

Ch-5

Answer the following questions-

1. Give the variation of the periodic properties:-

Along a period →

	Li ₃	Be ₄	B ₅	C ₆	N ₇	O ₈	F ₉	Ne ₁₀
E. Config.	2, 1	2, 2	2, 3	2, 4	2, 5	2, 6	2, 7	2, 8
V. Electrons	1	2	3	4	5	6	7	8
Valency	1	2	3	4	3	2	1	0

On moving from left to right in a period-

- Number of shells remain same
- Number of valence electrons increases
- Valency first increases till 4 and then decreases back to 1
- Atomic size of an atom decreases because number of protons increase due to which more nuclear pull is applied, hence size of an atom shrinks.

gaining or losing electrons. On moving from left to right in a period, reactivity first decreases and then increases because loss of electrons becomes difficult and gain of electrons becomes easy.

- Metallic character decreases and non-metallic character increases

★ Metallic character decreases due to increase in ionisation energy from left to right

★ Non metallic character increases from left to right due to increase in electron affinity which is due to decrease in atomic size.

eg -

Li, Be
Metals

B
Metalloid

C, N, O, F, Ne
Non-metals

- Oxides of elements in a particular period become progressively less basic and finally become acidic.

eg -

eg - $\text{Na}_2\text{O}, \text{MgO}$
Basic

Al_2O_3
Amphoteric

$\text{SiO}_2, \text{P}_2\text{O}_5, \text{SO}_3, \text{Cl}_2\text{O}$
Acidic

On moving from top to bottom in a group -

NOTE 8 Number of shells increase but the valence electrons remain same

eg -

Li₃ 2, 1

Na₁₁ 2, 8, 1

K₁₉ 2, 8, 8, 1

Rb₃₇ 2, 8, 18, 8, 1

- valency of an element equals the number of valence electrons, hence valency remains the same.
- Physical and chemical properties are almost similar in a particular group because the number of electrons in the outermost shell is same.

eg ① - Reactivity of alkali metals increases down the group because size of an atom increases, the nuclear pull decreases, hence loss of electrons becomes easy.

Li < Na < K < Rb < Cs

(Increasing order of reactivity)

② Reactivity of Halogens decreases on moving down the group because atomic size increases, nuclear charge decreases and gain of electrons become difficult.

F > Cl > Br > I

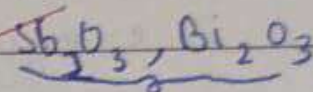
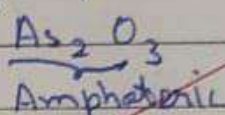
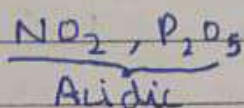
(Decreasing order of reactivity)

- Atomic size increases because of increasing number of shells.

- Metallic character increases as loss of electrons is easy due to increase in size and decrease in nuclear charge.

- Oxides of elements become increasingly basic in character

eg - Oxides of group 15



2. What is ionisation ~~energypotential~~ and how it varies along the groups and periods in a periodic table.

Ans) The energy required to move an electron from a neutral isolated gaseous atom and convert it into a positively charged ion is called ionisation potential (I.P.) or ionisation energy (I.E.)



Ionisation energy depends on atomic size and nuclear charge.

- * On moving left to right in a period, I.E. increases as atomic size decreases due to increase in nuclear charge. Hence more energy is required to remove an electron.

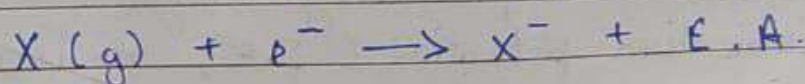
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* On moving from top to bottom in a group, ionisation energy decrease with an increase in atomic size. An increase in atomic size overcomes the effect of increase of nuclear charge.

eg- Helium will have highest ionisation energy and Cesium will have lowest ionisation energy.

3. What is electron affinity?

Ans) The amount of energy released by converting a neutral isolated gaseous atom into a negative gaseous ion by the addition of electron is called electron affinity or electron gain enthalpy.



- Electron affinity depends on atomic size and nuclear charge.
- On moving from left to right in a period electron affinity increases due to decrease in atomic size and increase in nuclear charge.
- On moving from top to bottom in a group, the atomic size increases more than nuclear charge thereby causing a decrease in electron

affinity

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- Eg - Electron affinity is highest for group 17 and lowest for group 1. Inert gases have zero electron affinity due to stable electronic configuration.

4. What do we mean by electronegativity and how it varies along periods and groups?

Ans) The tendency of an atom in a molecule to attract the shared pair of electrons towards itself is called its electronegativity. It depends on size of an atom and nuclear charge.

