

4. PERIODIC TABLE OF THE ELEMENTS

Table 4.1. Revised 2004 by C.G. Wohl (LBNL). Adapted from the Commission of Atomic Weights and Isotopic Abundances, “Atomic Weights of the Elements 1995,” Pure and Applied Chemistry **68**, 2339 (1996), and G. Audi and A.H. Wapstra, “The 1993 Mass Evaluation,” Nucl. Phys. **A565**, 1 (1993). The atomic number (top left) is the number of protons in the nucleus. The atomic mass (bottom) is weighted by isotopic abundances in the Earth’s surface. For a new determination of atomic masses, not weighted by abundances, see G. Audi, A.H. Wapstra, and C. Thibault, Nucl. Phys. **A729**, 337 (2003). Atomic masses are relative to the mass of the carbon-12 isotope, defined to be exactly 12 unified atomic mass units (u). Errors range from 1 to 9 in the last digit quoted. Relative isotopic abundances often vary considerably, both in natural and commercial samples. A number in parentheses is the mass of the longest-lived isotope of that element—no stable isotope exists. However, although Th, Pa, and U have no stable isotopes, they do have characteristic terrestrial compositions, and meaningful weighted masses can be given. For elements 110 and 111, the numbers of nucleons *A* of confirmed isotopes are given.

1 IA																	18 VIIIA																		
1 H Hydrogen 1.00794		2 IIA															13 IIIA					14 IVA		15 VA		16 VIA		17 VIIA		2 He Helium 4.002602					
3 Li Lithium 6.941		4 Be Beryllium 9.012182		PERIODIC TABLE OF THE ELEMENTS															5 B Boron 10.811		6 C Carbon 12.0107		7 N Nitrogen 14.00674		8 O Oxygen 15.9994		9 F Fluorine 18.9984032		10 Ne Neon 20.1797						
11 Na Sodium 22.989770		12 Mg Magnesium 24.3050		3 IIIB		4 IVB		5 VB		6 VIB		7 VIIB		8 VIII		9 VIII		10 VIII		11 IB		12 IIB		13 Al Aluminum 26.981538		14 Si Silicon 28.0855		15 P Phosph. 30.973761		16 S Sulfur 32.066		17 Cl Chlorine 35.4527		18 Ar Argon 39.948	
19 K Potassium 39.0983		20 Ca Calcium 40.078		21 Sc Scandium 44.955910		22 Ti Titanium 47.867		23 V Vanadium 50.9415		24 Cr Chromium 51.9961		25 Mn Manganese 54.938049		26 Fe Iron 55.845		27 Co Cobalt 58.933200		28 Ni Nickel 58.6934		29 Cu Copper 63.546		30 Zn Zinc 65.39		31 Ga Gallium 69.723		32 Ge German. 72.61		33 As Arsenic 74.92160		34 Se Selenium 78.96		35 Br Bromine 79.904		36 Kr Krypton 83.80	
37 Rb Rubidium 85.4678		38 Sr Strontium 87.62		39 Y Yttrium 88.90585		40 Zr Zirconium 91.224		41 Nb Niobium 92.90638		42 Mo Molybd. 95.94		43 Tc Technet. (97.907215)		44 Ru Ruthen. 101.07		45 Rh Rhodium 102.90550		46 Pd Palladium 106.42		47 Ag Silver 107.8682		48 Cd Cadmium 112.411		49 In Indium 114.818		50 Sn Tin 118.710		51 Sb Antimony 121.760		52 Te Tellurium 127.60		53 I Iodine 126.90447		54 Xe Xenon 131.29	
55 Cs Cesium 132.90545		56 Ba Barium 137.327		57–71 Lantha- nides		72 Hf Hafnium 178.49		73 Ta Tantalum 180.9479		74 W Tungsten 183.84		75 Re Rhenium 186.207		76 Os Osmium 190.23		77 Ir Iridium 192.217		78 Pt Platinum 195.078		79 Au Gold 196.96655		80 Hg Mercury 200.59		81 Tl Thallium 204.3833		82 Pb Lead 207.2		83 Bi Bismuth 208.98038		84 Po Polonium (208.982415)		85 At Astatine (209.987131)		86 Rn Radon (222.017570)	
87 Fr Francium (223.019731)		88 Ra Radium (226.025402)		89–103 Actinides		104 Rf Rutherford. (261.1089)		105 Db Dubnium (262.1144)		106 Sg Seaborg. (263.1186)		107 Bh Bohrium (262.1231)		108 Hs Hassium (265.1306)		109 Mt Meitner. (266.1378)		110 Ds Darmstadt. (269.271)		111 [272]															
Lanthanide series		57 La Lanthan. 138.9055		58 Ce Cerium 140.116		59 Pr Praseodym. 140.90765		60 Nd Neodym. 144.24		61 Pm Prometh. (144.912745)		62 Sm Samarium 150.36		63 Eu Europium 151.964		64 Gd Gadolin. 157.25		65 Tb Terbium 158.92534		66 Dy Dyspros. 162.50		67 Ho Holmium 164.93032		68 Er Erbium 167.26		69 Tm Thulium 168.93421		70 Yb Ytterbium 173.04		71 Lu Lutetium 174.967					
		89 Ac Actinium (227.027747)		90 Th Thorium 232.0381		91 Pa Protactin. 231.03588		92 U Uranium 238.0289		93 Np Neptunium (237.048166)		94 Pu Plutonium (244.064197)		95 Am Americ. (243.061372)		96 Cm Curium (247.070346)		97 Bk Berkelium (247.070298)		98 Cf Californ. (251.079579)		99 Es Einstein. (252.08297)		100 Fm Fermium (257.095096)		101 Md Mendelev. (258.098427)		102 No Nobelium (259.1011)		103 Lr Lawrenc. (262.1098)					