Glossary

Section numbers are provided in parentheses.

A

accuracy: the closeness of a measurement to an accepted value (1.2)

acid: a substance that produces hydrogen ions in aqueous solutions (10.1)

acid-base indicator: a substance, usually a weak monoprotic acid, that changes colour in acidic and basic solutions (10.3)

activity series: a ranking of the relative reactivity of metals or halogens in aqueous reactions (4.3)

actual yield: the measured quantity of product obtained in a chemical reaction (7.3)

aliphatic hydrocarbons: hydrocarbons that consist of chains or non-aromatic rings; the carbon atoms are bonded to the maximum number of hydrogen or carbon atoms (13.3)

alkanes: hydrocarbons that contain only carbon-carbon single bonds; general formula C_nH_{2n+2} (13.3)

alkenes: hydrocarbons that contain one or more carbon-carbon double bond; general formula C_nH_{2n} (13.3)

alkynes: hydrocarbons that contain one or more carbon-carbon triple bond; general formula C_nH_{2n-2} (13.3)

alloys: solid metallic solutions (8.1)

alpha particle emission: a radioactive process that involves the loss of one alpha ($\propto$) particle (a helium nucleus, ${}^4_2He$); also called *alpha decay* (4.4)

anhydrous: a term used to describe a compound that does not have any water molecules bonded to it; applies to compounds that can be hydrated (6.4)

aqueous solution: a solution in which water is the solvent (8.1)

Arrhenius theory of acids and bases: the theory stating that an acid is a substance that produces hydrogen ions in water and a base is a substance that produces hydroxide ions in water (10.1)

atmosphere (atm): a unit of pressure; equal to 101.325 kPa (11.2)

atom: the basic unit of an element, which still retains the element's properties (2.1)

atomic mass unit (u): a unit of mass that is 1/12 of the mass of a carbon-12 atom; equal to 1.66×10^{-24} g (2.1)

atomic number (Z): the unique number of protons in the nucleus of a particular element (2.1)

atomic symbol: a one- or two-letter abbreviation of the name of an element; also called *element symbol* (2.1)

average atomic mass: the average of the masses of all the isotopes of an element; given in atomic mass units (u) (5.1)

Avogadro constant (N_A): the experimentally-determined number of particles in 1 mol of a substance; the currently accepted value is $6.022\ 141\ 99 \times 10^{23}$ (5.2)

Avogadro's hypothesis: equal volumes of gases, at the same temperature and pressure, contain the same number of particles (12.1)

B

balanced chemical equation: a statement that uses chemical formulas and coefficients to show the identity and quantity of the reactants and products involved in a chemical reaction (4.1)

base: a substance that produces hydroxide ions in aqueous solutions (10.1)

benefit: a desirable result of an action (14.4)

beta decay: a nuclear reaction that results in the emission of a beta (β) particle (electron) from a nucleus (4.4)

binary acid: an acid that is composed of two elements: hydrogen and a non-metal (10.2)

binary compound: a compound that is composed of two elements (3.4)

bomb calorimeter: a device that combusts a substance in pure oxygen in order to measure the heat of combustion of that substance (14.4)

bond energy: the amount of energy that is produced or absorbed when a specific bond in a molecule is broken or formed; measured in kJ/mol (14.2)

Boyle's law: the law stating that the volume of a given amount of gas varies inversely with the applied pressure, if the temperature is constant: $V \propto \frac{1}{P}$ (11.2)

branched-chain alkane: an alkane with one or more side-chains that branch off the parent chain (13.3)

Brønsted-Lowry theory of acids and bases: the theory defining an acid as a substance from which a hydrogen ion can be removed and a base as a substance that can remove a hydrogen ion from an acid (10.1)

C

calorie: the amount of energy that is needed to raise the temperature of 1 g of liquid water by 1°C; equal to 4.184 J (14.4)

Calorie: a unit of energy equal to one thousand calories (1 kcal = 1000 cal) or 4.184 kJ (14.4)

calorimeter: a device that burns compounds containing carbon, hydrogen, and other elements in a stream of oxygen, O_2, to determine their composition (14.4)

calorimetry: the process of measuring changes in thermal energy (14.4)

carbon-hydrogen combustion analyzer: a device that uses the combustion-enabling properties of O_2 to determine the composition of compounds containing carbon, hydrogen, and oxygen (6.4)

cation: a positively charged ion (2.3)

