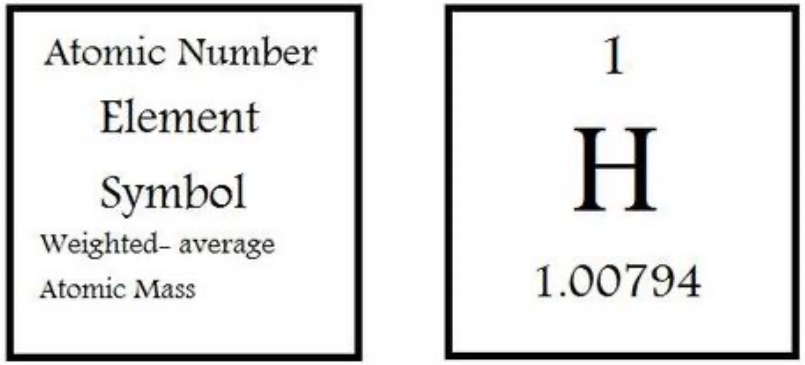
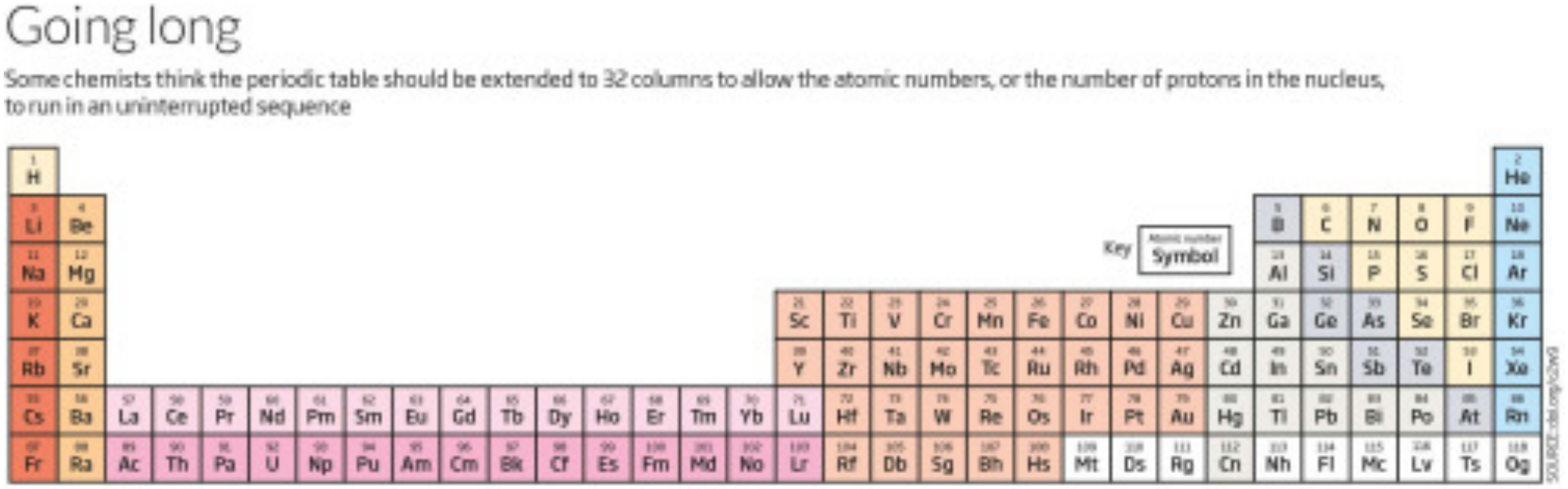
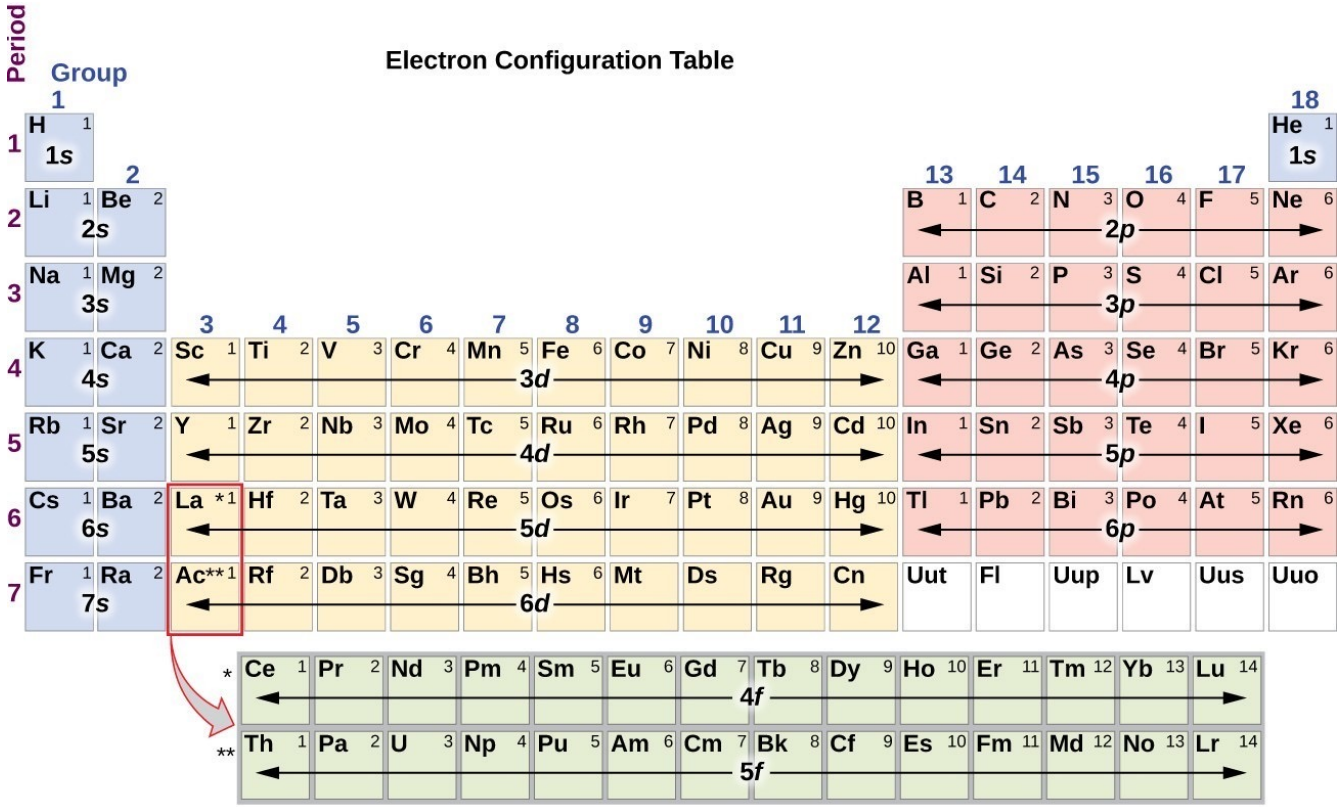
Everything is made of atoms.
In the universe there are 92 types of atoms, they are called elements.
Elements are a substance made of only one kind of atom.
There is a list to show all elements starting from the lightest element and ending with the heaviest.
Each element has its symbol.



