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Quick Study ACADEMIC CHEMISTRY Terminology

The ABCs of chemistry

A

A: Symbol for atomic mass number
absolute zero: Lowest temperature; 0 Kelvin
Ac: Symbol for the element actinium, Z = 89
accuracy: The closeness of measurement to true value
acetate anion: C₂H₃O₂⁻; charge -1
acetic acid: C₂H₄O₂
acetone: Dimethyl ketone; organic solvent
acid-base indicator: A chemical that changes color if the pH changes
acid-base titration: A method for determining acid or base concentrations
acid definition: See Arrhenius acid, Brønsted-Lowry acid, Lewis acid
acid ionization constant (K_a): Equilibrium constant for acid dissociation
acidic solution: pH below 7
actinide: Element with Z = 90 or above; radioactive
activation energy (E_a): A process's energy barrier

adhesion: Attraction of unlike molecules or materials
Ag: Symbol for the element silver, Z = 47
Al: Symbol for the element aluminum, Z = 13
alcohol: Organic compound with -OH group; ROH
aldehyde: Carbonyl group bonded to hydrogen and an organic group
alkali metal family: Lithium, sodium, potassium, rubidium, cesium, and francium; column #1
alkaline earth metal family: Beryllium, magnesium, calcium, strontium, barium, and radium; column #2
alkane: Hydrocarbon; all C-C single bonds
alkene: Hydrocarbon; 1 or more C=C double bonds
alkyne: Hydrocarbon; 1 or more C≡C triple bonds
allotropes: Two or more forms of an element
alloy: Solution of 2 or more metals
alpha (α): Greek letter that denotes radioactive particle and various scientific variables
alpha particle: Helium nucleus; charge +2
Am: Symbol for the element americium, Z = 95
amalgam: Alloy of mercury with other metal
amine: Organic base; RRRN; modified ammonia
amino acid: Compound with organic acid and organic base property; forms proteins and peptides
ammonia: NH₃; base
ammonium cation: NH₄⁺; charge +1
ammonium hydroxide: NH₄OH
amphoteric oxide: Exhibits both acid and basic properties
amu: Atomic mass unit; 1/12 mass of C-12
anion: Ion with a negative charge
anode: Electrode that supports oxidation
antibonding MO: MO is less stable than separate AOs
AO: Abbreviation for atomic orbital

aq: Aqueous; "dissolved in water"
Ar: Symbol for the element argon, Z = 18
aromatic: Organic compound with a benzene ring
Arrhenius acid: Produces hydronium ion in water solution
Arrhenius base: Yields hydroxide ion in water solution
Arrhenius equation for rate constant (k):
 $k = Ae^{-E_a/RT}$ E_a = activation energy
arsenide anion: As⁻³; charge -3
As: Symbol for the element arsenic, Z = 33
At: Symbol for the element astatine, Z = 85
atm: Symbol for pressure in "atmospheres"
atom: Fundamental unit of all matter
atomic mass number (A): Total number of protons and neutrons
atomic number (Z): Number of protons in the nucleus
atomic orbital: Wave motion of electrons in atoms
atomic radius: Empirical measure of atom size
atomic weight: Weighted average of natural isotopes of an element
Au: Symbol for the element gold, Z = 79
Aufbau principle: Guides the filling of electronic subshells of the elements
Avogadro's law: Volume is proportional to gas moles at fixed pressure and temperature
Avogadro's number: N_A = 6.022 × 10²³ mol⁻¹

Bk: Symbol for the element berkelium, Z = 97
bleach: Chemical that is a strong oxidizing agent
boiling: Liquid → gas at the boiling point
boiling point elevation: A solution has a higher boiling point than a pure solvent
boiling point (T_b): Liquid-gas equilibrium, P = 1 atm
boiling point of water: 100°C
bond energy: Energy held by a chemical bond
bond length: Distance between 2 atoms in a bond
bond order for Lewis model: # of bonds divided by # of bonded atoms
bond order for MO treatment: # of filled bonding MOs minus # of filled antibonding MOs
bonding electrons: Form chemical bonds in a compound
bonding MO: MO is more stable than AOs
Boyle's law: P₁V₁ = constant for gas, fixed T and n

Br: Symbol for the element bromine, Z = 35
bromide anion: Br⁻; charge -1
Brønsted-Lowry acid: Proton donor
Brønsted-Lowry base: Proton acceptor
buffer: Composed of weak acid and weak base; serves to keep pH constant

