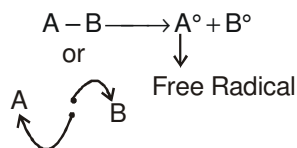
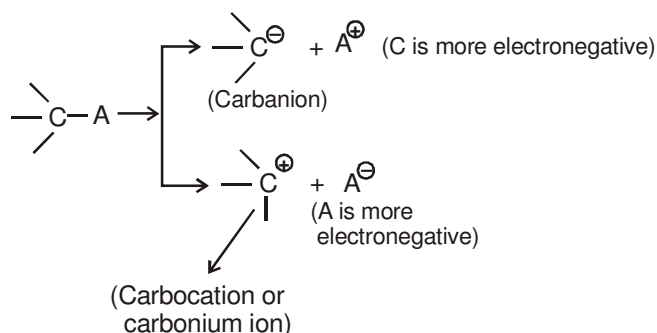


HOMOLYTIC BOND FISSION HOMOLYSIS

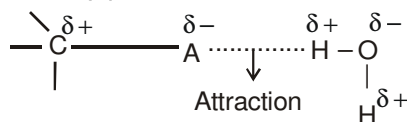
The bond cleavage in which each bonded atom gets their own contribution



- Cleavage takes place due to HELP (H = Heat, E = Electricity, L = light, P = Peroxide)
- Favoured when E.N. difference is less or zero.
- Cleavage favoured in non polar solvent.

HETEROLYTIC BOND FISSION

- It is formed when the electronegativity difference between the bonded atom is more
- formation is favoured by polar solvent



+ve charge of the solvent attracts the -ve pole of compound and the -ve pole of the solvent attracts +ve pole of compound and the bond breaks.

INTERMEDIATES OF ORGANIC COMPOUNDS

	Free Radical	Carbocation	Carbanion
(1) Lone pair	0	0	1
(2) Bond pair	3	3	3
(3) Unpaired e ⁻	1	x	x
(4) Bond Angle	120°	120°	107°
(5) Hybridisation	sp ²	sp ²	sp ³
(6) Shape	Trigonal planer	Trigonal planer	Pyramidal
(7) Magnetic property	Para magnetic	Diamagnetic	Dia magnetic)
(8) Stability order (As per inductive effect)	3° > 2° > 1°	3° > 2° > 1°	1° > 2° > 3°
(9) e ⁻ rich/deficient/poor	ED(Deficient)	ED	ER(Rich)
(10) Reactivity order	1° > 2° > 3°	1° > 2° > 3°	3° > 2° > 1°
(11) +I/-I (stabilized)	+I	+I	-I

ELECTRONIC DISPLACEMENT EFFECT

The displacement of electrons within the same molecule is known as electronic displacement. These effects affect the stability of a species or compound and it also affects the acidic & basic strength.

Electronic Displacement Effect is divided into two parts:-**(1) Permanent effect****(2) Temporary effect****(1) Permanent effect**

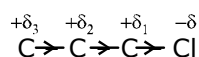
- (i) Inductive effect
- (ii) Mesomeric (resonance) effect
- (iii) Hyperconjugation

(2) Temporary effect:

- (i) Electromeric effect
- (ii) Inductomeric effect

(i) Inductive effect:

It is an effect in which permanent polarisation arises due to partial displacement of σ -electrons along carbon chain or partial displacement of sigma-bonded electron toward more electronegative atom in carbon chain.



Magnitude of partial positive charge

$$^{+\delta_1} > ^{+\delta_2} > ^{+\delta_3} = \delta^- \quad (\text{net charge remains constant in a molecule having inductive effect})$$

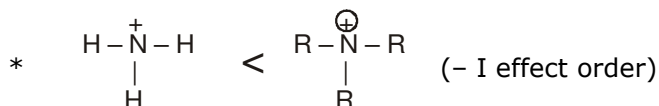
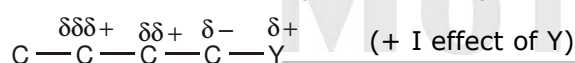
Inductive effect

It is a permanent effect



(After carbon No. 3 the effect disappears)

(-I effect of X)



- It is a permanent effect
- It is caused due to electronegative difference.
- It operates via σ bonded electron.
- It is distance dependent effect.

As distance increases, its effect decreases.

- It can be neglected after third carbon.
- It is a destabilising effect.
- It is divided into 2 parts. (On the basis of electronegativity w.r.t. hydrogen atom)
 - (1) +I effect
 - (2) - I effect

If any atom or group having electronegativity greater than that of hydrogen, then it is considered as - I effect and vice-versa.

+I effect

- I effect

- | | |
|--|--|
| (i) e ⁻ releasing group | (i) e ⁻ accepting group |
| (ii) EN less than H | (ii) EN greater than H |
| (iii) Those group which are showing + I effect, disperses partial - ve charge on the C-chain | (iii) Those group showing -I effect disperses + ve charge on the C-chain |

Eg. $\text{CH}_3 - \text{CH}_2 - \text{Cl}$ (-I of Cl)

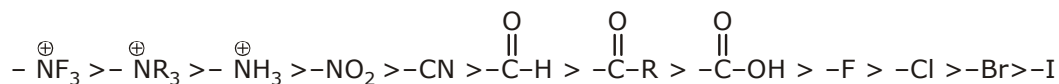
Eg. $\text{CH}_3 - \text{CH} = \text{CH}_2$ (-I of $-\text{CH}=\text{CH}_2$ & +I of $-\text{CH}_3$)

Eg. $\text{CH}_3 - \text{CH}_2 - \text{C} \equiv \text{CH}$ (-I of $-\text{C} \equiv \text{CH}$ & + I of $-\text{CH}_2-\text{CH}_3$)

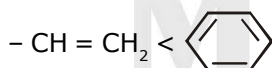
Eg. $\text{I} - \text{Cl}$
+I -I

Eg. $\text{CH}_2 = \text{CH} - \text{C}_6\text{H}_5$ (-I of -ph)

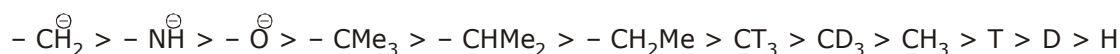
Order of -I effect showing group:



(-I order) $-\text{C} \equiv \text{CH} > -\text{CH} = \text{CH}_2$



Order of + I effect showing group



Bond Strength : $\text{CT}_3 > \text{CD}_3 > \text{CH}_3$ (+ I of $\text{T} > \text{D} > \text{H}$)

Q. Why carbon - hydrogen bond is longer than C - T bond

Ans. As the mass increases, vibration decreases as a result of which the heavier isotope will be more closer to the C-atom for a longer time. Therefore C - T bond is stronger $\text{C} - \text{T} > \text{C} - \text{D} > \text{C} - \text{H}$ Which implies that C - H bond has longest bond

APPLICATION OF INDUCTIVE EFFECT

To compare the stability of intermediates.

Intermediates

These are real reparable species having measurable stability formed during conversion of reactant to product. (After bond cleavage and before bond formation).

6 types of intermediates:

- (i) Free radical (ii) Carbocation (iii) Carbanion
(iv) Carbene (v) Nitrene (vi) Benzyne

They are formed by homolytical and heterolytical cleavage.

MESOMERIC EFFECT (RESONANCE EFFECT)

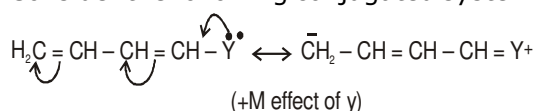
Mesomeric effect is valid only for conjugated system.

