



Massachusetts Comprehensive Assessment System

Chemistry Formula and Constants Sheet

Common Polyatomic Ions

Ion	Ionic Formula
Ammonium	NH_4^+
Carbonate	CO_3^{2-}
Hydroxide	OH^-
Nitrate	NO_3^-
Phosphate	PO_4^{3-}
Sulfate	SO_4^{2-}

Combined Gas Law:
$$\frac{P_1 V_1}{T_1} = \frac{P_2 V_2}{T_2}$$

Ideal Gas Law: $PV = nRT$

Molar Volume of Ideal Gas at STP: 22.4 L/mol

Ideal Gas Constant: $R = 0.0821 \text{ L} \cdot \text{atm/mol} \cdot \text{K} = 8.31 \text{ L} \cdot \text{kPa/mol} \cdot \text{K}$

STP: 1 atm (101.3 kPa), 273 K (0°C)

Absolute Temperature Conversion: $K = ^\circ\text{C} + 273$

Definition of pH: $\text{pH} = -\log [\text{H}_3\text{O}^+] = -\log [\text{H}^+]$

Avogadro's Number: 6.02×10^{23} particles/mol

Nuclear Symbols

Name	Symbol
Alpha particle	α or ${}^4_2\text{He}$
Beta particle	β or ${}^0_{-1}e$
Gamma ray	γ
Neutron	1_0n

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Periodic Table of the Elements

Group (Family)																		8A							
1A																		18							
1																		4.00							
1																		He							
1																		2							
1																		Helium							
Period	1	1.01 H 1 Hydrogen																	4.00 He 2 Helium						
	2	6.94 Li 3 Lithium	9.01 Be 4 Beryllium																	10.81 B 5 Boron	12.01 C 6 Carbon	14.01 N 7 Nitrogen	16.00 O 8 Oxygen	19.00 F 9 Fluorine	20.18 Ne 10 Neon
	3	22.99 Na 11 Sodium	24.31 Mg 12 Magnesium	3B 3	4B 4	5B 5	6B 6	7B 7	8B 8 9 10			1B 11	2B 12	26.98 Al 13 Aluminum	28.09 Si 14 Silicon	30.97 P 15 Phosphorus	32.06 S 16 Sulfur	35.45 Cl 17 Chlorine	39.95 Ar 18 Argon						
	4	39.10 K 19 Potassium	40.08 Ca 20 Calcium	44.96 Sc 21 Scandium	47.88 Ti 22 Titanium	50.94 V 23 Vanadium	52.00 Cr 24 Chromium	54.94 Mn 25 Manganese	55.85 Fe 26 Iron	58.93 Co 27 Cobalt	58.69 Ni 28 Nickel	63.55 Cu 29 Copper	65.39 Zn 30 Zinc	69.72 Ga 31 Gallium	72.59 Ge 32 Germanium	74.92 As 33 Arsenic	78.96 Se 34 Selenium	79.90 Br 35 Bromine	83.80 Kr 36 Krypton						
	5	85.47 Rb 37 Rubidium	87.62 Sr 38 Strontium	88.91 Y 39 Yttrium	91.22 Zr 40 Zirconium	92.91 Nb 41 Niobium	95.94 Mo 42 Molybdenum	(98) Tc 43 Technetium	101.07 Ru 44 Ruthenium	102.91 Rh 45 Rhodium	106.42 Pd 46 Palladium	107.87 Ag 47 Silver	112.41 Cd 48 Cadmium	114.82 In 49 Indium	118.71 Sn 50 Tin	121.75 Sb 51 Antimony	127.60 Te 52 Tellurium	126.91 I 53 Iodine	131.29 Xe 54 Xenon						
	6	132.91 Cs 55 Cesium	137.33 Ba 56 Barium			178.49 Hf 72 Hafnium	180.95 Ta 73 Tantalum	183.85 W 74 Tungsten	186.21 Re 75 Rhenium	190.23 Os 76 Osmium	192.22 Ir 77 Iridium	195.08 Pt 78 Platinum	196.97 Au 79 Gold	200.59 Hg 80 Mercury	204.38 Tl 81 Thallium	207.2 Pb 82 Lead	208.98 Bi 83 Bismuth	(209) Po 84 Polonium	(210) At 85 Astatine	(222) Rn 86 Radon					
	7	(223) Fr 87 Francium	(226) Ra 88 Radium			(267) Rf 104 Rutherfordium	(268) Db 105 Dubnium	(271) Sg 106 Seaborgium	(272) Bh 107 Bohrium	(277) Hs 108 Hassium	(276) Mt 109 Meitnerium	(281) Ds 110 Darmstadtium	(280) Rg 111 Roentgenium												

Mass numbers in parentheses are those of the most stable or most common isotope.

Lanthanide Series	138.91 La 57 Lanthanum	140.12 Ce 58 Cerium	140.91 Pr 59 Praseodymium	144.24 Nd 60 Neodymium	(145) Pm 61 Promethium	150.36 Sm 62 Samarium	151.96 Eu 63 Europium	157.25 Gd 64 Gadolinium	158.93 Tb 65 Terbium	162.50 Dy 66 Dysprosium	164.93 Ho 67 Holmium	167.26 Er 68 Erbium	168.93 Tm 69 Thulium	173.04 Yb 70 Ytterbium	174.97 Lu 71 Lutetium
	(227) Ac 89 Actinium	232.04 Th 90 Thorium	231.04 Pa 91 Protactinium	238.03 U 92 Uranium	(237) Np 93 Neptunium	(244) Pu 94 Plutonium	(243) Am 95 Americium	(247) Cm 96 Curium	(247) Bk 97 Berkelium	(251) Cf 98 Californium	(252) Es 99 Einsteinium	(257) Fm 100 Fermium	(258) Md 101 Mendelevium	(259) No 102 Nobelium	(262) Lr 103 Lawrencium

*Revised based on IUPAC Commission on Atomic Weights and Isotopic Abundances, "Atomic Weights of the Elements 2007."