

1 valence electron  
alkali metals group 1  
+1

2 valence electrons  
alkaline earth metals group 2  
+2



1s	1 H hydrogen 1.008 <small>(H is a nonmetal)</small>	
2s	3 Li lithium 6.94	4 Be beryllium 9.012
3s	11 Na sodium 22.99	12 Mg magnesium 24.31
4s	19 K potassium 39.10	20 Ca calcium 40.08
5s	37 Rb rubidium 85.47	38 Sr strontium 87.62
6s	55 Cs cesium 132.91	56 Ba barium 137.33
7s	87 Fr francium 223.02	88 Ra radium 226.03

transition metals

group 3	group 4	group 5	group 6	group 7	group 8	group 9	group 10	group 11	group 12
21 Sc scandium 44.96	22 Ti titanium 47.90	23 V vanadium 50.94	24 Cr chromium 52.00	25 Mn manganese 54.94	26 Fe iron 55.85	27 Co cobalt 58.93	28 Ni nickel 58.71	29 Cu copper 63.55	30 Zn zinc 65.37
39 Y yttrium 88.91	40 Zr zirconium 91.22	41 Nb niobium 92.91	42 Mo molybdenum 95.94	43 Tc technetium 96.91	44 Ru ruthenium 101.07	45 Rh rhodium 102.91	46 Pd palladium 106.40	47 Ag silver 107.87	48 Cd cadmium 112.40
71 Lu lutetium 174.97	72 Hf hafnium 178.49	73 Ta tantalum 180.95	74 W tungsten 183.85	75 Re rhenium 186.21	76 Os osmium 190.20	77 Ir iridium 192.22	78 Pt platinum 195.09	79 Au gold 196.97	80 Hg mercury 200.59
103 Lr lawrencium 262.11	104 Rf rutherfordium 267.12	105 Db dubnium 268.13	106 Sg seaborgium 271.13	107 Bh bohrium 270.13	108 Hs hassium 277.15	109 Mt meitnerium 278.16	110 Ds darmstadtium 281.17	111 Rg roentgenium 281.16	112 Cn copernicium 285.18

valence electrons:  
common charges

metal	nonmetal	3	4	5	6	7	8 noble gases group 18
group 13	group 14	group 15	group 16	group 17	halogens	-1	2 He helium 4.00
5 B boron 10.81	6 C carbon 12.01	7 N nitrogen 14.01	8 O oxygen 16.00	9 F fluorine 19.00	10 Ne neon 20.18		
13 Al aluminum 26.98	14 Si silicon 28.09	15 P phosphorus 30.97	16 S sulfur 32.07	17 Cl chlorine 35.45	18 Ar argon 39.95		
31 Ga gallium 69.72	32 Ge germanium 72.59	33 As arsenic 74.92	34 Se selenium 78.96	35 Br bromine 79.91	36 Kr krypton 83.80		
49 In indium 114.82	50 Sn tin 118.69	51 Sb antimony 121.75	52 Te tellurium 127.60	53 I iodine 126.90	54 Xe xenon 131.30		
81 Tl thallium 204.37	82 Pb lead 207.19	83 Bi bismuth 208.980	84 Po polonium 208.982	85 At astatine 209.99	86 Rn radon 222.02		
113 Nh nihonium 286.19	114 Fl flerovium 289.19	115 Mc moscovium 289.19	116 Lv livermorium 293.20	117 Ts tennessine 294	118 Og oganesson 294		



atomic number	symbol: solid liquid gas metalloid
Sc scandium 44.96	name
metal	average atomic mass (amu)
metalloid	nonmetal

common ions

4f	57 La lanthanum 138.91	58 Ce cerium 140.12	59 Pr praseodymium 140.91	60 Nd neodymium 144.24	61 Pm promethium (144.91)	62 Sm samarium 150.41	63 Eu europium 151.96	64 Gd gadolinium 157.25	65 Tb terbium 158.92	67 Ho holmium 164.93	68 Er erbium 167.26	69 Tm thulium 168.93	70 Yb ytterbium 173.04	to 5d	
5f	89 Ac actinium 227.03	90 Th thorium 232.04	91 Pa protactinium 231.04	92 U uranium 238.03	93 Np neptunium 237.05	94 Pu plutonium 244.06	95 Am americium 243.06	96 Cm curium 247.07	97 Bk berkelium 247.07	98 Cf californium 251.08	99 Es einsteinium 252.08	100 Fm fermium 257.10	101 Md mendelevium 258.10	102 No nobelium 259.10	to 6d

common ions

acetate CH <sub>3</sub> CO <sub>2</sub> <sup>-</sup>	bisulfite HSO <sub>3</sub> <sup>-</sup>	chlorite ClO <sub>2</sub> <sup>-</sup>	hydroxide OH <sup>-</sup>	nitrite NO <sub>2</sub> <sup>-</sup>	phosphide P <sup>3-</sup>
ammonium NH <sub>4</sub> <sup>+</sup>	bromide Br <sup>-</sup>	chromate CrO <sub>4</sub> <sup>2-</sup>	hypochlorite ClO <sup>-</sup>	oxide O <sup>2-</sup>	sulfate SO <sub>4</sub> <sup>2-</sup>
bromide Br <sup>-</sup>	carbonate CO <sub>3</sub> <sup>2-</sup>	cyanide CN <sup>-</sup>	iodide I <sup>-</sup>	perchlorate ClO <sub>4</sub> <sup>-</sup>	sulfide S <sup>2-</sup>
bicarbonate HCO <sub>3</sub> <sup>-</sup>	chlorate ClO <sub>3</sub> <sup>-</sup>	dichromate Cr <sub>2</sub> O <sub>7</sub> <sup>2-</sup>	nitrate NO <sub>3</sub> <sup>-</sup>	permanganate MnO <sub>4</sub> <sup>-</sup>	sulfite SO <sub>3</sub> <sup>2-</sup>
bisulfate HSO <sub>4</sub> <sup>-</sup>	chloride Cl <sup>-</sup>	fluoride F <sup>-</sup>	nitride N <sup>3-</sup>	phosphate PO <sub>4</sub> <sup>3-</sup>	thiosulfate S <sub>2</sub> O <sub>3</sub> <sup>2-</sup>