B

B: Symbol for the element boron, Z = 5
Ba: Symbol for the element barium, Z = 56
balanced equation: Each side of the equation has the same number of atoms of each element and charge
balanced redox: Electron loss = electron gain
barium cation: Ba²⁺; charge +2
base definition: See Arrhenius base, Brønsted-Lowry base, Lewis base
base ionization constant (K_b): Equilibrium constant for base dissociation
basic solution: pH over 7
battery: Source of electrical power; galvanic cell
Be: Symbol for the element beryllium, Z = 4
benzene: C₆H₆; organic solvent; aromatic ring of 6 carbon atoms

beryllium cation: Be²⁺; charge +2
beta (β): Greek letter that denotes radioactive particle and a number of scientific variables
beta particle: Energetic electron from the nucleus; charge -1
Bh: Symbol for the element bohrium, Z = 107
Bi: Symbol for the element bismuth, Z = 83
bicarbonate anion: HCO₃⁻; charge -1
bimolecular oxygen: O₂
binary compound: Formed from 2 elements
bisulfate anion: HSO₄⁻; charge -1

C

c: Symbol for centi-, the SI prefix for 1/100 or 10⁻²
c: Symbol for the speed of light
°C: Celsius temperature scale
C: Symbol for the element carbon, Z = 6
C₂H₄O₂: Acetic acid
Ca: Symbol for the element calcium, Z = 20
calcium cation: Ca²⁺; charge +2
calcium fluoride: CaF₂
calcium hydroxide: Ca(OH)₂
calorie: English unit of heat energy
calorimetry: Study of the release or absorption of heat
carbide anion: C⁴⁻; charge -4
carbohydrate: Organic compound; carbon bonded to several -OH groups (sugar and starch)
carbon dioxide: CO₂
carbon monoxide: CO
carbonate anion: CO₃²⁻; charge -2
carbonic acid: H₂CO₃
carbonyl group: CO; ligand complex
carboxyl group: >CO bonded to 2 groups
carboxylic acid: Organic acid; R-COOH
catalyst: Accelerates a reaction but is not consumed in the reaction; lowers the activation energy
cathode: Electrode that supports reduction
cation: Ion with a positive charge
Cd: Symbol for the element cadmium, Z = 48



The World of Chemistry

Study Guide

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Saunders College Publishing
Harcourt Brace Jovanovich College Publishers
Fort Worth Philadelphia San Diego
New York Orlando Austin San Antonio
Toronto Montreal London Sydney Tokyo

Lane Community College
Biology Department

See P. 10
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Chapter 2

I. Atoms and Molecules

- A. Emergent properties - atoms and molecules
 - B. Life requires about 25 chemical elements
 - C. Elements combine to form compounds - 2 or more elements in fixed ratio
 1. table salt is NaCl, instead (Pg. 34)
 2. Water
 - D. Atomic model of protons, neutrons and electrons
 1. atom is the smallest unit of matter
 2. subatomic particles make up the atom
 3. Differences in elements
 4. Isotopes - different numbers of neutrons in mass changes
 - E. Electron arrangement determines chemical properties of atom
 1. electrons determine how an atom behaves
 2. electrons vary in energy
 3. electrons occur at certain energy levels
 - F. Ions form by loss or gain of electrons
 1. ion is loss or gain of electrons
 2. ions with opposite charges attract each other
 3. resulting compound is electrically neutral
 4. sodium and chloride ions are always present in 1:1 ratio
 - G. Covalent bonds = sharing of electrons in pairs that
 1. molecule
 2. single covalent bond
 3. double bond
 4. NO and CO are molecules but not compounds
 - H. Chemical reactions rearrange matter
 1. chemical reactions
 2. reactants
 3. product
 4. $2\text{H}_2 + \text{O}_2 \rightarrow 2\text{H}_2\text{O}$
- ### II. Properties of water
- A. water is a polar molecule
 - B. Water's polarity leads to H bonding
 - C. Hydrogen bonds make liquid water coherent
 1. Hydrogen has for only a few billionths of a second
 2. cohesion and adhesion
 3. surface tension
 - D. Hydrogen bonds of water moderate temperature
 1. heat
 2. temperature
 - E. Ice is less dense than water
 - F. water is a versatile solvent
 1. solution
 2. solvent
 3. solute
 4. aqueous solution
- ### III. pH Scale
- A. The chemistry of life is sensitive to acid and base conditions
 1. some water molecules break apart naturally in water
 2. ions formed are called hydrogen (H^+) and hydroxide (OH^-) ions
 3. for life chemistry, proper balance of these ions is necessary
 4. the more OH^- a solution, the more H^+ ions. Acids are substances that donate H^+
 5. in your stomach, HCl donates H^+ ions when in solution



