

DIPOLE MOMENT

It is a measure of unsymmetrical distribution of charge

In other words, it is the measure of overall polarity of a molecule.

⊗ $\vec{\mu} = q \times d$

Debye
col-m
esu-cm

$\downarrow$
esu/col.

$\downarrow$
cm/m

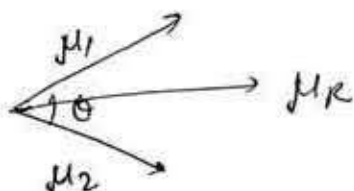
Units

$$1D = 10^{-18} \text{ esu cm}$$

$$1e = 1.6 \times 10^{-19} \text{ col}$$

$$1e = 4.8 \times 10^{-10} \text{ esu}$$

* $1D = 3.3 \times 10^{-30} \frac{\text{col-m}}{\text{esu}}$



⊗ $\therefore \mu_R = \sqrt{\mu_1^2 + \mu_2^2 + 2\mu_1\mu_2 \cos \theta}$

$\theta \uparrow \cos \theta \downarrow \mu_R \downarrow$

Q) For a molecule H-X . Dipole moment is 1.2 D and the bond distance is 1 Å .

what fraction of electronic charge appears on each atom

i) 0.75

ii) 0.5

~~iii~~ 0.25

iv) 0.125

$$\mu = q \times d$$

$$1.2 \times 3.3 \times 10^{-30} = q \times 10^{-10}$$

Comparison of D.M. ionic > covalent

Q) Compare the D.M of following molecules

- ΔEN dominant
- i) $HF > HCl > HBr > HI$
 - ii) NH_3, PH_3, AsH_3
 - iii) H_2O, H_2S, H_2Se
 - iv) HF, H_2O, NH_3
 - v) $CH_3F, CH_3Cl, CH_3Br, CH_3I$

MRT

* vi) $CH_3Cl > CH_2Cl_2 > CHCl_3 > CCl_4 (0)$

It can't be solved by vector theory as it gives incorrect result and is explained by wave theory

vii) H_2O, KBr, NH_3 EN

viii) $NH_3 > NF_3$

ix) $NF_3 < PF_3$ more ΔEN and d.

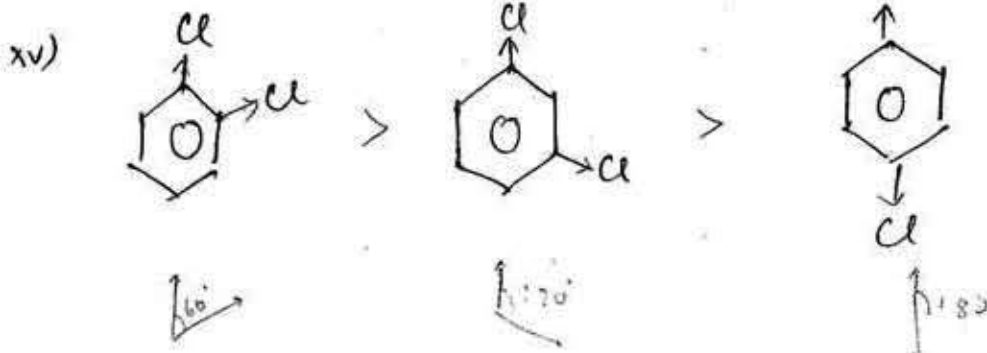
x) $CO_2 < SO_2$ $O=C=O \mu=0 < \mu \neq 0$

