic field. (p. 720)

## gravity

The force that objects exert on each other because of their mass. (p. 381)

## grounding

The creation of a harmless, low-resistance path—a ground—for electricity to follow. Grounding is an important electrical safety procedure. (p. 649)

## group

A vertical column in the periodic table of the elements. Elements in a group have similar properties. (p. 150)

# H

## half-life

The amount of time it takes for half of the nuclei of a radioactive isotope to decay into atoms of another element. (p. 160)

## heat

1. The flow of energy from an object at a higher temperature to an object at a lower temperature. (p. 110)
2. Energy that is transferred from a warmer object to a cooler object.

## hertz Hz

The unit used to measure frequency. One hertz is equal to one complete cycle per second. (p. 526)

## horizontal

Parallel to the horizon; level.

## horsepower hp

The unit of measurement of power for engines and motors. One horsepower equals 745 watts. (p. 436)

## hydrocarbon

A compound that contains only carbon and hydrogen. (p. 291)

## hypothesis

A tentative explanation for an observation or phenomenon. A hypothesis is used to make testable predictions. (p. xl)

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## I

### image

A picture of an object formed by rays of light. (p. 595)

### incandescence (IHN-kuhn-DEHS-uhns)

1. The production of light by materials having high temperatures. (p. 569) 2. Light produced by an incandescent object.

### inclined plane

A simple machine that is a sloping surface, such as a ramp. (p. 462)

### induction

The build-up of a static charge in an object when the object is close to, but not touching, a charged object. (p. 637)

### inertia (ih-NUR-shuh)

The resistance of an object to a change in the speed or the direction of its motion. (p. 350)

### infrared light

Part of the electromagnetic spectrum that consists of waves with frequencies between those of microwaves and visible light. (p. 564)

### inorganic compound

A compound that is not considered organic. All compounds that do not contain carbon are inorganic, as are some types of carbon-containing compounds. (p. 276)

## insulator

1. A material that does not transfer energy easily. (p. 117) 2. A material that does not transfer electric charge easily. (p. 646)

## intensity

The amount of energy of a wave, per wavelength. Intensity is associated with the amplitude of a sound wave and with the quality of loudness produced by the sound wave. (p. 532)

## interference

The meeting and combining of waves; the adding or subtracting of wave amplitudes that occurs as waves overlap. (p. 507)

## ion

An atom or group of atoms that has a positive or negative electric charge. (p. 142)

## ionic bond

The electrical attraction between a negative ion and a positive ion. (p. 176)

## isomer

Any of two or more compounds that contain the same atoms but that have different structures. (p. 280)

## isotope

An atom of one element that has a different number of neutrons than another atom of the same element. (p. 140)

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## J

### joule (jool)

A unit used to measure energy and work. One calorie is equal to 4.18 joules of energy; one joule of work is done when a force of one newton moves an object one meter. (pp. 112, 421)

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## K

### kilowatt kW

A unit of measurement for power equal to 1000 watts. (p. 728)

### kilowatt-hour kWh

The unit of measurement for electrical energy equal to one kilowatt of power over a one-hour period. (p. 729)

**kinetic energy** (kuh-NEHT-ihk)

The energy of motion. A moving object has the most kinetic energy at the point where it moves the fastest. (pp. 74, 426)

**kinetic theory of matter** (kuh-NEHT-ihk)

A theory stating that all matter is made of particles in motion. (p. 104)

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**L****laser** (LAY-zuhr)

A device that produces an intense, concentrated beam of light that can be brighter than sunlight. Lasers are often used in medicine and communications. (p.615)

**law**

In science, a rule or principle describing a physical relationship that always works in the same way under the same conditions. The law of conservation of energy is an example.

