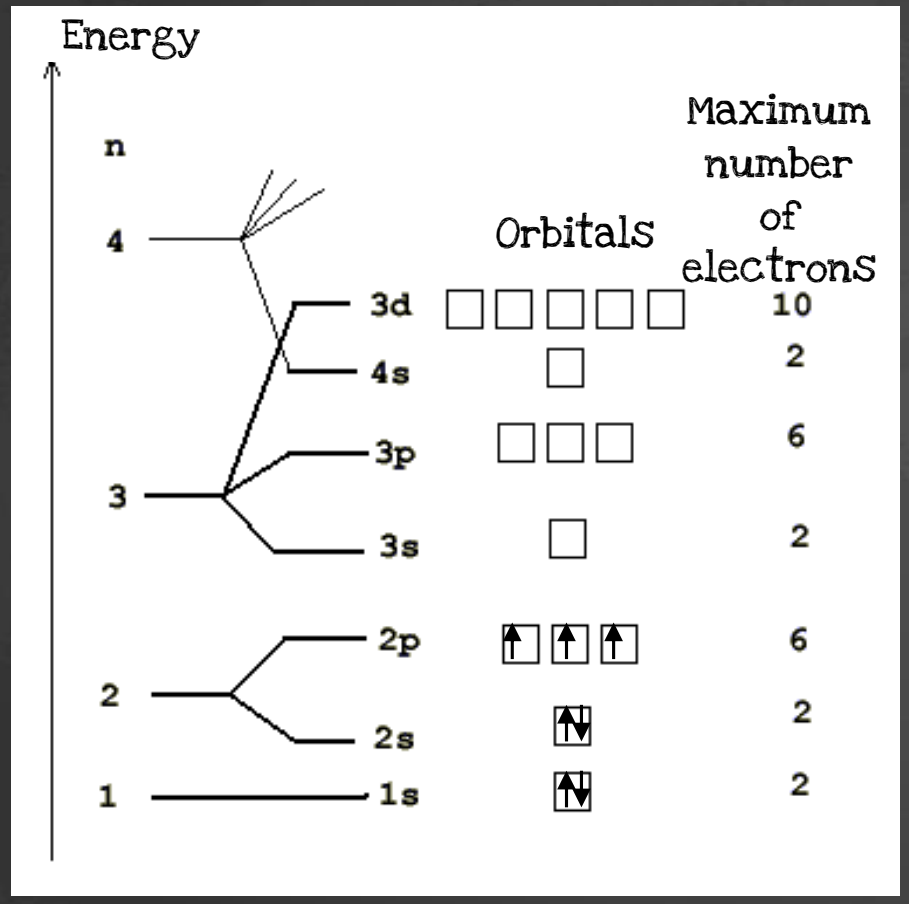
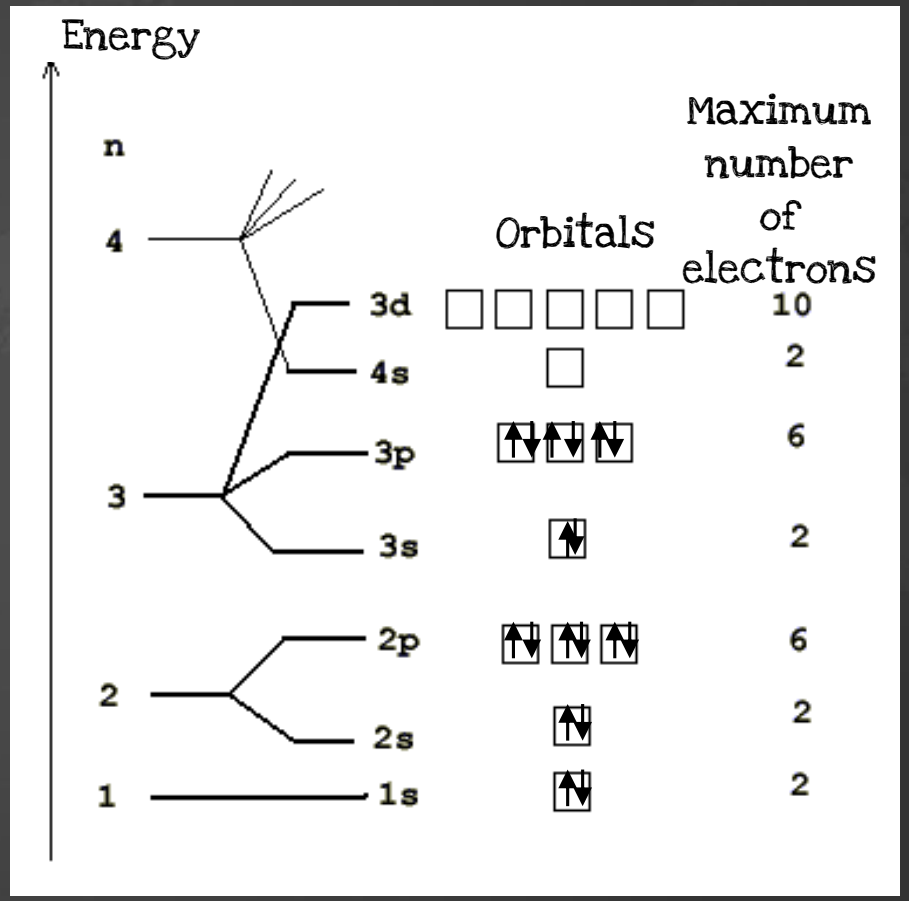
$_{7}N$



