What can we tell about element looking at the periodic table:

1. We can know its atomic number and atomic weight.

2. We can determine its highest energy level. It corresponds to the period of the periodic table.

3. We can figure out the number of electrons in the outer shell (group number helps us to identify this) and so we can determine the number of electrons participating in chemical reactions.

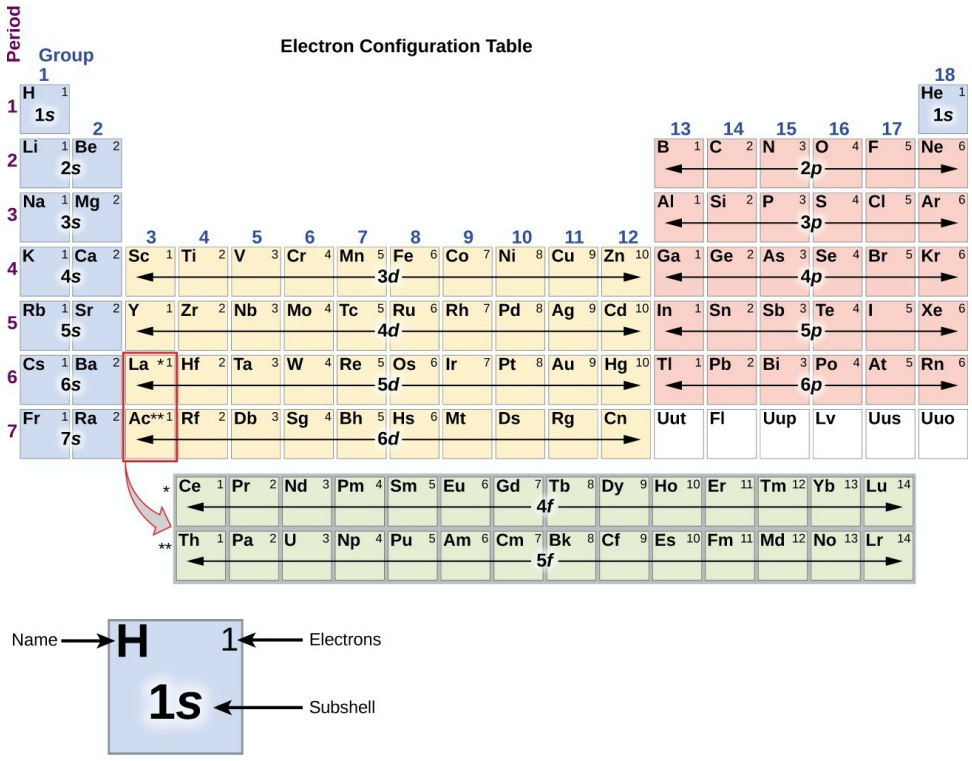
Electrons in the outer shell (the highest main energy level) of an atom are called VALENCE ELECTRONS. The elements in group 1 have 1 valence electron. The elements in group 2 have two valence electrons. The elements in groups 13-18 have valence electrons = group number – 10.

Most elements in d block (yellow color) have valency of 2.

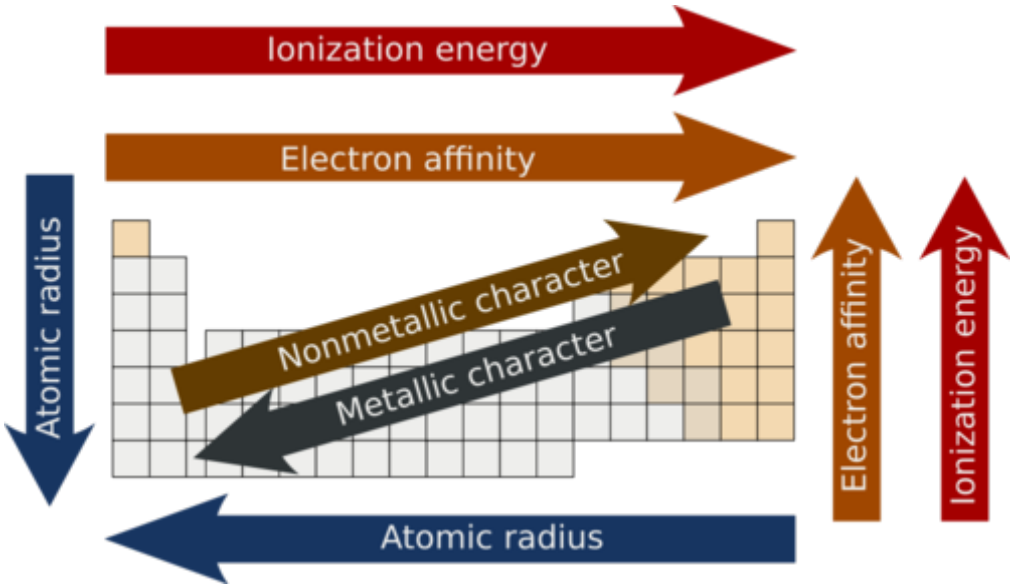
4. We can see some physical characteristic of element, if it is metal or nonmetal etc.
5. For majority of atoms the electrons will occupy levels and orbitals as following: 1s,2s,2p,3s,3p,4s,3d,4p,5s,4d,5p,6s,4f,5d,6p,7s,5f,6d… Examples of electron configurations: K - $[Ar]4s^1$; Sc – $[Ar]4s^23d^1$;

Ga - $[Ar]4s^23d^{10}4p^1$; Cs – $[Xe]\ 6s^1$; La - $[Xe]\ 6s^24f^1$; Pb - $[Xe]\ 6s^24f^{14}5d^{10}6p^2$; Rf – $[Rn]\ 7s^25f^{14}6d^2$

In the Row 1 in periodic table
we have energy level (shell) **1** (we are talking about elements in stable or ground state, not exited). It has one sub-level (sub-shell) **s**, we call it **1s** here.
In the row 2, we have highest energy occupied level **2**, it has two sub-levels **s** and **p**, we call it **2s** and **2p**. And of course, we have to fill the first level with electrons here before we fill the level 2.
In the row 3, energy level **3** (before this, we still have to fill levels 1 and 2), it can have 3 sub-levels **s**, **p**, and **d**. The thing to remember here, we cannot fill 3d sub-level before 4 sub-levels, so we will see 3 d sub-levels not in the third row, but in the 4th row in the periodic table.
Row 4, energy level **4**, it has 4 sub-levels **s, d, p, and f.** But we will see these f sub-level in 6th row, etc.
So, levels - it is just number, called principal quantum number. Sub-levels - we see different orbitals here, on s sub-levels - one s orbital, on p sub-levels - three p orbitals, on d sub-levels - 5 d orbitals, on f sub-levels - 7 f orbitals.
When someone is asking to write down outer shell configuration for example for Sulfur (S), we write 3s^2 3p^4. When we are asked to write outer sub-shell configuration, we write 3p^4.



Properties of elements down a group and across a period.



Answer the following questions

1. Carbon and Lead belong to the same group in the periodic table. They have the same outer shell ns^2np^2. However, Carbon is nonmetal, but Pb is metal. How do you explain this difference?
2. What can you tell about element with symbol N and element with symbol Bi?