**law of conservation of energy**

A law stating that no matter how energy is transferred or transformed, it continues to exist in one form or another. (pp. 82, 430)

**law of conservation of mass**

A law stating that atoms are not created or destroyed in a chemical reaction. (p. 207)

**law of conservation of momentum**

A law stating that the amount of momentum a system of objects has does not change as long as there are no outside forces acting on that system. (p. 371)

**law of reflection**

A law of physics stating that the angle at which light strikes a surface (the angle of incidence) equals the angle at which it reflects off the surface (the angle of reflection). (p. 594)

**lens**

A transparent optical tool that refracts light. (p. 601)

**lever**

A solid bar that rotates, or turns, around a fixed point (fulcrum); one of the six simple machines. (p. 459)

**lipid**

A type of carbon-based molecule in living things. Lipids include fats and oils used for energy or as structural materials. (p. 284)

**liquid**

Matter that has a definite volume but does not have a definite shape. The molecules in a liquid are close together but not bound to one another. (p. 28)

**longitudinal wave** (LAHN-jih-TOOD-uhn-uhl)

A type of wave in which the disturbance moves in the same direction that the wave travels. (p. 494)

**luminescence**

The production of light without the high temperatures needed for incandescence. (p. 569)

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**M****machine**

Any device that makes doing work easier. (p. 449)

**magnet**

An object that attracts certain other materials, particularly iron and steel. (p. 703)

**magnetic domain**

A group of atoms whose magnetic fields align, or point in the same direction. Magnetic materials have magnetic domains, whereas nonmagnetic materials do not. (p.707)

**magnetic field**

An area surrounding a magnet within which the magnet can exert a force. Magnetic fields are concentrated into a pattern of lines that extend from the magnet's north pole to its south pole. (p. 705)

**magnetic pole**

One of two ends of a magnet where the magnetic force is the strongest. Every magnet has two poles.

**magnetism**

The force exerted by a magnet. Opposite poles of two magnets attract, or pull together, whereas like poles of two magnets repel, or push apart. (p. 704)

**mass**

A measure of how much matter an object is made of. (p. 10)

**matter**

Anything that has mass and volume. Matter exists ordinarily as a solid, a liquid, or a gas. (p. 9)

**mechanical advantage**

The number of times a machine multiplies the input force; output force divided by input force (p. 451)

**mechanical energy**

A combination of the kinetic energy and potential energy an object has. (p. 429)

**mechanical wave**

A wave, such as a sound wave or a seismic wave, that transfers kinetic energy through matter. (p. 491)

**medium**

A substance through which a wave moves. (p. 491)

**melting**

The process by which a substance changes from its solid state to its liquid state. (p. 51)

**melting point**

The temperature at which a substance changes from its solid state to its liquid state through melting. (p. 51)

**metal**

An element that tends to be shiny, easily shaped, and a good conductor of electricity and heat. (p. 155)

**metallic bond**

A certain type of bond in which nuclei float in a sea of electrons. (p. 184)

**metalloid**

An element that has properties of both metals and nonmetals. (p. 158)

**meter**

The international standard unit of length, about 39.37 inches.

**microwaves**

Part of the electromagnetic spectrum that consists of waves with higher frequencies than radio waves, but lower frequencies than infrared waves. (p. 563)

**mixture**

A combination of two or more substances that do not combine chemically but remain the same individual substances. Mixtures can be separated by physical means. (p. 23)

**molecule**

A group of atoms that are held together by covalent bonds so that they move as a single unit. (pp. 18, 179)

**momentum** (moh-M EHN-tuhm)

A measure of mass in motion. The momentum of an object is the product of its mass and velocity. (p. 368)

**monomer**

One of many small, repeating units linked together to form a polymer. (p. 294)

**motion**

A change of position over time. (p. 315)

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**N****nanotechnology**

The science and technology of building electronic circuits and devices from single atoms and molecules. (p. 471)

**net force**

The overall force acting on an object when all of the forces acting on it are combined. (p. 347)

**neutral**

Describing a solution that is neither an acid nor a base. A neutral solution has a pH of 7. (p. 257)

**neutron**

A particle that has no electric charge and is located in an atom's nucleus. (p.139)