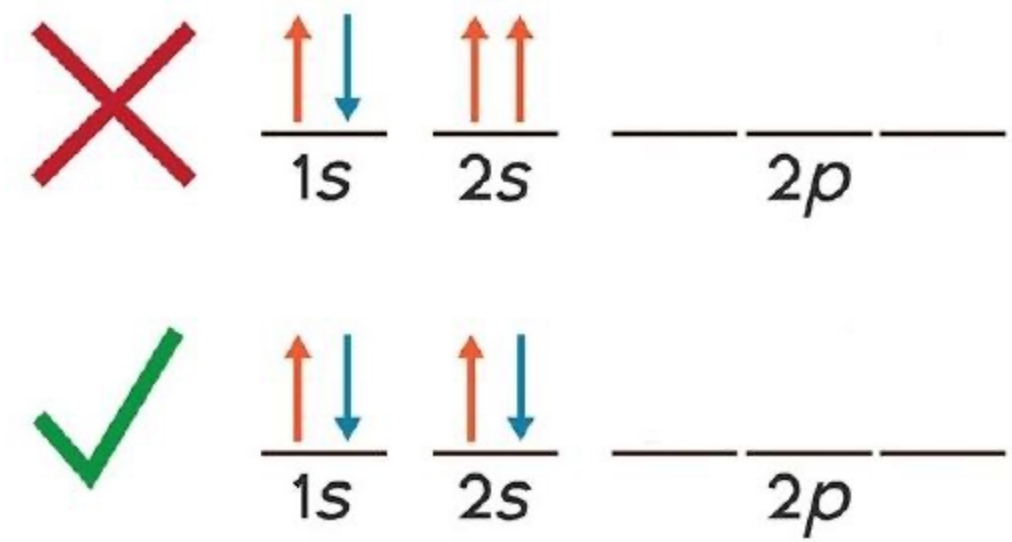
$_{18}Ar$



The further we go from the nucleus the smaller distances between levels and sublevels, they start to “overlap” each other.

Putting electrons into orbitals

1. The Pauli exclusion principle: the maximum number of electrons in an orbital is two. If there are two electrons in an orbital, they must have opposite spin.
2. Hund's rule: electrons fill orbitals of the same energy so as to give the maximum number of electrons with the same spin.



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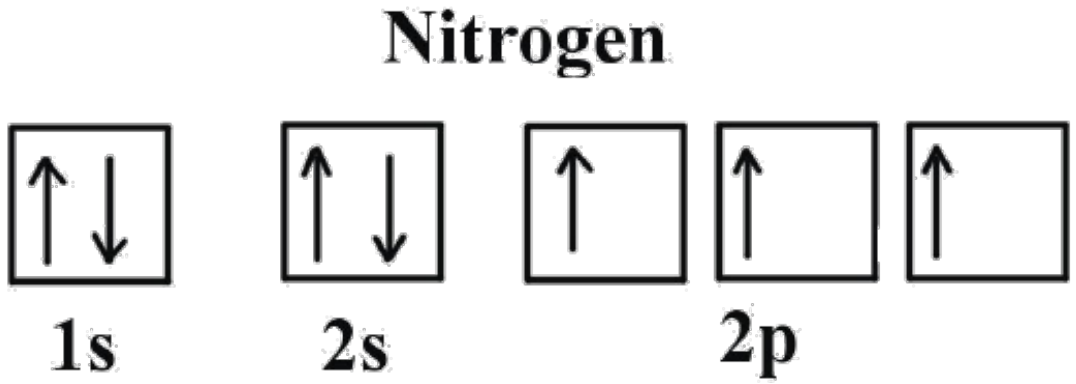

