

CHEMICAL PERIODICITY

1st periodic table - Dimitri Mendeleev

-by arranging elements with similar physical and chemical properties together; atomic mass

Revision done by Moseley

-by atomic number

PERIODIC LAW - Moseley

ELECTRON CONFIGURATION AND PERIODICITY

1. NOBLE GASES (Group 8A) Inert gases

e- fill up s and p orbitals

2. REPRESENTATIVE (Group IA-VIIA)

e- partially fill up s or p orbitals

Ex. K $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

3. TRANSITION (Group B - main)

Outermost s sublevel and d sublevel contain e-

Ex. Fe $[\text{Ar}] 4s^2 3d^6$

4. INNER TRANSITION (Group B - lower)

Outermost s and nearby f sublevels contain e-.

Ex. Ce - cerium - 58 e- $[\text{Xe}] 6s^2 4f^2$

ALKALI - ALKALINE - HALOGENS - LANTHANIDES - ACTINIDES

PERIODIC TRENDS INCLUDE:

1. ATOMIC SIZE

2. IONIZATION ENERGY

3. ELECTRON AFFINITY

4. IONIC SIZE

5. ELECTRONEGATIVITY

1. ATOMIC RADII -(Atomic size)

Group Trend:

Going down a group, the radius increases. The nuclear charge increases because e- are put into higher E levels.

Periodic Trend:

From left to right, atomic size DECREASES. The more e- and atom has, the more it shields the nucleus.

The inner e- have the lowest E and exhibit a major shielding effect.

2. IONIC SIZE -

METALS:

Low I.E. because they form cations easily: ionic size is small (decrease number of electrons)

NONMETALS:

High I.E. because they don't form cations (they form anions) ionic size is large (increase number of electrons)

Periodic Trend:

Gradual DECREASE from left to right across a period. (Group 5 - extreme INCREASE in ionic size, but then drops as you go to the right)

Group Trend:

INCREASE as you go down a group. (Groups IA-IVA and Groups V-VII).

3. IONIZATION ENERGY

The ability for an atom to lose the outermost e-.

(concentration - CATIONS)



$$\text{I.E.} = 495.8 \text{ KJ/mol}$$

It takes the above amount of energy for the electron to be given up or lost.

Periodic Trend:

From left to right the 1st I.E. (for representative elements) INCREASES. If there is a great attraction toward the nucleus for an electron, then the higher I.E. (it takes more energy)

Group Trend:

1st I.E. going down a group DECREASES.

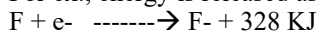
Electron is easily removed because it is far away from the nucleus. For ex., Fr, the outermost e⁻ in the 7s orbital and is further away from the nucleus than Na.

4. ELECTRON AFFINITY

Energy needed to add an e⁻ to an atom (E.A.) concentration - ANIONS (like to gain e⁻)

Most values are negative (exothermic) and very few are positive (endothermic); thermochemical reaction

For ex., energy is released as an e⁻ is gained in the equation:



$$\text{E.A.} = -328 \text{ kJ/mol released}$$

Periodic Trend: (not clear...but,)

Generally moving from left to right, E.A. INCREASES Atoms are smaller and nuclear charge increases.

Group Trend: (not clear...but,)

Down a group, E.A. DECREASES with increasing atomic size.

5. ELECTRONEGATIVITY -

Attractability of e⁻ to an atom which is combined to another atom.

Lowest? Cs⁺¹ (doesn't want to attract e⁻)

Highest? F⁻¹ (strongly attracts e⁻)

Periodic Trend:

INCREASES as you go from left to right

Group Trend:

DECREASES as you go down a group (exception: transition elements)

HALOGENS

-found as salts (seawater)

F, Cl, I

Health needs

Manufacture of non-stick coatings - pans

Toothpaste

TRANSITION METALS

Industrial use

Fe, Co, Zn - vitamins

W - light bulbs

Rare earth metals:

LANTHANIDE SERIES ----> La-Lu

ACTINIDE SERIES ---> Ac-Lr