Electron affinity

1. (d) Atomic size and nuclear charge both

Factors affecting EA:

Atomic size: Smaller atoms → added electron closer to nucleus → more energy released → higher EA
Nuclear charge (Z): Higher Z → stronger attraction → higher EA

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

N → –7 (small), Al → –42, O → –141, Cl → –349

3. (c) $\underset{140.9}{O} > \underset{122.3}{C} > \underset{83}{B} > \underset{0}{N}$ Value of electron affinity increases on going from left to right in periods but the value of electron affinity of V^{th} A elements is less than that of IV^{th} 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 **Cl > F**.

Reason: **Fluorine is very small**, so the added electron experiences **strong electron–electron repulsion** in the compact 2p orbital → energy released is slightly less.
Cl has larger size → weaker repulsion → 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 $2p^3$ makes IE higher)

(b) **EA of F > Cl** False (as given, Cl = 349 > F = 322 kJ/mol)

(c) **IP of Be > B** True (Be $2s^2$ vs B $2s^22p^1$ → p-electron easier to remove)

(d) **Electronegativity of F > Cl** True

8. (b) Energy released when an electron is added to an isolated atom in gaseous state.

9. (a) Electron affinity value of Cl 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 → 27
C → 122
N → –7
O → –141

Observation: Nitrogen has **lowest (even slightly negative) EA** due to **half-filled $2p^3$ configuration** → added electron experiences repulsion.

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

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

Reason: F is very small → added electron in compact 2p orbital experiences **strong electron–electron repulsion** → less energy released
Cl has larger radius → weaker repulsion → 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

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**
Iodine vs Bromine: EA(I) ≈ 295 kJ/mol, EA(Br) ≈ 324 kJ/mol → **Iodine < 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 ($1s^2\ 2s^2\ 2p^3$) → half-filled p-orbitals are stable → **less tendency to accept an extra electron** → lower EA than Carbon.

21. **(a) Nitrogen**

Approximate EA values (kJ/mol):

N → –7, C → 122, O → 141, S → 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 $Cl > F > S > O$