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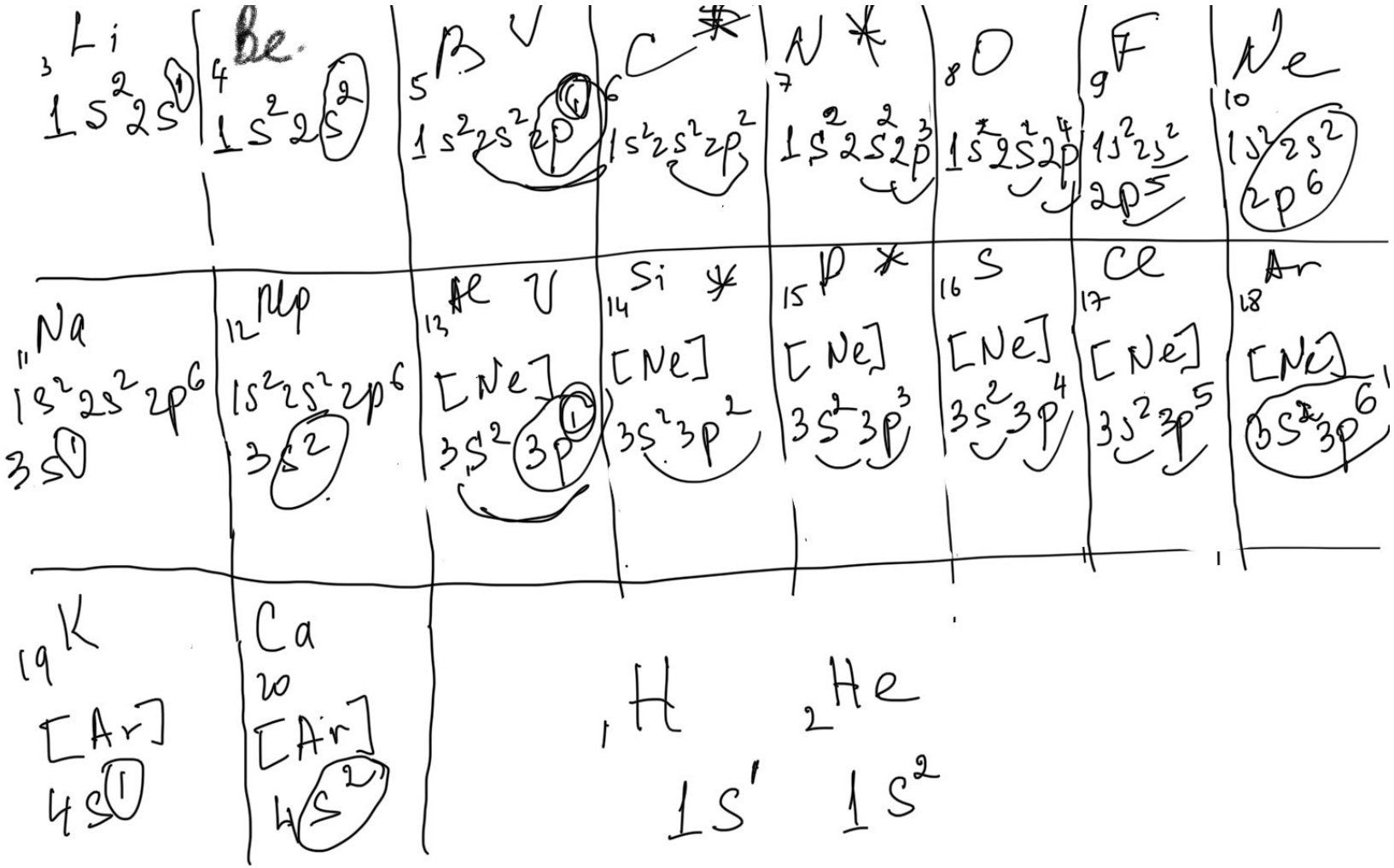
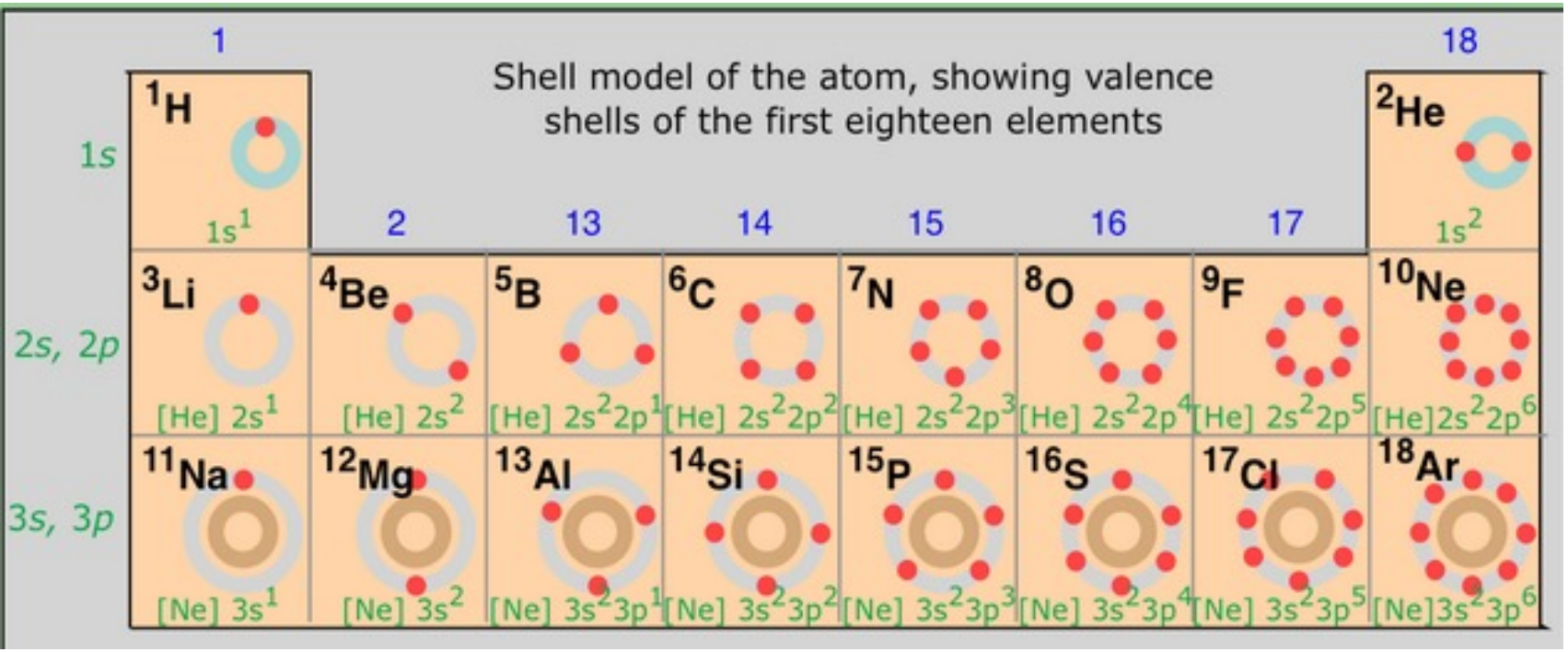

