

fluid a nonsolid state of matter in which the atoms or molecules are free to move past each other, as in a gas or liquid (333)

formula equation a representation of the reactants and products of a chemical reaction by their symbols or formulas (264)

formula mass the sum of the average atomic masses of all atoms represented in the formula of any molecule, formula unit, or ion (237)

formula unit the collection of atoms corresponding to an ionic compound's formula such that the molar mass of the compound is the same as the mass of 1 mol of formula units (190)

free energy the energy in a system that is available for work; a system's capacity to do useful work (548)

free-energy change the difference between the change in enthalpy, ΔH , and the product of the Kelvin temperature and the entropy change, which is defined as $T\Delta S$, at a constant pressure and temperature (548)

freezing the change of state in which a liquid becomes a solid as energy as heat is removed (336)

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 (345)

freezing-point depression the difference between the freezing points of a pure solvent and a solution, which is directly proportional to the amount of solute present (448)

frequency the number of cycles or vibrations per unit of time; *also* the number of waves produced in a given amount of time (98)

functional group the portion of a molecule that is active in a chemical reaction and that determines the properties of many organic compounds (730)

G

gamma ray the high-energy photon emitted by a nucleus during fission and radioactive decay (687)

gas a form of matter that does not have a definite volume or shape (8)

Gay-Lussac's law the law that states that the volume occupied by a gas at a constant pressure is directly proportional to the absolute temperature (373)

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 a ratio of small whole numbers (378)

Geiger-Müller counter an instrument that detects and measures the intensity of radiation by counting the number of electric pulses that pass between the anode and the cathode in a tube filled with gas (694)

geometric isomer a compound that exists in two or more geometrically different configurations (714)

Graham's law of effusion the law that states that the rate of effusion of a gas is inversely proportional to the square root of the gas's density (387)

ground state the lowest energy state of a quantized system (100)

group a vertical column of elements in the periodic table; elements in a group share chemical properties (17)

H

half-cell a single electrode immersed in a solution of its ions (656)

half-life the time required for half of a sample of a radioactive substance to disintegrate by radioactive decay or by natural processes (688)

half-reaction the part of a reaction that involves only oxidation or reduction (633)

halogen one of the elements of Group 17 (fluorine, chlorine, bromine, iodine, and astatine); halogens combine with most metals to form salts (147)

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 (532)

Heisenberg uncertainty principle the principle that states that determining both the position and velocity of an electron or any other particle simultaneously is impossible (105)

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 (413)

Hess's law the overall enthalpy change in a reaction is equal to the sum of the enthalpy changes for the individual steps in the process (539)

heterogeneous composed of dissimilar components (12)

heterogeneous catalyst a catalyst that is in a different phase from the phase of the reactants (570)

heterogeneous reaction a reaction in which the reactants are in two different phases (568)

heterotroph an organism that obtains organic food molecules by eating other organisms or their byproducts and that cannot synthesize organic compounds from inorganic materials (766)

homogeneous describes something that has a uniform structure or composition throughout (12)

homogeneous catalyst a catalyst that is in the same phase as the reactants are (570)

homogeneous reaction a reaction in which all of the reactants and products are in the same phase (562)

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 (112)

hybrid orbitals orbitals that have the properties to explain the geometry of chemical bonds between atoms (202)

hybridization the mixing of two or more atomic orbitals of the same atom to produce new orbitals; hybridization represents the mixing of higher- and lower-energy orbitals to form orbitals of intermediate energy (201)