Periodic System of Elements

first conceived by Dimitri Mendeleev (1869)

Explanation

H	1	1.008
0.0899		0.32
14.03		0.00182
$1s^1$		
1		2.2
0.79		14.304
		0

Density(g/cm³)
Melting point (K)
Electron configuration
Oxidation state
Atomic radius (Å)

Atomic number
Atomic mass
Covalent radius (Å)
Thermal conductivity (W/(cm K))

Electronegativity (Pauling's number)
Specific heat capacity (J/(g K))
Electrical conductivity (10^6/(Ω cm))
(intrin = intrinsic; poly = polycrystalline)

*Estimated Values

© E. F. Schubert

IA	IIA	IIIB	IVB	VB	VIB	VIIB	VIIIB			IB	IIB	IIIA	IVA	VA	VIA	VIIA	VIII
H 1 1.008 0.0899 0.32 14.03 0.00182 $1s^1$ 1 2.2 0.79 14.304 0																	He 2 4.003 0.1787* 0.93 0.95 0.00152 $1s^2$ - - 0.49 5.193 -
Li 3 6.941 0.053 1.23 453.7 0.847 $1s^2 2s^1$ 1 0.98 2.05 3.6 0.108	Be 4 9.012 1.85 0.90 1560 2.00 $1s^2 2s^2$ 2 1.57 1.40 1.82 0.313 (poly)											B 5 10.81 2.34 0.82 2300 0.270 $1s^2 2s^2 p^1$ 3 2.04 1.17 1.02 10^{-12} (poly)	C 6 12.011 2.62 0.77 4100*- 1.29 $1s^2 2s^2 p^2$ ±4,2 2.55 0.91 0.71 0.00061(graphite)	N 7 14.007 1.251* 0.75 63.14 0.0002598 $1s^2 2s^2 p^3$ ±3,5,4,2 3.04 0.75 1.04 -	O 8 15.999 1.429* 0.73 50.35 0.0002674 $1s^2 2s^2 p^4$ -2 3.44 0.65 0.92 -	F 9 18.998 1.696* 0.72 53.48 0.000279 $1s^2 2s^2 p^5$ -1 3.98 0.57 0.82 -	Ne 10 20.179 0.901* 0.71 24.553 0.000493 $1s^2 2s^2 p^6$ - - 0.51 0.904 -
Na 11 22.990 0.97 1.54 371.0 1.41 [Ne]$3s^1$ 1 0.93 2.23 1.23 0.210	Mg 12 24.305 1.74 1.36 922 1.56 [Ne]$3s^2$ 2 1.31 1.72 1.02 0.226 (poly)											Al 13 26.9815 2.70 1.18 933.25 2.37 [Ne]$3s^2 p^1$ 3 1.61 1.82 0.90 0.377	Si 14 28.0855 2.33 1.11 1685 1.48 [Ne]$3s^2 p^2$ 4 1.90 1.46 0.71 2.52×10^{-12}(intrin)	P 15 30.97376 1.82 1.06 317.3 0.00235 [Ne]$3s^2 p^3$ ±3,5,4 2.19 1.23 0.77 10^{-17} (white)	S 16 32.06 2.07 1.02 388.36 0.00269 [Ne]$3s^2 p^4$ ±2,4,6 2.58 1.09 0.71 0.5×10^{-23} (poly)	Cl 17 35.453 3.17* 0.99 172.16 0.000089 [Ne]$3s^2 p^5$ ±1,3,5,7 3.16 0.97 0.48 -	Ar 18 39.948 1.784* 0.98 83.81 0.0001772 [Ne]$3s^2 p^6$ - - 0.88 0.520 -
