

PERIODIC TABLE OF ELEMENTS										Non Metals					VIII A				
IA	Group																		
1 2,2 -253 -260 Hydrogen 1s ¹	2 1,008 HI	Atomic number Z (number of Protons) Jhon G. Gramer "Twistor" Electro negativity Boiling point temperature										25 1,55 2097 1244	54,94	Relative atomic mass A for radioactive Isotopes with longest decaying period enclosed in square brackets [270]					2 4,003 -268,6 — Helium 1s ²
3 0,98 1318 179 Lithium [He]2s ¹	4 9,012 1,57 — 1278 Beryllium [He]2s ²	Melting point temperature										Mn	Manganese	5 10,81 2,04 — 2300 Boron [He]2s ² 1p ¹	6 12,01 2,55 4827 3550 Carbon [He]2s ² 2p ²	7 14,01 3,04 -195,8 -209,9 Nitrogen [He]2s ² 3p ³	8 16,00 3,44 -183,0 -218,4 Oxygen [He]2s ² 4p ²	9 19,00 4,1 -188,1 -219,6 Fluor [He]2s ² 5p ⁵	10 20,18 — -246,1 -248,7 Neon 2s ² 2p ⁶
11 0,93 892 97,8 Sodium [Ne]3s ¹	12 24,30 1,31 1107 651 Magnesium [Ne]3s ²	Aggregate State <i>Shadow letters:</i> gas forming <i>Italic letters:</i> liquid <i>Normal letters:</i> solid <i>Outline letters:</i> all in nature radio active isotopes										[Ar]3d ⁵ 4s ²	Electron configuration	13 26,98 2467 660,4 Aluminum [Ne] 3s ² 3p ¹	14 28,09 1,90 2355 1410 Silicon [Ne] 3s ² 3p ²	15 30,97 2,19 280 44 P4 Phosphor [Ne] 3s ² 3p ³	16 32,06 2,58 444 114,6 Sulfur [Ne] 3s ² 4p ⁴	17 35,45 3,16 -34,6 101,0 Chlorine [Ne] 3s ² 3p ⁵	18 39,95 — -185,7 -189,2 Argon 3s ² 3p ⁶
19 0,82 774 63,7 Potassium [Ar]4s ¹	20 40,08 1,00 1487 845 Calcium [Ar]4s ²	21 44,96 1,36 2832 1539 Scandium [Ar]3d ¹ 4s ²	22 47,90 1,54 3260 1675 Titanium [Ar]3d ² 4s ²	23 50,94 1,63 3380 1890 Vanadium [Ar]3d ³ 4s ²	24 52,00 1,66 2482 1890 Chromium [Ar]3d ⁴ 4s ²	25 54,94 1,55 2097 1244 Manganese [Ar]3d ⁵ 4s ²	26 55,85 1,83 2750 1535 Iron [Ar]3d ⁶ 4s ²	27 58,93 1,88 2870 1495 Cobalt [Ar] 3d ⁷ 4s ²	28 58,70 1,91 2730 1453 Nickel [Ar] 3d ⁸ 4s ²	29 63,55 1,90 2595 1083 Copper [Ar]3d ¹⁰ 4s ¹	30 65,38 1,65 907 419,6 Zinc [Ar] 3d ¹⁰ 4s ²	31 69,72 1,81 2403 29,8 Gallium [Ar] 3d ¹⁰ 4s ² 1p ¹	32 72,59 2,01 2830 937,4 Germanium [Ar]3d ¹⁰ 4s ² 2p ²	33 74,92 2,18 subl. Arsenic [Ar]3d ¹⁰ 4s ² 3p ³	34 78,96 2,55 685 217 Selenium [Ar] 3d ¹⁰ 4s ² 4p ⁴	35 79,90 2,96 58,8 -7,2 Bromine [Ar] 3d ¹⁰ 4s ² 5p ⁵	36 83,80 — -152,3 -156,6 Krypton 3d ¹⁰ 4s ² 6p ⁶		