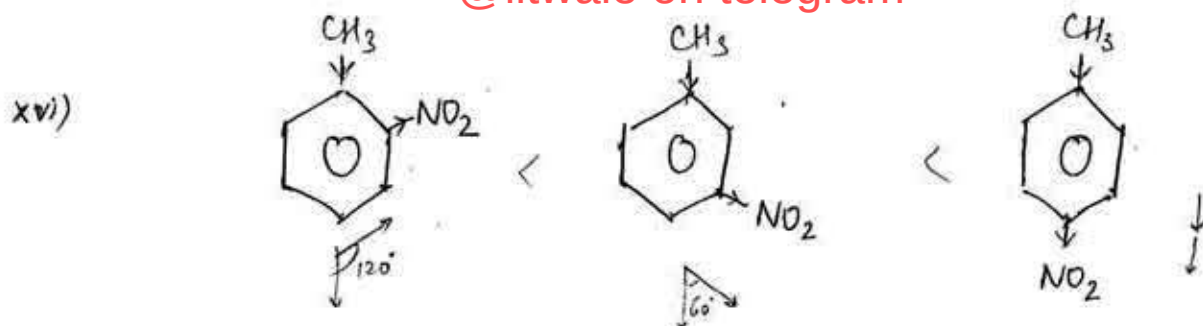
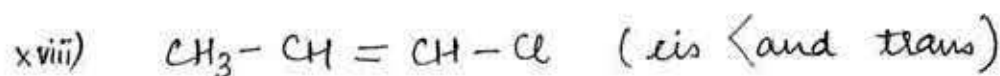
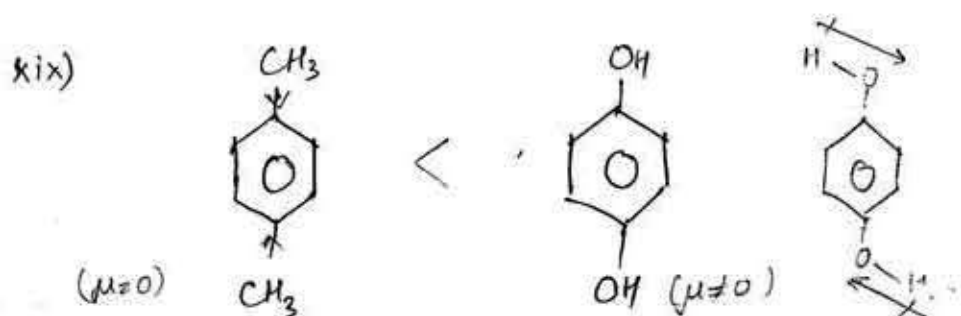
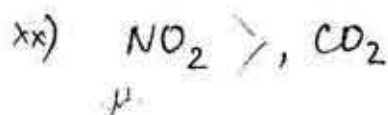
xi) $NO_2^- > NO_3^-$ $O=N-O \mu \neq 0 > \mu=0$ AB_2L_1 AB_3L_2

xii) $BF_3 < ClF_3$ $AB_2L_0 < \mu \neq 0 AB_3L_2$

* xiii) $PCl_3F_2 < PF_3Cl_2$ (Bent rule)

***xiv) $R_3NO > R_3PO$ (Back bonding) Resonance





* * For the hydrides of group 15, 16 and 17
 ΔEN factor is dominant.

* * In methyl halides ΔEN factor is dominant
 but CH_3F is exception

* When both the groups are similar,
 then μ is ortho > meta > para.

When the groups are of opp nature,
 then μ is para > meta > ortho

Inert pair effect

In the p-block elements, it is observed that, the lower O.S. becomes increasingly stable down the group.

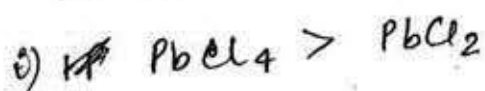
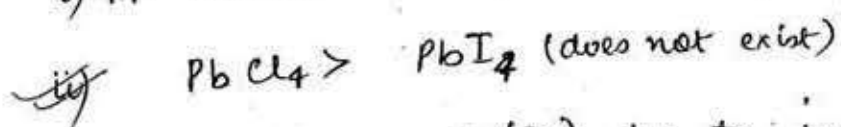
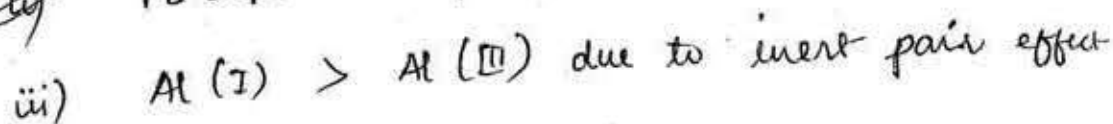
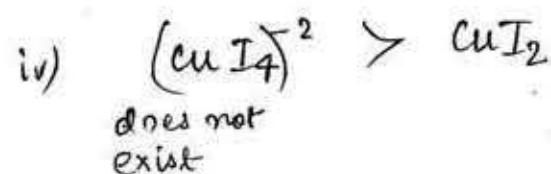
This indicates the reluctancy (less tendency) of ~~s~~ s e⁻ pair to take part in chemical reaction down the group. This is called inert pair effect.