**Newton's first law**

A scientific law stating that objects at rest remain at rest, and objects in motion remain in motion with the same velocity, unless acted on by an unbalanced force. (p. 349)

**Newton's second law**

A scientific law stating that the acceleration of an object increases with increased force and decreases with increased mass. (p. 354)



### **Newton's third law**

A scientific law stating that every time one object exerts a force on another object, the second object exerts a force that is equal in size and opposite in direction back on the first object. (p. 361)

### **nonmetal**

An element that is not a metal and has properties generally opposite to those of a metal. (p. 157)

### **nucleic acid**

One of several carbon-based molecules that carry an organism's genetic code. One of the nucleic acids DNA- contains the information needed to construct proteins. (p. 289)

### **nucleus**

The central region of an atom where most of the atom's mass is found in protons and neutrons. (p. 139)

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## **O**

### **ohm Q**

The unit of measurement for electrical resistance. (p. 647)

### **Ohm's law**

The mathematical relationship among current, voltage, and resistance, expressed in the formula  $I = V/R$  (current = voltage/resistance). (p. 653)

### **optics** (AH P-tihks)

The study of light, vision, and related technology. (p. 593)

### **orbit**

The elliptical path one celestial body follows around another celestial body. An object in orbit has a centripetal force acting on it that keeps the object moving in a circle or other ellipse. (p. 384)

### **organic compound**

A compound that is based on carbon. (p. 275)

### **parallel circuit**

A circuit in which current follows more than one path. Each device that is wired in a parallel circuit has its own path to and from the voltage source. (p. 677)

### **particle**

A very small piece of matter, such as an atom, molecule, or ion.

### **pascal Pa**

The unit used to measure pressure. One pascal is the pressure exerted by one newton of force on an area of one square meter, or one N/m<sup>2</sup>. (p. 396)

### **Pascal's principle**

A statement that says when an outside pressure is applied at any point to a fluid in a container, that pressure is transmitted throughout the fluid with equal strength. (p. 406)

### **period**

A horizontal row in the periodic table of the elements. Elements in a period have varying properties. (p.150)

### **periodic table**

A table of the elements, arranged by atomic number, that shows the patterns in their properties. (p. 146)

### **pH**

The concentration of hydrogen ions in a solution; a measurement of acidity. (p. 257)

### **photosynthesis**

In green plants, the endothermic process in which light is absorbed and used to change carbon dioxide and water into glucose and oxygen. (p. 218)

### **physical change**

A change in a substance that does not change the substance into a different one. (p. 44)

### **physical property**

A characteristic of a substance that can be observed without changing the identity of the substance. (p. 41)

### **pitch**

The quality of highness or lowness of a sound. Pitch is associated with the frequency of a sound wave- the higher the frequency, the higher the pitch. (p. 525)

### **plastic**

A polymer that can be molded or shaped. (p. 295)

**polar covalent bond**

The unequal sharing of electrons between two atoms that gives rise to negative and positive regions of electric charge. (p. 179)

**polarization** (POH-luhr-ih-ZAY-shuhn)

A way of filtering light so that all of the waves vibrate in the same direction. (p. 576)

**polymer**

A very large carbon-based molecule made of smaller, repeating units. (p. 294)

**position**

An object's location. (p. 313)

**potential energy**

Stored energy; the energy an object has due to its position, molecular arrangement, or chemical composition. (pp. 75, 426)

**power**

The rate at which work is done. (p. 434)

**precipitate**

n. A solid substance that forms as a result of a reaction between chemicals in two liquids. (p. 200)  
v. To come out of solution.