K 19 39.098 0.86 2.03 336.35 1.024 [Ar]$4s^1$ 1 0.82 2.77 0.75 0.139	Ca 20 40.08 1.55 1.74 1112 2.00* [Ar]$4s^2$ 2 1.00 2.23 0.63 0.298	Sc 21 44.956 3.0 1.44 1812 0.158 [Ar]$3d^1 4s^2$ 3 1.36 2.09 0.6 0.0177 (poly)	Ti 22 47.90 4.50 1.32 1943 0.219 [Ar]$3d^2 4s^2$ 4,3 1.54 2.00 0.52 0.0234 (poly)	V 23 50.942 5.8 1.22 2175 0.307 [Ar]$3d^3 4s^2$ 5,4,3,2 1.63 1.92 0.49 0.0489	Cr 24 51.996 7.19 1.18 2130 0.937 [Ar]$3d^5 4s^1$ 6,3,2 1.66 1.85 0.45 0.0774	Mn 25 54.938 7.43 1.17 1517 0.0782 [Ar]$3d^5 4s^2$ 7,6,4,2,3 1.55 1.79 0.48 0.00695	Fe 26 55.847 7.86 1.17 1809 0.802 [Ar]$3d^6 4s^2$ 2,3 1.83 1.72 0.44 0.0993	Co 27 58.933 8.90 1.16 1768 1.00 [Ar]$3d^7 4s^2$ 2,3 1.88 1.67 0.42 0.172 (poly)	Ni 28 58.70 8.90 1.15 1726 0.907 [Ar]$3d^8 4s^2$ 2,3 1.91 1.62 0.44 0.143	Cu 29 63.546 8.96 1.17 1357.6 4.01 [Ar]$3d^{10} 4s^1$ 2,1 1.90 1.57 0.38 0.596	Zn 30 65.38 7.14 1.25 692.73 1.16 [Ar]$3d^{10} 4s^2$ 2 1.65 1.53 0.39 0.166 (poly)	Ga 31 69.72 5.91 1.26 302.90 0.406 [Ar]$3d^{10} 4s^2 p^1$ 3 1.81 1.81 0.37 0.0678 (poly)	Ge 32 72.59 5.32 1.22 1210.4 0.599 [Ar]$3d^{10} 4s^2 p^2$ 4 2.01 1.52 0.32 1.45×10^{-8} (intrin)	As 33 74.9216 5.72 1.20 1081(28atm) 0.500 [Ar]$3d^{10} 4s^2 p^3$ ±3,5 2.18 1.33 0.33 0.0345 (poly)	Se 34 78.96 4.80 1.16 494 0.0204 [Ar]$3d^{10} 4s^2 p^4$ -2,4,6 2.55 1.22 0.32 10^{-12} (gray)	Br 35 79.904 3.12 1.14 265.90 0.00122 [Ar]$3d^{10} 4s^2 p^5$ ±1,5 2.96 1.12 0.473 -	Kr 36 83.80 3.74* 1.12 115.78 0.0000949 [Ar]$3d^{10} 4s^2 p^6$ - - 1.03 0.248 -
Rb 37 85.468 1.53 2.16 312.64 0.582 [Kr]$5s^1$ 1 0.82 2.98 0.363 0.0779	Sr 38 87.62 2.6 1.91 1041 0.353 [Kr]$5s^2$ 2 0.95 2.45 0.30 0.0762	Y 39 88.906 4.5 1.62 1799 0.172 [Kr]$4d^1 5s^2$ 3 1.22 2.27 0.30 0.0166 (poly)	Zr 40 91.22 6.49 1.45 2125 0.227 [Kr]$4d^2 5s^2$ 4 1.33 2.16 0.27 0.0236 (poly)	Nb 41 92.906 8.55 1.34 2740 0.537 [Kr]$4d^4 5s^1$ 5,3 1.6 2.08 0.26 0.0693	Mo 42 95.94 10.2 1.30 2890 1.38 [Kr]$4d^5 5s^1$ 6,5,4,3,2 2.16 2.01 0.25 0.187	Tc 43 (98) 11.5 1.27 2473 0.506 [Kr]$4d^5 5s^2$ 7 1.9 1.95 0.21 0.067 (poly)	Ru 44 101.07 12.2 1.25 2523 1.17 [Kr]$4d^7 5s^1$ 2,3,4,6,8 2.2 1.89 0.238 0.137 (poly)	Rh 45 102.906 12.4 1.25 2236 1.50 [Kr]$4d^8 5s^1$ 2,3,4 2.28 1.83 0.242 0.211	Pd 46 106.4 12.0 1.28 1825 0.718 [Kr]$4d^{10}$ 2,4 2.20 1.79 0.24 0.0950	Ag 47 107.868 10.5 1.34 1234 4.29 [Kr]$4d^{10} 5s^1$ 1 1.93 1.75 0.235 0.630	Cd 48 112.41 8.65 1.48 594.18 0.968 [Kr]$4d^{10} 5s^2$ 2 1.69 1.71 0.23 0.138 (poly)	In 49 114.82 7.31 1.44 429.76 0.816 [Kr]$4d^{10} 5s^2 p^1$ 3 1.78 2.00 0.23 