GLOSSARY

A

accuracy
a description of how close a measurement is to the true value of the quantity measured (p. 55)

acid-ionization constant, K_a
the equilibrium constant for a reaction in which an acid donates a proton to water (p. 559)

actinide
any of the elements of the actinide series, which have atomic numbers from 89 (actinium, Ac) through 103 (lawrencium, Lr) (p. 130)

activated complex
a molecule in an unstable state intermediate to the reactants and the products in the chemical reaction (p. 590)

activation energy
the minimum amount of energy required to start a chemical reaction (p. 590)

activity series
a series of elements that have similar properties and that are arranged in descending order of chemical activity; examples of activity series include metals and halogens (p. 280)

actual yield
the measured amount of a product of a reaction (p. 316)

addition reaction
a reaction in which an atom or molecule is added to an unsaturated molecule (p. 694)

alkali metal
one of the elements of Group 1 of the periodic table (lithium, sodium, potassium, rubidium, cesium, and francium) (p. 125)

alkaline-earth metal
one of the elements of Group 2 of the periodic table (beryllium, magnesium, calcium, strontium, barium, and radium) (p. 126)

alkane
a hydrocarbon characterized by a straight or branched carbon chain that contains only single bonds (p. 681)

alkene
a hydrocarbon that contains one or more double bonds (p. 681)

alkyne
a hydrocarbon that contains one or more triple bonds (p. 681)

alloy
a solid or liquid mixture of two or more metals (p. 130)

amino acid
any one of 20 different organic molecules that contain a carboxyl and an amino group and that combine to form proteins (p. 717)

amphoteric
describes a substance, such as water, that has the properties of an acid and the properties of a base (p. 538)

anion
an ion that has a negative charge (p. 161)

anode
the electrode on whose surface oxidation takes place; anions migrate toward the anode, and electrons leave the system from the anode (p. 614)

aromatic hydrocarbon
a hydrocarbon that contains six-carbon rings and is usually very reactive (p. 682)

atom
the smallest unit of an element that maintains the properties of that element (p. 21)

atomic mass
the mass of an atom expressed in atomic mass units (p. 100)

atomic number
the number of protons in the nucleus of an atom; the atomic number is the same for all atoms of an element (p. 84)

ATP
adenosine triphosphate, an organic molecule that acts as the main energy source for cell processes; composed of a nitrogenous base, a sugar, and three phosphate groups (p. 737)

Aufbau principle
the principle that states that the structure of each successive element is obtained by adding one proton to the nucleus of the atom and one electron to the lowest-energy orbital that is available (p. 97)

average atomic mass
the weighted average of the masses of all naturally occurring isotopes of an element (p. 235)

Avogadro's law
the law that states that equal volumes of gases at the same temperature and pressure contain equal numbers of molecules (p. 432)

Avogadro's number
6.02×10^{23}, the number of atoms or molecules in 1 mol (p. 101, p. 224)

B

beta particle
a charged electron emitted during certain types of radioactive decay, such as beta decay (p. 649)

boiling point
the temperature and pressure at which a liquid and a gas are in equilibrium (p. 382)

bond energy
the energy required to break the bonds in 1 mol of a chemical compound (p. 192)

bond length
the distance between two bonded atoms at their minimum potential energy; the average distance between the nuclei of two bonded atoms (p. 192)

bond radius
half the distance from center to center of two like atoms that are bonded together (p. 135)

Boyle's law
the law that states that for a fixed amount of gas at a constant temperature, the volume of the gas increases as the pressure of the gas decreases and the volume of the gas decreases as the pressure of the gas increases (p. 424)

Brønsted-Lowry acid
a substance that donates a proton to another substance (p. 535)

Brønsted-Lowry base
a substance that accepts a proton (p. 536)

buffer
a solution made from a weak acid and its conjugate base that neutralizes small amounts of acids or bases added to it (p. 561)

C

calorimeter
a device used to measure the heat absorbed or released in a chemical or physical change (p. 351)

calorimetry
the measurement of heat-related constants, such as specific heat or latent heat (p. 351)

carbohydrate
any organic compound that is made of carbon, hydrogen, and oxygen and that provides nutrients to the cells of living things (p. 712)

catalysis
the acceleration of a chemical reaction by a catalyst (p. 593)

catalyst
a substance that changes the rate of a chemical reaction without being consumed or changed significantly (p. 593)

cathode
the electrode on whose surface reduction takes place (p. 613)

cation
an ion that has a positive charge (p. 161)

chain reaction
a reaction in which a change in a single molecule makes many molecules change until a stable compound forms (p. 654)

