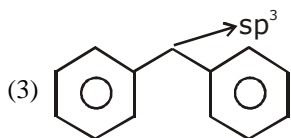


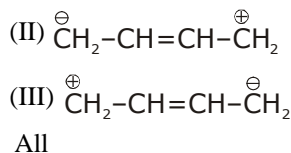
Here methyl groups repel to each other and any one ring goes not of plane.

- Q.15** (3)
Coplanar = carbon should have sp^2 hybridised.



- Q.16** (2)
ol. (I) $\text{CH}_3-\text{CH}=\text{O}$
(II) $\text{CH}_2=\text{CH}-\text{OH}$ (III) $\text{CH}_3-\overset{\oplus}{\text{C}}\text{H}-\overset{\ominus}{\text{O}}$
B \rightarrow (I) & (III) are canonical structures.

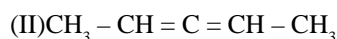
- Q.17** (4)
(I) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}_2$
I, II, III are canonical structures to each other.



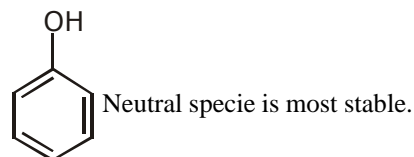
- Q.18** (3)
- | | | |
|-------------------|-----------------|-----------------|
| I | II | III |
| | | |
| Neutral structure | 3 covalent Bond | 4 covalent Bond |

- Q.19** (D)
IV str. is least stable $\text{CH}_2=\text{CH}-\overset{\oplus}{\text{C}}\text{H}-\overset{\ominus}{\text{C}}\text{H}-\text{OCH}_3$ due to repulsion b/w \ominus & l.p.

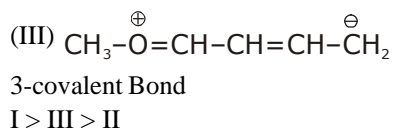
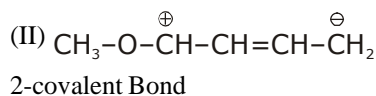
- Q.20** (1)
(I) $\text{CH}_2=\text{CH}-\text{CH}=\text{CH}-\text{CH}_3 \longleftrightarrow \overset{\ominus}{\text{C}}\text{H}_2-\text{CH}=\text{CH}-\overset{\oplus}{\text{C}}\text{H}-\text{CH}_3$



- Q.21** Here in str. (I) Resonance occurs But not in IInd.



- Q.22** (3)
(I) $\text{CH}_3-\text{O}-\text{CH}=\text{CH}-\text{CH}=\text{CH}_2$
Neutral



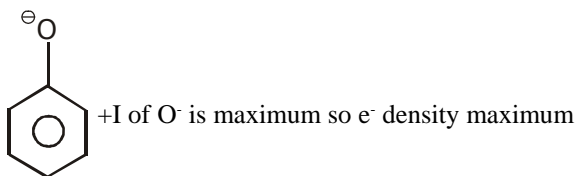
- Q.23** (4)
- Complete octate & Extended conjugation

- Q.24** (3)
- (I = V) > (II > IV) > III
Neutral Opposite charge nearest Opposite charge at more distance.

- Q.25** (3)
- (I) > III = IV > II = V
Opposite charge near opposite charge have more distance

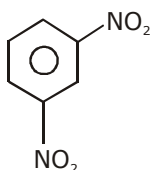
- Q.26** (2)
- more electronegative atom 'O' contain \oplus ve charge. so least stable str.

Q.27 (3)



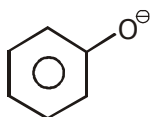
in ring.

Q.28 (4)



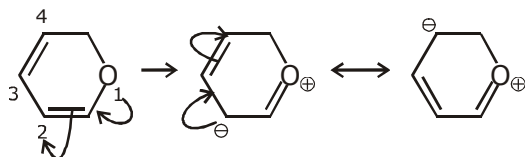
NO₂ (-I effect) occur at two places
So π e⁻ density is minimum.

Q.29 (2)



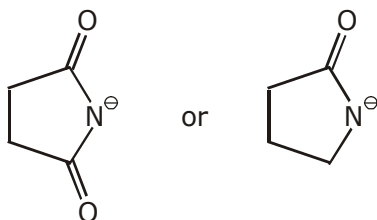
+ I effect of o⁻ is maximum so e⁻ density maximum in ring

Q.30 (2)



π -e⁻ density is more on C₂ & C₄

Q.31 (4)

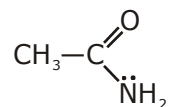
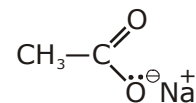
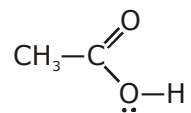


2(-I groups are here)
So -ve ion stable.

Q.32 (C)

- (I) CH₃-COOH
(II) CH₃COO⁻Na⁺

(III) CH₃CONH₂

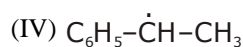
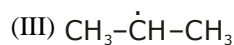
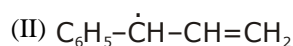
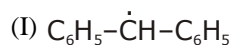


more delocalisation less E.N. of N
O atom is more E.N. due to -ve charge

R.E. order = II > III > I

Q.33

(1)

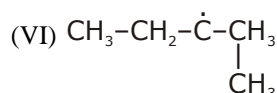
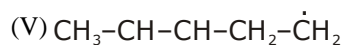


more R.S.

Reso. + hyper conj.

(2) + I group

R.S.