Types

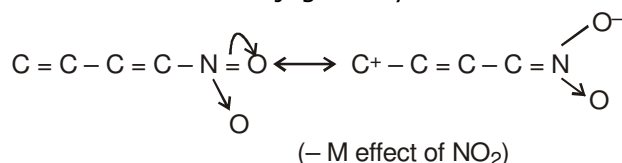
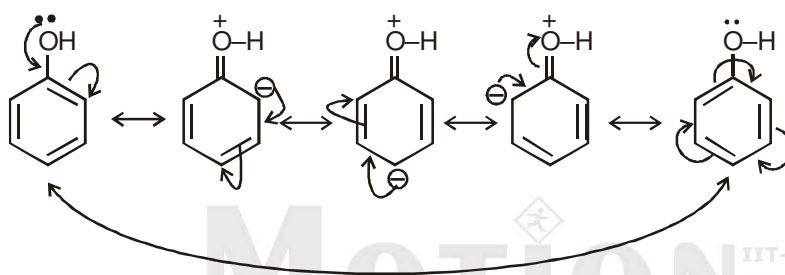
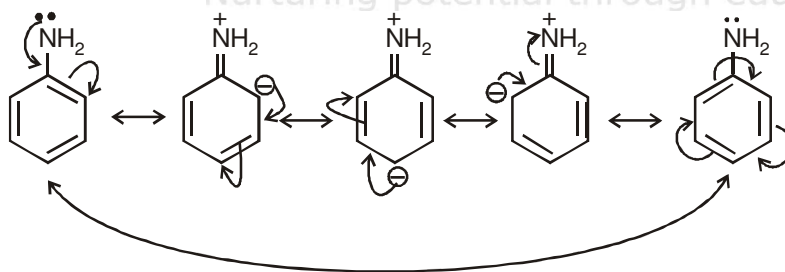
1 + M effect (+R)

2 - M Effect (-R)

- * Consider the following conjugated system



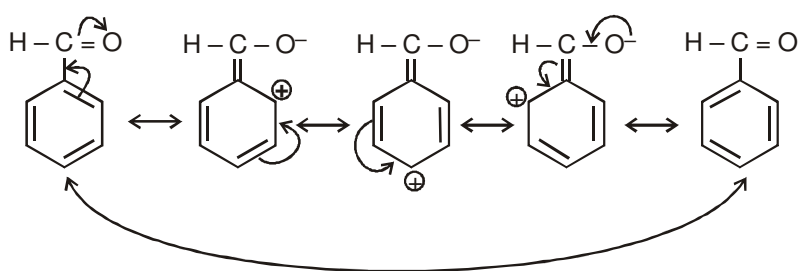
- * Consider another conjugated system

**MESOMERIC EFFECT IN PHENOL (+ M EFFECT)****+M effect in aniline**

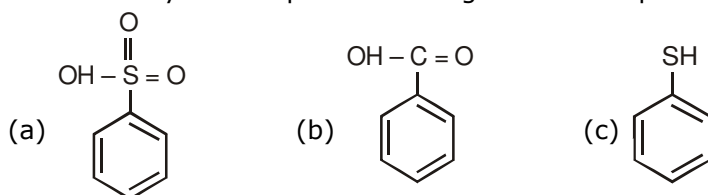
if more of e⁻ towards ring ⇒ (+M effect)

⇒ This effect increases the electron density over benzene ring.

- * -M effect in Benzaldehyde



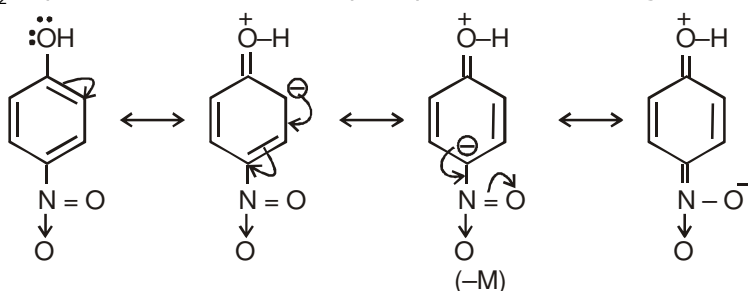
Ex.23 Identify the compound showing +M or -M separately



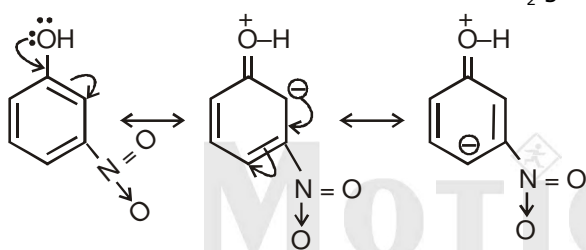
Sol. (a) (-M) (b) (-M) (c) +M

* +M group increases electron density of ring while -M decreases the electron density of benzene ring.

* if NO_2 is present on the ortho or para position then along with its -I effect, It will also show -M effect.



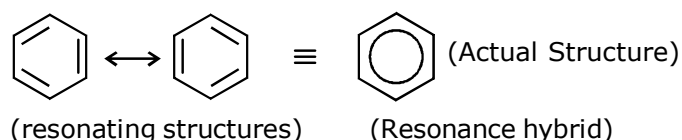
* Above compound have +M of -OH and -M of NO_2 group.

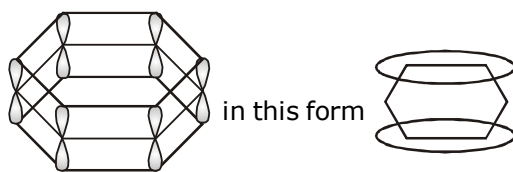


as we can easily see that $-\text{NO}_2$ at meta position is not attracting e^- density towards it self and that's why it will not show -M effect at m-position

RESONANCE

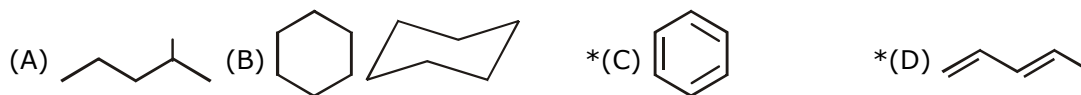
Delocalisation of π -electrons in conjugation is known as resonance.



**CONDITION FOR SHOWING RESONANCE**

1. Molecule should be planer, nearly planer or a part of it is planar

Q.1 Which are planer



Because they are sp^2 hybridised.

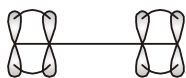
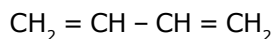
Q.2 Molecule should posses conjugated system.

Conjugated system:-

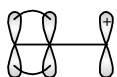
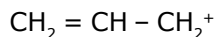
Continous unhybridised p-orbital parallel to each-other.

