

Periodic Table of the Elements

Key

atomic number	melting point (°C)
electronegativity	boiling point (°C)
common ion charge	density of solid (g/cm ³)
other ion charge	density of liquid (g/mL)
	density of gas at SATP (g/L)
symbol of element (solids in black, liquids in blue, gases in red)	atomic radius (pm)
	name of element

1 IA																		2 IIA																		13 IIIA																		14 IVA																		15 VA																		16 VIA																		17 VIIA																		18 VIIIA																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
1 2.1 -259 0.0899 37 H hydrogen 1.01																		3 1.0 181 1342 0.534 152 Li lithium 6.94																		4 1.5 1278 2970 1.85 111 Be beryllium 9.01																		11 0.9 97.8 883 0.971 186 Na sodium 22.99																		12 1.2 649 1107 1.74 160 Mg magnesium 24.31																		19 0.8 63.3 760 0.862 227 K potassium 39.10																		20 1.0 839 1484 1.54 197 Ca calcium 40.08																		21 1.3 1541 2836 2.99 161 3+ Sc scandium 44.96																		22 1.5 1660 3287 4.54 145 3+ Ti titanium 47.88																		23 1.6 1890 3380 5.96 132 4+ V vanadium 50.94																		24 1.6 1857 2672 7.20 125 2+ Cr chromium 52.00																		25 1.5 1244 1962 7.20 124 4+ Mn manganese 54.94																		26 1.535 1535 2750 7.87 124 2+ Fe iron 55.85																		27 1.8 1495 2870 8.9 125 3+ Co cobalt 58.93																		28 1.8 1455 2730 8.90 124 3+ Ni nickel 58.69																		29 1.9 1083 2567 8.92 128 1+ Cu copper 63.55																		30 1.6 420 907 7.14 133 2+ Zn zinc 65.38																		31 1.6 29.8 2403 5.90 122 3+ Ga gallium 69.72																		32 1.8 937 2830 5.35 123 4+ Ge germanium 72.61																		33 2.0 817 813 5.73 121 3+ As arsenic 74.92																		34 2.4 217 684 4.81 117 4+ Se selenium 78.96																		35 2.8 -7.2 58.8 3.12 114 3+ Br bromine 79.90																		36 -157 -152 3.74 112 X Kr krypton 83.80																		37 0.8 89.9 686 1.53 248 Rb rubidium 85.47																		38 1.0 769 1384 2.6 215 Sr strontium 87.62																		39 1.3 1522 3338 4.47 181 3+ Y yttrium 88.91																		40 1.4 1852 4377 6.49 160 4+ Zr zirconium 91.22																		41 1.6 2488 5127 8.57 143 5+ Nb niobium 92.91																		42 1.8 2610 5560 10.2 136 6+ Mo molybdenum 95.94																		43 1.9 2172 4877 11.5 136 7+ Tc technetium 98.91																		44 2.2 2310 3900 12.4 133 8+ Ru ruthenium 101.07																		45 1986 2.2 3727 12.4 135 3+ Rh rhodium 102.91																		46 2.2 1554 2970 12.0 138 4+ Pd palladium 106.42																		47 1.9 962 2212 10.5 144 1+ Ag silver 107.87																		48 1.7 321 765 8.64 149 2+ Cd cadmium 112.41																		49 1.7 157 2080 7.30 163 3+ In indium 114.82																		50 1.8 232 2270 7.31 140 4+ Sn tin 118.69																		51 1.9 831 1750 6.68 141 5+ Sb antimony 121.75																		52 2.1 450 990 6.2 137 2+ Te tellurium 127.60																		53 2.5 114 184 4.93 133 3+ I iodine 126.90																		54 -112 -107 5.89 130 X Xe xenon 131.29																		55 0.7 89.9 686 1.88 265 Cs cesium 132.91																		56 0.9 725 1640 3.5 217 Ba barium 137.33																		57 1.2 1663 3402 9.84 188 3+ Lu lutetium 174.97																		58 1.3 2227 4602 13.3 156 4+ Hf hafnium 178.49																		59 1.5 2996 5425 16.6 143 5+ Ta tantalum 180.95																		60 1.7 3410 5660 19.4 137 6+ W tungsten 183.85																		61 1.9 3180 5627 21.9 137 7+ Re rhenium 186.21																		62 2.2 2700 5300 22.5 134 4+ Os osmium 190.2																		63 2.2 2410 4130 22.4 136 4+ Ir iridium 192.22																		64 2.2 1772 3827 21.5 138 4+ Pt platinum 195.08																		65 2.4 1084 2806 19.3 144 3+ Au gold 196.97																		66 -39.0 1.9 357 13.5 160 1+ Hg mercury 200.59																		67 1.8 304 1457 11.85 170 3+ Tl thallium 204.38																		68 1.8 328 1740 11.3 175 4+ Pb lead 207.20																		69 2.71 383 1500 9.80 155 5+ Bi bismuth 208.98																		70 2.54 2.2 337 142 X Po polonium (209)																		71 302 337 142 X At astatine (210)																		72 -71 -61.8 5.73 140 X Rn radon (222)																		73 0.7 27 677 5 215 Fr francium (223)																		74 0.9 700 1140 5 215 Ra radium 226.03																		75 1.627 103 3+ Lr lawrencium (260)																		76 — 104 — Rf rutherfordium (261)																		77 — 105 — Db dubnium (262)																		78 — 106 — Sg seaborgium (266)																		79 — 107 — Bh borium (264)																		80 — 108 — Hs hassium (269)																		81 — 109 — Mt meitnerium (268)																		82 1.2 1074 1794 7.52 185 2+ Sm samarium 150.36																		83 — 63 822 1527 5.24 185 2+ Eu europium 151.96																		84 1.1 64 1313 3273 7.90 180 3+ Gd gadolinium 157.25																		85 1.2 65 1356 3230 8.23 175 3+ Tb terbium 158.92																		86 — 66 1412 2567 8.55 175 3+ Dy dysprosium 162.50																		87 1.2 67 1474 2700 8.80 175 3+ Ho holmium 164.93																		88 1.2 68 1529 2868 9.07 175 3+ Er erbium 167.26																		89 1.2 69 1545 1960 9.32 175 3+ Tm thulium 168.93																		90 1.1 70 819 1196 6.57 175 2+ Yb ytterbium 173.04																		91 1.1 91 1600 — 15.4 180 4+ Pa protactinium 231.04																		92 1.3 92 1750 4790 11.7 180 4+ Th thorium 232.04																		93 1.5 93 1900 — 15.4 180 4+ U uranium 238.03																		94 1.3 94 1132 3818 19.1 175 6+ Np neptunium (237)																		95 1.3 95 994 2607 13.7 175 4+ Pu plutonium (244)																		96 1.3 96 1340 3110 13.5 — 3+ Cm curium (247)																		97 — 97 986 — 14 — 4+ Bk berkelium (247)																		98 — 98 900 — — 3+ Cf californium (251)																		99 — 99 880 — — 3+ Es einsteinium (252)																		100 — 100 1527 — — 3+ Fm fermium (257)																		101 101 101 1021 3074 — 2+ 3+ Md mendelevium (258)																		102 883 102 102 863 — 2+ 3+ No nobelium (259)																	