3 Li
1s² 2s¹
4 Be
1s² 2s²
5 B V
1s² 2s² 2p¹
6 C *
1s² 2s² 2p²
7 N *
1s² 2s² 2p³
8 O
1s² 2s² 2p⁴
9 F
1s² 2s² 2p⁵
10 Ne
1s² 2s² 2p⁶
11 Na
1s² 2s² 2p⁶ 3s¹
12 Mg
1s² 2s² 2p⁶ 3s²
13 Al V
[Ne] 3s² 3p¹
14 Si *
[Ne] 3s² 3p²
15 P *
[Ne] 3s² 3p³
16 S
[Ne] 3s² 3p⁴
17 Cl
[Ne] 3s² 3p⁵
18 Ar
[Ne] 3s² 3p⁶
19 K
[Ar] 4s¹
20 Ca
[Ar] 4s²
1 H
1s¹
2 He
1s²



Element	Charge of the nuclei	Outer shell
H	1	...$1s^1$
Li	3	...$2s^1$
Na	11	...$3s^1$
K	19	...$4s^1$
Rb	37	...$5s^1$
Cs	55	...$6s^1$
Fr	87	...$7s^1$

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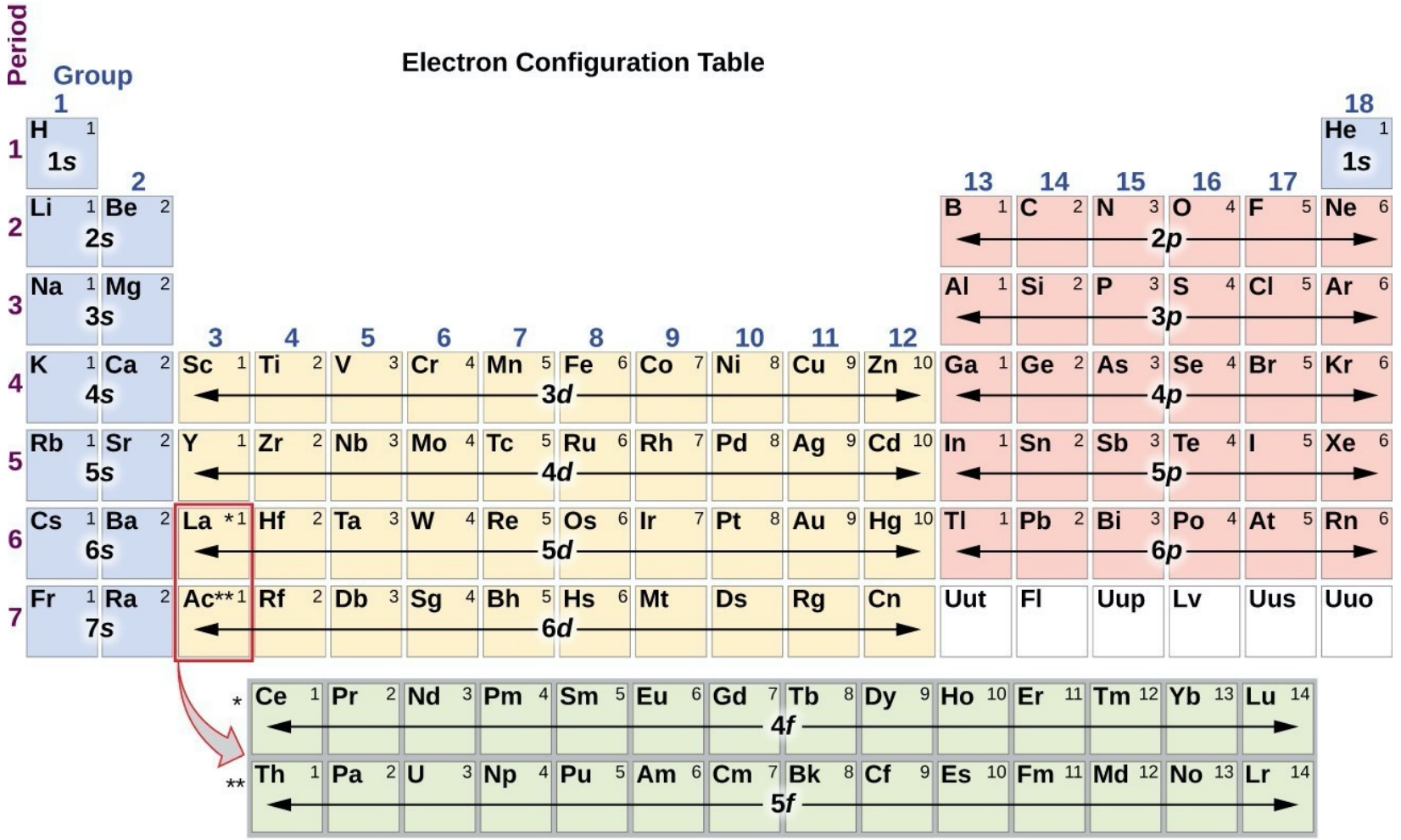
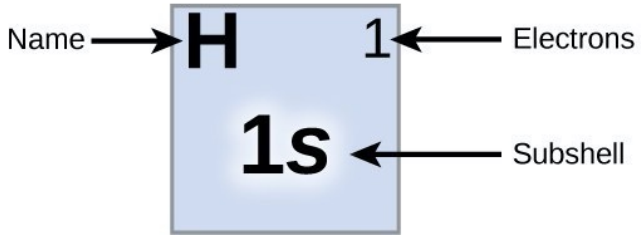
A complete outer shell, ns^2np^6, is energetically more advantageous than an incomplete one.