Types of conjugated system:-

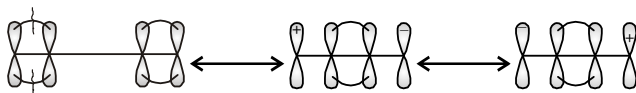
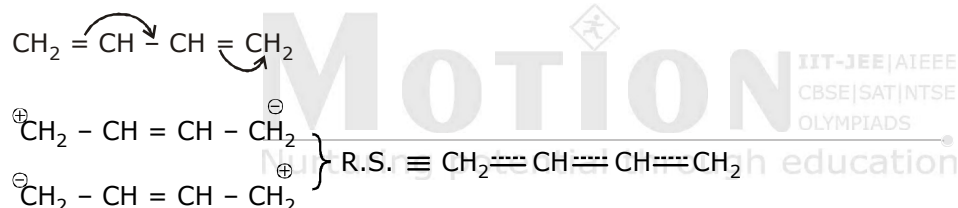
(1) π -bond alternate to π -bond



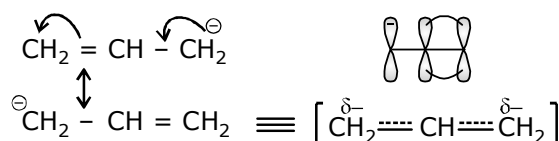
(2) π -bond alternate to + charge

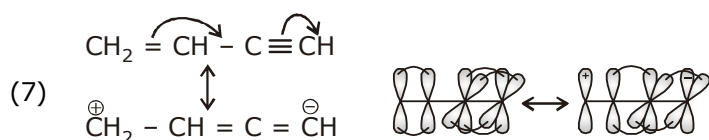
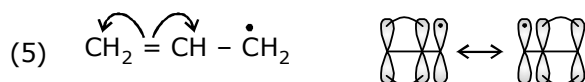
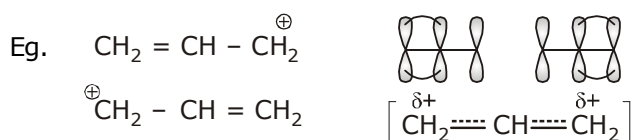


Eg.

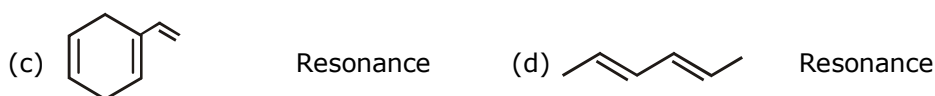
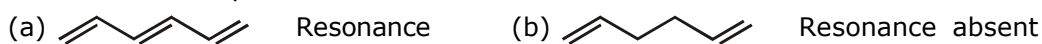


Eg.

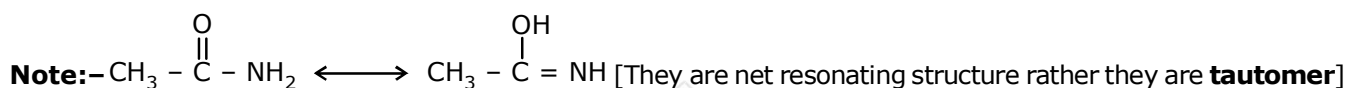




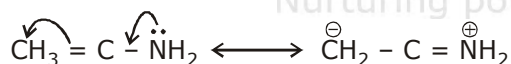
(2) Resonance takes place due to delocalization of πe^- .



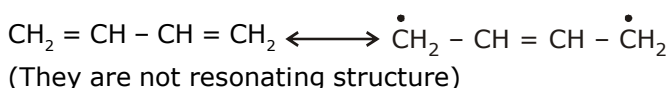
(3) Position of the atoms remains the same, only delocalization of πe^- takes place.



(4) Bond pair get converted into lone pair and l.p. get converted into b.p.



(5) In Resonance No. of unpaired e^- remains the same



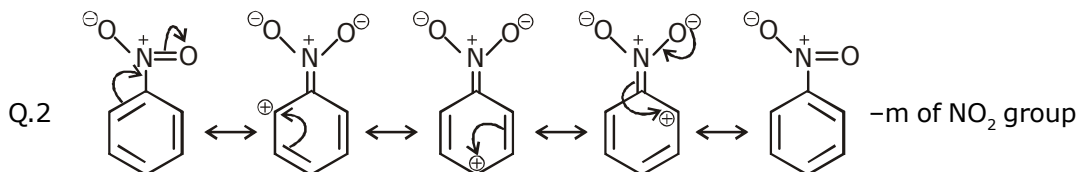
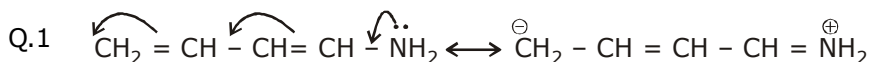
Resonating structure :

(1) Hypothetical structure exist on paper

(2) The energy difference b/w different resonating structure is very small.

- (3) All R. S. contribute towards the formation of resonance hybrid (Their contribution may be different)
- (4) A single R. S. Can't explain each & every property of that particular compound

Draw the resonating structures : -



Resonance hybrid : -

It is a real structure which explain all the properties of a compound, formed by the contribution of different R. S. It has got maximum stability as compared R. S.

Resonance Energy : -

It is the difference b/w theoretical value of H.O.H & experimental value.

Or

It is the difference b/w more stable R.S. & R. H.

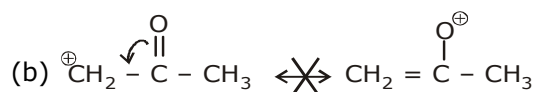
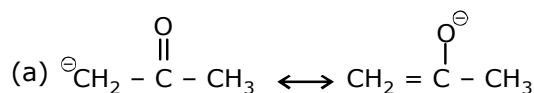
- * More the resonance energy, more stable will be the molecule.
- * Cyclohexane is thermodynamically more stable than benzene, even though resonance energy of benzene is more.
- * Resonance energy is an absolute term.

CONTRIBUTION OF DIFFERENT R. S. TOWARDS RESONANCE HYBRID

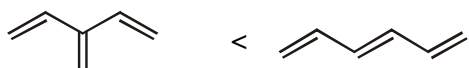
- (1) Non-polar R. S. contribute more than polar R. S.
 - (a) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$ (b) $^+\text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2^-$ (c) $^-\text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2^+$
 - $a > b = c$ stability
- (2) Polar R. S. With complete octet will contribute more as compared with the one with incomplete octet

$$\text{CH}_3 - \text{CH}^+ - \text{OCH}_3 \longleftrightarrow \text{CH}_3 - \text{CH} = \text{O}^+ - \text{CH}_3$$

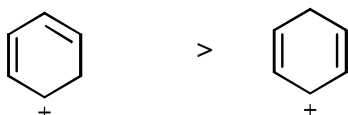
Incomplete octet Complete octet
- (3) In polar R. S. The -ve charge should be on more electro - ve atom & +ve charge should be on more electro + ve atom



- (4) Compound with more covalent bond will contribute more
- (5) Unlike charges should be closer to each other whereas like charges should be isolated.
- (6) Extended conjugation contribute more than cross conjugation.