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



There are 7 rows in the periodic table, they are called periods, period number = highest energy level number.
Elements in the same row are going to have the same highest energy level (shell) number.



The 18 columns are called groups.

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. Most elements in d block (yellow color) have valency of 2. Remember Cu, its electron configuration
$4s^1 3d^{10}$. Copper can have valency 1 and 2.

Elements in the same group will have equal valency (number of electrons participating in chemical reactions)

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… Examples of electron configurations: K - $[Ar]4s^1$; Sc – $[Ar]4s^2 3d^1$; Ga - $[Ar]4s^2 3d^{10} 4p^1$; Cs – [Xe] $6s^1$; La - [Xe] $6s^2 4f^1$; Pb - [Xe] $6s^2 4f^{14} 5d^{10} 6p^2$; Rf – [Rn] $7s^2 5f^{14} 6d^2$

What can we tell about elements looking at the periodic table:
Atomic number.
Atomic weight.
The highest energy level.
The number of electrons in the outer shell, and so we can the number of electrons participating in chemical reactions.
Some physical characteristic of element, if it is metal or nonmetal etc.

Metallic and non-metallic properties

Properties of metals
- High density
- High melting and boiling points
- Good electrical conductivity
- Shiny
- Malleable (easy to shape)
- Ductile (easy to stretch into wires) • Reactive with nonmetals

Properties of nonmetals
- Often liquid or gaseous at room temperature
- Brittle when solid
- Dull-looking
- Poor electrical conductivity
- Reactive with metals (except for the last group)

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	$...7s^1$

Alkali metals.

They are all highly reactive, soft metals. They have 1 electron in outer shell.

The reactions of an element are determined by the number of electrons in the outer shell of their atoms. Because elements in the same group have the same number of electrons in their outer shell, they react in basically the same way.

