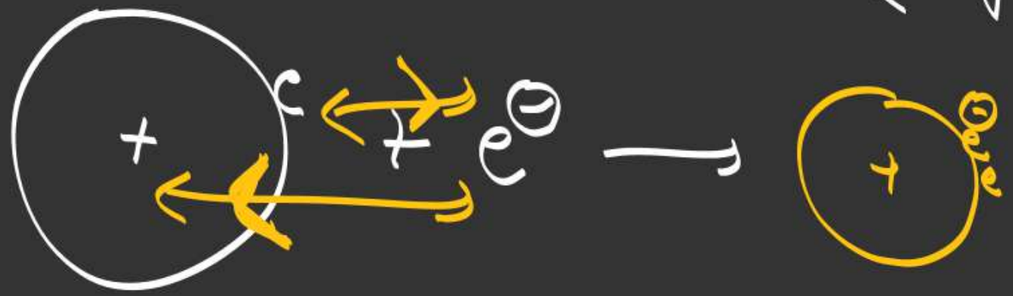
Electron gain enthalpy ΔH_{eg} / E.A.

amount of released energy When one e^- is added in to isolated gaseous atom.

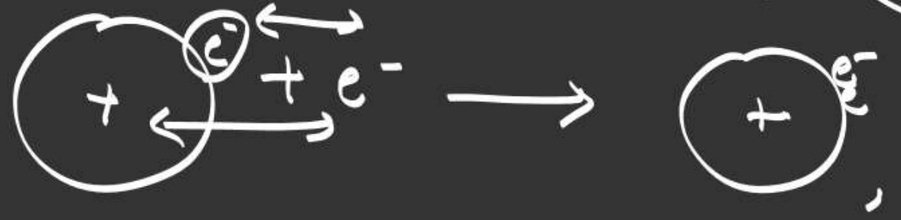
$$X + e^- \longrightarrow X^{\ominus}, \quad (\Delta H_{eg} = -ive)$$



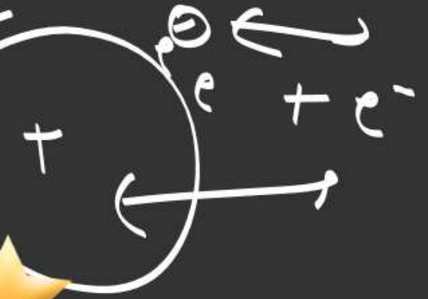
Nishant Jindal

ΔH_{eg} / E.A

$X_{(g)} + e^- \longrightarrow X^{\ominus}_{(g)}$ (ΔH_{eg} = -ive)



