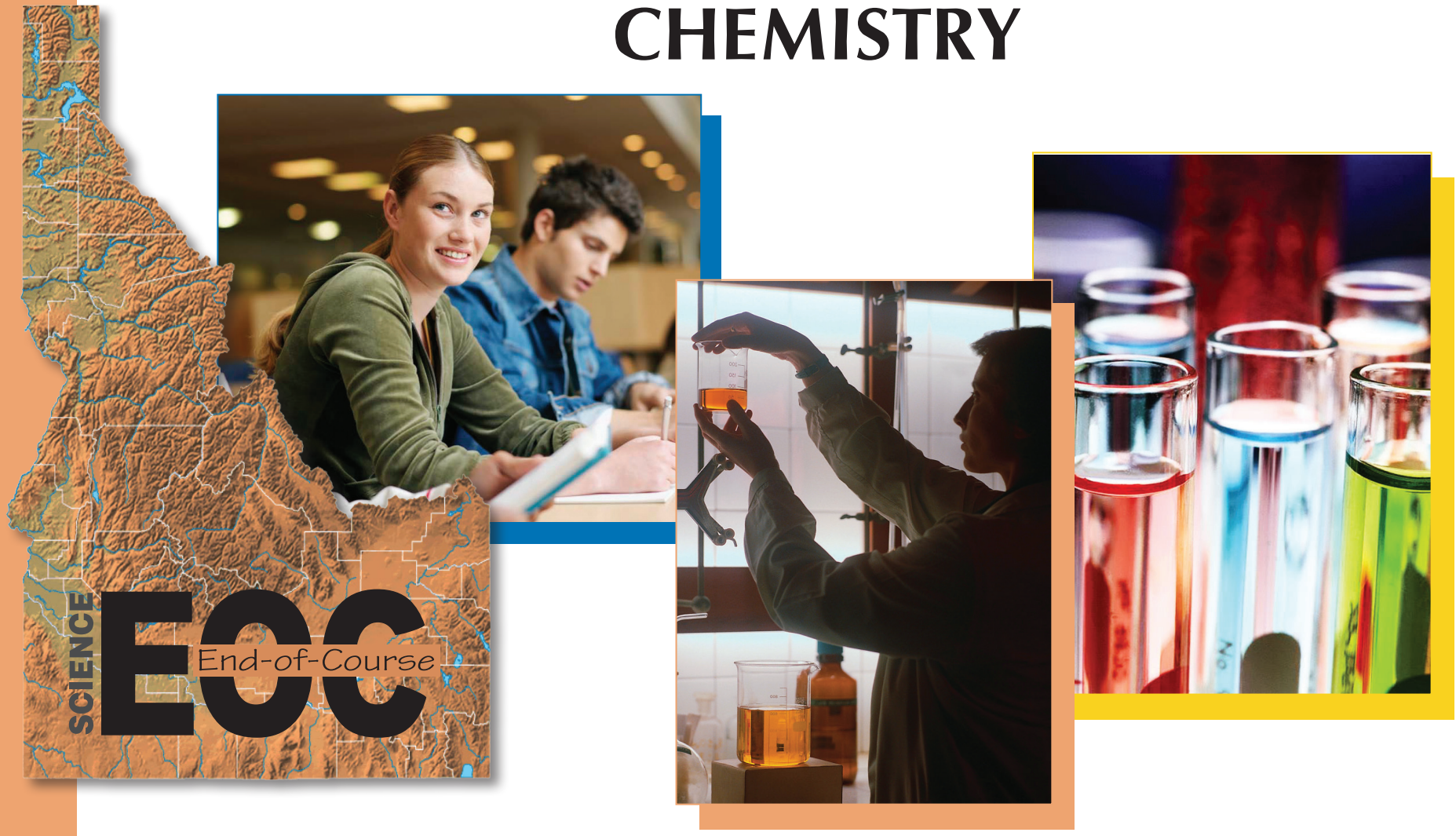
Idaho End-of-Course Assessment:
Chemistry Glossary for Objectives and Content Limits