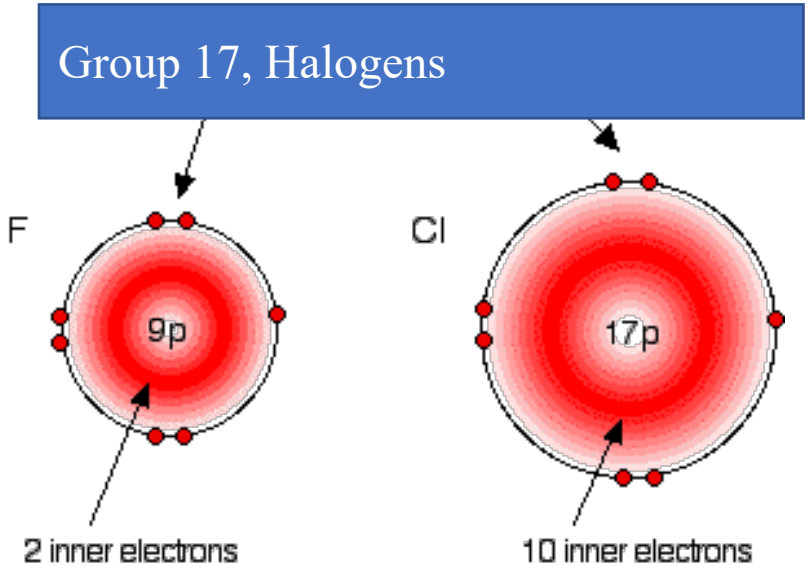
A complete outer shell, ns^2np^6, is energetically more advantageous than an incomplete one.

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.

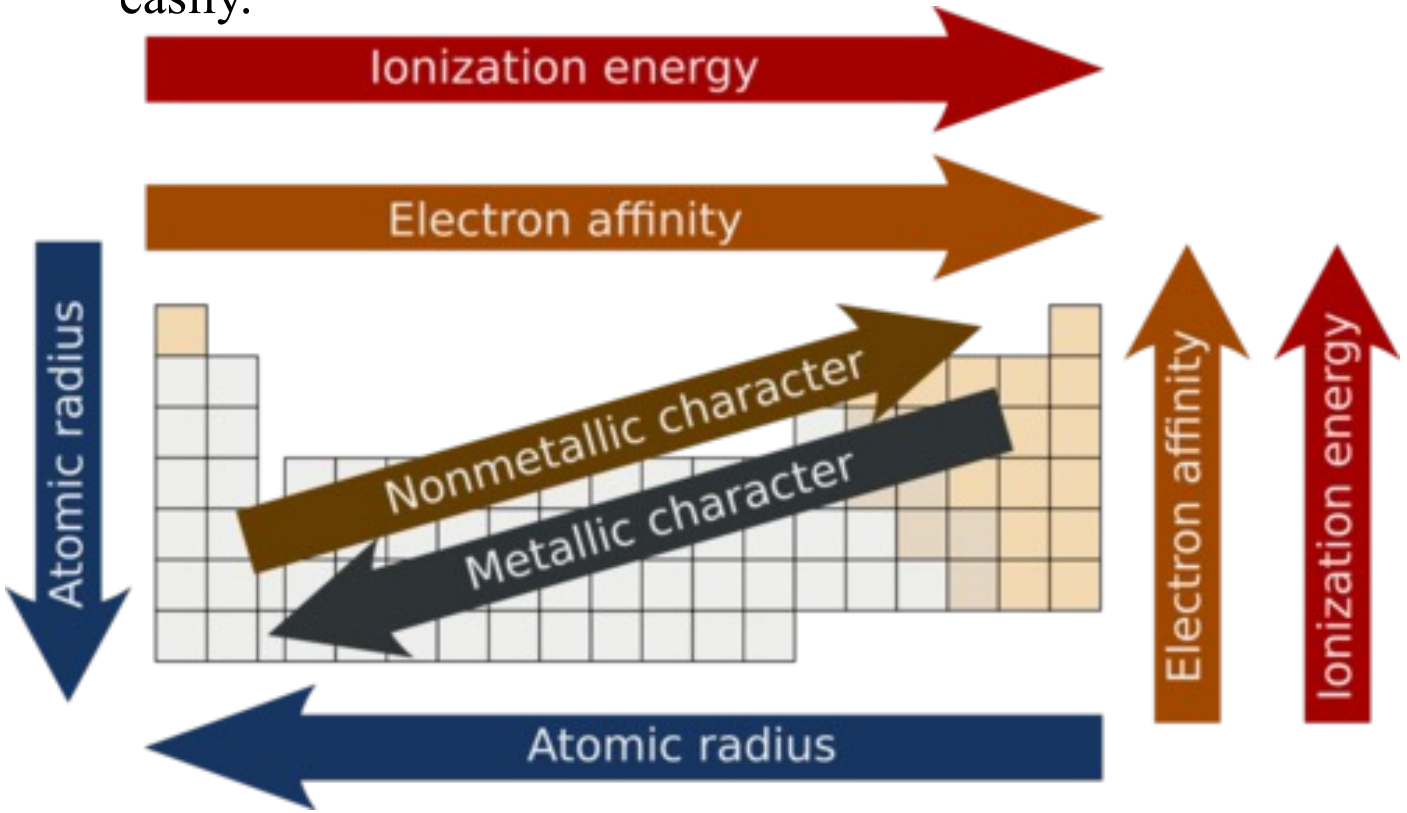
Group 1 elements are happy to give away 1 electron, and they react readily with among other things, oxygen, water, halogens.