Charles's law
the law that states that for a fixed amount of gas at a constant pressure, the volume of the gas increases as the temperature of the gas increases and the volume of the gas decreases as the temperature of the gas decreases (p. 426)

GLOSSARY

chemical
any substance that has a defined composition (p. 4)

chemical change
a change that occurs when one or more substances change into entirely new substances with different properties (p. 39)

chemical equation
a representation of a chemical reaction that uses symbols to show the relationship between the reactants and the products (p. 263)

chemical equilibrium
a state of balance in which the rate of a forward reaction equals the rate of the reverse reaction and the concentrations of products and reactants remain unchanged (p. 497)

chemical kinetics
the area of chemistry that is the study of reaction rates and reaction mechanisms (p. 576)

chemical property
a property of matter that describes a substance's ability to participate in chemical reactions (p. 18)

chemical reaction
the process by which one or more substances change to produce one or more different substances (p. 5, p. 260)

clone
an organism that is produced by asexual reproduction and that is genetically identical to its parent; to make a genetic duplicate (p. 731)

coefficient
a small whole number that appears as a factor in front of a formula in a chemical equation (p. 268)

colligative property
a property that is determined by the number of particles present in a system but that is independent of the properties of the particles themselves (p. 482)

colloid
a mixture consisting of tiny particles that are intermediate in size between those in solutions and those in suspensions and that are suspended in a liquid, solid, or gas (p. 456)

combustion reaction
the oxidation reaction of an organic compound, in which heat is released (p. 276)

common-ion effect
the phenomenon in which the addition of an ion common to two solutes brings about precipitation or reduces ionization (p. 517)

compound
a substance made up of atoms of two or more different elements joined by chemical bonds (p. 24)

concentration
the amount of a particular substance in a given quantity of a mixture, solution, or ore (p. 460)

condensation
the change of state from a gas to a liquid (p. 382)

condensation reaction
a chemical reaction in which two or more molecules combine to produce water or another simple molecule (p. 699, p. 715)

conductivity
the ability to conduct an electric current (p. 478)

conjugate acid
an acid that forms when a base gains a proton (p. 537)

conjugate base
a base that forms when an acid loses a proton (p. 537)

conversion factor
a ratio that is derived from the equality of two different units and that can be used to convert from one unit to the other (p. 13)

corrosion
the gradual destruction of a metal or alloy as a result of chemical processes such as oxidation or the action of a chemical agent (p. 620)

covalent bond
a bond formed when atoms share one or more pairs of electrons (p. 191)

critical mass
the minimum mass of a fissionable isotope that provides the number of neutrons needed to sustain a chain reaction (p. 654)

critical point
the temperature and pressure at which the gas and liquid states of a substance become identical and form one phase (p. 402)

crystal lattice
the regular pattern in which a crystal is arranged (p. 174)

D

Dalton's law of partial pressures
the law that states that the total pressure of a mixture of gases is equal to the sum of the partial pressures of the component gases (p. 439)

decomposition reaction
a reaction in which a single compound breaks down to form two or more simpler substances (p. 278)

density
the ratio of the mass of a substance to the volume of the substance; often expressed as grams per cubic centimeter for solids and liquids and as grams per liter for gases (p. 16)

denature
to change irreversibly the structure or shape—and thus the solubility and other properties—of a protein by heating, shaking, or treating the protein with acid, alkali, or other species (p. 723)

detergent
a water-soluble cleaner that can emulsify dirt and oil (p. 484)

diffusion
the movement of particles from regions of higher density to regions of lower density (p. 436)

dipole
a molecule or a part of a molecule that contains both positively and negatively charged regions (p. 195)

dipole-dipole forces
interactions between polar molecules (p. 386)

disaccharide
a sugar formed from two monosaccharides (p. 712)

dissociation
the separating of a molecule into simpler molecules, atoms, radicals, or ions (p. 472)

DNA
deoxyribonucleic acid, the material that contains the information that determines inherited characteristics (p. 726)