Charles' law: the law stating that the volume of a fixed mass of gas is directly proportional to its kelvin temperature, if the pressure remains constant: $V \propto T$ (11.3)

chemical bond: the force that holds atoms together in compounds (3.1)

chemical change: the type of change that occurs when elements and/or compounds interact with each other to form different substances with different properties; involves the rearrangement of atoms (1.3)

chemical equation: a statement of what occurs in a chemical reaction; can be a word equation, a skeleton equation, or a balanced chemical equation (4.1)

chemical formula: a representation, in atomic symbols and numerical subscripts, of the type and number of atoms that are present in a compound (3.4)

chemical nomenclature: the system that is used to name chemical compounds (3.4)

chemical property: a property of a substance that can only be observed as the substance changes into another substance (1.2)

chemical reaction: a process in which a substance (or substances) changes, forming one or more different substances (4.1)

chemistry: the study of matter, its composition, and its interactions (1.1)

chlorofluorocarbon (CFC): a compound containing carbon, fluorine, and chlorine atoms that is chemically inert in the troposphere, but that is broken down by solar radiation in the stratosphere (12.4)

cis-trans isomers: compounds that have the same formula but different arrangements of atoms around a fixed carbon-carbon double bond; also called *geometric isomers* (13.3)

closed system: a system in which the total amount of matter remains constant; matter can neither enter nor leave this system (11.2)

coefficient: in a balanced chemical equation, a positive number that is placed in front of a formula to show how many units of the substance are involved (4.1)

combined gas law: a combination of Boyle's law and Charles' law, which states that the pressure and volume of a given amount of gas are inversely proportional, and directly proportional to the kelvin temperature of the gas: $V \propto \frac{T}{P}$ (11.4)

combustion: the reaction of a substance with oxygen, producing oxides, heat, and light; burning (14)

common name: a name for a compound that does not necessarily suggest anything about the chemical composition of the compound (e.g., water, baking soda); also called the *trivial name* (3.4)

competing reaction: a reaction that occurs at the same time as a principal reaction and consumes the reactants and/or products of the principal reaction (7.3)

complete combustion: combustion in which a hydrocarbon fuel is completely reacted in the presence of sufficient oxygen, producing only carbon dioxide gas and water vapour (14.1)

complete combustion reaction: a synthesis reaction in which a compound burns in the presence of oxygen gas, forming the most common oxides of the elements in the compound (4.2)

complete structural diagram: a symbolic representation of all the atoms in a molecule, showing how they are bonded (13.2)

compound: a pure substance that is composed of two or more elements chemically combined in fixed proportions (1.3)

concentration: the ratio of the amount of solute per quantity of solvent (8)

condensation: a physical change from the gaseous state to the liquid state (11.1)

condensed structural diagram: a symbolic representation of a compound, showing most atoms present, and the bonds between carbon atoms (13.2)

conjugate acid: the particle that results when a base receives a proton (10.1)

conjugate acid-base pair: two molecules or ions that are linked by the transfer of a proton (10.1)

conjugate base: the particle that remains when a proton is removed from an acid (10.1)

covalent bond: a chemical bond in which two electrons are shared by two atoms (3.1)

cracking: the use of heat or catalysts, in the absence of air, to break down or rearrange large hydrocarbon molecules (13.4)

cyclic hydrocarbon: a hydrocarbon that consists of one or more rings; can be a cycloalkane, a cycloalkene, or a cycloalkyne (13.3)

D

Dalton's law of partial pressures: the law stating that the total pressure of a mixture of gases is the sum of the pressures of each of the individual gases (11.4)

decomposition reaction: a chemical reaction in which a compound breaks down into elements or simpler compounds (4.2)

ΔT: a symbol used to indicate change in temperature (14.3)

diatomic element: an atom of this element tends to bond with another atom of the same element, forming a molecule that contains two atoms (3.2)

diffraction grating: a device that separates light into a spectrum (2.2)

dipole: dipole moment; a distribution of molecular charge consisting of two opposite charges that are separated by a short distance (8.2)

dipole-dipole attraction: the intermolecular force between oppositely charged ends of two polar molecules (molecules with dipoles) (8.2)

diprotic acid: an acid that contains two hydrogen ions that can dissociate (10.2)

double bond: a covalent bond in which two atoms share two pairs of electrons (3.2)

double displacement reaction: a chemical reaction in which the cations of two ionic compounds exchange places, resulting in the formation of two new compounds (4.3)