$X^{\ominus} + e^- \longrightarrow \underline{X^{-2}}$ ΔH_{eg_2} = +ive

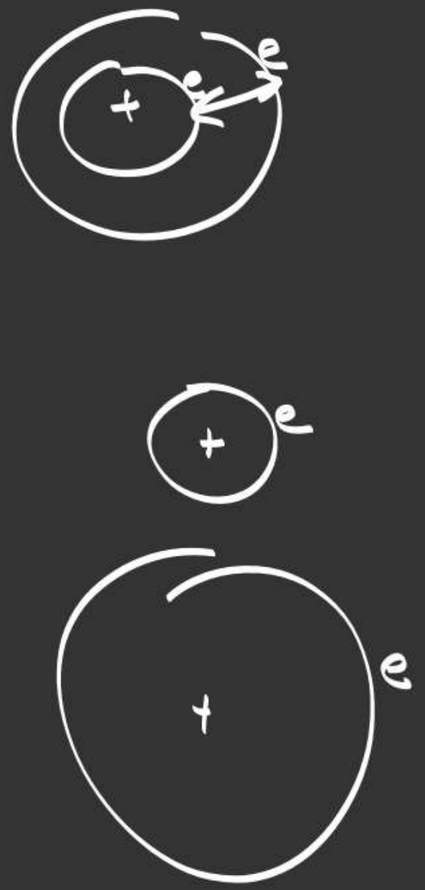


$$|\Delta H_{eg_2}| > |\Delta H_{eg_1}|$$

$$\Delta H_{eg_2} + \Delta H_{eg_1} > 0$$

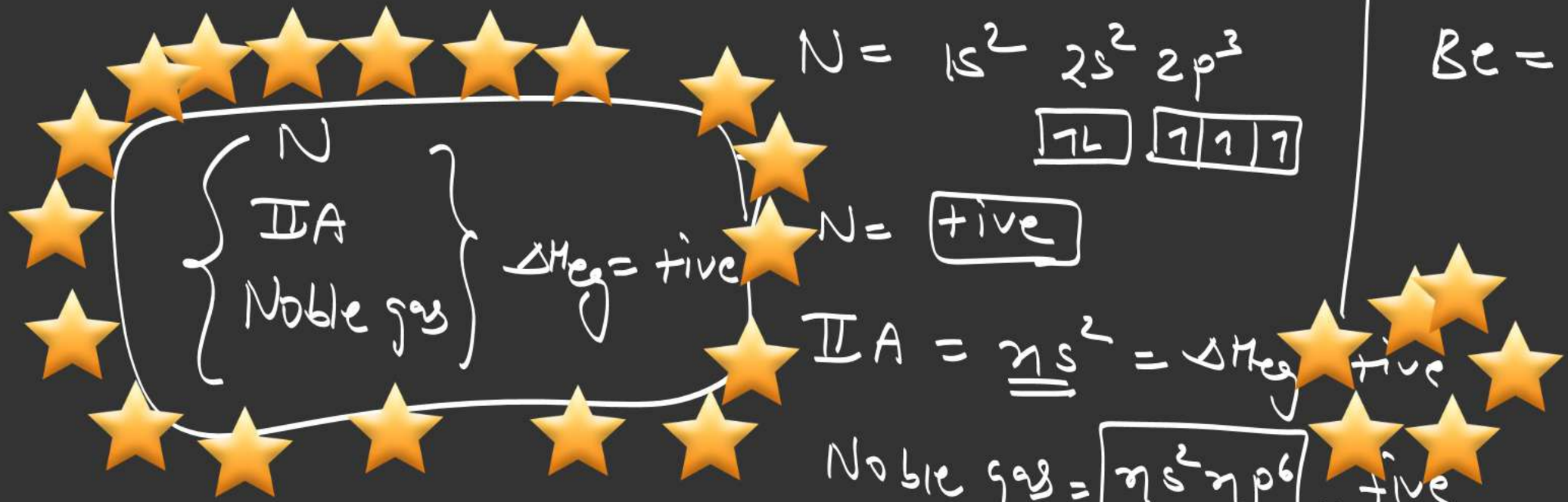
Nishant Jindal

factors affecting ΔH_{eg}



1. $Z \uparrow \Rightarrow \Delta H_{eg} \uparrow$
2. $Z_{eff} \uparrow \Rightarrow \Delta H_{eg} \uparrow$
3. η (shield) $\uparrow \Rightarrow \Delta H_{eg} \downarrow$
4. $r \uparrow \Rightarrow \Delta H_{eg} \downarrow$