PUBLISHED FALL 2013

CHEMISTRY



The Idaho Chemistry Glossary includes key scientific terminology and definitions. This information is intended to assist Idaho educators in better understanding the Idaho Chemistry Objectives and Content Limits. The glossary does not define all possible terms included on an actual Idaho Chemistry End-of-Course Test, and it does not include a complete list of terms for use in classroom instruction for a particular course. This document will be updated periodically, as needed.

absolute zero	The lowest possible temperature where molecules no longer move.
accuracy	Describes the nearness of a measured value to an accepted value.
acid rain	Precipitation with a pH value less than 5.6, due to atmospheric pollutants (SO_x and NO_x).
actinide	Any member of a group of *f*–block elements with an atomic number ranging from 89–103.
activated complex	An unstable, high-energy group of atoms that forms a transitional structure between reactants and products.
activation energy	The minimum amount of energy required to produce an activated complex.
alkali metals	Group 1A (1) elements in the periodic table (lithium, sodium, potassium, rubidium, cesium, and francium).
alkaline	Describes a substance with a pH value greater than 7.
alkaline earth metals	Group 2A (2) elements in the periodic table (beryllium, magnesium, calcium, strontium, barium, and radium).
alpha particle	A highly energetic particle emitted in radioactive decay or nuclear fission. It is equivalent to the nucleus of a helium atom.
anion	A negatively charged ion.
anode	Electrode at which oxidation reactions occur.
aqueous (solution)	Describes a solution in which water acts as the solvent. Often expressed as (*aq*).
Arrhenius acid	A substance that produces hydrogen ions when combined with water.

Arrhenius base	A substance that produces hydroxide ions when combined with water.
atom	The smallest part of an element that still has the identity of the element. Composed of proton(s), neutron(s), and electron(s).
atomic mass	The mass of an atom, usually described in atomic mass units (amu).
atomic number	Refers to the number of protons in an atom, which is unique to each element.
atomic radius	Half of the distance between the nuclei of two bonded atoms consisting of the same element.
Aufbau principle	Describes the order in which electron orbitals are filled. Electrons occupy the lowest energy orbitals first.
Avogadro's law	States that equal volumes of gases contain the same number of molecules when the gases are at the same temperature and pressure.
Avogadro's number	The number of particles, atoms or molecules in one mole of that substance (approximately 6.02×10^{23}).
binary ionic compound	A compound comprised of two types of elements (a metal and a nonmetal) which contain an ionic bond.
biodiesel	An alternative fuel often made from recycled fats, such as vegetable oil.
boiling point	The temperature at which a liquid boils, occurring when the vapor pressure is equal to atmospheric pressure.
Boyle's law	Describes the inverse relationship between the pressure and volume of an ideal gas at a constant temperature.

Brønsted-Lowry acid	A substance that donates a proton (hydrogen ion) in an acid-base reaction.
Brønsted-Lowry base	A substance that accepts a proton (hydrogen ion) in an acid-base reaction.
calorimeter	A piece of equipment used to measure heat loss or gain during chemical or physical changes.
catalyst	A substance that increases the rate of a chemical reaction but is not consumed by the reaction.
cathode	Electrode at which reduction reactions occur.
cathode ray tube (CRT)	A glass vacuum tube containing an electron gun which discharges electrons toward a screen that emits light when struck.
cation	A positively charged ion.
Charles's law	Describes the direct (proportional) relationship between the volume and temperature of an ideal gas at a constant pressure.
chemical change	A change which causes a substance to rearrange its atoms to form a new substance or substances with different properties. Also known as a chemical reaction.
chemical equation	A symbolic way of representing substances involved in a chemical reaction.
chemical equilibrium	The state of a reaction when the forward and reverse reaction rates are equal.
chemical kinetics	The study of chemical reaction rates.
chemical property	Property of matter that is observed during a chemical reaction in which the identity of the substance is changed.