Elements form group 17
Need one electron to have full octet.



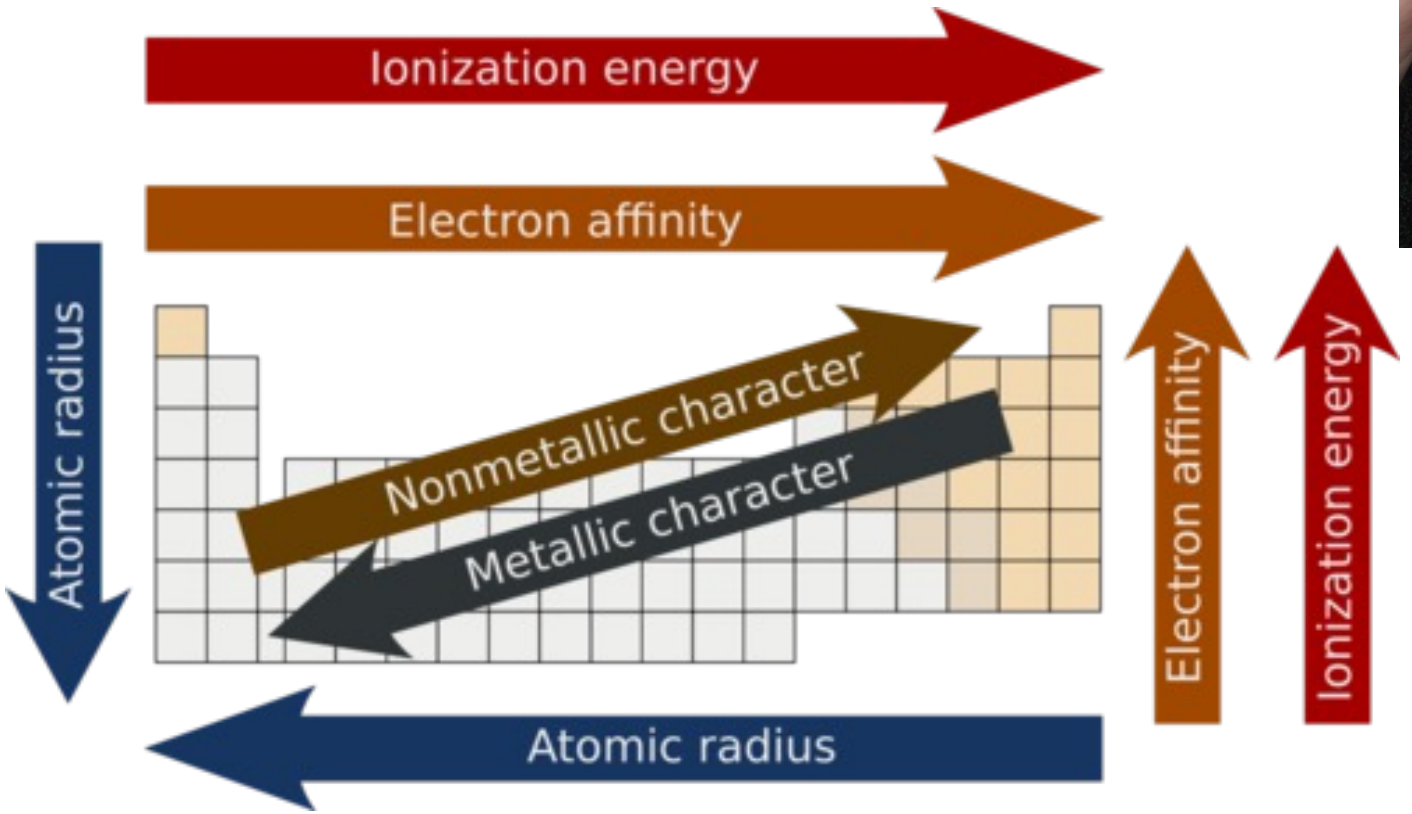
Ionization energy

An atom's ionization energy – the energy needed to remove an outer electron. It depends on the atom size. Group 1 has low ionization energy and give up electron easily.



Electron affinity

It measures an atom's "willingness" to add extra electron. Group 17 elements will gladly accept electron from alkali metals.



DO NOT EAT ANYTHING IN THE LAB!

https://youtu.be/d2geiGKFveE

Nobel gases.

They have high ionization energy and low electron affinity. They outer orbitals are full.
THEY NEED NOTHING.
THEY YIELD NOTHING.