PERIODIC LAW

Chemical properties of an element depend on the number and the configuration of their (valence) electrons. According this all the elements are sorted into 4 blocks: s, p, d, f elements.

Properties of elements

3rd period elements: Na Mg Al Si^{IV}_{-IV} P S Cl

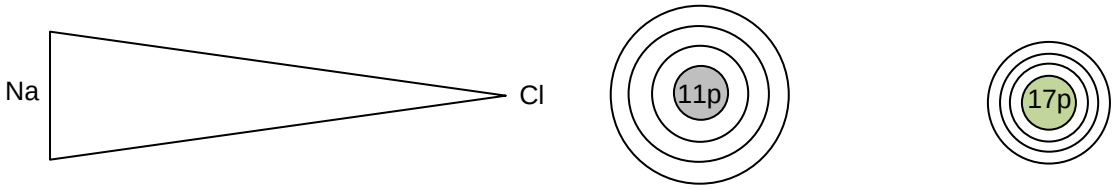
Oxidation numbers: The highest possible oxidation number responds to the number of the group. The lowest negative oxidation number = number of the group − 8.

1. *Give the highest possible positive and the negative oxidation number for the 3th period elements.*

Atomic radius:

Atomic radius ..... going down the group because of the increasing number of the .....

Atomic radius ..... across the period as the electrons are attracted by more positive protons.



Ionization energy: energy required for removing an electron from an atom: I_1: $M(g) - e^- \rightarrow M^+(g)$

I_2: $M^+(g) - e^- \rightarrow M^{2+}(g)$

Ionization energy ..... going down the group because the valence electrons are ..... from the nucleus and the attractive forces are .....

Ionization energy ..... across the period. As the valence electron of chlorine is attracted by more protons and it is ..... to the nucleus, it is *more difficult/easier* to remove it compared to the valence electron of sodium.

Electron affinity: energy liberated when an atom accepts an electron *EA*: $A(g) + e^- \rightarrow A^-(g)$

Electron affinity ..... going down the group because the last shell is ..... from the nucleus and the attractive forces are .....

Electron affinity ..... across the period. As the diameter of chlorine is ..... than that of sodium the last shell is ..... to the nucleus and the attractive forces are .....

Electronegativity: ability of an atom to hold the bonding electrons. Its value is calculated from the values of ionization energy and electron affinity. The higher ionization energy the ..... electronegativity. Electronegativity ..... from sodium to chlorine and ..... going down the group.

Metallic × non-metallic properties

Elements with low *I* are typical ....., those with high *I* are typical .....

Na Mg Al Si P S Cl

.....

....

Redox properties

Elements with a low value of ionization energy (metals) easily ..... electrons, they are good ..... agents.

Elements with a high value of ionization energy (non-metals) easily ..... electrons, they are good ..... agents.

Na Mg Al Si P S Cl

..... agents ..... agents

Properties of compounds

Type of bonding in halides (chlorides)

$NaCl$ $MgCl_2$ $AlCl_3$ $SiCl_4$ PCl_5 SF_6 Cl_2

....

Covalent character of bonding ..... Polar character of bonding .....

Acid – base properties

Oxides: Na_2O MgO Al_2O_3 SiO_2 P_2O_5 SO_3 Cl_2O_7

....

Acidity .....

Hydroxides, acids: NaOH $Ca(OH)_2$ $Al(OH)_3$ H_4SiO_4 H_3PO_4 H_2SO_4 $HClO_4$

..... weak ..... weak .... the strongest

base .... acid acid .....

The strength of acids ....., the strength of bases .....

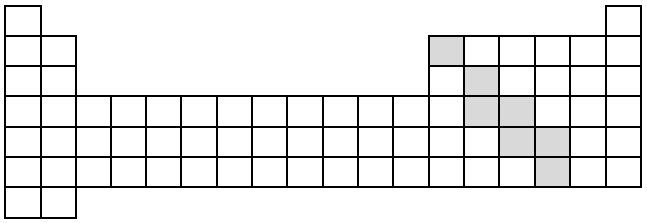
2. *Where in the periodic table would you find elements with the following properties?*

Basic

Non-metals

Metals

Acidic



Reducing agents

Oxidizing agents

High electron affinity

Low ionization energy

Low electronegativity

High electronegativity