E

elastomer: a polymer that can be bent or twisted by an outside force; it will return to its previous shape once the force is removed (13.3)

electrolyte: a solute that conducts a current in an aqueous solution (8.2)

electron: a negatively charged subatomic particle that occupies the space around the nucleus of an atom (2.1)

electron affinity: the change in energy that accompanies the addition of an electron to an atom in the gaseous state (2.3)

electronegativity: a relative measure of an atom's ability to attract shared electrons in a chemical bond (3.1)

element: a pure substance that cannot be broken down into smaller particles and retain the same properties (1.3)

empirical formula: shows the lowest whole number ratio of atoms of each element in a compound (6.2)

endothermic process: a process that absorbs thermal energy (14.2)

end-point: the point in a titration when the acid-base indicator changes colour (10.3)

energy level: fixed, three-dimensional volume in which electrons travel around the nucleus (2.2)

equivalence point: the point in a titration when the number of moles of added solution is stoichiometrically equal to the number of moles of standard solution (10.3)

exothermic process: a process that produces thermal energy (14.2)

expanded molecular formula: a symbolic representation that shows the arrangement of atoms in a molecule (e.g., $CH_3CH_2CH_3$ for propane, C_3H_8) (13.2)

F

forensic scientist: a scientist who uses specialized knowledge to analyze evidence in legal cases (6.3)

fossil fuel: a fuel that is formed over geologic time by the action of pressure and heat on organic materials (e.g., petroleum, coal) (14)

fractional distillation: a process that uses the specific boiling points of substances to refine a mixture into separate components (13.4)

fraction: one component of a substance that has been refined by fractional distillation (13.4)

fuel cell: a technology that produces energy by the reaction of hydrogen and oxygen, leaving water as a by-product (11.5)

fusible plug: a safety device that melts at a high temperature to relieve gas pressure inside a container (11.3)

G

gamma radiation: a type of high-energy electromagnetic radiation in which gamma (γ) photons are emitted from a nucleus (4.4)

Gay-Lussac's law: the law stating that the pressure of a fixed amount of gas is directly proportional to its Kelvin temperature, if the volume is constant: $P \propto T$ (11.3)

general solubility guidelines: a set of guidelines that characterize the solubility of substances in water (9.1)

geometric isomers: compounds that have the same formula but different arrangements of atoms around a fixed carbon-carbon double bond; also called cis-trans isomers (13.3)

global warming: a gradual increase in the average temperature of Earth's atmosphere (14.5)

greenhouse gas: a gas that prevents some of the heat produced by solar radiation from leaving the atmosphere (e.g., carbon dioxide) (14.5)

H

hard water: water with a high concentration of dissolved ions (9.4)

heat: the transfer of thermal energy between objects with different temperatures (14.3)

heat capacity: the amount of energy that is needed to change the temperature of a particular substance or system by 1°C; measured in kJ/°C (14.4)

heat of combustion: the heat that is released by a combustion reaction; usually measured in kJ/mol (14.4)

heat of solution: the change in the thermal energy when a solute dissolves in a solvent (14.4)

heterogeneous mixture: a mixture in which the different components can be distinctly seen (1.3)

homogeneous mixture: a mixture in which the different components are mixed so that they appear to be a single substance; a solution (1.3)

homologous series: a series of molecules in which each member differs from the next by an additional specific structural unit (e.g. $–CH_2–$) (13.3)

hydrate: a compound that has a specific number of water molecules bonded to each formula unit (6.4)

hydrated: a term used to describe ions in aqueous solutions, surrounded by and attached to water molecules (8.2)

hydrocarbon: a molecular compound that contains only hydrogen and carbon atoms (13)

hydrogen bonding: the strong intermolecular attraction between molecules containing a hydrogen atom bonded to an atom of a highly electronegative element, especially oxygen (8.2)

hydronium ion: a proton that is bonded to a water molecule; chemical formula H_3O^+ (10.1)