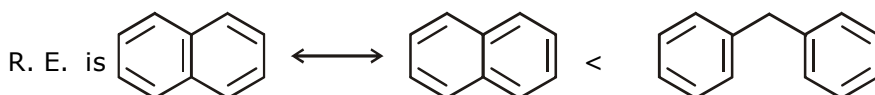
Cross conjugation < Extended conjugation



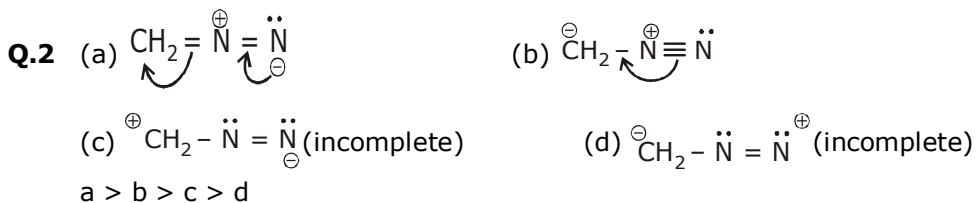
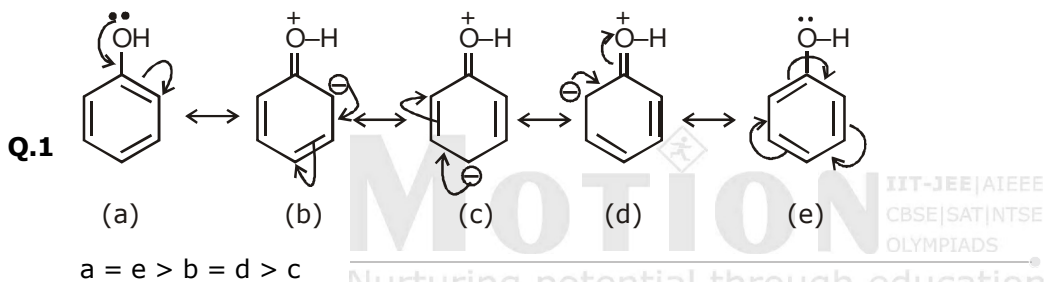
(Extended) (cross)

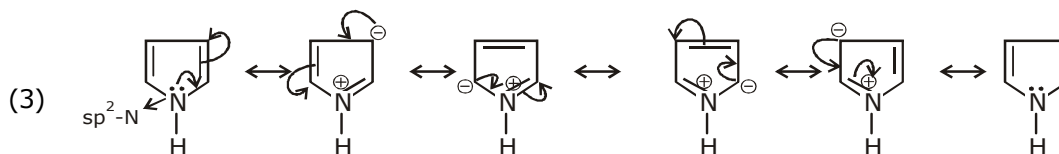
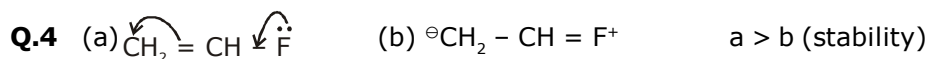
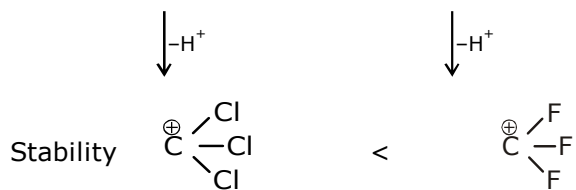
Fries Rule :-

Compound with more benzenoid structure are more stable as their Resonance energy is greater than those in which lesser no. of benzenoid structure are present.



- * If double bond is participating in resonance then it will acquire partial single bond character as a result of which bond length increases & bond strength decreases.
- If a single bond is involved in resonance then it will acquire partial double bond character. As a result of which bond length decreases & bond strength increases.



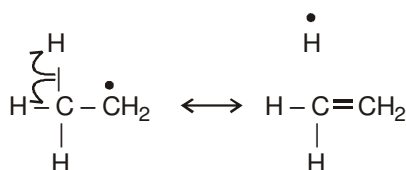


Note:—When lone pair as well as double bond as present in some atom. Then only π bond will participating resonance. Where as lone pair remains sp^2 hybridises orbital.

When an atom two and more then two known a lone pair of e^- will participet. Then only one lone pair remins sp^2 hybridised.

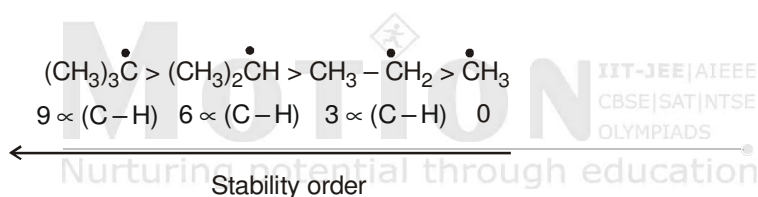
HYPER CONJUGATION

Permanent polarisation caused by displacement of σ -electrons into π -molecular orbital is known as hyperconjugation



Hyper conjugation is called No bond Resonance

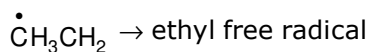
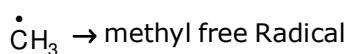
- * More α C – H bond, more will be the no bond resonating structure (Hyper conjugation)
- More α (C – H) bond, more will be the stability of free radical.



Properties of Free Radical

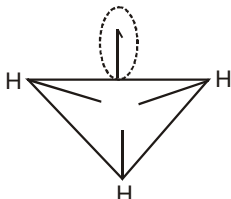
1. It is a neutral species.
2. It has one upaired electron that's why paramagnetic in nature.

Structure :



3. its hybridisation is sp^2 and triangular planar shape.

Note : unpaired electron is not counted while calculating the hybridisation state.

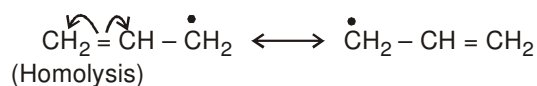


(unpaired electron stay perpendicular to the plane)

Stability of free Radical :

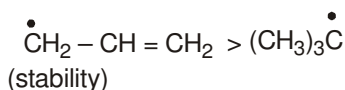
Its stability can be determined with the help of hyperconjugation as well as Resonance effect

ALLYLIC FREE RADICAL

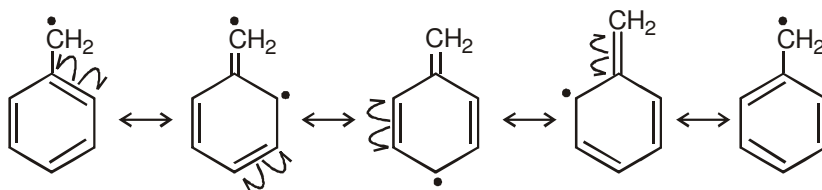


(Free Radical is on next carbon to doubly bonded carbon atoms)

Effect of Resonance > Hyper conjugation



BENZYLIC FREE RADICAL

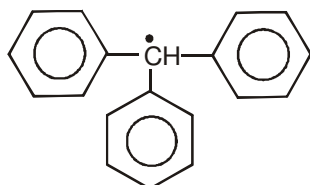


(4 Resonating structure)

* More Resonating structure, more will be the stability of the free Radical.

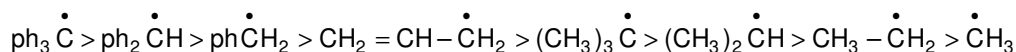
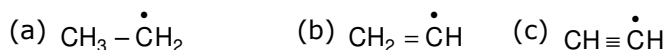
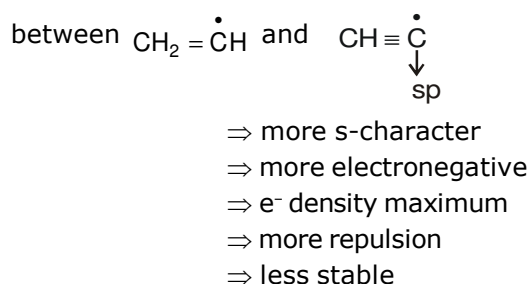