coefficient	Numbers placed before the chemical formulas of reactants and products in a chemical equation that indicate the relative numbers of molecules, particles, or moles present in the reaction.
colligative properties	Properties of solutions that depend on the number of particles dissolved in solution rather than the individual properties of the dissolved particles.
collision theory	A theory that describes how molecules must collide in order to undergo a chemical reaction.
colloid	A mixture that contains microscopic particles smaller than those observed in suspensions but larger than those observed in solutions.
combined gas law	Shows the relationship between the pressure, volume, and temperature of an ideal gas when the number of moles of gas is held constant.
combustion reaction	An exothermic chemical reaction in which a substance (usually a carbon-containing substance) reacts with oxygen gas.
compound	Two or more different elements that have been combined through a chemical reaction.
concentration	The measure of the amount of solute dissolved in a specific amount of solvent.
conductivity	A measure of how well a substance conducts electricity or heat.
conjugate acid	The acid produced when a Brønsted-Lowry base gains a proton (hydrogen ion).
conjugate base	The base produced when a Brønsted-Lowry acid loses a proton (hydrogen ion).
control	A group of experimental subjects that is not exposed to a chemical or treatment being investigated so that it can be compared with experimental groups that are exposed to the chemical or treatment.

covalent bond	A bond formed when valence electrons are shared between atoms.
critical point	The temperature and pressure at which a liquid and gas become indistinguishable from one another.
decomposition reaction	A reaction in which one chemical substance separates into two or more smaller substances (or particles).
density	The amount of mass per unit volume for a given substance.
dependent variable	The variable that changes in response to a manipulated (independent) variable in an investigation.
deposition	The change from a gas directly into a solid.
diatomic element	A substance made of two atoms of the same element forming a molecule that is covalently bonded. Examples include O_2 and H_2.
diffusion	The movement of particles from regions of high concentration to low concentration or density.
dimensional analysis	A mathematical system which uses conversion factors to move from one unit of measurement to a different unit of measurement.
dipole	A molecule that contains regions of opposite charges.
dipole-dipole attraction	Attraction between molecules where the positively charged end of one molecule is attracted to the negatively charged end of another molecule.
diprotic	Type of acid having two transferrable hydrogen ions (H^+).

dissociation	The process by which a substance separates into smaller or simpler parts.
distillation	A technique that condenses and vaporizes a substance to separate it from another substance.
double bond	A bond in which two pairs of valence electrons are shared between two atoms.
double-replacement reaction	A chemical reaction between two compounds in which the positive ion of one compound is exchanged with the positive ion of another compound.
ductile	The ability to be drawn into a thin wire.
electrode	An electrical conductor used to pass electricity to another substance.
electrolysis	The separation of a compound while in a molten or aqueous state into simpler substances using an electrical current.
electrolyte	A chemical compound that ionizes when dissolved in water to produce a substance that is able to conduct electricity.
electromagnetic spectrum	The range of wavelengths or frequencies over which electromagnetic radiation can be observed.
electron	A subatomic particle that has a negative charge and is located outside the nucleus of an atom.
electron cloud	A model describing how electrons occur around the nucleus of an atom, not in fixed orbits but rather in probable regions.
electron configuration	The arrangement of electrons in atomic orbitals within an atom.
electron shielding	The effect of electrons closer to the positively charged nucleus blocking some of the attractive force between the nucleus and valence electrons.