I

ideal gas: a hypothetical gas with particles that have mass but no volume or attractive forces between them (11.1)

ideal gas law: the law stating that the pressure times the volume of a gas equals the number of moles of the gas times the universal gas constant and the temperature of the gas; $PV = nRT$ (12.1)

immiscible: a term used to describe substances that are not able to combine with each other in a solution (8.1)

incomplete combustion: combustion in which insufficient oxygen prevents a hydrocarbon fuel from reacting completely, leaving products other than carbon dioxide gas and water vapour (4.2, 14.1)

insoluble: a term used to describe a substance that has a solubility of less than 0.1 g per 100 mL in a particular solvent (8.1)

intermolecular forces: the forces that exist between molecules (3.2)

International System of Units (SI): the international system of measurement units, including units, including units such as the metre, the kilogram, and the mole; from the French *Système international d'unités* (1.2)

intramolecular forces: the forces that bond atoms together within a molecule (e.g., covalent bonds) (3.2)

ion: a positively or negatively charged particle that results from a neutral atom or group of atoms giving up or gaining electrons (2.2)

ion-dipole attractions: the intermolecular forces between ions and polar molecules (8.2)

ion exchange: a process for softening water by exchanging one type of ion with another (9.4)

ionic bond: a bond between oppositely charged ions that arises from electron transfer; usually involves a metal atom and a non-metal atom (3.1)

ionization energy: the energy that is needed to remove an electron from a neutral atom (2.3)

isolated system: a system in which the total amount of matter and energy remains constant (14.4)

isomers: compounds that have the same chemical formula but different molecular arrangements and properties (13.2)

isotopes: atoms of an element that are chemically similar but have different numbers of neutrons and thus, different mass numbers (2.1)

isotopic abundance: the relative amount of an isotope of an element; expressed as a percent or a decimal fraction (5.1)

IUPAC: the acronym for *International Union of Pure and Applied Chemistry*, an organization that specifies rules for chemical names and symbols (3.4)

K

Kelvin scale: a temperature scale that begins at the theoretical point of absolute zero kinetic energy (0 K = –273.15°C); each unit (a kelvin) is equal to 1°C (11.3)

kilopascal: a unit of pressure equal to 1000 Pa (11.2)

kinetic molecular theory: the theory explaining gas behaviour in terms of the random motion of particles with negligible volume and negligible intermolecular forces (11.1)

L

law of combining volumes: the law stating that when gases react, the volumes of the gaseous reactants and products, at constant temperatures and pressures, are always in whole number ratios (12.1)

law of conservation of mass: the law stating that matter can be neither created nor destroyed; in any chemical reaction, the mass of the products is always equal to the mass of the reactants (4.1)

law of definite proportions: the law stating that the elements in a chemical compound are always present in the same proportions by mass (6.1)

law of multiple proportions: the law stating that the masses of two or more elements that combine to form a compound can be expressed in small whole number ratios (12.1)

Lewis structure: a symbolic representation of the arrangement of the valence electrons of an element (2.2)

limiting reactant: the reactant that is completely consumed during a chemical reaction, limiting the amount of product produced (7.2)

line structural diagram: a graphical representation of the bonds between carbon atoms in a hydrocarbon (13.2)

lone pairs: pairs of electrons in an atom's outer valence shell that are not involved in covalent bonding (3.3)

M

mass/mass percent: the mass of a solute divided by the mass of the solution, expressed as a percent (8.3)

mass number (*A*): the sum of the protons and neutrons in the nucleus of one atom of a particular element (2.1)

mass percent: the mass of an element in a compound, expressed as a percent of the compound's total mass (6.1)

mass spectrometer: an instrument that uses magnetic fields to separate the isotopes of an element and measure the mass and abundance of each isotope (5.1)

mass/volume percent: the mass of a solute divided by the volume of the solution, expressed as a percent (8.3)

matter: anything that has mass and occupies space (1.2)

metathesis reaction: a double displacement reaction (9.2)

millimetre of mercury (mm Hg): a unit of pressure that is based on the height of a column of mercury in a barometer or manometer; equal to 1 torr (11.2)

miscible: a term used to describe substances that are able to combine with each other in any proportion (8.1)

mixture: a combination of two or more kinds of matter, in which each component retains its own characteristics (1.3)