No. of Resonating structure = 7

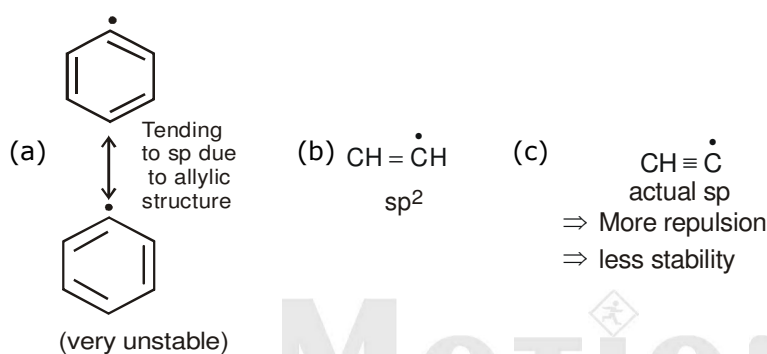


(Triphenylmethyl free Radical)

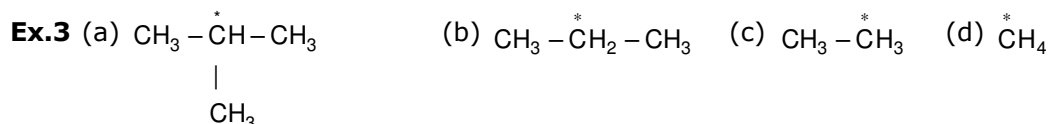
No. of Resonating structure = 10

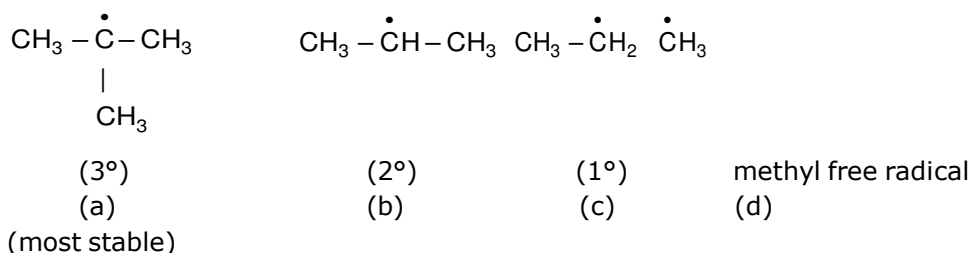
Stability Order :**Ex.1** Compare the stability of the following free Radical.**Sol.** (a) $\text{CH}_3 - \dot{\text{C}}\text{H}_2$ will be most stable due to hyper conjugation**Ans. a > b > c**

* More repulsion, less stability

Ex.2 Compare the stability of the following free Radicals

(Therefore this resonating structure is not possible)

Sol. b > a > cCompare the $\overset{*}{\text{C}}\text{H}$ bond energy of the above compounds.**Sol.** After forming free radical from the compound



\downarrow
 therefore will have more
 tendency to come in this form
 \downarrow

And C – H bond will break very readily
 \Rightarrow bond energies will be very less.
 $a < b < c < d <$ (bond energies order)

* Bond energy $\propto \frac{1}{\text{stability of free Radical}}$

* Bond length $\propto \text{stability of free Radical}$

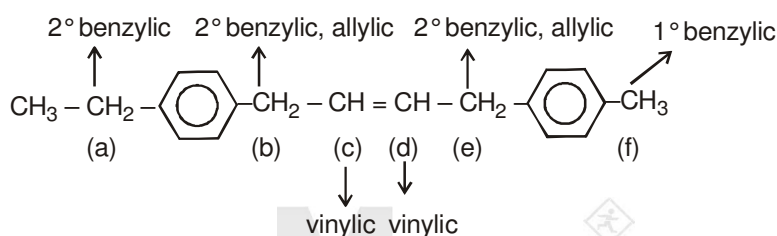
Ex.4 Compare the potential energy of the following compounds (above compounds)

Sol. If compound after being in free Radical form is very stable (i.e., less energy) it mean it would have possessed more energy initially i.e. its potential energy will be most

$$a < b < c < d$$

* Potential energy $\propto \text{stability of free Radical}$

Ex.5 Compare the bond energies of C – H bond
 (at a, b, c, d, e and f position)

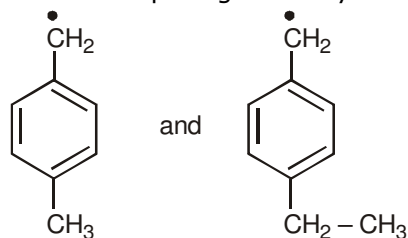


$$e > b > a > f > c = d$$

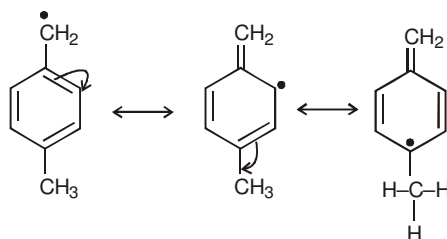
Stability order of free Radical that might be formed after removal of H (Homolytically) from the given carbon.

\Rightarrow $e < b < a < f < c = d$
 (C – H bond energies)

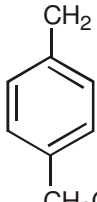
- In the above compound while comparing 2° benzylic allylic stability at two given position



while drawing the resonating structure of the

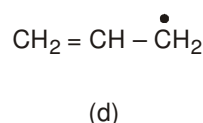
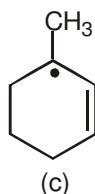
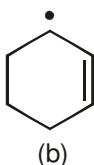
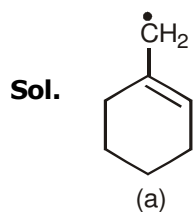
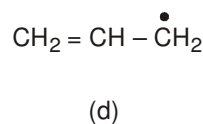
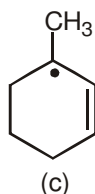
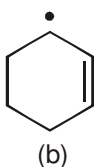
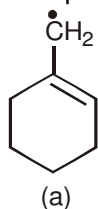


(Here inspite of Resonance three α (C - H) bond are available for no bond Resonance.

\Rightarrow Therefore extra stable than  which have only two α (C - H) bond for Hyper conjugation.

Therefore 2° benzylic allylic corresponding to structure (a) is more stable than that of structure (b)

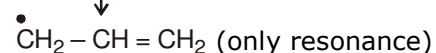
Ex.6 Compare the stability of the following free Radical



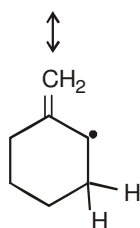
1° allylic

2° allylic + 2 α H

3° allylic + 5 α H



(d)



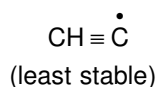
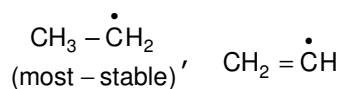
(Resonance + 2 α H)

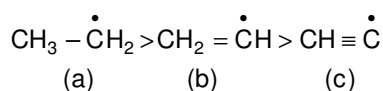
MOTION IIT-JEE | AIEEE
CBSE | SAT | NTSE
OLYMPIADS
Nurturing potential through education

$\Rightarrow c > b > a > d$

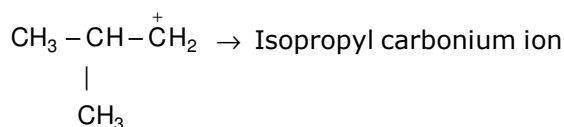
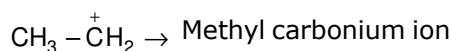
Ex.7 Compare the potential energy of $\text{CH}_3 - \text{CH}_3$, $\text{CH}_2 = \text{CH}_2$
 $\text{CH} \equiv \text{CH}$

Sol. After making free Radical of the above compounds





$$a > b > c$$

CARBOCATION**Properties of Carbocation :**

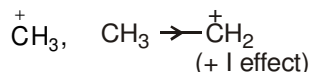
1. it is positively charged species
2. it has sextet of electrons i.e. diamagnetic
3. it is formed by heterolysis
4. it is generally formed due to polar solvent

Structure :

(sp²) Triangular planar

Stability :

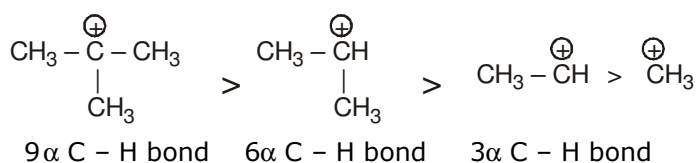
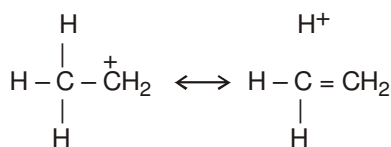
Its stability can be determined with the help of Inductive effect, Hyper conjugation and Resonance effect.