DNA fingerprint
the pattern of bands that results when an individual's DNA sample is fragmented, replicated, and separated (p. 730)

double bond
a covalent bond in which two atoms share two pairs of electrons (p. 204)

double-displacement reaction
a reaction in which a gas, a solid precipitate, or a molecular compound forms from the apparent exchange of atoms or ions between two compounds (p. 283)

E

effusion
the passage of a gas under pressure through a tiny opening (p. 437)

electrochemical cell
a system that contains two electrodes separated by an electrolyte phase (p. 613)

electrochemistry
the branch of chemistry that is the study of the relationship between electric forces and chemical reactions (p. 612)

electrode
a conductor used to establish electrical contact with a nonmetallic part of a circuit, such as an electrolyte (p. 613)

electrolysis
the process in which an electric current is used to produce a chemical reaction, such as the decomposition of water (p. 627)

electrolyte
a substance that dissolves in water to give a solution that conducts an electric current (p. 478)

electrolytic cell
an electrochemical device in which electrolysis takes place when an electric current is in the device (p. 627)

electromagnetic spectrum
all of the frequencies or wavelengths of electromagnetic radiation (p. 92)

electron
a subatomic particle that has a negative charge (p. 80)

electron shielding
the reduction of the attractive force between a positively charged nucleus and its outermost electrons due to the cancellation of some of the positive charge by the negative charges of the inner electrons (p. 133)

electron configuration
the arrangement of electrons in an atom (p. 96)

electronegativity
a measure of the ability of an atom in a chemical compound to attract electrons (p. 137)

electroplating
the electrolytic process of plating or coating an object with a metal (p. 630)

element
a substance that cannot be separated or broken down into simpler substances by chemical means; all atoms of an element have the same atomic number (p. 22)

elimination reaction
a reaction in which a simple molecule, such as water or ammonia, is removed and a new compound is produced (p. 699)

empirical formula
a chemical formula that shows the composition of a compound in terms of the relative numbers and kinds of atoms in the simplest ratio (p. 242)

emulsion
any mixture of two or more immiscible liquids in which one liquid is dispersed in the other (p. 484)

endothermic
describes a process in which heat is absorbed from the environment (p. 40)

end point
the point in a titration at which a marked color change takes place (p. 554)

energy
the capacity to do work (p. 38)

enthalpy
the sum of the internal energy of a system plus the product of the system's volume multiplied by the pressure that the system exerts on its surroundings (p. 340)

entropy
a measure of the randomness or disorder of a system (p. 358)

enzyme
a type of protein that speeds up metabolic reactions in plant and animals without being permanently changed or destroyed (p. 595, p. 722)

equilibrium
in chemistry, the state in which a chemical process and the reverse chemical process occur at the same rate such that the concentrations of reactants and products do not change (p. 400)

equilibrium constant
a number that relates the concentrations of starting materials and products of a reversible chemical reaction to one another at a given temperature (p. 503)

evaporation
the change of a substance from a liquid to a gas (p. 39, p. 382)

excess reactant
the substance that is not used up completely in a reaction (p. 313)

excited state
a state in which an atom has more energy than it does at its ground state (p. 94)

exothermic
describes a process in which a system releases heat into the environment (p. 40)

F

freezing
the change of state in which a liquid becomes a solid as heat is removed (p. 383)

freezing point
the temperature at which a solid and liquid are in equilibrium at 1 atm pressure; the temperature at which a liquid substance freezes (p. 383)

functional group
the portion of a molecule that is active in a chemical reaction and that determines the properties of many organic compounds (p. 683)

G

gamma ray
the high-energy photon emitted by a nucleus during fission and radioactive decay (p. 649)

Gay-Lussac's law
the law that states that the pressure of a gas at a constant volume is directly proportional to the absolute temperature (p. 430)

Gay-Lussac's law of combining volumes of gases
the law that states that the volumes of gases involved in a chemical change can be represented by the ratio of small whole numbers (p. 439)

gene
a segment of DNA that is located in a chromosome and that codes for a specific hereditary trait (p. 728)

Gibbs energy
the energy in a system that is available for work (p. 362)

Graham's law of diffusion
the law that states that the rate of diffusion of a gas is inversely proportional to the square root of the gas's density (p. 437)

ground state
the lowest energy state of a quantized system (p. 94)

group
a vertical column of elements in the periodic table; elements in a group share chemical properties (p. 119)

