**Table 4.1.** Revised 1997 by C.G. Wohl (LBNL). Heavy element updates in May 2000 by D.E. Groom. 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. 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 110–112, the atomic numbers of known isotopes are given. 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).

## PERIODIC TABLE OF THE ELEMENTS

| 1 IA | | | | | | | | | | | | 13 IIIA | 14 IVA | 15 VA | 16 VIA | 17 VIIA | 18 VIIIA |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 H Hydrogen 1.00794 | 2 IIA | | | | | | | | | | | | | | | | 2 He Helium 4.002602 |
| 3 Li Lithium 6.941 | 4 Be Beryllium 9.012182 | | | | | | | | | | | 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 | 9 VIII | 10 | 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 (269, 273) | 111 (272) | 112 (277) | | | | | | |

| 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 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Actinide series | 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) |