37 0,82 688 38,9 Rubidium [Kr]5s ¹	38 87,62 0,95 1384 769 Strontium [Kr]5s ²	39 88,91 1,22 3337 1523 Yttrium [Kr]4d ¹ 5s ²	40 91,22 1,33 4377 1852 Zirconium [Kr]4d ² 5s ²	41 92,95 1,60 4927 2468 Niobium [Kr]4d ³ 5s ²	42 95,94 2,16 5560 2610 Molybdenum [Kr]4d ⁴ 5s ²	43 (98) 1,9 5030 2200 Technetium [Kr]4d ⁵ 5s ²	44 101,1 2,20 3900 2310 Ruthenium [Kr]4d ⁶ 5s ²	45 102,9 2,28 3730 1966 Rhodium [Kr]4d ⁷ 5s ²	46 106,4 2,20 3140 1552 Palladium [Kr]4d ⁸ 5s ²	47 107,8 1,93 2212 962 Silver [Kr]4d ¹⁰ 5s ¹	48 112,4 1,69 765 320,9 Cadmium [Kr] 4d ¹⁰ 5s ²	49 114,8 1,78 2080 156,6 Indium [Kr] 4d ¹⁰ 5s ² 1p ¹	50 118,7 1,96 2270 231,9 Tin [Kr] 4d ¹⁰ 5s ² 2p ²	51 121,7 2,05 1750 630,7 Antimony [Kr] 4d ¹⁰ 5s ² 3p ³	52 127,6 2,10 890 449,5 Tellurium [Kr] 4d ¹⁰ 5s ² 4p ⁴	53 126,9 2,66 184,4 113,5 Iodine [Kr] 4d ¹⁰ 5s ² 5p ⁵	54 131,29 — -107 -111,9 Xenon 4d ¹⁰ 5s ² 6p ⁶		
55 0,79 690 28,5 Cesium [Xe] 6s ¹	56 137,3 0,89 1640 725 Barium [Xe] 6s ²	57 138,9 1,10 1410 920 Lanthanum [Xe] 5d ¹ 6s ²	72 178,5 1,30 5400 2150 Hafnium Xe 4f ¹⁴ d ² 6s ²	73 181,0 1,50 5430 2996 Tantalum [Xef] 5d ³ 6s ²	74 183,8 2,36 5927 3410 Tungsten [Xef] 5d ⁴ 6s ²	75 186,2 1,90 5630 3180 Rhenium [Xef] 5d ⁵ 6s ²	76 190,2 2,20 5030 3045 Osmium [Xef] 5d ⁶ 6s ²	77 192,2 2,28 4130 2410 Iridium [Xef] 5d ⁷ 6s ²	78 195,1 2,28 3830 1772 Platinum [Xef] 5d ⁸ 6s ²	79 197,0 2,04 2940 1064 Gold [Xef] 5d ¹⁰ 6s ¹	80 200,6 1,90 356,6 -38,9 Mercury [Xef] 5d ¹⁰ 6s ²	81 204,4 1,80 1457 303,5 Thallium [Xe]5d ¹⁰ 6s ² 1p ¹	82 207,2 1,8 1740 327,5 Lead [Xe] 6s ² 2p ²	83 209,0 1,9 1560 271,3 Bismuth [[Xe] 6s ² 3p ³	84 208,99 2,00 962 254 Polonium [[Xe]6s ² 4p ⁴	85 209,99 2,20 — 302 Astatine [Xe] 6s ² 5p ⁵	86 222,02 — -61,8 — Radon [Xe] 6s ² 6p ⁶		