H

half-life
the time required for half of a sample of a radioactive substance to disintegrate by radioactive decay or by natural processes (p. 658)

half-reaction
the part of a reaction that involves only oxidation or reduction (p. 608)

halogen
one of the elements of Group 17 (fluorine, chlorine, bromine, iodine, and astatine); halogens combine with most metals to form salts (p. 126)

heat
the energy transferred between objects that are at different temperatures; energy is always transferred from higher-temperature objects to lower-temperature objects until thermal equilibrium is reached (p. 41, p. 338)

Henry's law
the law that states that at constant temperature, the solubility of a gas in a liquid is directly proportional to the partial pressure of the gas on the surface of the liquid (p. 477)

Hess's law
the law that states that the amount of heat released or absorbed in a chemical reaction does not depend on the number of steps in the reaction (p. 353)

heterogeneous
composed of dissimilar components (p. 26)

homogeneous
describes something that has a uniform structure or composition throughout (p. 26)

Hund's rule
the rule that states that for an atom in the ground state, the number of unpaired electrons is the maximum possible and these unpaired electrons have the same spin (p. 98)

hydration
the strong affinity of water molecules for particles of dissolved or suspended substances that causes electrolytic dissociation (p. 472)

hydrocarbon
an organic compound composed only of carbon and hydrogen (p. 680)

hydrogen bond
the intermolecular force occurring when a hydrogen atom that is bonded to a highly electronegative atom of one molecule is attracted to two unshared electrons of another molecule (p. 387)

hydrolysis
a chemical reaction between water and another substance to form two or more new substances; a reaction between water and a salt to create an acid or a base (p. 716)

hydronium ion
an ion consisting of a proton combined with a molecule of water; H_3O^+ (p. 480)

hypothesis
a theory or explanation that is based on observations and that can be tested (p. 50)

I

ideal gas
an imaginary gas whose particles are infinitely small and do not interact with each other (p. 433)

ideal gas law
the law that states the mathematical relationship of pressure (P), volume (V), temperature (T), the gas constant (R), and the number of moles of a gas (n); $PV = nRT$ (p. 434)

immiscible
describes two or more liquids that do not mix with each other (p. 470)

indicator
a compound that can reversibly change color depending on the pH of the solution or other chemical change (p. 546)

intermediate
a substance that forms in a middle stage of a chemical reaction and is considered a stepping stone between the parent substance and the final product (p. 589)

intermolecular forces
the forces of attraction between molecules (p. 386)

ion
an atom, radical, or molecule that has gained or lost one or more electrons and has a negative or positive charge (p. 161)

isomer
one of two or more compounds that have the same chemical composition but different structures (p. 686)

isotope
an atom that has the same number of protons (atomic number) as other atoms of the same element do but that has a different number of neutrons (atomic mass) (p. 88)

K

kinetic energy
the energy of an object that is due to the object's motion (p. 42)

kinetic-molecular theory
a theory that explains that the behavior of physical systems depends on the combined actions of the molecules constituting the system (p. 421)

L

lanthanide
a member of the rare-earth series of elements, whose atomic numbers range from 58 (cerium) to 71 (lutetium) (p. 130)

lattice energy
the energy associated with constructing a crystal lattice relative to the energy of all constituent atoms separated by infinite distances (p. 168)

law
a summary of many experimental results and observations; a law tells how things work (p. 52)

law of conservation of energy
the law that states that energy cannot be created or destroyed but can be changed from one form to another (p. 40)

law of conservation of mass
the law that states that mass cannot be created or destroyed in ordinary chemical and physical changes (p. 52, p. 76)

law of definite proportions
the law that states that a chemical compound always contains the same elements in exactly the same proportions by weight or mass (p. 75)

law of multiple proportions
the law that states that when two elements combine to form two or more compounds, the mass of one element that combines with a given mass of the other is in the ratio of small whole numbers (p. 77)

Le Châtelier's principle
the principle that states that a system in equilibrium will oppose a change in a way that helps eliminate the change (p. 512)

Lewis structure
a structural formula in which electrons are represented by dots; dot pairs or dashes between two atomic symbols represent pairs in covalent bonds (p. 199)

limiting reactant
the substance that controls the quantity of product that can form in a chemical reaction (p. 313)

London dispersion force
the intermolecular attraction resulting from the uneven distribution of electrons and the creation of temporary dipoles (p. 390)

