Periodic Table of Elements

groups (CAS):

I A	Alkali metals
II A	Alkaline earths
I B	Coinage metals
III A	Boron group
IV A	Carbon group
V A	Pnictogens
VI A	Chalcogens
VII A	Halogens
VIII A	Noble gases

A: main groups
B: transition elements

UIPAC: number groups 1–18

categories:

- nonmetal
- alkali metal
- alkaline earth metal
- lanthanide
- actinide
- transition metal
- post-transition metal
- metalloid
- halogen
- noble gas

79.904: atomic weight
aka. "relative atomic mass"
(average over isotopes)

79: mass number (A):
number of nucleons
(most common isotope)

35: atomic number (Z):
number of protons
(= number of electrons)

electron configuration:
[Ar] $3d^{10}\ 4s^2\ 4p^5$
valence electrons in blue

Madelung ordering rule: (n+l, n)
⇒ 1s, 2s, 2p, 3s, 3p, 4s, 3d, 4p, 5s, 4d, 5p, 6s, 4f, 5d, 6p, 7s, 5f, 6d, 7p, . . .

state of matter:
○ gaseous
◒ liquid
☘ radioactive

I=3/2: nuclear spin of most common isotope.
When I = 0 for most common isotope , shows "Z: I=/" for most common isotope with I ≠ 0.
E.g. for $^{24}_{12}$Mg: I=0, but for $^{25}_{12}$Mg: I=5/2.

Nuclear spin rules: based on Z, N=A-Z
even/even: I=0; odd/odd: integer I;
even/odd or odd/even: half-integer I