0.116 (poly)	Sn 50 118.69 7.30 1.41 505.06 0.666 [Kr]$4d^{10} 5s^2 p^2$ 4,2 1.96 1.72 0.227 0.0917 (poly)	Sb 51 121.75 6.68 1.40 904 0.243 [Kr]$4d^{10} 5s^2 p^3$ ±3,5 2.05 1.53 0.21 0.0288 (poly)	Te 52 127.60 6.24 1.36 722.65 0.0235 [Kr]$4d^{10} 5s^2 p^4$ −2,4,6 2.1 1.42 0.20 2×10^{-6} (intrinsic)	I 53 126.9045 4.92 1.33 386.7 0.00449 [Kr]$4d^{10} 5s^2 p^5$ ±1,5,7 2.66 1.32 0.214 8×10^{-16} (poly)	Xe 54 131.30 5.89* 1.31 161.36 0.0000569 [Kr]$4d^{10} 5s^2 p^6$ - - 1.24 0.158 -
Cs 55 132.905 1.87 2.35 301.55 0.359 [Xe]$6s^1$ 1 0.79 3.34 0.24 0.0489	Ba 56 137.33 3.5 1.98 1002 0.184* [Xe]$6s^2$ 2 0.89 2.78 0.204 0.030	La* 57 138.906 6.7 1.69 1193 0.135 [Xe]$5d^1 6s^2$ 3 1.10 2.74 0.19 0.0126 (poly)	Hf 72 178.49 13.1 1.44 2500 0.230 [Xe]$4f^{14} 5d^2 6s^2$ 4 1.3 2.16 0.14 0.0312 (poly)	Ta 73 180.948 16.6 1.34 3287 0.575 [Xe]$4f^{14} 5d^3 6s^2$ 5 1.5 2.09 0.14 0.0761	W 74 183.85 19.3 1.30 3680 1.74 [Xe]$4f^{14} 5d^4 6s^2$ 6,5,4,3,2 2.36 2.02 0.13 0.189	Re 75 186.207 21.0 1.28 3453 0.479 [Xe]$4f^{14} 5d^5 6s^2$ 7,6,4,2,-1 1.9 1.97 0.13 0.0542 (poly)	Os 76 190.2 22.4 1.26 3300 0.876 [Xe]$4f^{14} 5d^6 6s^2$ 2,3,4,6,8, 2.2 1.92 0.13 0.109 (poly)	Ir 77 192.22 22.5 1.27 2716 1.47 [Xe]$4f^{14} 5d^7 6s^2$ 2,3,4,6 2.20 1.87 0.130 0.197	Pt 78 195.09 21.4 1.30 2045 0.716 [Xe]$4f^{14} 5d^9 6s^1$ 2,4 2.28 1.83 0.13 0.0966	Au 79 196.967 19.3 1.34 1337.58 3.17 [Xe]$4f^{14} 5d^{10} 6s^1$ 3,1 2.54 1.79 0.128 0.452	Hg 80 200.59 13.53 1.49 234.28 0.0834 [Xe]$4f^{14} 5d^{10} 6s^2$ 2,1 2.00 1.76 0.139 0.0104 (liquid)	Tl 81 204.37 11.85 1.48 577 0.461 [Xe]$4f^{14} 5d^{10} 6s^2 p^1$ 3,1 2.04 2.08 0.13 0.0617 (poly)	Pb 82 207.2 11.4 1.47 600.6 0.353 [Xe]$4f^{14} 5d^{10} 6s^2 p^2$ 4,2 2.33 1.81 0.13 0.0481	Bi 83 208.9804 9.8 1.46 544.52 0.0787 [Xe]$4f^{14} 5d^{10} 6s^2 p^3$ 3,5 2.02 1.63 0.12 0.00867 (poly)	Po 84 (209) 9.4 1.46 527 0.20* [Xe]$4f^{14} 5d^{10} 6s^2 p^4$ 4,2 2.0 1.53 - 0.0219	At 85 (210) - (1.45) 575 0.017* [Xe]$4f^{14} 5d^{10} 6s^2 p^5$ ±1,3,5,7 2.2 1.43 - -	Rn 86 (222) 9.91* - 202 0.0000364 [Xe]$4f^{14} 5d^{10} 6s^2 p^6$ - - 1.34 0.09* -
Fr 87 (223) - - 300 0.15* [Rn]$7s^1$ 1 0.7 - - 0.03	Ra 88 226.025 5 - 973 0.186* [Rn]$7s^2$ 2 0.9 - - -	Ac** 89 227.028 10.07 - 1323 0.12* [Rn]$6d^1 7s^2$ 3 1.1 - - -															

