

Common Polyatomic Ions	
ammonium	NH ₄ ⁺
acetate	CH ₃ COO ⁻
carbonate	CO ₃ ²⁻
hydrogen carbonate (bicarbonate)	HCO ₃ ⁻
hydroxide	OH ⁻
nitrite	NO ₂ ⁻
nitrate	NO ₃ ⁻
phosphate	PO ₄ ³⁻
hydrogen phosphate	HPO ₄ ²⁻
dihydrogen phosphate	H ₂ PO ₄ ⁻
hypochlorite	ClO ⁻
sulfite	SO ₃ ²⁻
sulfate	SO ₄ ²⁻
hydrogen sulfite (bisulfite)	HSO ₃ ⁻
hydrogen sulfate (bisulfate)	HSO ₄ ⁻
cyanide	CN ⁻

Prefix	Symbol	Multiplier
tera	T	10 ¹²
giga	G	10 ⁹
mega	M	10 ⁶
kilo	k	10 ³
deci	d	10 ⁻¹
centi	c	10 ⁻²
milli	m	10 ⁻³
micro	μ	10 ⁻⁶
nano	n	10 ⁻⁹
pico	p	10 ⁻¹²
femto	f	10 ⁻¹⁵

Conversions	
1 pound = 453.6 grams	
1 inch = 2.54 cm	
1 foot = 12 inches	
1 mile = 5280 feet	
1 mile = 1.609 km	
1 mL = 1 cm ³ = 1 cc	
1 gallon = 4 quarts	
1 liter = 1.06 quarts	
1 atm = 760 mmHg = 760 torr = 1.013 × 10 ⁵ Pa	
molar volume of gas = 22.4 L/mol at STP	

Nuclear Decay Reactions

Type of radiation	Symbol	Mass number	charge
Alpha particle	α or ⁴ He	4	2+
Beta particle	β or ⁰ ₋₁ e	0	1-
Gamma ray	γ or ⁰ ₀ γ	0	0
Neutron	¹ ₀ n	1	0
Positron	β ⁺ or ⁰ ₁ e	0	1+

PERIOD 1 18

1 IA 2 IIA 13 IIIA 14 IVA 15 VA 16 VIA 17 VIIA 18 VIIIA

2 3 4 5 6 7 8 9 10 11 12

3 11 Na Sodium 12 Mg Magnesium 13 Al Aluminum 14 Si Silicon 15 P Phosphorus 16 S Sulfur 17 Cl Chlorine 18 Ar Argon

4 19 K Potassium 20 Ca Calcium 21 Sc Scandium 22 Ti Titanium 23 V Vanadium 24 Cr Chromium 25 Mn Manganese 26 Fe Iron 27 Co Cobalt 28 Ni Nickel 29 Cu Copper 30 Zn Zinc 31 Ga Gallium 32 Ge Germanium 33 As Arsenic 34 Se Selenium 35 Br Bromine 36 Kr Krypton

5 37 Rb Rubidium 38 Sr Strontium 39 Y Yttrium 40 Zr Zirconium 41 Nb Niobium 42 Mo Molybdenum 43 Tc Technetium 44 Ru Ruthenium 45 Rh Rhodium 46 Pd Palladium 47 Ag Silver 48 Cd Cadmium 49 In Indium 50 Sn Tin 51 Sb Antimony 52 Te Tellurium 53 I Iodine 54 Xe Xenon

6 55 Cs Cesium 56 Ba Barium 57 La Lanthanum 58 Ce Cerium 59 Pr Praseodymium 60 Nd Neodymium 61 Pm Promethium 62 Sm Samarium 63 Eu Europium 64 Gd Gadolinium 65 Tb Terbium 66 Dy Dysprosium 67 Ho Holmium 68 Er Erbium 69 Tm Thulium 70 Yb Ytterbium 71 Lu Lutetium 72 Hf Hafnium 73 Ta Tantalum 74 W Tungsten 75 Re Rhenium 76 Os Osmium 77 Ir Iridium 78 Pt Platinum 79 Au Gold 80 Hg Mercury 81 Tl Thallium 82 Pb Lead 83 Bi Bismuth 84 Po Polonium 85 At Astatine 86 Rn Radon