molar concentration (*C*): a unit of concentration expressed as the number of moles of solute present in one litre of solution; also called *molarity* (8.3)

molar mass (*M*): the mass of 1 mol of a substance, numerically equal to the element's average atomic mass; expressed in g/mol (5.2)

molar volume: the amount of space that is occupied by 1 mol of a substance; equal to 22.4 L for a gas at standard temperature and pressure (STP) (12.1)

molecular compound: a non-conducting compound whose intramolecular bonds are not broken when the compound changes state (3.2)

molecular formula: a formula that gives the actual number of atoms of each element in a molecule or formula unit (6.2)

mole (mol): the SI base unit for amount of substance; contains the same number of atoms, molecules, or formula units as exactly 12 g of carbon-12 (5.2)

mole ratio: a ratio that compares the number of moles of different substances in a balanced chemical equation (7.1)

monomer: a small, repeating molecular unit in a polymer chain (13.1)

monoprotic acid: an acid that contains only one hydrogen ion that can dissociate (10.2)

Montréal Protocol: an international agreement that limits the global use of CFCs and other ozone-destroying chemicals (12.4)

N

net ionic equation: a representation of a chemical reaction in a solution that shows only the ions involved in the chemical change (9.2)

neutralization reaction: a double displacement reaction in which an acid and a base combine to form water and a salt (4.3, 10.3)

neutron: an uncharged subatomic particle in the nucleus of an atom (2.1)

non-electrolyte: a solute that does not conduct a current in an aqueous solution (8.2)

non-polar molecule: a covalently bonded molecule that does not possess a dipole moment, because of the arrangement of its molecules (3.3)

nuclear equation: a symbolic representation of a nuclear reaction, showing how a nucleus gains or loses subatomic particles (4.4)

nuclear fission: the process in which an unstable, heavy isotope splits into smaller, lighter nuclei (4.4)

nuclear fusion: the process by which a nucleus absorbs lighter, accelerated nuclei (4.4)

nuclear reaction: a reaction that involves changes in the nuclei of atoms (4.4)

nucleus: the central core of an atom, composed of protons and neutrons (2.1)

O

octet: an arrangement of eight electrons in the valence shell of an atom (2.2)

octet rule: the rule stating that atoms bond in such a way as to attain eight electrons in their valence shells (3.2)

organic compound: a molecular compound based on carbon, almost always containing carbon-carbon and carbon-hydrogen bonds (13.1)

oxoacid: an acid formed from a polyatomic ion that contains oxygen, hydrogen, and one other acid (10.2)

P

parts per million/parts per billion: units of concentration used to express very small quantities of solute (8.3)

pascal: the SI unit of pressure; equal to 1 N/m^2 (11.2)

percentage composition: the relative mass of each element in a compound (6.1)

percentage purity: the percent of a sample that is composed of a specific compound or element (7.3)

percentage yield: the actual yield of a reaction, expressed as a percent of the theoretical yield (7.3)

periodic table: a system for organizing the elements by atomic number into groups (columns) and periods (rows), so that elements with similar properties are in the same column (2.2)

periodic trend: a pattern that is evident when elements are organized by their atomic numbers (2.2)

petrochemical: a product that is derived from petroleum (13.4)

petroleum: a complex mixture of solid, liquid, and gaseous hydrocarbons (13.1)

pH: the negative logarithm of the concentration of hydronium ions, $-\log [H_3O^+]$, measured in mol/L (10.2)

pH scale: a mathematical scale that is used to express the concentration of hydronium ions in a solution as a number from 0 to 14 (10.2)

physical change: a change, such as change of state, that does not alter the composition of matter (1.3)

physical property: a property of a substance that can be observed without the substance changing into or interacting with another substance (1.2)

polar covalent bond: a covalent bond between atoms that have significantly different electronegativities, in which the electron pair is unevenly shared (3.3)

polar molecule: a molecule that has an uneven distribution of charge; one end has a partial positive charge and one end has a partial negative charge (3.3)

polyatomic ion: an ion that is made up of two or more atoms; it has a positive or negative charge (3.4)

polymerization: a process, common in the plastics industry, in which polymers are formed by reacting monomers (13.3)

polymer: a very long molecule that is formed by the covalent bonding of many smaller, identical molecular units (monomers) (13.1)