M

main-group element
an element in the s-block or p-block of the periodic table (p. 124)

mass
a measure of the amount of matter in an object; a fundamental property of an object that is not affected by the forces that act on the object, such as the gravitational force (p. 10)

mass defect
the difference between the mass of an atom and the sum of the masses of the atom's protons, neutrons, and electrons (p. 644)

mass number
the sum of the numbers of protons and neutrons in the nucleus of an atom (p. 85)

matter
anything that has mass and takes up space (p. 10)

melting
the change of state in which a solid becomes a liquid by adding heat or changing pressure (p. 383)

melting point
the temperature and pressure at which a solid becomes a liquid (p. 383)

miscible
describes two or more liquids that can dissolve into each other in various proportions (p. 470)

mixture
a combination of two or more substances that are not chemically combined (p. 25)

molarity
a concentration unit of a solution expressed as moles of solute dissolved per liter of solution (p. 462)

molar mass
the mass in grams of 1 mol of a substance (p. 101, p. 230)

mole
the SI base unit used to measure the amount of a substance whose number of particles is the same as the number of atoms of carbon in exactly 12 g of carbon-12 (p. 101, p. 224)

molecular formula
a chemical formula that shows the number and kinds of atoms in a molecule, but not the arrangement of the atoms (p. 244)

molecular orbital
the region of high probability that is occupied by an individual electron as it travels with a wavelike motion in the three-dimensional space around one of two or more associated nuclei (p. 191)

molecule
the smallest unit of a substance that keeps all of the physical and chemical properties of that substance; it can consist of one atom or two or more atoms bonded together (p. 23)

monosaccharide
a simple sugar that is the basic subunit of a carbohydrate (p. 712)

N

neutral
describes an aqueous solution that contains equal concentrations of hydronium ions and hydroxide ions (p. 542)

neutralization reaction
the reaction of the ions that characterize acids (hydronium ions) and the ions that characterize bases (hydroxide ions) to form water molecules and a salt (p. 548)

neutron
a subatomic particle that has no charge and that is found in the nucleus of an atom (p. 82)

newton
the SI unit for force; the force that will increase the speed of a 1 kg mass by 1 m/s each second that the force is applied (abbreviation, N) (p. 419)

noble gas
an unreactive element of Group 18 of the periodic table; the nobles gases are helium, neon, argon, krypton, xenon, or radon (p. 127)

nonelectrolyte
a liquid or solid substance or mixture that does not allow an electric current (p. 479)

nonpolar covalent bond
a covalent bond in which the bonding electrons are equally attracted to both bonded atoms (p. 194)

nuclear fission
the splitting of the nucleus of a large atom into two or more fragments; releases additional neutrons and energy (p. 654)

nuclear fusion
the combination of the nuclei of small atoms to form a larger nucleus; releases energy (p. 656)

nuclear reaction
a reaction that affects the nucleus of an atom (p. 143)

nucleic acid
an organic compound, either RNA or DNA, whose molecules are made up of one or two chains of nucleotides and carry genetic information (p. 725)

nucleon
a proton or neutron (p. 642)

nucleus
in physical science, an atom's central region, which is made up of protons and neutrons (p. 81)

nuclide
an atom that is identified by the number of protons and neutrons in its nucleus (p. 642)

O

octet rule
a concept of chemical bonding theory that is based on the assumption that atoms tend to have either empty valence shells or full valence shells of eight electrons (p. 159)

orbital
a region in an atom where there is a high probability of finding electrons (p. 91)

order
in chemistry, a classification of chemical reactions that depends on the number of molecules that appear to enter into the reaction (p. 586)

oxidation
a reaction that removes one or more electrons from a substance such that the substance's valence or oxidation state increases (p. 604)

oxidation number
the number of electrons that must be added to or removed from an atom in a combined state to convert the atom into the elemental form (p. 606)

oxidation-reduction reaction
any chemical change in which one species is oxidized (loses electrons) and another species is reduced (gains electrons); also called redox reaction (p. 605)

oxidizing agent
the substance that gains electrons in an oxidation-reduction reaction and that is reduced (p. 611)

P

partial pressure
the pressure of each gas in a mixture (p. 439)

pascal
the SI unit of pressure; equal to the force of 1 N exerted over an area of 1 m^2 (abbreviation, Pa) (p. 419)