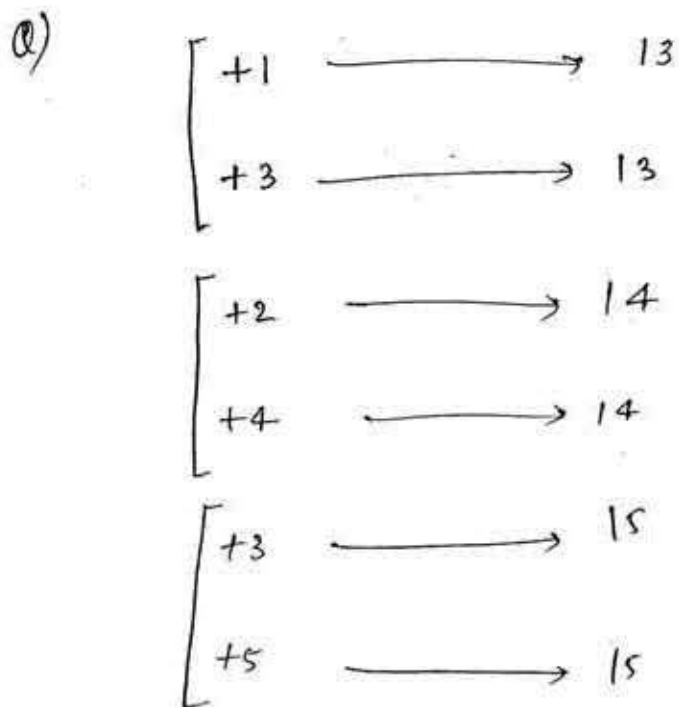
Reasons :

- i) Increasing nuclear charge down the group.
- ii) Poor shielding of inner e⁻.
- iii) ~~B.E~~ Bond enthalpy ↓ down the group.

* It is a thermodynamic effect, not a kinetic effect.

Q) which of the following stability order is correct.





Q) Which of the following compounds have oxidising / reducing behaviour :

i) HI Reducing (R)

ii) Tl^+ X neither oxidising nor reducing

iii) Tl^{+3} Oxidation (O)