potential energy: stored energy; the energy of an object due to its position (14.4)

precipitate: an insoluble solid that is formed by a chemical reaction between two soluble compounds (4.3) (9.1)

precipitation reaction: a double displacement reaction that forms a precipitate (9.2)

precision: the closeness of a measurement to other measurements of the same object or phenomena (1.2)

pressure: the force that is exerted on an object, per unit of surface area (11.2)

pressure relief valve: a device that regulates the pressure of a gas inside a container (11.3)

product: a substance that is formed by a chemical reaction (4.1)

property: a characteristic that distinguishes different types of matter; (e.g., colour, melting or boiling point, conductivity, density) (1.2)

proton: a positively charged subatomic particle in the nucleus of an atom (2.1)

pure covalent bond: a chemical bond between two atoms with identical or nearly identical electronegativities (3.2)

pure substance: a material that is composed of only one type of particle (e.g., iron, water, sodium chloride) (1.3)

Q

qualitative analysis: the process of separating and identifying ions in an aqueous solution (9.2)

qualitative property: a property of matter that can be observed but cannot be precisely measured or expressed numerically (e.g., colour, odour) (1.2)

quantitative property: a property of matter that can be measured and expressed numerically (e.g., density, boiling point) (1.2)

R

radioactivity: the process in which unstable nuclei spontaneously decay, releasing energy and subatomic particles (2.1)

radioisotope: an unstable isotope of an element, which undergoes radioactive decay (2.1)

rate of dissolving: the speed at which a solute dissolves in a solvent (8.2)

reactant: a substance that undergoes a chemical change in a chemical reaction (4.1)

reforming: the use of heat, pressure, and catalysts to convert a large hydrocarbon molecule into other compounds (13.4)

risk: a potential danger; a chance of an undesirable consequence (14.4)

risk-benefit analysis: a thoughtful assessment of both the positive and negative results that may be caused by a particular course of action (14.4)

rotational motion: the motion of particles around other particles; characteristic of liquids (11.1)

S

salt: any ionic compound that is formed in a neutralization reaction from the anion of an acid and the cation of a base (10.3)

saturated hydrocarbon: a hydrocarbon that consists of chains or non-aromatic rings, whose carbon atoms are bonded to the maximum number of hydrogen or carbon atoms (13.3)

saturated solution: a solution in which no more of a particular solute can be dissolved at a specific temperature (8.1)

SI: the international system of measurement units, including units such as the metre, the kilogram, and the mole; from the French *Système international d'unités*) (1.2)

significant digits: the number of meaningful digits, including a final uncertain digit, that is obtained by measurement or used in calculations (1.2)

single displacement reaction: a chemical reaction in which one element in a compound is replaced (displaced) by another element (4.3)

skeleton equation: an equation that identifies the reactants and products in a chemical reaction by their chemical formulas but does not quantify them (4.1)

soft water: water with a low concentration of dissolved ions (9.4)

solubility: the amount of solute that dissolves in a given quantity of solvent at a specific temperature (8.1)

soluble: a term used to describe a substance that has a solubility greater than 1 g per 100 mL of a particular solvent (8.1)

solute: a substance that is dissolved in a solution (8.1)

solution: a homogeneous mixture of a solvent and one or more solutes (8.1)

solvent: a substance that has other substances dissolved in it (8.1)

specific heat capacity (*c*): the amount of energy (in J) required to change the temperature of 1 g of a substance by 1°C; measured in J/g•°C (14.3)

spectator ions: ions that are present in a solution but are not involved in the chemical reaction (9.2)

stable octet: an arrangement of eight electrons in the valence shell of an atom (2.2)

standard ambient temperature and pressure (SATP): 25°C and 100 kPa (11.4)

standard atmospheric pressure: 101.325 kPa at sea level and 0°C; the pressure that supports a column of mercury exactly 760 mm in height (11.2)

standard solution: a solution of known concentration (8.4)

standard temperature: 0°C, the freezing point of water (11.4)

standard temperature and pressure (STP): 0°C and 101.325 kPa (11.4)