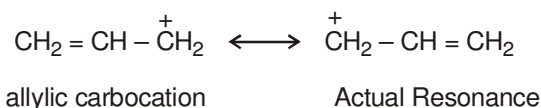
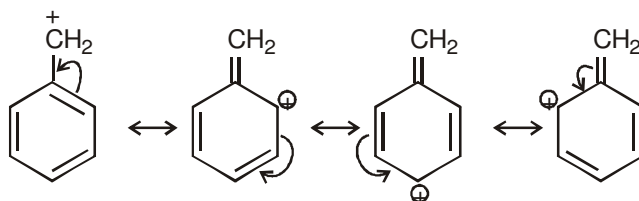
Stability of Carbocation :

$$\text{charge} \propto \frac{1}{\text{Stability}}$$



Stability of carbocation can also be determined by Hyper conjugation (no bond Resonance)



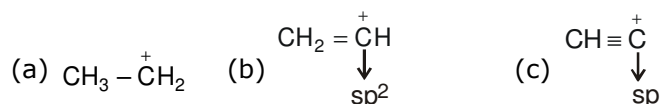
ALLYLIC CARBOCATION**BENZYLIC CARBOCATION**

$\text{ph}_2\overset{+}{\text{C}}\text{H} \rightarrow 7$ Resonating structure

$\text{ph}_3\overset{+}{\text{C}} \rightarrow 10$ Resonating structure

$\text{ph}_3\overset{+}{\text{C}} > \text{ph}_2\overset{+}{\text{C}}\text{H} > (\text{CH}_3)_3\overset{+}{\text{C}} > \text{ph}\overset{+}{\text{C}}\text{H}_2$

Ex.8 Compare the stability of the following carbocation

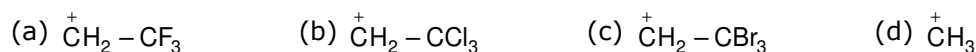


\Rightarrow more electronegativity

\Rightarrow +ve charge on more electronegative element is symbol of instability.

a > b > c

Ex.9 Compare the stability of the following compounds



Sol. $d > c > b > a$

F being most electron attracting group decreases the e^- density from positively charged C-atom and decreases the charge density and makes the carbocation less stable.

Ex.10 Compare the stability of the following carbocation :

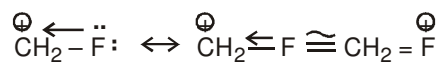


Sol. due to greater size of Iodine, its L.P. will not be available for coordinate bond. Therefore L.P. would not stabilize carbocation.

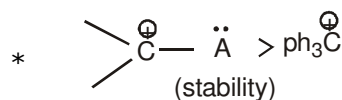
In case of F due to its small size its lone pair can be easily coordinated to $\overset{+}{\text{C}}$ making it most stable

a > b > c > d (Stability)

* By coordination the carbocation completes its octet and structure having complete octet of its atom is supposed to be most stable.

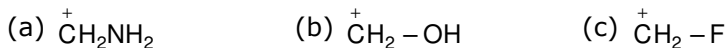


(Each atom has its full octet)



Note : In Resonating Structure of ph_3C^+ , at least one C gets sextet of e^- and hence less stable than coordinated compound.

Ex.11 Compare the stabilities of the following carbocation



Sol. N, O, F belongs to same period

- ⇒ In period Electronegativity of the atom is deciding factor
 - ⇒ F being most electronegative, holds its e^- pair very firmly.
 - ⇒ Its L.P. will not be easily available for coordination.
 - ⇒ Stability by it will be minimum.
- $a > b > c$

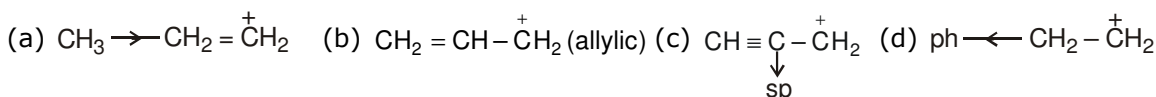
Ex.12 Compare the following carbocation in order of their stability.



Sol. If periods of atoms which have to donate their electrons for coordination (for stability) is different then atomic size will be deciding factor. The atom whose size is greater will be unable to make its e^- pair available for coordination.

$$b > a$$

Ex.13 Compare the stability of the following compounds



- Sol** ⇒ more s-character
 ⇒ more e.n.
 ⇒ attracts e^-
 ⇒ reduces, stability

$$b > a > d > c$$

CARBANION

1. it is a -ve charged species
2. it has octet of electrons.
3. diamagnetic

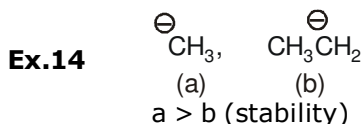
Structure :

- * If -ve charge is in Resonance then the hybridisation of carbanion is sp^2 (Triangular planar shape)
- * If -ve charge is not in Resonance then the hybridisation of carbanion is sp^3 (pyramidal)

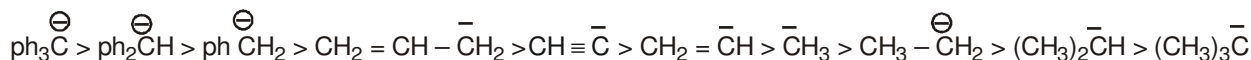
Stability :

Its stability can be determined with the help of

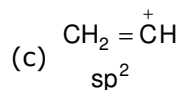
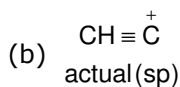
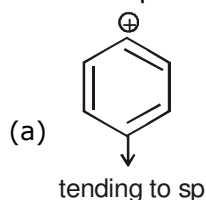
- (1) Inductive effect (2) Resonance effect



- * Stability of the carbanion is as follows

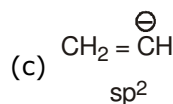
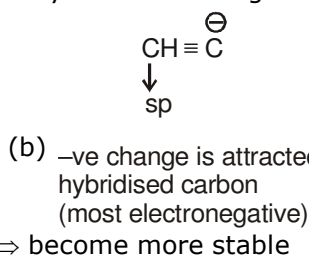
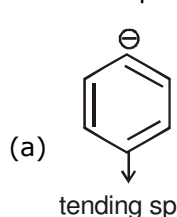


Ex.15 Compare the stability of the following carbocation



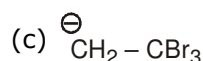
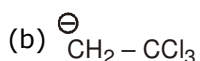
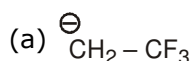
Sol. $c > a > b$