electronegativity	The ability of an atom to attract electrons from neighboring atoms.
element	A pure substance consisting of one type of atom.
empirical formula	A chemical formula that shows the simplest whole number ratio of atoms in a compound.
endothermic	A type of reaction in which heat is absorbed from the surroundings.
energy level/energy state	Designation of the specific energy and probable distance of electrons from the nucleus (also referred to as principle energy levels).
enthalpy	A measure of the total amount of energy or heat in a system.
enthalpy diagram	A diagram that expresses the amount of heat involved in a chemical reaction by using horizontal line segments to represent enthalpy values, with changes in enthalpy represented by vertical distances between the line segments.
entropy	The measure of disorder within a system.
evaporation	The process of a substance changing from a liquid to a gas at the surface of the liquid.
excited state	The state of an atom in which an electron has absorbed energy and moved to a higher energy level.
exothermic	A type of reaction in which heat is released to the surroundings.
filtration	A mechanical separation technique in which solid particles are separated from fluids.
fission	The splitting of a large atomic nucleus into smaller atomic nuclei which releases a large amount of energy.
flammability	A chemical property describing how readily a substance burns.

fluidity	The ability of a substance to flow (ability of particles to move freely past one another).
formula unit	Shows the smallest whole number ratio of ions in an ionic compound.
fossil fuel	Fuel formed from the decomposition of organic matter under pressure.
freezing	The process of a liquid becoming a solid.
freezing point	The temperature at which a substance freezes.
frequency	The number of waves/oscillations that pass a point per unit of time.
fusion	The combining of two atomic nuclei which releases a large amount of energy.
gram	Metric unit for mass.
gas	A state of matter in which a substance can be compressed and completely fill its container.
gas pressure	Force per unit area exerted by gas molecules as they collide with the walls of a container.
Gay-Lussac's law	Describes the direct (proportional) relationship between the pressure and absolute temperature of an ideal gas at a constant volume.
Gibbs free energy	Measurement of the amount of energy in a chemical reaction that is free to do work.
ground state	The lowest energy state for an electron in an atom.
group	A column on the periodic table where elements have similar physical properties. Also known as a family.
halogens	Group 7A (17) in the periodic table (fluorine, chlorine, bromine, iodine, and astatine).

hazardous waste	Waste that poses a substantial or potential threat to public health or the environment.
heat	A transfer of energy from warmer substances to cooler substances.
molar heat of fusion	The energy required to melt one mole of a solid at constant temperature.
molar heat of vaporization	The energy required to vaporize one mole of a liquid at constant temperature.
heating curve	A temperature-time graph for a substance where energy is added at a constant rate.
Hess's law	States that the enthalpy change is the same for a given chemical reaction regardless of whether the reaction occurs in one step or many steps.
heterogeneous mixture	A mixture with a non-uniform composition.
homogeneous mixture	A mixture with a uniform composition.
Hund's rule	States that each orbital in a subshell must be occupied by a single electron before the orbital can be doubly occupied.
hydrogen bonding	A type of intermolecular attraction that occurs between polar molecules containing hydrogen bonded to a highly electronegative element such as fluorine (F), oxygen (O), or nitrogen (N).
hydronium ion	The positive ion formed when a water molecule gains a proton (H_3O^+).
hypothesis	A tentative explanation for an observed phenomenon or a scientific inquiry that is scientifically testable.
ideal gas	A hypothetical gas whose molecules occupy negligible space, have no interactions and obey the gas laws.

ideal gas law	Relates the pressure and volume to the moles and temperature of an ideal gas, using the ideal gas constant, R ($PV = nRT$).
independent variable	The variable in an investigation that is manipulated.
inhibitor	A substance that decreases the rate of a chemical reaction or stops the reaction.
intermediate	The substance formed in one step of a chemical reaction that is later consumed in another step of the reaction.
intermolecular force	The force of attraction between molecules.
inverse relationship	A mathematical relationship where one value, x, increases, causing another value, y, to decrease ($y = k/x$).
ion	A charged atom produced by gaining or losing one or more electrons.
ionic bond	A chemical bond formed by the attraction of two oppositely charged ions.
ionic charge	The charge on an ion equivalent to the charge of an electron multiplied by an integer.
ionic compound	A compound composed of atoms or groups of atoms held together by ionic bonds.
ionization	A process that occurs when an electron is gained or lost by an atom.
ionization energy	The energy required to remove an electron from an atom.
isotope	Atoms of the same element with a different number of neutrons.
isotopic notation	A notation used to represent an isotope, which includes the elemental symbol, the mass number, atomic number, and sometimes the charge of an ion.