87 0,70 — 27 Francium [Rn]7s ¹	88 226,03 0,90 1140 700 Radium [Rn]7s ²	89 [227,03] 1,10 Actind — 1050 Actinium [Rn] 6d ¹ 7s ²	104 [265,12] — — — Rutherfordium Rn5f ¹⁴ 6d ² 7s ²	105 [268,13] — — — Dubnium [Rnf] 6d ³ 7s ²	106 [271,13] — — — Seaborgium [Rnf]6d ⁴ 7s ²	107 [270] — — — Bohrium [Rnf]6d ⁵ 7s ²	108 [277,15] — — — Hassium [Rnf]6d ⁶ 7s ²	109 [276,15] — — — Meitnerium [Rnf]6d ⁷ 7s ²	110 [281,16] — — — Darmstadtium [Rnf]6d ⁸ 7s ²	111 [280,16] — — — Roentgenium [Rnf]6d ¹⁰ 7s ¹	112 [285,17] — — — Copernicium [Rnf]6d ¹⁰ 7s ²	113 [?] — — — Ununtrium [Rn]d ¹⁰ 7s ² p ²	114 [289,19] — — — Flerovium [Rn] d ¹⁰ 7s ² p ³	116 [293] — — — Livermorium [Rn] d ¹⁰ 7s ² 5p ⁶	Metals	Non Metals			
Riga (RSU)	Stradin's University	Human Physiology and Biochemistry department	Asist.prof. A. Kaksis 2013. g.	Lanthanoids>	Actinoids>	58 140,1 1,12 3257 798 Cerium [Xe] 4f ² 6s ²	59 140,9 1,13 3212 931 Praseodymium [Xe]4f ³ 6s ²	60 144,2 1,14 3127 1010 Neodymium [Xe]4f ⁴ 6s ²	61 (145) 1,13 1080 Promethium [Xe] 4f ⁵ 6s ²	62 150,4 1,17 1072 Samarium [Xe]4f ⁶ 6s ²	63 151,96 1,20 822 Europium [Xe]4f ⁷ 6s ²	64 157,2 1,20 3233 1312 Gadolinium Xe 4f ⁷ 5d ¹ 6s ²	65 158,9 1,20 3041 1360 Terbium [Xe]4f ⁹ 6s ²	66 162,5 1,22 2335 1409 Dysprosium [Xe]4f ¹⁰ 6s ²	67 164,9 1,23 2720 1470 Holmium [Xe]4f ¹¹ 6s ²	68 167,3 1,24 2510 1522 Erbium [Xe]4f ¹² 6s ²	69 168,9 1,25 1727 1545 Thulium [Xe]4f ¹³ 6s ²	70 173,0 1,10 824 Ytterbium [Xe]4f ¹⁴ 6s ²	71 175,0 1,27 3315 1656 Lutetium [Xe]4f ¹⁴ 5d ¹ 6s ²
90 232,0 1,30 3800 1750 Thorium [Rn] 6d ² 7s ²	91 231,04 1,50 1554 Protactinium [Rn] 5f ² 6d ¹ 7s ²	92 238,0 1,38 3818 1132 Uranium [Rn] 5f ³ 6d ¹ 7s ²	93 237,05 1,36 3902 640 Neptunium [Rn] 5f ⁴ 6d ¹ 7s ²	94 244,06 1,28 3327 641 Plutonium [Rn] 5f ⁶ 7s ²	95 243,06 1,30 1000 Americium [Rn] 5f ⁷ 7s ²	96 247,07 1,30 1340 Curium [Rn] 5f ⁷ 6d ¹ 7s ²	97 247,07 1,30 986 Berkelium [Rn] 5f ⁹ 7s ²	98 251,08 1,30 900 Californium [Rn] 5f ¹⁰ 7s ²	99 252,08 1,30 — Einsteinium [Rn] 5f ¹¹ 7s ²	100 257,09 1,30 — Fermium [Rn] 5f ¹² 7s ²	101 258,10 1,30 — Mendelevium [Rn] 5f ¹³ 7s ²	102 259,10 1,30 — Nobelium [Rn] 5f ¹⁴ 7s ²	103 260,11 — — Lawrencium [Rn]5f ¹⁴ 6d ¹ 7s ²						