We call it the RULE OF EIGTH: an atom tends to pick up or give away just enough electrons to make eight in its outer shell – AN ELECTRON OCTET.

Electrons in the outer shell (the highest main energy level) of an atom are called VALENCE ELECTRONS.





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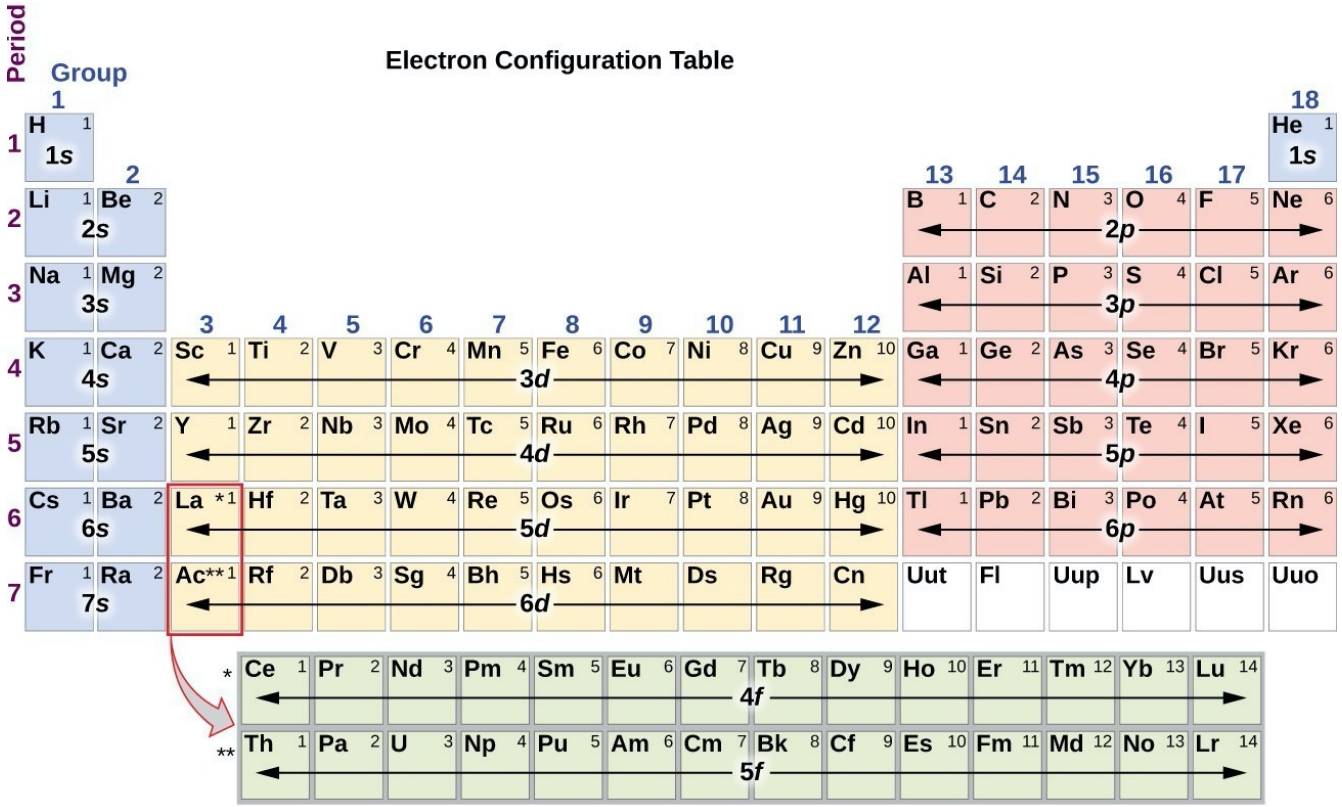
For majority of atoms the electrons will occupy levels and orbitals as following:
1s,2s,2p,3s,3p,4s,3d,4p,5s,4d,5p,6s,4f,5d,6p,7s,5f,6d…