IUPAC	Acronym for the International Union of Pure and Applied Chemistry.
Joule (J)	The SI unit of energy.
Kelvin scale	A temperature scale that starts at absolute zero (0 K).
kinetic energy	The energy of an object due to its motion.
kinetic molecular theory	A theory that states that all matter is made of particles that are in constant, random motion with collisions that are perfectly elastic.
lanthanide	Any member of a group of *f*–block elements with an atomic number ranging from 57–71.
law of conservation of energy	States that energy cannot be created nor destroyed during a physical or chemical process.
law of conservation of mass	States that mass cannot be created nor destroyed during a physical or chemical process.
law of conservation of matter	States that matter cannot be created nor destroyed.
law of definite proportions	States that a compound is always composed of the same elements in the same proportion by mass.
law of multiple proportions	States that elements always combine in ratios of small whole numbers.
Lewis dot diagram	A model that uses dots to represent valence electrons that do not participate in bonding and line segments to represent pairs of electrons that form covalent bonds.
limiting reactant	The reactant that is used up first in a chemical reaction and determines how much product will be formed.
line-emission spectrum	A set of specific wavelengths of electromagnetic radiation emitted when excited electrons fall back to their ground state.

liquid	A state of matter in which a substance has a fixed volume, takes the shape of a container and has the ability to flow.
liter	Metric unit for volume.
London dispersion forces	Forces of attraction between atoms or nonpolar molecules created by a temporary uneven distribution of negative charge.
lone pair	A pair of valence electrons that do not participate in bonding.
main group elements (representative elements)	Elements occurring in the *s*– and *p*– blocks of the periodic table.
malleability	A physical property describing the ability of a substance to be shaped, or molded.
mass	The amount of matter in an object.
mass number	The sum of the neutrons and protons in an atom.
mass percent	The percentage of the mass of a compound represented by the constituent elements or the percentage of the mass of a mixture represented by one of the components.
matter	A substance that has a volume and a mass.
melting	The change from a solid to a liquid.
melting point	The temperature at which matter changes from a solid to a liquid.
metal	An element that usually has the following physical properties: conducts electricity, is malleable, is ductile, and is a solid at room temperature.

metallic bond	The force that holds atoms within metals together by sharing delocalized electrons within a framework of nuclei.
metalloid (semi-metal)	A group in the periodic table that contains elements having properties of both metals and nonmetals.
meter	Metric unit for length.
metric system	A decimal system of units based on the meter as the unit of length, the kilogram as the unit of mass, the liter as the unit of volume, and the second as the unit of time.
mixture	A classification of matter in which individual components maintain their chemical identity.
molality	A measure of solution concentration expressed in moles of solute per kilogram of solvent.
molar mass	The mass of one mole of a substance.
molar ratio	A ratio of coefficients from a balanced equation that can be used to convert from moles of one substance to moles of another substance.
molarity	A measure of solution concentration expressed in moles of solute per liter of solution.
mole	Unit which describes the amount of a substance containing 6.02×10^{23} particles (the same number of particles in exactly 12 grams of carbon-12).
molecular formula	A chemical formula that specifies how many atoms of each element are in a molecule of a substance.
molecular mass	The mass of one molecule of a particular substance.
molecular speed	The rate at which molecules move.