Pauli exclusion principle
the principle that states that two particles of a certain class cannot be in exactly the same energy state (p. 96)

peptide bond
the chemical bond that forms between the carboxyl group of one amino acid and the amino group of another amino acid (p. 718)

percentage composition
the percentage by mass of each element in a compound (p. 241)

period
in chemistry, a horizontal row of elements in the periodic table (p. 122)

periodic law
the law that states that the repeating chemical and physical properties of elements change periodically with the atomic numbers of the elements (p. 119)

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 (p. 542)

phase
in chemistry, a part of matter that is uniform (p. 399)

phase diagram
a graph of the relationship between the physical state of a substance and the temperature and pressure of the substance (p. 402)

photosynthesis
the process by which plants, algae, and some bacteria use sunlight, carbon dioxide, and water to produce carbohydrates and oxygen (p. 734)

physical change
a change of matter from one form to another without a change in chemical properties (p. 39)

physical property
a characteristic of a substance that does not involve a chemical change, such as density, color, or hardness (p. 15)

polar covalent bond
a covalent bond in which a pair of electrons shared by two atoms is held more closely by one atom (p. 194)

polyatomic ion
an ion made of two or more atoms (p. 178)

polymer
a large molecule that is formed by more than five monomers, or small units (p. 696)

polypeptide
a long chain of several amino acids (p. 718)

polysaccharide
one of the carbohydrates made up of long chains of simple sugars; polysaccharides include starch, cellulose, and glycogen (p. 712)

precision
the exactness of a measurement (p. 55)

pressure
the amount of force exerted per unit area of a surface (p. 419)

product
a substance that forms in a chemical reaction (p. 8)

protein
an organic compound that is made of one or more chains of amino acids and that is a principal component of all cells (p. 717)

proton
a subatomic particle that has a positive charge and that is found in the nucleus of an atom; the number of protons of the nucleus is the atomic number, which determines the identity of an element (p. 82)

pure substance
a sample of matter, either a single element or a single compound, that has definite chemical and physical properties (p. 22)

Q

quantity
something that has magnitude, size, or amount (p. 12)

quantum number
a number that specifies the properties of electrons (p. 95)

R

radioactivity
the process by which an unstable nucleus emits one or more particles or energy in the form of electromagnetic radiation (p. 648)

rate-determining step
in a multistep chemical reaction, the step that has the lowest velocity, which determines the rate of the overall reaction (p. 589)

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 (p. 586)

reactant
a substance or molecule that participates in a chemical reaction (p. 8)

reaction mechanism
the way in which a chemical reaction takes place; expressed in a series of chemical equations (p. 586)

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 (p. 578)

recombinant DNA
DNA molecules that are artificially created by combining DNA from different sources (p. 732)

reducing agent
a substance that has the potential to reduce another substance (p. 611)

reduction
a chemical change in which electrons are gained, either by the removal of oxygen, the addition of hydrogen, or the addition of electrons (p. 605)

resonance structure
in chemistry, any one of two or more possible configurations of the same compound that have identical geometry but different arrangements of electrons (p. 206)

respiration
in chemistry, the process by which cells produce energy from carbohydrates; atmospheric oxygen combines with glucose to form water and carbon dioxide (p. 736)

reversible reaction
a chemical reaction in which the products re-form the original reactants (p. 497)

S

salt
an ionic compound that forms when a metal atom or a positive radical replaces the hydrogen of an acid (p. 167)

saturated hydrocarbon
an organic compound formed only by carbon and hydrogen linked by single bonds (p. 688)

saturated solution
a solution that cannot dissolve any more solute under the given conditions (p. 474)

scientific method
a series of steps followed to solve problems, including collecting data, formulating a hypothesis, testing the hypothesis, and stating conclusions (p. 46)

self-ionization constant of water, K_w
the product of the concentrations of the two ions that are in equilibrium with water; $[H_3O^+][OH^-]$ (p. 540)

significant figure
a prescribed decimal place that determines the amount of rounding off to be done based on the precision of the measurement (p. 56)

single bond
a covalent bond in which two atoms share one pair of electrons (p. 200)

soap
a substance that is used as a cleaner and that dissolves in water (p. 484)

solubility
the ability of one substance to dissolve in another at a given temperature and pressure; expressed in terms of the amount of solute that will dissolve in a given amount of solvent to produce a saturated solution (p. 468)

solubility equilibrium
the physical state in which the opposing processes of dissolution and crystallization of a solute occur at equal rates (p. 476)