Google 3D periodic table

https://artsexperiments.withgoogle.com/periodic-table/



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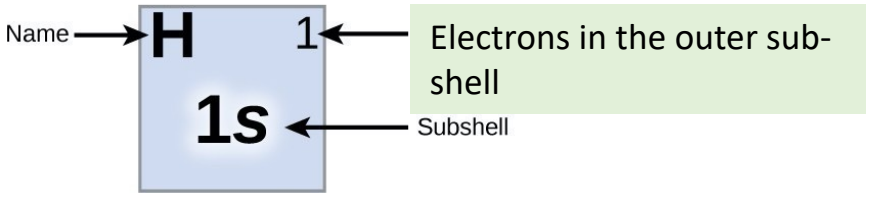
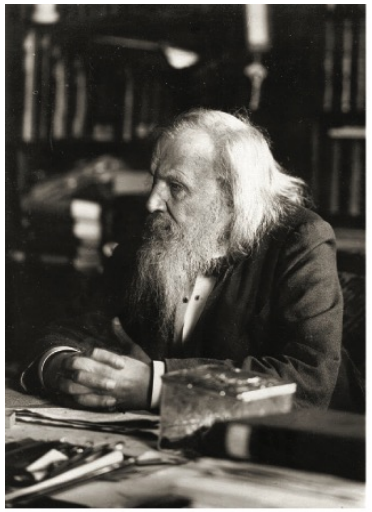


Electrons in the outer shell (the highest main energy level) of an atom are called VALENCE ELECTRONS. The elements in group 1 have 1 valence electron. The elements in group 2 have two valence electrons. The elements in groups 13-18 have valence electrons = group number – 10.

What can we tell about Sulfur ($_{16}$S)?
Valency?
Energy level (shell)?
Highest energy occupied subshell?
Outer shell electron configuration?

For majority of atoms the electrons will occupy levels and orbitals as following:
1s,2s,2p,3s,3p,4s,3d,4p,5s,4d,5p,6s,4f,5d,6p,7s,5f,6d…



(a)

Reihen	Gruppo I. — R'0	Gruppo II. — RO	Gruppo III. — R'O³	Gruppo IV. RH⁴ RO²	Gruppo V. RH³ R'O⁵	Gruppo VI. RH² RO³	Gruppo VII. RH R'O⁷	Gruppo VIII. — RO⁴
1	H=1							
2	Li=7	Be=9,4	B=11	C=12	N=14	O=16	F=19	
3	Na=23	Mg=24	Al=27,3	Si=28	P=31	S=32	Cl=35,5	
4	K=39	Ca=40	—=44	Ti=48	V=51	Cr=52	Mn=55	Fe=56, Co=59, Ni=59, Cu=63.
5	(Cu=63)	Zn=65	—=68	—=72	As=75	Se=78	Br=80	
6	Rb=85	Sr=87	?Yt=88	Zr=90	Nb=94	Mo=96	—=100	Ru=104, Rh=104, Pd=106, Ag=108.
7	(Ag=108)	Cd=112	In=113	Sn=118	Sb=122	Te=125	J=127	
8	Cs=133	Ba=137	?Di=138	?Ce=140	—	—	—	— — — —
9	(—)	—	—	—	—	—	—	
10	—	—	?Er=178	?La=180	Ta=182	W=184	—	Os=195, Ir=197, Pt=198, Au=199.
11	(Au=199)	Hg=200	Tl=204	Pb=207	Bi=208	—	—	
12	—	—	—	Th=231	—	U=240	—	— — — —

(b)