7 87 Fr Francium 88 Ra Radium 89 Ac Actinium 90 Th Thorium 91 Pa Protactinium 92 U Uranium 93 Np Neptunium 94 Pu Plutonium 95 Am Americium 96 Cm Curium 97 Bk Berkeium 98 Cf Californium 99 Es Einsteinium 100 Fm Fermium 101 Md Mendelevium 102 No Nobelium 103 Lr Lawrencium 104 Rf Rutherfordium 105 Db Dubnium 106 Sg Seaborgium 107 Bh Bohrium 108 Hs Hassium 109 Mt Meitnerium 110 Ds Darmstadtium 111 Rg Roentgenium 112 Cn Copernicium 113 Nh Nihonium 114 Fl Flerovium 115 Mc Moscovium 116 Lv Livermorium 117 Ts Tennessine 118 Og Oganesson

Know the abbreviations and names of shaded elements.

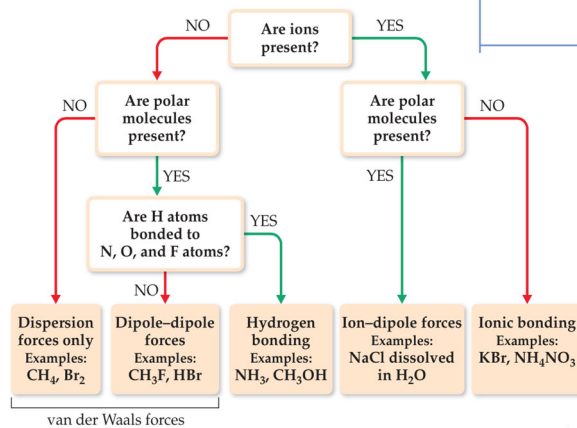
57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium
89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	93 Np Neptunium	94 Pu Plutonium	95 Am Americium	96 Cm Curium	97 Bk Berkeium	98 Cf Californium	99 Es Einsteinium	100 Fm Fermium	101 Md Mendelevium	102 No Nobelium

Number of electron pairs	Electron pair geometries: 0 lone pair	1 lone pair	2 lone pairs	3 lone pairs	4 lone pairs
2	180° Linear				
3	120° Trigonal planar	<120° Bent or angular			
4	109° Tetrahedral	<109° Trigonal pyramid	<<109° Bent or angular		

104

Strong Acids	Strong Bases
HCl, HBr, HI, HNO ₃ , HClO ₄ , H ₂ SO ₄	Group I & II metal hydroxides

Intermolecular Forces



Increasing interaction strength

Concentration Unit	Definition
molarity (M)	$\frac{\text{mol solute}}{\text{L solution}}$
mole fraction (c)	$\frac{\text{moles of solute}}{\text{moles of solute} + \text{moles of solvent}}$
percent by mass (%)	$\frac{\text{mass of solute}}{\text{mass of solution}} \times 100$
parts per million (ppm)	$\frac{\text{mass of solute}}{\text{mass of solution}} \times 10^6$
parts per billion (ppb)	$\frac{\text{mass of solute}}{\text{mass of solution}} \times 10^9$
Dilution formula	
$M_1V_1 = M_2V_2$	

Soluble compounds contain	Except when paired with
Group I metal cations or NH ₄ ⁺	None
CH ₃ COO ⁻ , HCO ₃ ⁻ , NO ₃ ⁻ , or ClO ₃ ⁻	None
Cl ⁻ , Br ⁻ , or I ⁻	Ag ⁺ , Hg ₂ ²⁺ , Pb ²⁺
SO ₄ ²⁻	Ag ⁺ , Hg ₂ ²⁺ , Pb ²⁺ , Ca ²⁺ , Sr ²⁺ , Ba ²⁺
Insoluble compounds contain	Except when paired with
CO ₃ ²⁻ , CrO ₄ ²⁻ , PO ₄ ³⁻ , or S ²⁻	Group I cations or NH ₄ ⁺
OH ⁻	Group I cations or NH ₄ ⁺ , or Ba ²⁺