Stock system: the current system for naming compounds that have elements that can have more than one valence; the valence of the first element name (usually a metal) in roman numerals in parentheses (e.g., copper(II)) (3.4)

stoichiometric amount: the exact molar amounts of a reactant or a product, as predicted by a balanced chemical equation (7.2)

stoichiometric coefficient: a number that is placed in front of the formula of the formula of a product or a reactant of a chemical equation to indicate how many moles are involved in the reaction (7.2)

stoichiometry: the study of the mass-mole-number relationships in chemical reactions and formulas (7.1)

straight-chain alkane: a hydrocarbon whose carbon atoms form a continuous chain of single carbon-carbon bonds (13.3)

strong acid: an acid that completely dissociates into ions in aqueous solutions (10.2)

strong base: a base that completely dissociates into ions in aqueous solutions (10.2)

structural diagram: a two-dimensional representation of the structure of a compound; can be a complete diagram, a condensed diagram, or a line diagram (13.2)

structural model: a three-dimensional representation of the structure of a compound (13.2)

STSE: an abbreviation for the interactions between science, technology, society, and the environment (1.1)

subatomic particle: one of the small particles (protons, neutrons, and electrons) that make up an atom (2.1)

sustainable development: the use of resources in a way that meets our current needs, without jeopardizing the ability of other people, or future generations, to meet their needs (14.5)

synthesis reaction: a chemical reaction in which two or more reactants combine to produce a single, different substance (4.2)

systematic name: a name that is based on the IUPAC rules for naming compounds (13.3)

T

temperature: a measure of the average kinetic energy of a substance or a system (14.3)

theoretical yield: the amount of product that is produced by a chemical reaction as predicted by the stoichiometry of the chemical equation (7.3)

thermal energy: the kinetic energy of particles; the energy possessed by vibrating particles (14.3)

thermal equilibrium: the state that is achieved when all the substances in a system have the same final temperature (14.4)

thermochemical equation: an equation that shows the energy produced or absorbed in a reaction (14.2)

titration: a laboratory process that is used to determine the concentration of a acidic or basic solution by reacting it with a solution of known concentration (10.3)

torr: a unit of pressure; equal to 1 mm of mercury in the column of a barometer or manometer (11.2)

total ionic equation: a form of chemical equation that shows dissociated ions of soluble ionic compounds (9.2)

translational motion: the independent motion of particles from one point in space to another; characteristic of gases (11.1)

triple bond: a covalent bond in which two atoms share three pairs of electrons (3.2)

trivial name: a name for a compound that does not necessarily suggest anything about the chemical composition of the compound (e.g., water, baking soda); also called the *common name* (3.4)

troposphere: the layer of the atmosphere that is closest to the surface of Earth (12.4)

U

universal gas constant (R): a proportionality constant that relates pressure, temperature, volume, and amount of gas; equal to 8.31 kPa·L/mol·K (12.1)

unsaturated hydrocarbon: a hydrocarbon that contains carbon-carbon double or triple bonds; the carbon atoms can potentially bond to additional atoms (13.3)

unsaturated solution: a solution in which more of a particular solute can be dissolved at a specific temperature (8.1)

V

valence: a number, positive or negative, that describes the bonding capacity of an element or ion (3.4)

valence electron: an electron that occupies the outermost energy level of an atom (2.2)

variable composition: a term used to describe a solution; capable of having different ratios of solutes to solvent (8.1)

vibrational motion: the motion of particles that are fixed in position; a characteristic of solids (11.1)

volumetric flask: a flat-bottomed, tapered glass vessel that is used to prepare standard solutions; accurate to ± 0.1 mL (8.4)

volume/volume percent: the volume of a liquid solute divided by the volume of the solution, expressed as a percent (8.3)

W

waste-water treatment: the cleaning of used water by physical, chemical, and biological processes (9.4)

water treatment: the process of removing chemical, biological, and physical contaminants to make water suitable for consumption (9.4)

weak acid: an acid that only slightly dissociates into ions in aqueous solutions (10.2)

weak base: a base that only slightly dissociates into ions in aqueous solutions (10.2)

weighted average: an average that takes into account the abundance or importance of each value (5.3)

word equation: an equation that identifies the reactants and products of a chemical reaction by name, but does not specify their amounts (4.1)

Z

zero sum rule: the rule stating that for chemical formulas of neutral compounds involving ions, the sum of positive valences and negative valences must equal zero (3.4)