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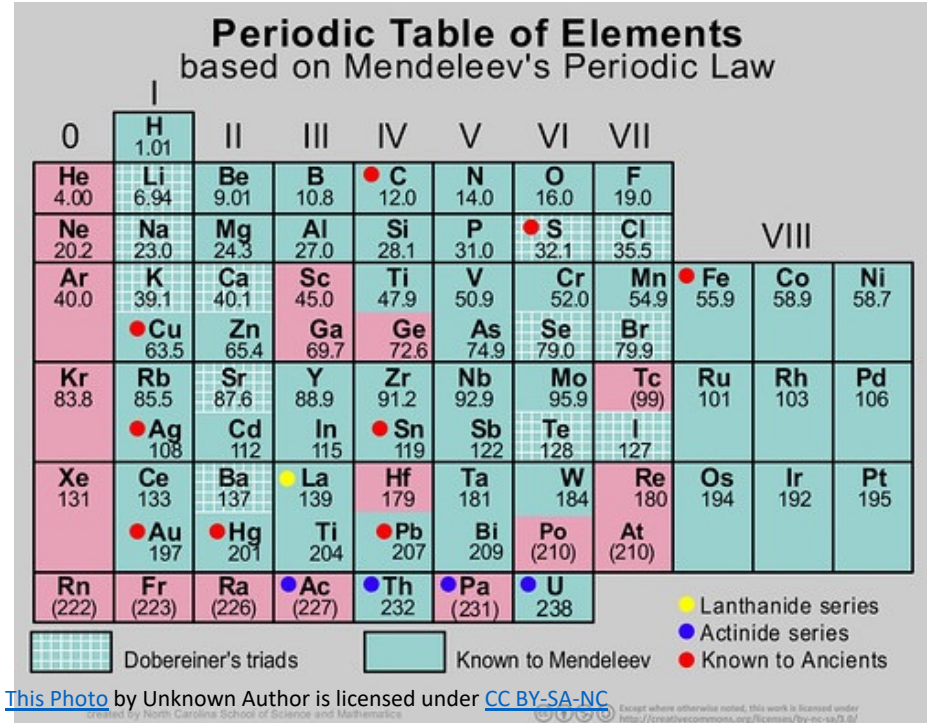

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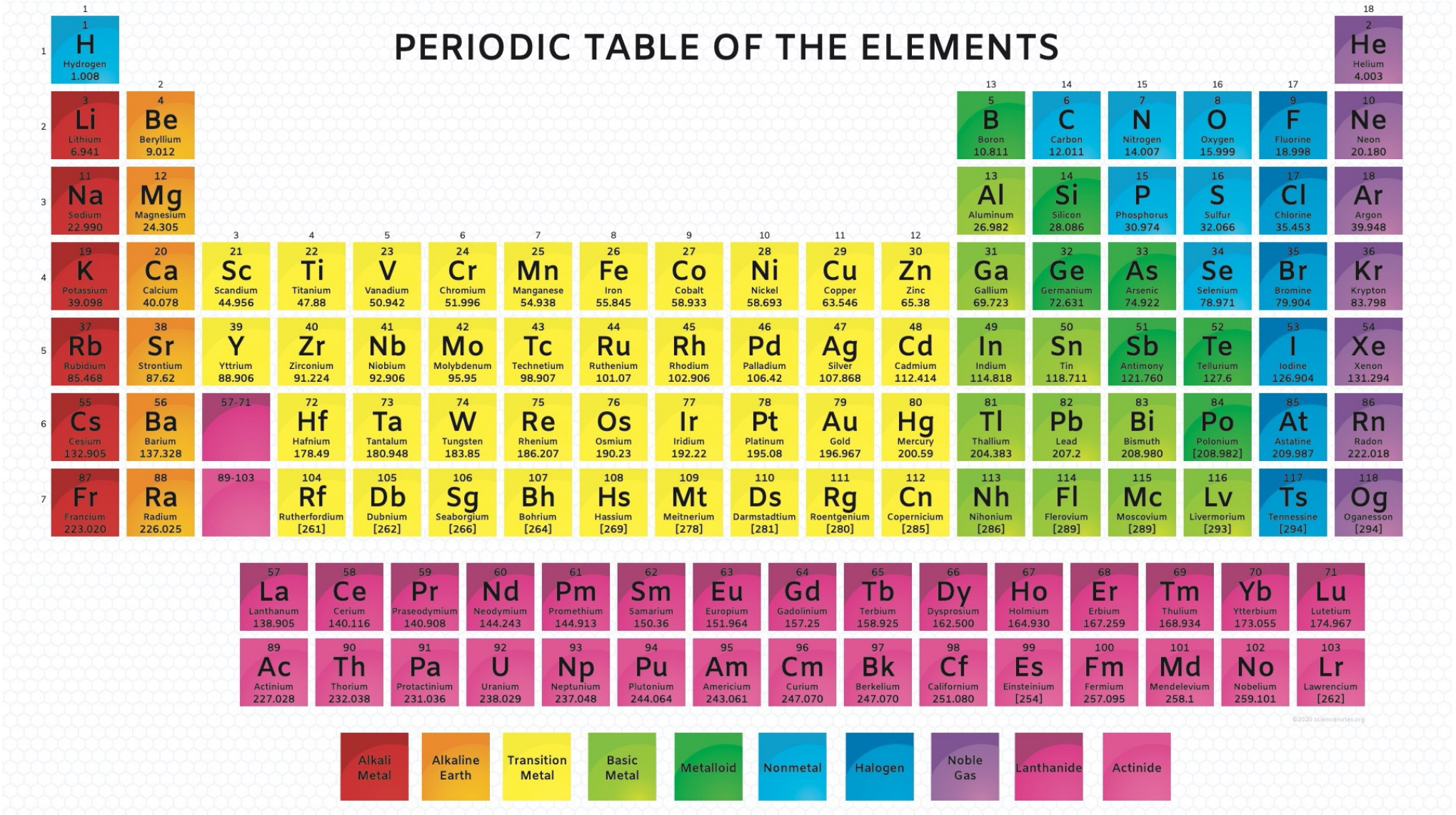
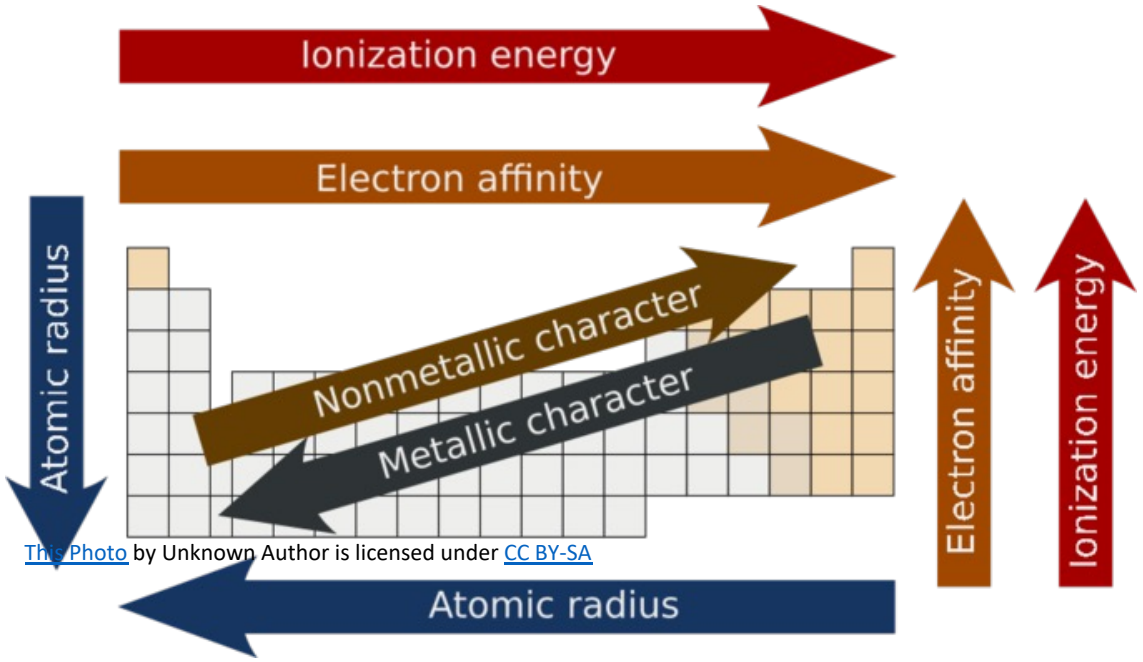