**pressure**

A measure of how much force is acting on a certain area; how concentrated a force is. Pressure is equal to the force divided by area. (p. 395)

**primary colors**

Three colors of light—red, green, and blue—that can be mixed to produce all possible colors. (p. 578)

**primary pigments**

Three colors of substances—cyan, yellow, and magenta that can be mixed to produce all possible colors. (p. 579)

**prism**

An optical tool that uses refraction to separate the different wavelengths that make up white light. (p. 577)

**product**

A substance formed by a chemical reaction. A product is made by the rearrangement of atoms and bonds in reactants. (p. 199)

**protein**

A macromolecule in living things that is made of smaller molecules called amino acids. (p. 286)

**proton**

A positively charged particle located in an atom's nucleus. (p. 139)

**pulley**

A wheel with a grooved rim that turns on an axle; one of the six simple machines. (p. 460)

**pupil**

The circular opening in the iris of the eye that controls how much light enters the eye. (p. 607)

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**R****radiation** (RAY-dee-AY-shuhn)

Energy that travels across distances in the form of electromagnetic waves. (pp. 119, 555)

**radioactivity**

The process by which the nucleus of an atom of an element releases energy and particles. (p. 158)

**radio waves**

The part of the electromagnetic spectrum that consists of waves with the lowest frequencies. (p. 562)

**reactant**

A substance that is present at the beginning of a chemical reaction and is changed into a new substance. (p. 199)

**reactive**

Likely to undergo a chemical change. (p. 154)

**reference point**

A location to which another location is compared. (p. 314)

**reflection**

The bouncing back of a wave after it strikes a barrier. (p. 505)

**refraction**

The bending of a wave as it crosses the boundary between two mediums at an angle other than 90 degrees. (p. 505)

### **regular reflection**

The reflection of parallel light rays in the same direction.. (p. 594)

### **resistance**

The property of a material that determines how easily a charge can move through it. Resistance is measured in ohms. (p. 653 )

### **resistor**

An electrical device that slows the flow of charge in a circuit. (p. 668)

### **resonance**

The strengthening of a sound wave when it combines with an object's natural vibration. (p. 528)

### **respiration**

The exothermic process by which living things release energy from glucose and oxygen and produce carbon dioxide and water. (p. 222)

### **retina** (REHT-uhn-uh)

A light-sensitive membrane at the back of the inside of the eye. (p. 607)

### **robot**

A machine that works automatically or by remote control. (p. 473)

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## **S**

### **saturated**

Containing the maximum amount of a solute that can be dissolved in a particular solvent at a given temperature and pressure. (p. 246)

### **scattering**

The spreading out of light rays in all directions as particles reflect and absorb the light. (p. 575)

### **screw**

A simple machine that is an inclined plane wrapped around a cylinder. A screw can be used to raise and lower weights as well as to fasten objects. (p. 463 )

### **second s**

A unit of time equal to one-sixtieth of a minute.

### **series circuit**

A circuit in which current follows a single path. Each device that is wired in a series circuit shares a path to and from the voltage source. (p. 676)

### **short circuit**

An unintended and undesired path connecting one part of a circuit with another. (p. 670)

### **simple machine**

One of the basic machines on which all other mechanical machines are based. The six simple machines are the lever, inclined plane, wheel and axle, pulley, wedge, and screw. (p. 458)

### **solar cell**

A type of technology in which light-sensitive materials convert sunlight into electrical energy. (p. 88)

### **solid**

Matter that has a definite shape and a definite volume. The molecules in a solid are in fixed positions and are close together. (p. 28)

### **solubility**

The amount of solute that dissolves in a certain amount of a solvent at a given temperature and pressure to produce a saturated solution. (p. 247)

### **solute**

In a solution, a substance that is dissolved in a solvent. (p. 240)

### **solution**

A mixture of two or more substances that is identical throughout; a homogeneous mixture. (p. 239)

### **solvent**

In a solution, the substance that dissolves a solute and makes up the largest percentage of a solution. (p. 240)

### **sonar**

Instruments that use echolocation to locate objects underwater; acronym for "sound navigation and ranging." (p. 539)

### **sound**

A type of wave that is produced by a vibrating object and that travels through matter. (p. 5 17)

### **specific heat**

The amount of energy required to raise the temperature of one gram of a substance by one degree Celsius. (p. 113 )

## speed

A measure of how fast something moves through a particular distance over a definite time period. Speed is distance divided by time. (p. 320)

## states of matter

The different forms in which matter can exist. Three familiar states are solid, liquid, and gas. (p. 27)

## static charge

The buildup of electric charge in an object caused by the uneven distribution of charged particles. (p. 635)

## sublimation

The process by which a substance changes directly from its solid state to its gas state without becoming a liquid first. (p. 53)

## subscript

A number written slightly below and to the right of a chemical symbol that shows how many atoms of an element are in a compound. (p. 171)

## substance

Matter of a particular type. Elements, compounds, and mixtures are all substances.