molecule	Two or more atoms covalently bonded together.
monoprotic	Type of acid having only one transferrable hydrogen ion (H^+).
net ionic equation	An ionic equation that excludes spectator ions and contains only those substances undergoing a chemical change.
neutralization reaction	A reaction between an acid and a base that produces water and a salt.
neutron	A neutral subatomic particle located within the nucleus of an atom.
noble gases	Group 8A (18) elements in the periodic table that are gases at room temperature and have little or no reactivity (helium, neon, argon, krypton, xenon, and radon).
nonelectrolyte	A substance that does not dissociate into ions and does not conduct electricity when in solution.
nonmetal	An element that usually has the following physical properties: does not conduct electricity, brittle, and dull.
nonpolar covalent	A bond in which electrons are shared evenly between atoms (with electronegativity differences less than 0.5).
nuclear energy	Energy produced through a nuclear reaction in which atomic nuclei are changed.
nuclear radiation	The emission of waves or particles (alpha, beta, or gamma) from the nucleus of a radioactive isotope.
nuclear reaction	A reaction that alters the nucleus of an atom.
nuclear waste	Waste produced as a byproduct of a nuclear reaction.

nucleus	A dense region in the center of an atom consisting of protons and neutrons.
octet rule	A rule that states that atoms are usually most energetically stable when they have a full shell of eight valence electrons.
orbital	The specific region of space where electrons are most likely located in an energy level.
orbital energy diagram	A diagram that depicts the location of electrons within different subshells.
oxidation number	A number representing the total number of electrons that an atom either gains (written as a negative number) or loses (written as a positive number) in order to form a chemical bond with another atom.
oxidation-reduction reaction (redox)	A chemical reaction in which electrons are transferred from one species to another. Oxidation is the loss of electrons, while reduction is the gain of electrons.
Pascal (Pa)	SI unit of pressure.
Pauli exclusion principle	States that an orbital can hold up to a maximum of two electrons of opposite spin.
percent yield	Measures the efficiency of a reaction. The equation is: percent yield = (actual yield/theoretical yield) x100.
period	A horizontal row of elements in the periodic table.
periodic law	States that the properties of the elements recur in a predictable way when the elements are arranged in order of increasing atomic number.
periodic table	A display of the chemical elements organized on the basis of their atomic numbers.
periodic trends	Physical and chemical patterns in the periodic table based on the location of the elements.

petroleum	A type of fossil fuel.
pH	A measure of the hydrogen ion concentration in a solution.
pOH	A measure of the hydroxide ion concentration in a solution.
pH scale	A logarithmic scale ranging from 0 to 14 that shows how acidic (below 7) or basic (above 7) a solution is.
phase change	The conversion of one state of matter into a different state of matter.
phase diagram	A pressure-temperature graph that shows the states of matter under different conditions.
physical change	A change in a substance that does not alter the chemical characteristics of that substance.
physical property	A physical characteristic of a substance that can be determined without altering the chemical composition.
polar-covalent	A bond in which electrons are shared unevenly between atoms (with electronegativity differences of 0.5-1.7).
polarity	A molecule having a separation of charge created by the uneven sharing of electrons due to electronegativity differences among atoms.
polyatomic ion	An ion made of more than one atom.
polymer	A large molecule made of repeating structural units called monomers.
polyprotic	A type of acid having two or more transferrable hydrogen ions (H^+).
precipitate	A solid formed in a solution during a chemical reaction.

precision	The ability of a measurement to be consistently reproduced.
pressure	The amount of force exerted on a given area.
product	The substances produced by a chemical reaction, often shown on the right side of the arrow in a chemical equation.
proportional relationship	A mathematical relationship where one value, x, increases causing another value, y, to also increase ($y = kx$).
proton	A positively charged subatomic particle located within the nucleus of an atom.
pure substance	A type of matter that consists of only a single element or compound.
quanta of energy	A discrete amount of energy.
quantum model	Describes electrons as having wave properties and can predict probable regions of space around the nucleus in which electrons can be found.
radioactive decay	The spontaneous release of radiation (alpha, beta, or gamma) from the nucleus of a radioactive isotope.
radioisotope	A specific isotope that undergoes radioactive decay.
reactant	The starting materials in a chemical reaction that form a new substance or new substances, often shown on the left side of the arrow in a chemical equation.
reaction mechanism	The individual steps involved in a multistep reaction.
reaction rate	The change in the concentration of any one of the reactants or products per unit time, often expressed as moles per liter per second.