What is periodic law? The statement that the chemical and physical properties of the elements recur periodically When the elements are arranged in the order of their atomic weight.

Properties of elements down a group and across a period.



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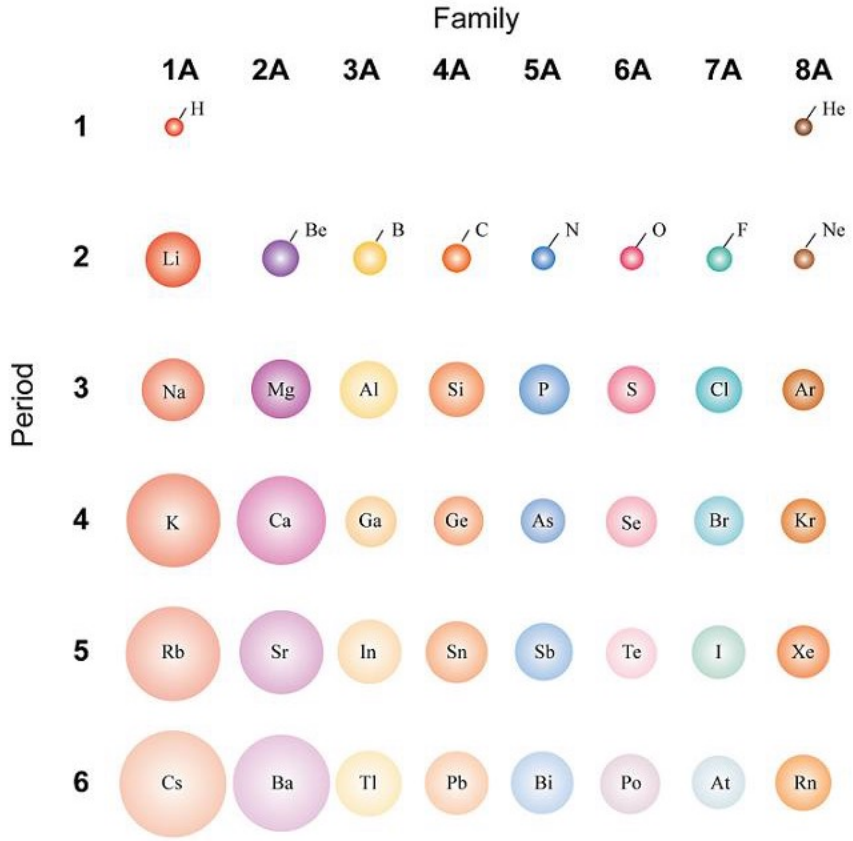

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Manyuilov and Rodionov “Chemistry for children and adults”
Steve Owen Chemistry for the IB diploma