Ex.16 Compare the stability of the following carbanion



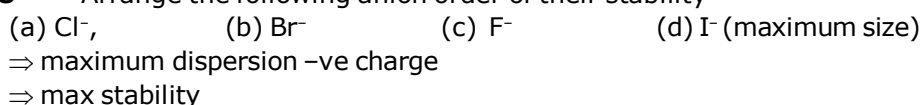
Sol. $b > a > c$

Ex.17 Compare the stability of the following carbanion



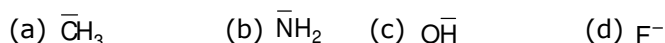
Sol. $a > b > c$

Ex.18 Arrange the following anion order of their stability



Sol. $d > b > a > c$

Ex.19 Compare the stability of the following



Sol. Same period element (C, N, O, F)

⇒ Stability ∝ E.N. of the atom
 $d > c > b > a$

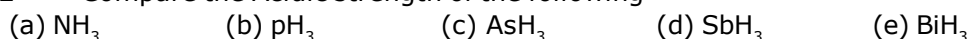
Ex.20 Compare the acidic strength



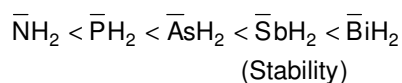
Sol. Acidic strength ∝ stability of the anion formed (conjugate base)

as we know $\text{I}^- > \text{Br}^- > \text{Cl}^- > \text{F}^-$
⇒ $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$

Ex.21 Compare the Acidic strength of the following

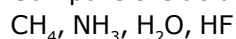


Sol. Anion formed from these acids are

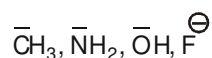


⇒ acidic strength $e > d > c > b > a$

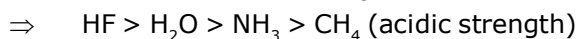
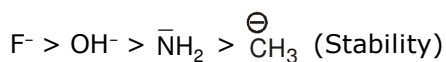
Ex.22 Compare the acidic strength of the following compounds



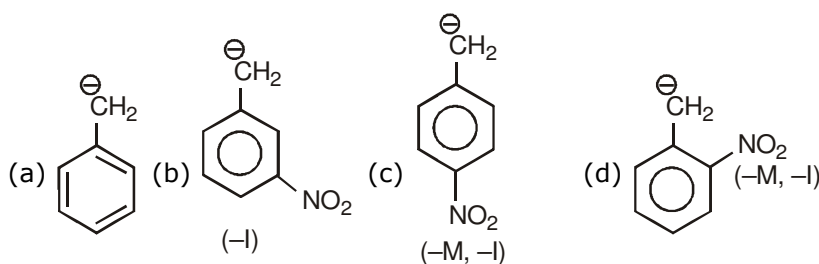
Sol. The conjugate base of the given acid is as follows



we have already proved that



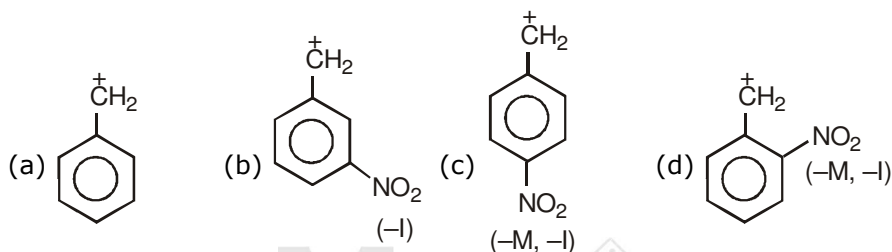
Ex.24 Compare the stability of the following carbanion.



Sol. $d > c > b > a$

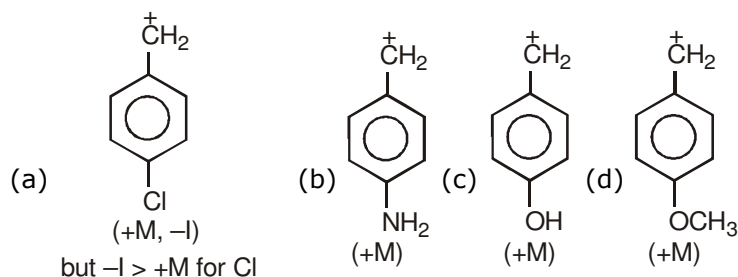
* +M or -M is not distance dependent

Ex.25 compare the stability of the following carbocation



Sol. $a > b > c > d$

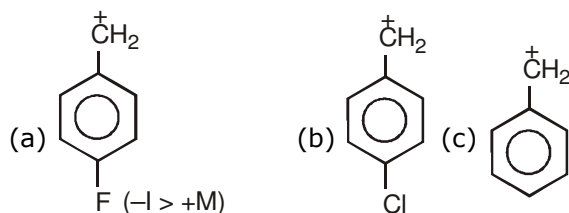
Ex.26 Compare the stability of the following carbocation.



but $-I > +M$ for Cl

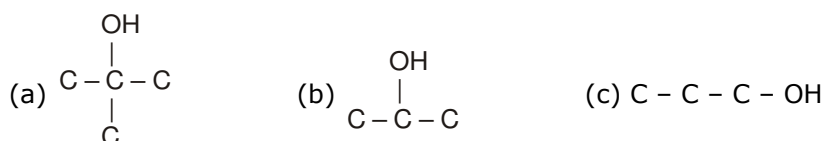
Sol. $+M(\text{OH}) > +M(\text{OCH}_3)$
 $b > c > d > a$

Ex.27 Compare the stability of the following carbocation

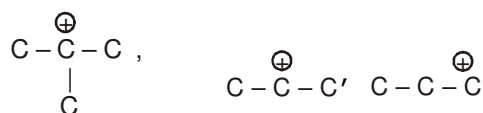


Sol. $c > a > b$

Ex.28 Compare order of dehydration of the following alcohols :



Sol. After formation of carbocation



Since 3° carbocation is most stable therefore it will show greatest tendency to lose water as after loss of water it comes in stable form.

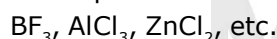
TYPES OF REAGENT

1. Electrophilic reagent : All electron deficient atom or group of atoms is known as Electrophilic reagent, the electrophile attacks at the electron rich centre.

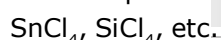
(a) all positively charged species are electrophile



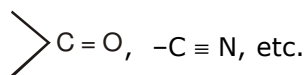
(b) The compound in which the octet of central atom is not complete



(c) all the compound in which the central atom can expand its octet



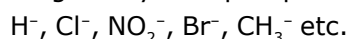
(d) all polarising functional group are electrophile as well as nucleophile



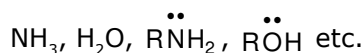
Nucleophile :

All electron rich compounds are nucleophile and attack at the electron deficient centre.

(a) all negatively charged species




(b) the compound in which the central atom has lone pair of electron.



(c) all organometallic compounds are nucleophile

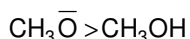
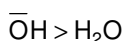


(d) The compound having π e⁻ density, $CH_2 = CH_2$,  etc.

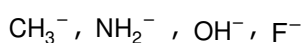
Nucleophilicity :

The power of nucleophile is known as nucleophilicity .

⇒ The nucleophilicity of negative charge is greater than the nucleophilicity of lone pair



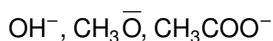
⇒ If lone pair or -ve charge is present on the different atom then less electronegativity, more will be the nucleophilicity.



