ARJUNA NEET BATCH

CLASSIFICATION OF ELEMENTS & PERIODICITY IN PROPERTIES DPP-06

E.A.

The correct order of electron affinity is:-

(A) Be < B < C < N ✓
(B) Be < N < B < C
(C) N < Be < C < B ✗
(D) N < C < B < Be ✗

Be, B, C, N → belongs to same period.

In general, Electron affinity increases along a period from left to right in period table.

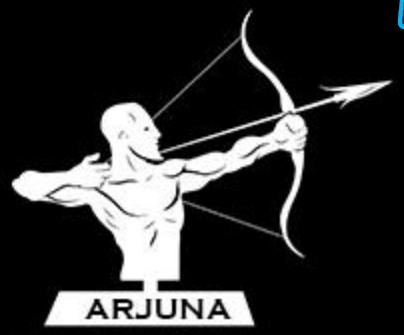
Be $2s^2$ — fully filled s orbital ← extra stable

B $2p^1$

C $2p^2$

N $2p^3$ → highly stable electronic configuration as p orbital is half filled which decreases its tendency to accept an electron ∴ E.A decreases

Be < N < B < C



In the formation of a chloride ion, from an isolated gaseous chlorine atom, 3.8 eV energy is released, which would be equal to:-

(A) Electron affinity of Cl^- ✗
(B) Ionisation potential of Cl ✗
(C) Electronegativity of Cl ✗
(D) Ionisation potential of Cl^- ✓

$Cl_{(g)} \xrightarrow{+e^-} Cl^-_{(g)} + 3.8\,eV$

forward process → Electron affinity of Cl

Backward process → $Cl^-_{(g)} + 3.8\,eV \longrightarrow Cl_{(g)} + e^-$

Ionization potential of Cl^-

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$O(g) + 2e^- \rightarrow O^{2-}(g)$ $\Delta H_{eg} = 603$ KJ/mole. The positive value of ΔH_{eg} is due to:-

(A) Energy is released to add on 1 e^- to O^{-1} ✗

(B) Energy is required to add on 1 e^- to O^{-1}

(C) Energy is needed to add on 1e^- to O ✗ → negative.

(D) None of the above is correct ✓

Ist $\Delta_{eg}H$

$O_{(g)} + e^- \longrightarrow O^-_{(g)}$ → $\Delta_{eg}H$ = Negative

$O^-_{(g)} + e^- \rightarrow O^{2-}$ $\Delta_{eg}H$ = positive.

After addition of 1 electron oxygen acquire -ve charge due to small size of O, inter electronic repulsions takes place and hence addition of 1 extra e^- became difficult and energy is required to overcome the repulsions for addition of e^-.

→ ΔH = positive

↓

endothermic.

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Group 17 elements

The electron affinity values for the halogens shows the following trend:

(A) F < Cl > Br > I

(B) F < Cl < Br < I ✗

(C) F > Cl > Br > I ✗

(D) F < Cl > Br < I ✗

Grp 17, In general, electron affinity decreases down the groups.

F

Cl

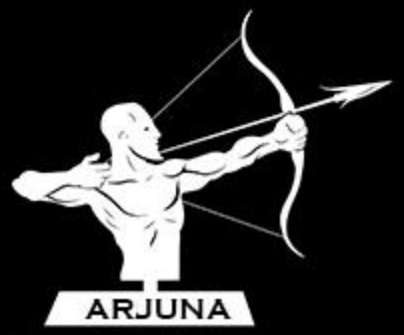
Br

I

but here, E.A of Cl is more than F.

In F, an extra e^- is added to small size 2p orbital due to which inter-electronic repulsions takes place. which decreases its electron affinity.

∴ order of E.A : F < Cl > Br > I



The process requiring the absorption of energy is.

(A) $F \rightarrow F^-$ → released

(B) $Cl \rightarrow Cl^-$ → released

(C) $O \rightarrow O^{2-}$ → required.

