

Preparation for General Chemistry
CHEM 50, Instructor: Ram Subramaniam

TABLE 3.1 THE METRIC SYSTEM

PHYSICAL QUANTITY	BASIC UNIT	SYMBOL
length	meter*	m
mass	gram	g
volume	liter*	L
time	second	s

*The U.S. Metric Association recommends the spellings "meter" and "liter." All other English-speaking nations, however, use the spellings "metre" and "litre."

TABLE 3.2 METRIC PREFIXES

PREFIX	SYMBOL	MULTIPLE/FRACTION
tera-	T	1,000,000,000,000 = 1×10^{12}
giga-	G	1,000,000,000 = 1×10^9
mega-	M	1,000,000 = 1×10^6
kilo-	k	1,000 = 1×10^3
Basic unit: meter, gram, liter, second		
deci-	d	0.1 = 1×10^{-1}
centi-	c	0.01 = 1×10^{-2}
milli-	m	0.001 = 1×10^{-3}
micro-	μ^*	0.000 001 = 1×10^{-6}
nano-	n	0.000 000 001 = 1×10^{-9}
pico-	p	0.000 000 000 001 = 1×10^{-12}

TABLE 3.3 METRIC-ENGLISH EQUIVALENTS

PHYSICAL QUANTITY	ENGLISH UNIT	METRIC EQUIVALENT
length	1 inch (in.)	1 in. = 2.54 cm
mass	1 pound (lb)	1 lb = 454 g
volume	1 quart (qt)	1 qt = 946 mL
time	1 second (sec)	1 sec = 1.00 s

When applying these metric equivalents, assume three significant digits. Since the metric and English systems have different reference standards, these are not exact equivalents; however, the U.S. Bureau of Weights and Measures has redefined 1 in. as exactly equal to 2.54 cm.

Temperature Conversions

- This is the equation for converting °C to °F.

$$^{\circ}\text{C} \times \left(\frac{180^{\circ}\text{F}}{100^{\circ}\text{C}} \right) + 32 = ^{\circ}\text{F}$$

- This is the equation for converting °F to °C.

$$(^{\circ}\text{F} - 32^{\circ}\text{F}) \times \left(\frac{100^{\circ}\text{C}}{180^{\circ}\text{F}} \right) = ^{\circ}\text{C}$$

- To convert from °C to K, add 273.

$$^{\circ}\text{C} + 273 = \text{K}$$

Atomic number — 1
Symbol — H
Atomic mass — 1.01

	1 IA	2 IIA																	13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
2	3 Li 6.94	4 Be 9.01																	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31																	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80						
5	37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (99)	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.90	54 Xe 131.29						
6	55 Cs 132.91	56 Ba 137.33	57 La 138.91	72 Hf 178.49	73 Ta 180.95	74 W 183.85	75 Re 186.21	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po (209)	85 At (210)	86 Rn (222)						
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 Ds (271)	111 — (272)	112 — (277)		114 — (285)		116 — (289)								
				58 Ce 140.12	59 Pr 140.91	60 Nd 144.24	61 Pm (147)	62 Sm 150.36	63 Eu 151.97	64 Gd 157.25	65 Tb 158.93	66 Dy 162.50	67 Ho 164.93	68 Er 167.26	69 Tm 168.93	70 Yb 173.04	71 Lu 174.97							
				90 Th 232.04	91 Pa (231)	92 U 238.03	93 Np (237)	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)							

(Learn: Name, Symbol, and Atomic number of first 20 elements)

	1 IA	2 IIA											13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
2	Li ⁺														N ³⁻	O ²⁻	F ⁻	
3	Na ⁺	Mg ²⁺											Al ³⁺		P ³⁻	S ²⁻	Cl ⁻	
4	K ⁺	Ca ²⁺				Cr ³⁺	Mn ²⁺	Fe ²⁺	Co ²⁺	Ni ²⁺	Cu ²⁺	Zn ²⁺					Br ⁻	
5		Sr ²⁺									Cu ⁺			Sn ⁴⁺			I ⁻	
6		Ba ²⁺									Ag ⁺	Cd ²⁺		Pb ⁴⁺				
7												Hg ²⁺	Hg ₂ ²⁺	Pb ²⁺				

TABLE 7.3 COMMON POLYATOMIC IONS

CATION	IUPAC NAME	ANION	IUPAC NAME
NH ₄ ⁺	ammonium ion	OH ⁻	hydroxide ion*
C ₂ H ₃ O ₂ ⁻	acetate ion	ClO ⁻	hypochlorite ion
CO ₃ ²⁻	carbonate ion	NO ₃ ⁻	nitrate ion
ClO ₃ ⁻	chlorate ion	NO ₂ ⁻	nitrite ion
ClO ₂ ⁻	chlorite ion	ClO ₄ ⁻	perchlorate ion
CrO ₄ ²⁻	chromate ion	MnO ₄ ⁻	permanganate ion
CN ⁻	cyanide ion*	PO ₄ ³⁻	phosphate ion
Cr ₂ O ₇ ²⁻	dichromate ion	SO ₄ ²⁻	sulfate ion
HCO ₃ ⁻	hydrogen carbonate ion	SO ₃ ²⁻	sulfite ion
HSO ₄ ⁻	hydrogen sulfate ion		

*Note that the suffix *-ide* is an exception to the general *-ate* and *-ite* rule.

TABLE 7.4 GREEK PREFIXES FOR BINARY MOLECULAR COMPOUNDS

ATOMS	PREFIX	ATOMS	PREFIX
1	<i>mono-</i>	6	<i>hexa-</i>
2	<i>di-</i>	7	<i>hepta-</i>
3	<i>tri-</i>	8	<i>octa-</i>
4	<i>tetra-</i>	9	<i>nona-</i> *
5	<i>penta-</i>	10	<i>deca-</i>

*Although the Latin prefix *nona-* is commonly used, IUPAC prefers the Greek prefix *ennea-*.

List of Acids

Name	Formula
Hydro chloric acid	HCl
Hydro fluoric acid	HF
Hydro bromic acid	HBr
Hydro iodic acid	HI
Nitric acid	HNO ₃
Nitrous acid	HNO ₂
Sulfuric acid	H ₂ SO ₄
Sulfurous acid	H ₂ SO ₃
Phosphoric acid	H ₃ PO ₄
Acetic acid	HC ₂ H ₃ O ₂
Chloric acid	HClO ₃
Chlorous acid	HClO ₂
Hypo chloric acid	HClO
Per chloric acid	HClO ₄