Table 3 IUPAC Names and Formulas of Some Common Polyatomic Ions

Ion	Name	Ion	Name
$C_2H_3O_2^-$	acetate	CO_3^{2-}	carbonate
ClO_3^-	chlorate*	CrO_4^{2-}	chromate
ClO_2^-	chlorite*	$Cr_2O_7^{2-}$	dichromate
CN^-	cyanide	HPO_4^{2-}	hydrogen phosphate
$H_2PO_4^-$	dihydrogen phosphate	$C_2O_4^{2-}$	oxalate
HCO_3^-	hydrogen carbonate (bicarbonate)	O_2^{2-}	peroxide
HSO_4^-	hydrogen sulfate (bisulfate)	SiO_3^{2-}	silicate
HS^-	hydrogen sulfide (bisulfide)	SO_4^{2-}	sulfate
HSO_3^-	hydrogen sulfite (bisulfite)	SO_3^{2-}	sulfite
ClO^- , OCl^-	hypochlorite*	$S_2O_3^{2-}$	thiosulfate
OH^-	hydroxide	BO_3^{3-}	borate
NO_2^-	nitrite	PO_3^{3-}	phosphate
NO_3^-	nitrate	$P_3O_{10}^{5-}$	tripolyphosphate
ClO_4^-	perchlorate*	NH_4^+	ammonium
MnO_4^-	permanganate	H_3O^+	hydronium
SCN^-	thiocyanate	Hg_2^{2+}	mercury(I)

*There are also corresponding ions that contains Br and I instead of Cl.

Ion	Flame
Li^+	bright red
Na^+	yellow
K^+	violet
Ca^{2+}	yellow-red
Sr^{2+}	bright red
Ba^{2+}	yellow-green
Cu^{2+}	blue (halides) green (others)
Pb^{2+}	light blue-grey
Zn^{2+}	whitish green

Solubility of Ionic Compounds at SATP

		Anions:				
		Cl^- , Br^- , I^-	S^{2-}	OH^-	SO_4^{2-}	CO_3^{2-} , PO_4^{3-} , SO_3^{2-} , $C_2H_3O_2^-$
CATIONS	High Solubility (aq) ≥ 0.1 mol/L (at SATP)	Most	Group 1, NH_4^+ , Group 2	Group 1, NH_4^+ , Si^{4+} , Bi^{3+} , Tl^+	Most	All
	Low Solubility (s) < 0.1 mol/L (at SATP)	All Group 1 compounds, including acids, and all ammonium compounds are assumed to have high solubility in water. Ag^+ , Pb^{2+} , Tl^+ , Hg_2^{2+} (Hg ⁺), Cu^+	most	most	most	Ag^+

Vapour Pressure of Water at Various Temperature

Temperature °C	Vapour Pressure (kPa)
17.0	1.94
18.0	2.06
19.0	2.20
20.0	2.34
21.0	2.49
22.0	2.64
23.0	2.81
24.0	2.98
25.0	3.17
26.0	3.36
27.0	3.57
28.0	3.78
29.0	4.01
30.0	4.24

Halogen Activity Series	Metal Activity Series
$F \rightarrow Cl \rightarrow Br \rightarrow I$	$Li \rightarrow K \rightarrow Ba \rightarrow Ca \rightarrow Na \rightarrow Mg \rightarrow Al \rightarrow Zn \rightarrow Fe \rightarrow Ni \rightarrow Sn \rightarrow Pb \rightarrow H \rightarrow Cu \rightarrow Ag \rightarrow Pt \rightarrow Au$
Most Reactive	Most Reactive