Coinage metals

Elemental semiconductors

Halogens

Noble gases

Metals ← → Non-metals

Alkaline metals

Alkaline-earth metals

Transition metals
(partially filled *d*-electron shell)

Lanthanides*	Ce 58 140.12 6.78 1.65 1071 0.114 [Xe]$4f^1 5d^1 6s^2$ 3,4 1.12 2.70 0.19 0.0115	Pr 59 140.9077 6.77 1.65 1204 0.125 [Xe]$4f^3 6s^2$ 3,4 1.13 2.67 0.19 0.0148 (poly)	Nd 60 144.24 7.00 1.64 1289 0.165 [Xe]$4f^4 6s^2$ 3 1.14 2.64 0.19 0.0157 (poly)	Pm 61 (145) 6.475 1.63 1204 0.179* [Xe]$4f^5 6s^2$ 3 1.13 2.62 - -	Sm 62 150.4 7.54 1.62 1345 0.133 [Xe]$4f^6 6s^2$ 3,2 1.17 2.59 0.20 0.00956 (poly)	Eu 63 151.96 5.26 1.85 1090 0.139* [Xe]$4f^7 6s^2$ 3,2 1.2 2.56 0.18 0.0112	Gd 64 157.25 7.89 1.61 1585 0.106 [Xe]$4f^7 5d^1 6s^2$ 3 1.20 2.54 0.23 0.00736 (poly)	Tb 65 158.925 8.27 1.59 1630 0.111 [Xe]$4f^9 6s^2$ 3,4 1.2 2.51 0.18 0.00889 (poly)	Dy 66 162.50 8.54 1.59 1682 0.107 [Xe]$4f^{10} 6s^2$ 3 1.22 2.49 0.17 0.0108 (poly)	Ho 67 164.930 8.80 1.58 1743 0.162 [Xe]$4f^{11} 6s^2$ 3 1.23 2.47 0.16 0.0124 (poly)	Er 68 167.26 9.05 1.57 1795 0.143 [Xe]$4f^{12} 6s^2$ 3 1.24 2.45 0.17 0.0117 (poly)	Tm 69 168.93 9.33 1.56 1818 0.168 [Xe]$4f^{13} 6s^2$ 3,2 1.25 2.42 0.16 0.0150 (poly)	Yb 70 173.04 6.98 1.74 1097 0.349 [Xe]$4f^{14} 6s^2$ 3,2 1.1 2.40 0.15 0.0351	Lu 71 174.967 9.84 1.56 1936 0.164 [Xe]$4f^{14} 5d^1 6s^2$ 3 1.27 2.25 0.15 0.0185 (poly)
Actinides**	Th 90 232.038 11.7 1.65 2028 0.540 [Rn]$6d^2 7s^2$ 4 1.3 - 0.12 0.0653	Pa 91 231.036 15.4 - - 0.47* [Rn]$5f^2 6d^1 7s^2$ 5,4 1.5 - - 0.0529 (poly)	U 92 238.029 18.90 1.42 1405 0.276 [Rn]$5f^3 6d^1 7s^2$ 6,5,4,3 1.38 - 0.12 0.0380 (poly)	Np 93 237.048 20.4 - 910 0.063 [Rn]$5f^4 6d^1 7s^2$ 6,5,4,3 1.36 - 0.12 0.00822 (poly)	Pu 94 (244) 19.8 - 913 0.0674 [Rn]$5f^6 7s^2$ 6,5,4,3 1.28 - 0.13* 0.00666 (poly)	Am 95 (243) 13.6 - 1268 0.1* [Rn]$5f^7 7s^2$ 6,5,4,3 1.3 - 0.11* 0.22 (60K)	Cm 96 (247) 13.511 - 1340 0.1* [Rn]$5f^7 6d^1 7s^2$ 3 1.3 - - -	Bk 97 (247) - - - 0.1* [Rn]$5f^9 7s^2$ 4,3 1.3 - - -	Cf 98 (251) - - 900 0.1* [Rn]$5f^{10} 7s^2$ 3 1.3 - - -	Es 99 (252) - - - 0.1* [Rn]$5f^{11} 7s^2$ - 1.3 - - -	Fm 100 (257) - - - 0.1* [Rn]$5f^{12} 7s^2$ - 1.3 - - -	Md 101 (258) - - - 0.1* [Rn]$5f^{13} 7s^2$ - 1.3 - - -	No 102 (259) - - - 0.1* [Rn]$5f^{14} 7s^2$ - 1.3 - - -	Lr 103 (260) - - - 0.1* [Rn]$5f^{14} 6d^1 7s^2$ - - - - -

Rare-earth elements

Note: s-electron shell can be occupied by at most 2 electrons; p-electron shell by at most 6 electrons; d-electron shell by at most 10 electrons; f-electron shell by at most 14 electrons; Noble gases have 2 (He), 10 (Ne), 18 (Ar), 36 (Kr), 54 (Xe), and 86 (Rn) electrons