Standard Electrode Potentials

Element	Oxidized form	Number of electrons e ⁻	Reduced form	Potential E ^o , V
N	$\text{NO}_3^- + 2\text{H}^+$	1	$\text{NO}_2^{(g)} + \text{H}_2\text{O}$	+0,80
	$\text{NO}_3^- + \text{H}_2\text{O}$	2	$\text{NO}_2^- + 2\text{OH}^-$	+0,01
	$\text{NO}_3^- + 2\text{H}^+$	2	$\text{NO}_2^- + \text{H}_2\text{O}$	+0,94
	$\text{NO}_3^- + 4\text{H}^+$	3	$\text{NO}^{(g)} + 2\text{H}_2\text{O}$	+0,96
	$\text{NO}_3^- + 7\text{H}_2\text{O}$	8	$\text{NH}_4\text{OH} + 9\text{OH}^-$	-0,12
	$\text{NO}_{2(g)}$	1	NO_2^-	+0,88
	$\text{NO}_2^- + 2\text{H}^+$	1	$\text{NO}^{(g)} + \text{H}_2\text{O}$	+0,99
Br	Br_2	2	2Br^-	+0,96
Bi	$\text{BiO}_3^- + 6\text{H}^+$	2	$\text{Bi}^{3+} + 3\text{H}_2\text{O}$	+1,80
H	H_3O^+	1	$(\text{Pt})\text{H} + \text{H}_2\text{O}$	+0,103 (0,00)
O	$\text{O}_2^{(g)} + 4\text{H}_3\text{O}^+$	4	$6\text{H}_2\text{O}$	+1,383 (1,229)
	$\text{H}_2\text{O}_2 + 2\text{H}_3\text{O}^+$	2	$4\text{H}_2\text{O}$	+1,982 (1,776)
	$\text{O}_{2(aq)} + 2\text{H}_3\text{O}^+$	2	$\text{H}_2\text{O}_2 + 2\text{H}_3\text{O}^+$	+0,7975 (0,695)
Mn (H⁺)	$\text{MnO}_4^- + 8\text{H}_3\text{O}^+$	5	$\text{Mn}^{2+} + 12\text{H}_2\text{O}$	+1,76 (1,51)
(H₂O)	$\text{MnO}_4^- + 2\text{H}_2\text{O}$	3	$\text{MnO}_2? + 4\text{OH}^-$	+0,531 (0,60)
(OH⁻)	MnO_4^-	1	MnO_4^{2-}	+0,56
Pb	$\text{PbO}_2(\text{s}) + 4\text{H}^+$	2	$\text{Pb}^{2+} + 2\text{H}_2\text{O}$	+1,80
S	$\text{SO}_4^{2-} + 2\text{H}^+$	2	$\text{SO}_3^{2-} + \text{H}_2\text{O}$	+0,20
	$\text{SO}_4^{2-} + \text{H}_2\text{O}$	2	$\text{SO}_3^{2-} + 2\text{OH}^-$	-0,93
	$\text{S}(\text{s})$	2	S^{2-}	-0,48
	$\text{S}(\text{s}) + 2\text{H}^+$	2	H_2S	+0,17
	$\text{S}_4\text{O}_6^{2-}$	2	$2\text{S}_2\text{O}_3^{2-}$	+0,10
Fe	Fe^{3+}	1	Fe^{2+}	+0,77
Ag	Ag^+	1	Ag	+0,799
I	I_2	2	2I^-	+0,54
Cu	Cu^{2+}	2	Cu	+0,337
F	F_2	2	2F^-	+2,87
	Cl_2	2	2Cl^-	+1,36
Cl	$\text{OCl}^- + 2\text{H}^+$	2	$\text{H}_2\text{O} + \text{Cl}^-$	+1,49
	$\text{Cr}_2\text{O}_7^{2-} + 14\text{H}^+$	6	$2\text{Cr}^{3+} + 7\text{H}_2\text{O}$	+1,33
Cr	$\text{CrO}_4^{2-} + 4\text{H}_2\text{O}$	3	$\text{Cr}(\text{OH})_3(\text{s}) + 5\text{OH}^-$	-0,13
	$2\text{CO}_2 + 2\text{H}^+$	2	$\text{H}_2\text{C}_2\text{O}_4$	-0,49
C	C	3	Cr	-0,744
Zn	Zn^{2+}	2	Zn	-0,763
Al	$\text{AlO}_2^- + 2\text{H}_2\text{O}$	3	$\text{Al} + 4\text{OH}^-$	-2,35

SOLUBILITY OF SALTS

ion	H ⁺	NH ₄ ⁺	K ⁺	Na ⁺	Ba ²⁺	Ca ²⁺	Mg ²⁺	Al ³⁺	Cr ³⁺	Fe ²⁺	Fe ³⁺	Mn ²⁺	Zn ²⁺	Ag ⁺	Hg ²⁺	Pb ²⁺	Sn ²⁺	Cu ²⁺
Cl ⁻	+	+	+	+	+	+	+	+	+	+	+	+	+	n	+	s	+	+
S ²⁻	+	+	+	+	+	s	+	#	#	n	n	n	n	n	n	n	n	n
SO ₃ ²⁻	+	+	+	+	n	n	n	#	#	n	#	n	n	n	n	n	#	n
SO ₄ ²⁻	+	+	+	+	n	s	+	+	+	+	+	+	+	s	+	n	+	+
PO ₄ ³⁻	+	+	+	+	n	n	n	n	n	n	n	n	n	n	n	n	n	n
CO ₃ ²⁻	+	+	+	+	n	n	n	#	#	n	#	n	n	n	n	n	n	n
SiO ₃ ²⁻	n	#	+	+	n	n	n	n	n	n	n	n	n	n	#	n	#	n
NO ₃ ⁻	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
acetate ⁻	+	+	+	+	+	+	+	s	+	+	+	+	+	+	+	+	+	+
OH ⁻	#	+	+	+	+	s	n	n	n	n	n	n	n	#	#	nn	n	n

Symbols in the table:

+ - soluble, n - practically insoluble, s - slightly soluble, # salt doesn't exist in water solution

-all nitrates NO₃⁻ are soluble .

What to remember about solubility:

-most chlorides Cl⁻, sulfates SO₄²⁻ and acetates CH₃COO⁻ are soluble .

-for other acids usually just the salts of alkaline metals (Na⁺, K⁺) and ammonium NH₄⁺ are soluble.

- sulfides S²⁻ usually are insoluble salts .

THE RANK OF METAL ACTIVITY (OF MEAL STANDARD POTENTIALS)

Li > K > Ca > Na > Mg > Al > Mn > Cr > Zn > Fe >

> Co > Ni > Sn > Pb > Hg > Cu > Hg > Ag > Au