**pH** a value that is used to express the acidity or alkalinity (basicity) of a system; each whole number on the scale indicates a tenfold change in acidity; a pH of 7 is neutral, a pH of less than 7 is acidic, and a pH of greater than 7 is basic (503)

**pH meter** a device used to determine the pH of a solution by measuring the voltage between the two electrodes that are placed in the solution (512)

**phase** in chemistry, one of the four states or conditions in which a substance can exist: solid, liquid, gas, or plasma; a part of matter that is uniform (342)

**phase diagram** a graph of the relationship between the physical state of a substance and the temperature and pressure of the substance (347)

**photoelectric effect** the emission of electrons from a material when light of certain frequencies shines on the surface of the material (99)

**photon** a unit or quantum of light; a particle of electromagnetic radiation that has zero rest mass and carries a quantum of energy (100)

**physical change** a change of matter from one form to another without a change in chemical properties (7)

**physical property** a characteristic of a substance that does not involve a chemical change, such as density, color, or hardness (7)

**plasma** in physical science, a state of matter that starts as a gas and then becomes ionized; it consists of free-moving ions and electrons, it takes on an electric charge, and its properties differ from those of a solid, liquid, or gas (8)

**pOH** the negative of the common logarithm of the hydroxide ion concentration of a solution (503)

**polar** describes a molecule in which the positive and negative charges are separated (176)

**polar covalent bond** a covalent bond in which a pair of electrons shared by two atoms is held more closely by one atom (176)

**polyatomic ion** an ion made of two or more atoms (194)

**polymer** a large molecule that is formed by more than five monomers, or small units (737)

**polyprotic acid** an acid that can donate more than one proton per molecule (479)

**polysaccharide** one of the carbohydrates made up of long chains of simple sugars; polysaccharides include starch, cellulose, and glycogen (753)

**positron** a particle that has the same mass and spin as an electron but that has a positive charge (686)

**precipitate** a solid that is produced as a result of a chemical reaction in solution (262)

**precision** the exactness of a measurement (44)

**pressure** the amount of force exerted per unit area of a surface (361)

**primary standard** a highly purified solid compound used to check the concentration of a known solution in a titration (517)

**principal quantum number** the quantum number that indicates the energy and orbital of an electron in an atom (107)

**product** a substance that forms in a chemical reaction (9)

**protein** an organic compound that is made of one or more chains of amino acids and that is a principal component of all cells (757)

**pure substance** a sample of matter, either a single element or a single compound, that has definite chemical and physical properties (13)

## Q

**quantity** something that has magnitude, size, or amount (33)

**quantum** the basic unit of electromagnetic energy; it characterizes the wave properties of electrons (99)

**quantum number** a number that specifies certain properties of electrons (107)

**quantum theory** the study of the structure and behavior of the atom and of subatomic particles from the view that all energy comes in tiny, indivisible bundles (105)

## R

**radioactive dating** the process by which the approximate age of an object is determined based on the amount of certain radioactive nuclides present (695)

**radioactive decay** the disintegration of an unstable atomic nucleus into one or more different nuclides, accompanied by the emission of radiation, the nuclear capture or ejection of electrons, or fission (685)

**radioactive nuclide** a nuclide that contains isotopes that decay and that emit radiation (685)

**radioactive tracer** a radioactive material that is added to a substance so that its distribution can be detected later (695)

**rate law** the expression that shows how the rate of formation of product depends on the concentration of all species other than the solvent that take part in a reaction (572)

**rate-determining step** in a multistep chemical reaction, the step that has the lowest velocity, which determines the rate of the overall reaction (576)

**reactant** a substance or molecule that participates in a chemical reaction (9)

**reaction mechanism** the way in which a chemical reaction takes place; expressed in a series of chemical equations (561)

**reaction rate** the rate at which a chemical reaction takes place; measured by the rate of formation of the product or the rate of disappearance of the reactants (568)

**reaction stoichiometry** calculations involving the mass relationships between reactants and products in a chemical reaction (299)

**real gas** a gas that does not behave completely like a hypothetical ideal gas because of the interactions between the gas molecules (332)

**redox reaction** [see *oxidation-reduction reaction*] (633)

**reduced** describes a substance that has gained electrons, lost an oxygen atom, or gained a hydrogen atom (633)