Period	I A	II A	III B	IV B	V B	VI B	VII B	— VIII B —		I B	II B	III A	IV A	V A	VI A	VII A	VIII A
1	1.0079 ○ $^{1}_{1}$H I=1/2 Hydrogen																4.0026 ○ $^{4}_{2}$He 3: I=1/2 Helium
2	6.9410 $^{7}_{3}$Li I=3/2 Lithium	9.0122 $^{9}_{4}$Be I=3/2 Beryllium										10.811 $^{11}_{5}$B I=3/2 Boron	12.011 $^{12}_{6}$C 13: I=1/2 Carbon	14.007 ○ $^{14}_{7}$N I=1 Nitrogen	15.999 ○ $^{16}_{8}$O 17: I=5/2 Oxygen	18.998 ○ $^{19}_{9}$F I=1/2 Fluorine	20.180 ○ $^{20}_{10}$Ne 21: I=3/2 Neon
3	22.990 $^{23}_{11}$Na I=3/2 Sodium	24.305 $^{24}_{12}$Mg 25: I=5/2 Magnesium										26.982 $^{27}_{13}$Al I=5/2 Aluminum	28.085 $^{28}_{14}$Si 29: I=1/2 Silicon	30.974 $^{31}_{15}$P I=1/2 Phosphorus	32.065 $^{32}_{16}$S 33: I=3/2 Sulfur	35.453 ○ $^{35}_{17}$Cl I=3/2 Chlorine	39.948 ○ $^{40}_{18}$Ar 39: I=7/2 Argon
4	39.098 $^{39}_{19}$K I=3/2 Potassium	40.078 $^{40}_{20}$Ca 43: I=7/2 Calcium	44.956 $^{45}_{21}$Sc I=7/2 Scandium	47.867 $^{48}_{22}$Ti 47: I=5/2 Titanium	50.941 $^{51}_{23}$V I=7/2 Vanadium	51.996 $^{52}_{24}$Cr 53: I=3/2 Chromium	54.938 $^{55}_{25}$Mn I=5/2 Manganese	55.845 $^{56}_{26}$Fe 57: I=1/2 Iron	58.933 $^{59}_{27}$Co I=7/2 Cobalt	58.693 $^{58}_{28}$Ni 61: I=3/2 Nickel	63.546 $^{63}_{29}$Cu I=3/2 Copper	65.380 $^{64}_{30}$Zn 67: I=5/2 Zinc	69.723 $^{69}_{31}$Ga I=3/2 Gallium	72.640 $^{74}_{32}$Ge 73: I=9/2 Germanium	74.922 $^{75}_{33}$As I=3/2 Arsenic	78.960 $^{80}_{34}$Se 77: I=1/2 Selenium	79.904 ◒ $^{79}_{35}$Br I=3/2 Bromine	83.798 ○ $^{84}_{36}$Kr 83: I=9/2 Krypton
5	85.468 $^{85}_{37}$Rb I=5/2 Rubidium	87.620 $^{88}_{38}$Sr 87: I=9/2 Strontium	88.906 $^{89}_{39}$Y I=1/2 Yttrium	91.224 $^{90}_{40}$Zr 91: I=5/2 Zirconium	92.906 $^{93}_{41}$Nb I=9/2 Niobium	95.960 $^{98}_{42}$Mo 95: I=5/2 Molybdenum	98.000 ☘ $^{98}_{43}$Tc 99: I=9/2 Technetium	101.07 $^{102}_{44}$Ru 101: I=5/2 Ruthenium	102.91 $^{103}_{45}$Rh I=1/2 Rhodium	106.42 $^{106}_{46}$Pd 105: I=5/2 Palladium	107.87 $^{107}_{47}$Ag I=1/2 Silver	112.41 $^{114}_{48}$Cd 111: I=1/2 Cadmium	114.82 $^{115}_{49}$In I=9/2 Indium	118.71 $^{120}_{50}$Sn 119: I=1/2 Tin	121.76 $^{121}_{51}$Sb I=5/2 Antimony	127.60 $^{130}_{52}$Te 125: I=1/2 Tellurium	126.90 $^{127}_{53}$I I=5/2 Iodine	131.29 ○ $^{132}_{54}$Xe 129: I=1/2 Xenon
6	132.91 $^{133}_{55}$Cs I=7/2 Cesium	137.33 $^{138}_{56}$Ba 137: I=3/2 Barium	138.91 $^{139}_{57}$La I=7/2 Lanthanum	178.49 $^{180}_{72}$Hf 177: I=7/2 Hafnium	180.95 $^{181}_{73}$Ta I=7/2 Tantalum	183.84 $^{184}_{74}$W 183: I=1/2 Tungsten	186.21 $^{187}_{75}$Re I=5/2 Rhenium	190.23 $^{192}_{76}$Os 189: I=3/2 Osmium	192.22 $^{193}_{77}$Ir I=3/2 Iridium	195.08 $^{195}_{78}$Pt I=1/2 Platinum	196.97 $^{197}_{79}$Au I=3/2 Gold	200.59 ◒ $^{202}_{80}$Hg 199: I=1/2 Mercury	204.38 $^{205}_{81}$Tl I=1/2 Thallium	207.20 $^{208}_{82}$Pb 207: I=1/2 Lead	208.98 $^{209}_{83}$Bi I=9/2 Bismuth	209 ☘ $^{209}_{84}$Po I=1/2 Polonium	210 ☘ $^{210}_{85}$At Astatine	222 ☘ $^{222}_{86}$Rn Radon
7	223 ☘ $^{223}_{87}$Fr Francium	226 ☘ $^{226}_{88}$Ra Radium	227 ☘ $^{227}_{89}$Ac I=3/2 Actinium	232.04 ☘ $^{232}_{90}$Th 229: I=5/2 Thorium	231.04 ☘ $^{231}_{91}$Pa Protactinium	238.03 ☘ $^{238}_{92}$U 235: I=7/2 Uranium	237 ☘ $^{237}_{93}$Np I=5/2 Neptunium	244 ☘ $^{244}_{94}$Pu 239: I=1/2 Plutonium	243 ☘ $^{243}_{95}$Am I=5/2 Americium	247 ☘ $^{247}_{96}$Cm Curium	247 ☘ $^{247}_{97}$Bk Berkelium	251 ☘ $^{251}_{98}$Cf Californium	252 ☘ $^{252}_{99}$Es Einsteinium	257 ☘ $^{257}_{100}$Fm Fermium	258 ☘ $^{258}_{101}$Md Mendelevium	259 ☘ $^{259}_{102}$No Nobelium	262 ☘ $^{262}_{103}$Lr Lawrencium
6				261 ☘ $^{261}_{104}$Rf Rutherfordium	262 ☘ $^{262}_{105}$Db Dubnium	266 ☘ $^{266}_{106}$Sg Seaborgium	264 ☘ $^{264}_{107}$Bh Bohrium	269 ☘ $^{269}_{108}$Hs Hassium	268 ☘ $^{268}_{109}$Mt Meitnerium	110 ☘ $^{110}_{110}$Ds Darmstadtium	111 ☘ $^{111}_{111}$Rg Roentgenium	112 ☘ $^{112}_{112}$Cn Copernicium	113 ☘ $^{113}_{113}$Nh Nihonium	114 ☘ $^{114}_{114}$Fl Flerovium	115 ☘ $^{115}_{115}$Mc Moscovium	116 ☘ $^{116}_{116}$Lv Livermorium	117 ☘ $^{117}_{117}$Ts Tennessine	118 ☘ $^{118}_{118}$Og Oganesson