solubility product constant
the equilibrium constant for a solid that is in equilibrium with the solid's dissolved ions (p. 507)

solute
in a solution, the substance that dissolves in the solvent (p. 455)

solution
a homogeneous mixture of two or more substances uniformly dispersed throughout a single phase (p. 454)

solvent
in a solution, the substance in which the solute dissolves (p. 455)

specific heat
the quantity of heat required to raise a unit mass of homogeneous material 1 K or 1°C in a specified way given constant pressure and volume (p. 45)

spectator ions
ions that are present in a solution in which a reaction is taking place but that do not participate in the reaction (p. 286)

standard electrode potential
the potential developed by a metal or other material immersed in an electrolyte solution relative to the potential of the hydrogen electrode, which is set at zero (p. 622)

standard solution
a solution of known concentration (p. 550)

standard temperature and pressure
for a gas, the temperature of 0°C and the pressure 1.00 atm (p. 420)

states of matter
the physical forms of matter, which are solid, liquid, gas, and plasma (p. 6)

stoichiometry
the proportional relationships between two or more substances during a chemical reaction (p. 303)

strong acid
an acid that ionizes completely in a solvent (p. 532)

strong base
a base that ionizes completely in a solvent (p. 534)

strong force
the interaction that binds nucleons together in a nucleus (p. 643)

sublimation
the process in which a solid changes directly into a gas (The term is sometimes also used for the reverse process.) (p. 383)

substitution reaction
a reaction in which one or more atoms replace another atom or group of atoms in a molecule (p. 696)

superheavy element
an element whose atomic number is greater than 106 (p. 147)

supersaturated solution
a solution that holds more dissolved solute than is required to reach equilibrium at a given temperature (p. 475)

surface tension
the force that acts on the surface of a liquid and that tends to minimize the area of the surface (p. 380)

surfactant
a compound that concentrates at the boundary surface between two immiscible phases, solid-liquid, liquid-liquid, or liquid-gas (p. 484)

suspension
a mixture in which particles of a material are more or less evenly dispersed throughout a liquid or gas (p. 454)

synthesis reaction
a reaction in which two or more substances combine to form a new compound (p. 277)

T

temperature
a measure of how hot (or cold) something is; specifically, a measure of the average kinetic energy of the particles in an object (p. 43, p. 339)

thermodynamics
the branch of science concerned with the energy changes that accompany chemical and physical changes (p. 348)

titrant
a solution of known concentration that is used to titrate a solution of unknown concentration (p. 550)

titration
a method to determine the concentration of a substance in solution by adding a

solution of known volume and concentration until the reaction is completed, which is usually indicated by a change in color (p. 550)

transition range
the pH range over which a variation in a chemical indicator can be observed (p. 554)

transition metal
one of the metals that can use the inner shell before using the outer shell to bond (p. 129)

triple bond
a covalent bond in which two atoms share three pairs of electrons (p. 205)

triple point
the temperature and pressure conditions at which the solid, liquid, and gaseous phases of a substance coexist at equilibrium (p. 402)

U

unit
a quantity adopted as a standard of measurement (p. 12)

unit cell
the smallest portion of a crystal lattice that shows the three-dimensional pattern of the entire lattice (p. 175)

unsaturated hydrocarbon
a hydrocarbon that has available valence bonds, usually from double or triple bonds with carbon (p. 688)

unsaturated solution
a solution that contains less solute than a saturated solution does and that is able to dissolve additional solute (p. 474)

unshared pair
a nonbonding pair of electrons in the valence shell of an atom; also called lone pair (p. 200)

valence electron
an electron that is found in the outermost shell of an atom and that determines the atom's chemical properties (p. 119, p. 199)

V

vapor pressure
the partial pressure exerted by a vapor that is in equilibrium with its liquid state at a given temperature (p. 400)

voltage
the potential difference or electromotive force, measured in volts; it represents the amount of work that moving an electric charge between two points would take (p. 613)

volume
a measure of the size of a body or region in three-dimensional space (p. 10)

VSEPR theory
a theory that predicts some molecular shapes based on the idea that pairs of valence electrons surrounding an atom repel each other (p. 209)

W

weak acid
an acid that releases few hydrogen ions in aqueous solution (p. 532)

weak base
a base that releases few hydroxide ions in aqueous solution (p. 534)

weight
a measure of the gravitational force exerted on an object; its value can change with the location of the object in the universe (p. 10)