

Electron affinity

1. (d) Atomic size and nuclear charge both

Factors affecting EA:

Atomic size: Smaller atoms \rightarrow added electron closer to nucleus \rightarrow more energy released \rightarrow higher EA

Nuclear charge (Z): Higher $Z \rightarrow$ stronger attraction \rightarrow higher EA

(c) Al < N < O < Cl
Actually EA trend (most negative = highest EA)

N
$$\rightarrow$$
 -7 (small), Al \rightarrow -42, O \rightarrow -141, Cl \rightarrow -349

- 3. (c) $\frac{O}{140.9} > \frac{C}{122.3} > \frac{B}{83} > \frac{N}{0}$ Value of electron affinity increases on going from left to right in periods but the value of electron affinity of Vth A elements is less than that of IVth A element, this is due to half filled p-orbitals presence.
- 4. (d) Halogens have maximum electron affinity due to their smaller size.
- **5.** (a) Zero, because of the stable electronic configuration the noble gases do not show any force of attraction towards the incoming electron.
- 6. (a) Weaker electron-electron repulsion in Cl

Normally, EA increases up a group, but here CI > F.

Reason: Fluorine is very small, so the added electron experiences strong electron–electron repulsion in the compact 2p orbital \rightarrow energy released is slightly less.

CI has larger size \rightarrow weaker repulsion \rightarrow higher EA.





- 7. (b) The electron affinity of fluorine is greater than that of chlorine
 - (a) **IP of N > O** True (half-filled stability of N's 2p³ makes IE higher)
 - (b) **EA of F > CI** False (as given, CI = 349 > F = 322 kJ/mol)
 - (c) **IP of Be > B** True (Be $2s^2$ vs B $2s^22p^1 \rightarrow p$ -electron easier to remove)
 - (d) Electronegativity of F > CI True
- **8.** (b) Energy released when an electron is added to an isolated atom in gaseous state.
- 9. (a) Electron affinity value of CI is greater the F and then decreases down the group.
- 10. (b) Electron affinity increases across the period.
- 11. (c) Nitrogen

Approximate EA values (kJ/mol):

$$B \rightarrow 27$$

$$C \rightarrow 122$$

$$N \rightarrow -7$$

$$O \rightarrow -141$$

Observation: Nitrogen has lowest (even slightly negative) EA due to half-filled 2p³ configuration → added electron experiences repulsion.

12. (a) Smaller radius of fluorine, high density

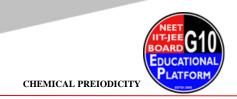
EA of halogens:
$$F = 322$$
, $CI = 349$ kJ/mol

Reason: F is very small \rightarrow added electron in compact 2p orbital experiences strong electron–electron repulsion \rightarrow less energy released CI has larger radius \rightarrow weaker repulsion \rightarrow higher EA

- 13. (c) Electron affinity of chorine is maximum.
- **14.** (b) The formation of ionic bond depends upon easy formation of cation and anion. therefore the ionisation energy value of the metal atom should be low, so that it



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can easily form cation. on the other hand, the electron affinity value of the non-metal atom should be high so that it can easily form anion.

- **15.** (a) Because it can easily accept an e^- .
- 16. (d) Bromine is less than chlorine

Carbon vs Oxygen: EA(C) ≈ 122 kJ/mol, EA(O) ≈ 141 kJ/mol → Carbon < Oxygen

Sulphur vs Oxygen: EA(S) ≈ 200 kJ/mol, EA(O) ≈ 141 kJ/mol → Sulphur >

Oxygen

lodine vs Bromine: EA(I) ≈ 295 kJ/mol, EA(Br) ≈ 324 kJ/mol → lodine <

Bromine

Bromine vs Chlorine: EA(Br) ≈ 324 kJ/mol, EA(Cl) ≈ 349 kJ/mol → Bromine <

Chlorine

17. (b) Electron affinity

Energy released when an extra electron is added to the outermost orbital of a gaseous atom is called electron affinity (EA)

- **18.** (a) Halogens have the highest e^- affinity.
- 19. (b) In IB group all elements are metals.
- 20. (c) Nitrogen atom has half filled p-orbital

General trend: Electron affinity (EA) **increases across a period**, but there are exceptions.

Nitrogen (1s² 2s² 2p³) \rightarrow half-filled p-orbitals are stable \rightarrow less tendency to accept an extra electron \rightarrow lower EA than Carbon.

21. (a) Nitrogen

Approximate EA values (kJ/mol):





$$N \rightarrow -7$$
, $C \rightarrow 122$, $O \rightarrow 141$, $S \rightarrow 200$

Observation: Nitrogen has the lowest EA due to half-filled stability.

- **22.** (b) Flourine although have highest electronegativity due to its very small size, effective inter electronic repulsions are observed which brings down its electron affinity.
- **23.** (d) The bond dissociation energy of F-F bond is very low. The weak F-F bond makes fluorine the strongest oxidising halogen.
- **24.** (c) Atomic radius increase from top to bottom in a group while decrease from left to right in a period on the other hand electron affinity shows severe trends i.e. decrease from top to bottom in a group and increase from left to right in a period.
- **25.** (d) It is a fact.
- **26.** (a) Electron affinity of Cl is greater than fluorine so the order are as F < Cl > Br > I
- 27. (b) Halogens have very high electron affinity. It may be rated that the electron affinity of fluorine is unexpectedly low (< Cl). This may perhaps be due to small size of F atom. The value of electron gain enthalpies for Cl, F, S and O are respectively 349, 333, 200 & 142 KJ / mol hence correct order is Cl > F > S > O

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