	I A	II A	III B	IV B	V B	VI B	VII B	— VIII B —		I B	II B	III A	IV A	V A	VI A	VII A	VIII A
K: 1	1																2
L: 2		1															2
M: 3			1									1					
N: 4				2	2	1	2	2	2	1	2						
O: 5												1	2	2	2	1	
P: 6																	
Q: 7																	
	s	p	d	f	s	p	d	f	s	p	d	f	s	p	d	f	s
	0 (s-block)		2	3 (f-block)								2 (d-block)					1 (p-block)
m_l	0	0	+2	+3	+2	+1	0	-1	-2	-3	+3	+2	+1	0	-1	-2	-3
m_s	+1/2	-1/2	+1/2	+1/2							-1/2						

	I A	II A	III B	IV B	V B	VI B	VII B	— VIII B —		I B	II B	III A	IV A	V A	VI A	VII A	VIII A
K: 1	1																2
L: 2		2															2
M: 3			2									2					
N: 4				2	2	2	2	2	2	2	2						
O: 5												2	2	2	2	2	
P: 6																	
Q: 7																	
	s	p	d	f	s	p	d	f	s	p	d	f	s	p	d	f	s
	0 (s-block)		2	3 (f-block)								2 (d-block)					1 (p-block)
m_l	0	0	+2	+3	+2	+1	0	-1	-2	-3	+3	+2	+1	0	-1	-2	-3
m_s	+1/2	-1/2	+1/2	+1/2							-1/2						

	I A	II A	III B	IV B	V B	VI B	VII B	— VIII B —		I B	II B	III A	IV A	V A	VI A	VII A	VIII A
K: 1	1																2
L: 2		2															2
M: 3			3									3					
N: 4				2	2	2	2	2	2	2	2						
O: 5												3	2	2	2	2	
P: 6																	
Q: 7																	
	s	p	d	f	s	p	d	f	s	p	d	f	s	p	d	f	s
	0 (s-block)		2	3 (f-block)								2 (d-block)					1 (p-block)
m_l	0	0	+2	+3	+2	+1	0	-1	-2	-3	+3	+2	+1	0	-1	-2	-3
m_s	+1/2	-1/2	+1/2	+1/2							-1/2						

	I A	II A	III B	IV B	V B	VI B	VII B	— VIII B —		I B	II B	III A	IV A	V A	VI A	VII A	VIII A
K: 1	1																2
L: 2		2															2
M: 3			3									3					
N: 4				2	2	2	2	2	2	2	2						
O: 5												3	2	2	2	2	
P: 6																	
Q: 7																	
	s	p	d	f	s	p	d	f	s	p	d	f	s	p	d	f	s
	0 (s-block)		2	3 (f-block)								2 (d-block)					1 (p-block)
m_l	0	0	+2	+3	+2	+1	0	-1	-2	-3	+3	+2	+1	0	-1	-2	-3
m_s	+1/2	-1/2	+1/2	+1/2							-1/2						

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