Nishant Jindal



$N = 1s^2\ 2s^2\ 2p^3$

N = +ive

IIA = ns^2 = ΔHeg +ive

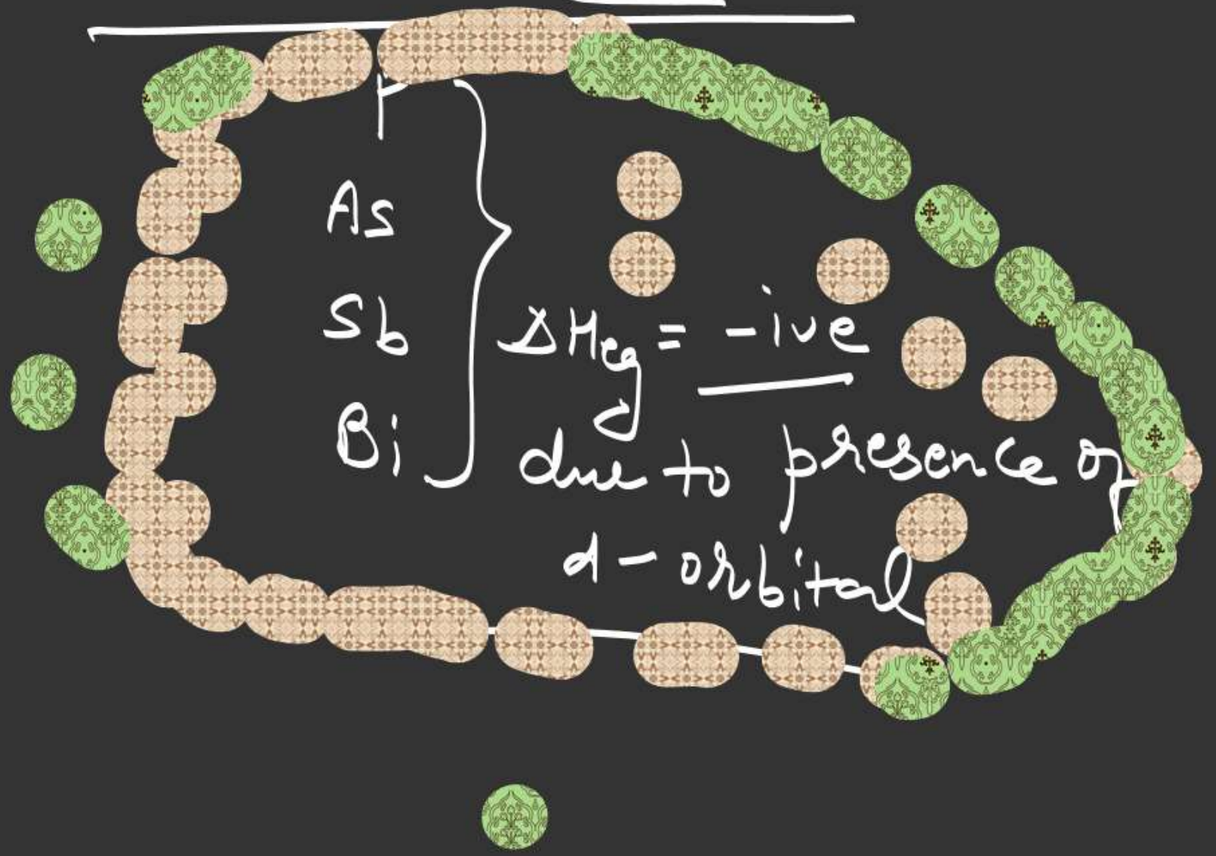
Noble gas = ns^2np^6 = +ive

$Be = 1s^2\ 2s^2$ (2p)