iv) PbO_2 O

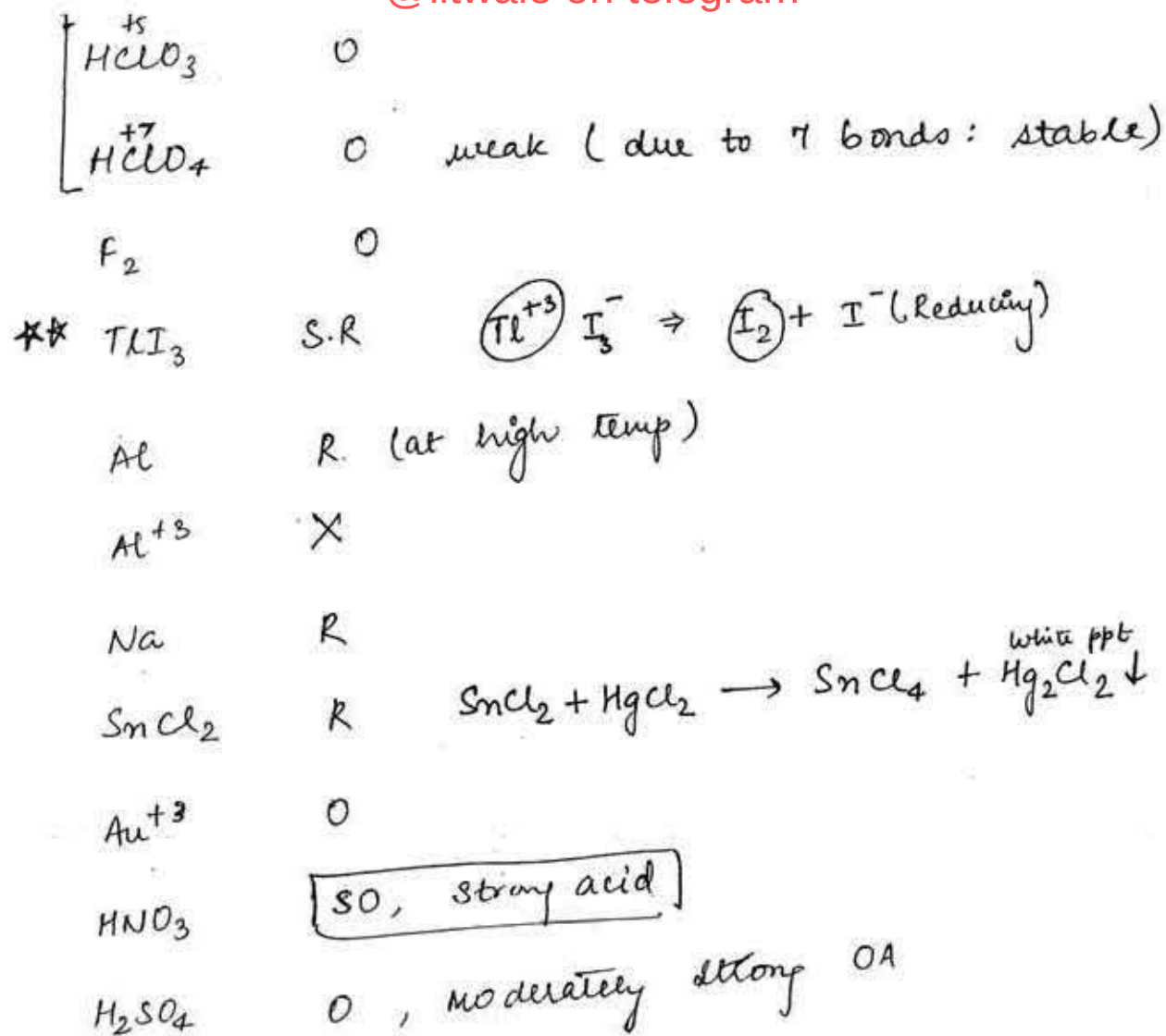
v) Pb_3O_4 O $[PbO_2 \cdot 2PbO]$ } mixed

vi) Pb_2O_3 O $[PbO_2 \cdot PbO]$

vii) PbO X

viii) HO^+Cl O Strong

ix) $HClO_2^{+3}$ O



Thermite welding:

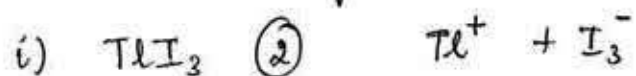
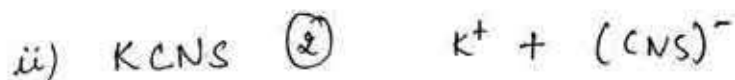
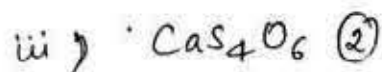


Al is a good R.A but at ~~elevated~~ ^{high} Temp.
 It can reduce ferric oxide and produce
 high amount of high which can be used
 for welding (Thermite reaction)

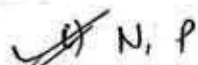
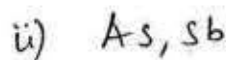
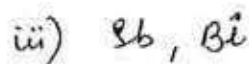
> All reactive metals produces H_2



Q) Which of the following compⁿ will contain max. no. of ions



Q) Which of the following elements in their +3 states have least stability towards disproportionation
does not take place



Bi^{+3} is stable towards disproportion

* The lower elements are more stable in the +3 states (group 15) and that's why they have lesser tendency to disproportionate.