Nucleophilicity $CH_3^- > NH_2^- > OH^- > F^-$

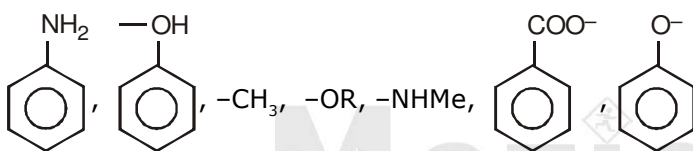
⇒ $NH_3 < PH_3 < AsH_3 < SbH_3 < BiH_3$ (Nucleophilicity)

⇒ If -ve charge or lone pair of electron is present on the same atom then the less stable -ve charge will be the better nucleophile

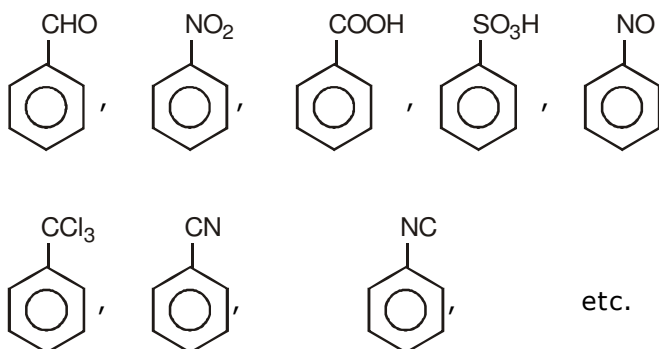


ACTIVATOR & DEACTIVATOR

The groups in benzene which show +M effect or +I effect Increases the electron density on benzene it means they activate the ring towards electrophile and known as activator.



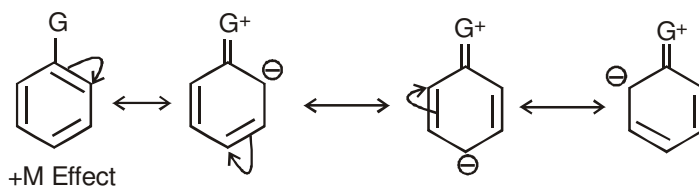
The groups which shows -M or -I effect (resultant) decreases the e⁻ density from benzene ring. It means they deactivate the ring towards electrophile



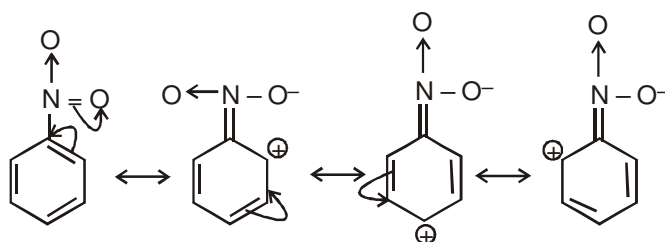
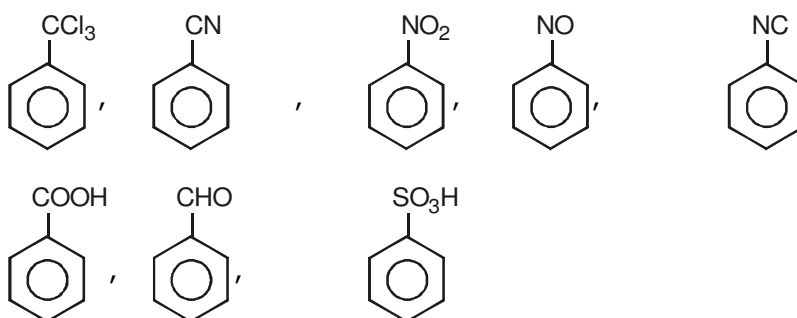
etc.

ORTHO PARA & META DIRECTOR

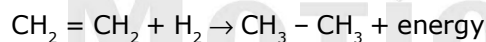
The groups which shows +I (resultant) or +M effect then negative charge is developed at the ortho & para position. Therefore electrophile attack at the ortho & para position and the groups are known as OP director.



- The groups which shows -M effect or -I effect (resultant) then +ve charge is developed at the ortho & para position this means electron density is minimum at the ortho & para positions and electrophile will attack at the meta position the groups are known as meta director.

**HEAT OF HYDROGENATION(H.O.H)**

It is the amount of energy released when one mole of H_2 is added to any unsaturated system.



HOH is exothermic process $\Delta H = -ve$

*HOH \propto No. of π -bonds in compound

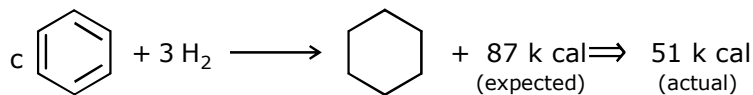
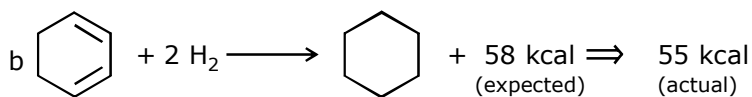
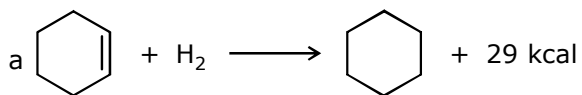
If no. of π -bonds is same then

*HOH $\propto \frac{1}{\text{stability of compound}}$

\therefore In case of alkene

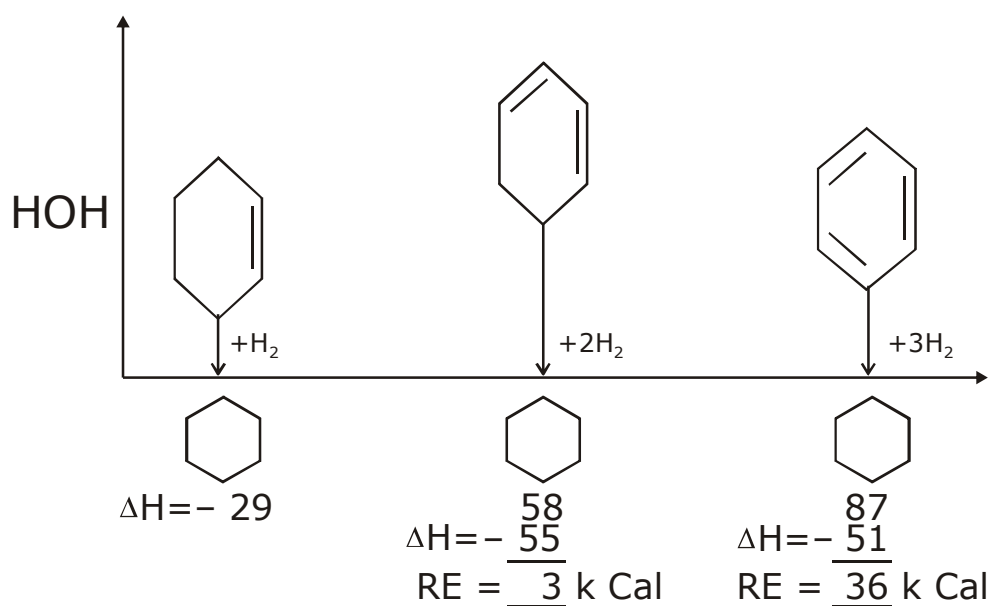
**HOH $\propto \frac{1}{\text{stability of compound}} \propto \frac{1}{\text{No. of } \alpha \text{ H}}$

Ex.



b > c > a

Energy



Some examples of Aromatic(A), Non-aromatic(NA) and Anti-aromatic(AA)