(D) $H \rightarrow H^-$ → released

$O_{(g)} + e^- \longrightarrow O^-_{(g)}$ (Energy is released)

$O^-_{(g)} + e^- \longrightarrow O^{2-}$ (energy is required)

→ Due to small size and high inter electronic repulsions energy is required to add one more e^- to O^-.

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Second electron affinity of an element is:

→ electron is added to uninegative ion.

(A) Always exothermic
(B) Endothermic for few elements
(C) Exothermic for few elements
(D) Always endothermic

$E_{(g)} + e^- \longrightarrow E^-_{(g)} \longrightarrow$ Electrons increases but no. of protons remain same and also the area in which e⁻ is to be added remain same, due to which inter-electronic repulsions takes place. So energy is required to overcome these repulsion to add an electron.

$E^-_{(g)}$ ↓ e⁻ (endothermic)

E^{2-}

∴ Process is endothermic

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Process, $Na^+_{(g)} \xrightarrow{I} Na_{(g)} \xrightarrow{II} Na_{(s)}$

(A) In (I) energy released, (II) energy absorbed
(B) In both (I) and (II) energy is absorbed
(C) In both (I) and (II) energy is released
(D) In (I) energy absorbed, (II) energy released

$Na^+_{(g)} + e^- \xrightarrow{I} Na_{(g)} \xrightarrow{II} Na_{(s)}$

Energy is released during addition of electron.

energy is released

less intermolecular spaces.

Energy ↑

S $\underset{\text{released}}{\overset{\text{required}}{\rightleftharpoons}}$ l $\underset{\text{released}}{\overset{\text{required}}{\rightleftharpoons}}$ g

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Which of the following configuration will have least electron affinity.

(A) ns^2np^5 $+1e^- \rightarrow ns^2np^6 \rightarrow$ noble gas configuration

(B) ns^2np^2 $+e^- \rightarrow ns^2np^3 \rightarrow$ stable

(C) ns^2np^3

(D) ns^2np^4

$ns^2np^3 \rightarrow$ half filled p-orbital $\rightarrow$ extra stable

$\downarrow$

its tendency to accept an electron is very less.

$\rightarrow$ maximum E.A.

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Which of the following will have the most negative electron gain enthalpy and which the least negative ?

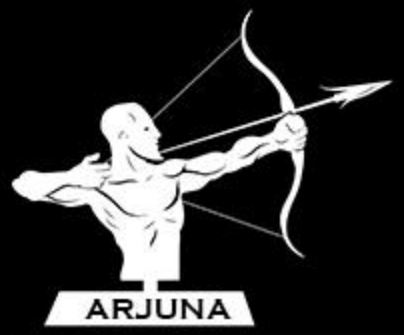
(A) F, Cl ✗
(B) Cl, F ✗
(C) Cl, S ✗
(D) Cl, P

F → $2p^5$, Cl → $3p^5$, S → $3p^4$, P → $3p^3$ → half filled p orbital → extra stable → less tendency to gain e⁻

E.G. enthalpy is least negative.

↳ E.G. enthalpy of chlorine is more negative than F. because in F, e⁻ is added to small size 2p orbital due to inter electronic repulsions takes place which decreases its value of electron gain enthalpy

while in chlorine, e⁻ is added to large size 3p orbital, so less electronic repulsions. ∴ Cl has most negative electron gain enthalpy.



Which arrangement represents the correct order of electron gain enthalpy (with negative sign) of the given atomic species ?

(A) S < O < Cl < F ✗
(B) O < S < F < Cl ✗
(C) Cl < F < S < O ✗
(D) F < Cl < O < S ✗

decreases down the group and increases along a period. But here we have exceptions down the group

O F → F > O
S Cl → Cl > S

$\Delta_{eg}H$ of O and F is less than S and Cl due to small size 2p orbital of O and F in which e^- is added and inter electronic repulsion takes place.

∴ order of $\Delta_{eg}H$: Cl > F > S > O

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Thank You