- On moving from left to right in a period electronegativity increases because nuclear charge increases due to an increase in atomic number.
- ~~On~~ On moving from top to bottom in a group the electronegativity decreases due to addition of extra shells the atomic size increases and it overcomes the effect of increased nuclear charge. Hence, electronegativity decreases.

Generally metals have lower electronegativity than non-metals.

5. Give reasons-

i) Alkali metals are kept in inert solvents.

Ans) They are kept in inert solvents due to their reactive nature.

ii) Alkali and alkaline earth metals compounds usually form electrovalent compounds.

Ans) As they have a tendency to lose electrons.

iii) ~~Chlorine~~ Fluorine has higher electronegativity than chlorine.

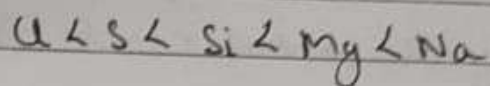
Ans) Because on moving from top to bottom electronegativity decreases and chlorine is below fluorine. Hence, fluorine has higher electronegativity.

iv) In group 17, fluorine has lower electron affinity than chlorine and in group 16, oxygen has lower electron affinity than sulphur.

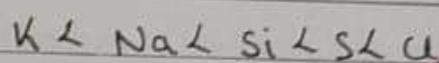
Ans) Because the size of fluorine and oxygen is very small. As a result there are strong inter-electronic repulsions and thus the incoming electron does not feel much attraction.

6. Arrange as directed -

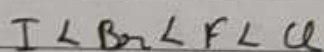
a) Mg, Cl, Na, S, Si (Increasing atomic size)



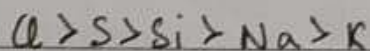
b) K, Na, Cl, S, Si (Increasing non-metallic character)



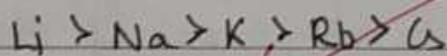
c) Cl, F, Br, I (Increasing electron affinity)



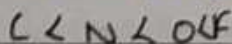
d) Na, K, Cl, S, Si (Decreasing ionisation energy)



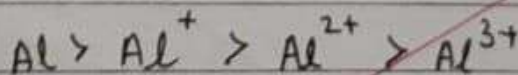
e) Cs, Na, K, Rb, Li (Decreasing electronegativity)



f) O, C, N, F, (Increasing electronegativity)



g) Al^{3+} , Al, Al^+ , Al^{2+} (Decreasing atomic radius)



27/8/19

Ch-5(C)

Ques / Ans

1. An element belongs to the 3rd period and Group III A (15) of the periodic table, State:

a) the number of valence electrons

Ans) 3

b) the valency

Ans) 3

c) if it is a metal or non-metal?

Ans) Metal

d) the name of the element

Ans) Aluminium

2. Name or state the following with reference to the elements of the first three periods of the periodic table.

a) Noble gas with duplet arrangement of electrons

Ans) Helium

b) Metalloid in Period 3

Ans) Silicon

c) Valency of elements in Group 14 and 15

Group 14: 4

Group 15: 3

d) Noble gas having electronic configuration: 2, 8, 8
Ans) Argon

e) Group whose elements have zero valency.
Ans) Group ~~zero~~ (18)

f) A covalent compound formed by an element in Period 2 and a halogen
Ans) Carbon tetrachloride (CCl_4)

g) Non-metallic element present in Period 3 of Groups 15 and 16
Ans) Group 15: Phosphorus Group 16: Sulphur

h) An electrovalent compound formed by an alkaline earth metal and a halogen
Ans) Magnesium Chloride (MgCl_2)

i) Bridge elements of Period 3 of Group 1, 2 and 3
Ans) Mg , ~~Aluminium~~

j) Alkali metal in Period 3 that dissolves in water giving a strong alkali.
Ans) Sodium (Na)

k) Typical elements of Groups 14 and 15
Ans) Group 14: Silicon Group 15: Phosphorus

l) Alkaline earth metal in Period 3.
Ans) Magnesium (Mg)

3. What is the colour of the flame of sodium potassium?

Ans) sodium's flame: golden yellow, potassium's flame: lilac

4. How many electrons do inert gases have in their valence shells?

Ans) 8

5. Name an element of group 18 which can form compounds.

Ans) xenon

13. a) $H < Li < Na < K < Rb < Cs < Fr$

b) $F > Cl > Br > I > At$

c) $He < Ne < Ar$

d) $Li < Mg < Na$

14. a)

18. a) P will have 1 electron less than Q

b) P will have more tendency to lose an electron

c) P will have higher metallic character than Q

d) $P = P_2O$ and $Q = QO$

e) $P = PCl$, $Q = QCl_2$

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2/19