reactivity	The ability of a substance to react with other substances.
salt	An ionic compound formed when an acid reacts with a base.
scientific method	A series of steps used in the study of science that often includes observation, hypothesis, data collection, analysis, and conclusion.
self-ionization constant of water (K_w)	An equilibrium constant that represents the product of the hydrogen ion (H^+) and hydroxide ion (OH^-) molarities ($K_w = 1.0 \times 10^{-14}$).
semiconductor	A metalloid with an electrical conductivity between that of a conductor and an insulator. Examples include silicon (Si) and germanium (Ge).
SI unit	Units of measure recognized by the International System of Units.
significant figures (digits)	Represents the known numbers of a measurement plus one estimated number.
single bond	A bond in which one pair of valence electrons is shared between two atoms.
single-replacement reaction	A chemical reaction in which an element replaces another element in a compound based on its chemical activity.
solid	A state of matter in which a substance has a fixed volume and fixed shape.
solubility	A measure of the ability of a substance to dissolve in another substance.
solubility curve	A graph of the solubility of a compound (usually in grams/100 grams water) at various temperatures.
solute	The substance dissolved in a solution.
solution	A type of homogenous mixture in which a solute is dissolved in a solvent.

solvent	The medium in which a solute is dissolved.
specific heat capacity	The amount of energy required to heat one gram of a substance by one degree Celsius.
spectator ions	The ions in a chemical reaction that are present as both reactants and products. They do not participate directly in the reaction.
spectroscopy	The study of absorption or transmission of light by matter.
standard enthalpy of formation	The change in heat energy as one mole of a substance is formed from its constituent elements in their standard state.
standard temperature and pressure (STP)	Conditions of 1.0 atm and 0°C or the equivalent.
state change	Changes from one state of matter to another (solid to liquid, for example).
stoichiometry	The mathematical relationships between the reactants and products in a chemical reaction.
strong acid	An acid that completely ionizes in solution.
strong base	A base that completely ionizes in solution.
structural formula	Shows the arrangement of atoms and their orientation in a molecule.
subatomic particle	A particle that is smaller than an atom.
sublimation	The change from a solid directly into a gas.
surface area	A sum of the areas on all surfaces of an object.
synthesis reaction	A chemical reaction in which two or more reactants form a single product.

temperature	The average kinetic energy of particles in a substance.
theoretical yield	The calculated yield of a product based on stoichiometric calculations under ideal conditions.
thermodynamics	The study of heat and other forms of energy in physical and chemical processes.
titration	A laboratory method used to determine the unknown concentration of a specific solution using a standard.
titration curve	A plot of the pH versus the amount of standard solution added during a titration.
total ionic equation	An equation showing all of the ions involved in a chemical reaction, including the spectator ions.
transition metals	Metals that are located in the *d*–block of the periodic table.
transition state	A hypothetical state between reactants and products during a chemical reaction in which an activated complex is formed.
transmutation	The conversion of one element to another element through a nuclear reaction.
triple bond	A bond in which three pairs of valence electrons are shared between two atoms.
triple point	The temperature and pressure at which three states of matter (solid, liquid, and gas) coexist in a balanced condition.
Tyndall effect	An effect in which light is scattered by the particles of a substance in a colloid.
vacuum	A region of space that has no matter, volume, or mass.
valence electron(s)	Outermost electron(s) of an atom.

vapor pressure	The partial pressure created by a vapor over a liquid.
vaporization	The change from a liquid to a gas.
viscosity	Describes the resistance of a fluid to flow.
volume	The amount of space an object occupies.
wavelength	The shortest distance between two successive points on a wave.
weak acid	An acid that does not completely ionize in solution.
weak base	A base that does not completely ionize in solution.

Idaho State
Department of Education

Copyright © 2013 by the Idaho State Department of Education. No part of this publication may be reproduced or distributed in any form or by any means, or stored in a database or retrieval system, without the prior written permission of the publisher.