## suspension

A mixture in which the different parts are identifiable as separate substances; a heterogeneous mixture. (p. 241)

## system

A group of objects or phenomena that interact. A system can be as simple as a rope, a pulley, and a mass. It also can be as complex as the interaction of energy and matter in the four parts of the Earth system.

# T

## technology

The use of scientific knowledge to solve problems or engineer new products, tools, or processes.

## temperature

A measure of the average amount of kinetic energy of the particles in an object. (p. 105)

## terminal velocity

The final, maximum velocity of a falling object. (p. 393)

## theory

In science, a set of widely accepted explanations of observations and phenomena. A theory is a well-tested explanation that is consistent with all available evidence.

## thermal energy

The energy an object has due to the motion of its particles; the total amount of kinetic energy of particles in an object. (p.111 )

## thermometer

A device for measuring temperature. (p. 107)

## transformer

A device that uses electromagnetism to increase or decrease voltage. A transformer is often used in the distribution of current from power plants. (p. 723)

## transmission (trans-M I H S H -uhn)

The passage of a wave through a medium. (p. 573)

## transverse wave

A type of wave in which the disturbance moves at right angles, or perpendicular, to the direction in which the wave travels. (p. 493)

## trough (trawf)

The lowest point, or valley, of a wave (p. 497)  
valle El punto mas bajo de una onda.

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# U

## ultrasound

Sound waves with frequencies above 20,000 hertz, the upper limit of typical hearing levels in humans, used for medical purposes, among other things. (p. 526)

## ultraviolet light

The part of the electromagnetic spectrum that consists of waves with frequencies higher than those of visible light and lower than those of x-rays. (p. 565)

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# V

## vacuum

A space containing few or no particles of matter. (p. 521)

## variable

Any factor that can change in a controlled experiment, observation, or model. (p. R30)

**velocity**

A speed in a specific direction. (p. 326)

**vertical**

Going straight up or down from a level surface.

**vibration**

A rapid, back-and-forth motion. (p. 517)

**visible light**

The part of the electromagnetic spectrum that consists of waves detectable by the human eye. (p. 564)

**volt V**

The unit of measurement for electric potential, which is equal to one joule per coulomb. The number of volts of an electric charge equals the charge's voltage. (p. 643)

**volume**

An amount of three-dimensional space, often used to describe the space that an object takes up. (p. 11)

**W****watt W**

The unit of measurement for power, which is equal to one joule of work done or energy transferred in one second. For example, a 75 W light bulb converts electrical energy into heat and light at a rate of 75 joules per second. (pp. 435, 728)

**wave**

A disturbance that transfers energy from one place to another without requiring matter to move the entire distance. (p. 489)

**wavelength**

The distance from one wave crest to the next crest; the distance from any part of one wave to the identical part of the next wave. (p. 497)

**wedge**

A simple machine that has a thick end and a thin end. A wedge is used to cut, split, or pierce objects, or to hold objects together. (p. 462)

**weight**

The force of gravity on an object. (pp. 11, 383)

**wheel and axle**

A simple machine that is a wheel attached to a shaft, or axle. (p. 460)

**work**

The use of force to move an object over a distance. (p. 419)

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**X, Y, Z****x-rays**

The part of the electromagnetic spectrum that consists of waves with high frequencies and high energies; electromagnetic waves with frequencies ranging from more than 10<sup>16</sup> hertz to more than 10<sup>21</sup> hertz. (p. 566)