Nishant Jindal

$N = \frac{\Delta H_{eg}}{+ive}$

$P = 1s^2 2s^2 2p^6 3s^2 3p^3$ 3d



Nishant Jindal

$N = 2s^2\ 2p^3$

$P = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$ 3d

Nishant Jindal

Trends in ΔHeg

L ⟶ R In periodic table

Z_{eff} ↑ ΔHeg ↑

order of ΔHeg

B C N O

and

ΔHeg = +ive

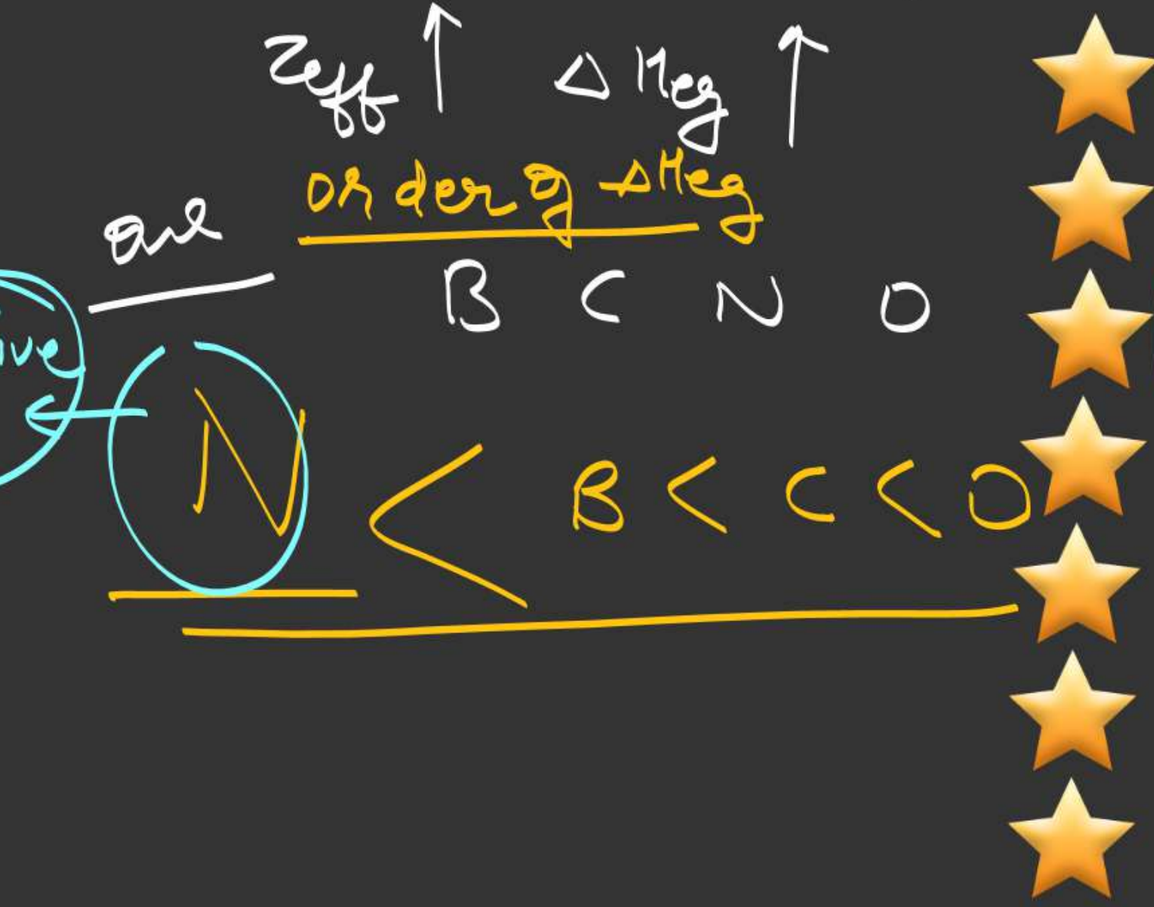
N

B < C < O

order of ΔHeg

Al $3p^1$ Si $3p^2$ P $3p^3$ S

Al < P < Si < S



as down the group

order ∆Neg

S > Se > Te > Po > O ★

2nd period = B C N O F

3rd period = Al Si P S Cl

2nd period < 3rd period

as

order of ∆Neg

F Cl Br I

★ Cl > F > Br > I

$F \xrightarrow{+e^-} F^{\ominus}$ ΔH_{eg} of F

$F^{\ominus} \longrightarrow F + e^-$ I.E of $F^{\ominus}$

$|\Delta H_{eg} \text{ of } F| = |\text{I.E of } F^{\ominus}|$

$Cl \xrightarrow{+e^-} Cl^{\ominus}$ ΔH_{eg} of Cl

$Cl^{\ominus} \longrightarrow Cl + \text{I.E of } Cl^-$

$|\Delta H_{eg} \text{ of } Cl| = |\text{I.E of } Cl^-|$

I.E

$F > F^{\ominus}$

$\frac{e}{p} = \frac{9}{9}$ $\quad \frac{10}{9}$

$C_1 > C_1^{\ominus}$

$\frac{17}{17}$ $\quad \frac{18}{17}$

$F^{\ominus}$ $\quad C_1^{\ominus}$

---

order of I.E

$F \quad C_1 \quad C_1^{-} \quad F^{\ominus}$

$\star$ $F > C_1 > C_1^{\ominus} > F^{\ominus}$

$$A + B \longrightarrow C + D, \quad \Delta H = -ive$$

$$C + D \longrightarrow A + B \quad \Delta H = +ive$$

Que

$$X + e^{\ominus} \longrightarrow X^{\ominus}, \quad \Delta H_{eg} = -ive$$

$$X^{\ominus} \longrightarrow X + e^{-} \quad \Delta H_{eg} = +ive$$

$Na \longrightarrow Na^+ + e^-$ $\quad \Delta H = +ive$

$Na^+ + e^- \longrightarrow Na$, $\quad \Delta H = -ive$

★ ΔH = +ive, endothermic

ΔH = -ive exothermic

Nishant Jindal

Que Which of the following reaction is endothermic

(a) $K \longrightarrow K^+ + e^-$

(b) $N + e^- \longrightarrow N^{\ominus}$

(c) $O + 2e^- \longrightarrow O^{-2}$

(d) all of these

ΔH_{eg} of N = +ive

$O + e^- \longrightarrow O^-$, ΔH_{eg} = -ive

$O^{\ominus} + e^- \longrightarrow O^{-2}$, ΔH_{eg} = +ive

Que Which of the following ion is least stable

IIA = ΔH_{eg} +ive

Be = +ive

(1) B^-

(2) Be^-

(3) C^-

(4) O^-

Application

① $\Delta H_{eg} \uparrow$ non metallic ch. $\uparrow$

$X + e^- \longrightarrow X^{\ominus}$

Periodic table non metallic ch. $\uparrow$

$L \longrightarrow R$

down the group $\Delta H_{eg} \downarrow$ non met. ch. $\downarrow$

② $X + e^- \longrightarrow X^{\ominus}$ (Reduction)

(Oxidising agent)

$\Delta H_{eg} \uparrow$ Oxidising power $\uparrow$

Ques F_2 Cl_2 Br_2 I_2

$F_2 > Cl_2 > Br_2 > I_2$

Nishant Jindal

down the group

B C N O F
↑ ↑ ↑ ↑ ↑
Al Si P S Cl

S > Se > Te > Po > O

Cl > F > Br > I

Nishant Jindal

$\Rightarrow \Delta H_{eg} =$ +ive

Note ⇒ We can not compare ΔH_{eg_1} and ΔH_{eg_2}

However

$$|\Delta H_{eg_2}| > |\Delta H_{eg_1}|$$

$$\Delta H_{eg_2} + \Delta H_{eg_1} > 0$$