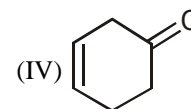
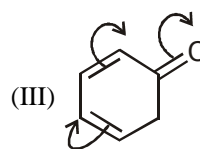
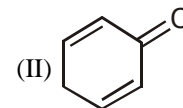
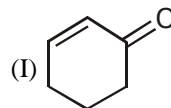
(1) + I group

(3) + I group

(1) I > II > IV > VI > III > V

Q.34

(C)

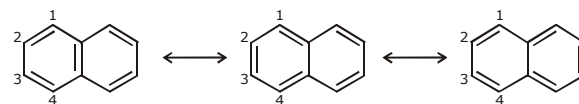


more resonance

so max. Resonance energy

Q.35

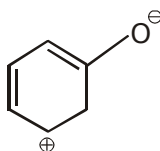
(2)



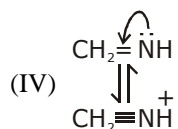
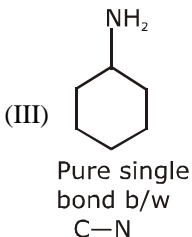
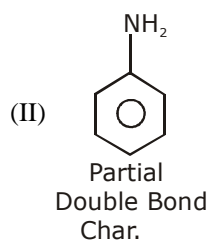
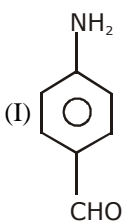
C₁ - C₂ Bond has double Bond in two structure so short Bond length

$C_2 - C_3$ Bond has single Bond in 2 structure.
 (2) So $C_1 - C_2$ Bond is shorter than $C_2 - C_3$ Bond.

Q.36 (2)



Q.37 (3)



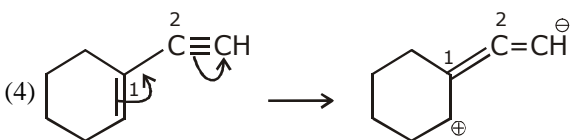
More

resonance
 more double

Bond.

III > II > I > IV

Q.38 (4)



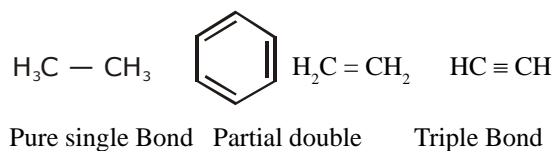
Bcoz only this str.

$C_1 - C_2$ Bond contain double Bond So bond length short.

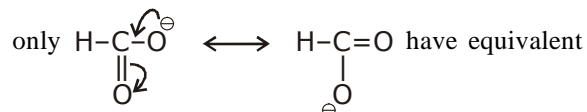
Q.39 (2)

(2) $C_2H_6 >$
 $C_2H_4 >$

$C_6H_6 >$
 $C_2H_2 >$

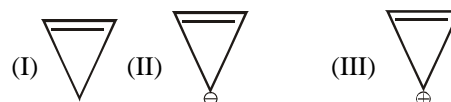


Q.40 (1)



type of R.S.

Q.41 (C)



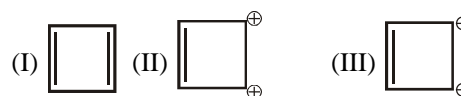
$(4n+2) \pi e^-$

$(4 \times 0 + 2) = 2\pi e^-$

Aromatic

(all carbon show sp^2 hybridization state)

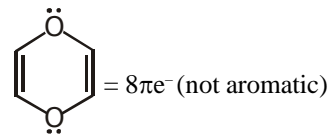
Q.42 (1)



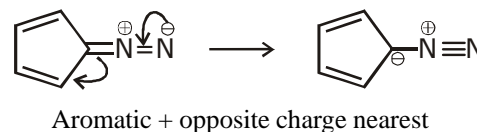
$4\pi e^-$

Anti Aromatic

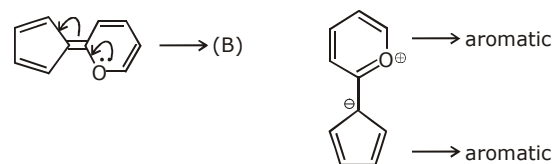
Q.43 (4)



Q.44 (3)

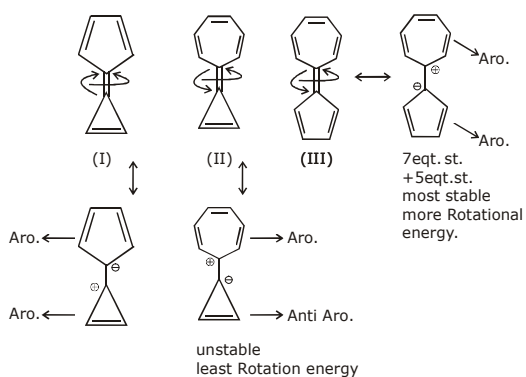


Q.45 (2)

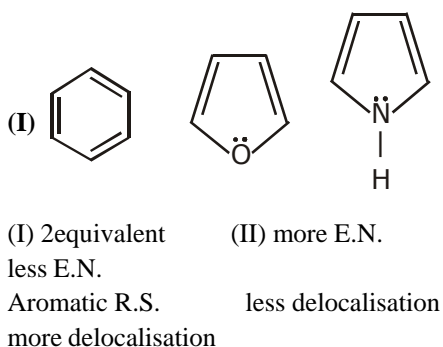


Both are aromatic

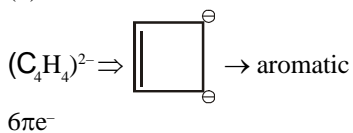
Q.46 (2)



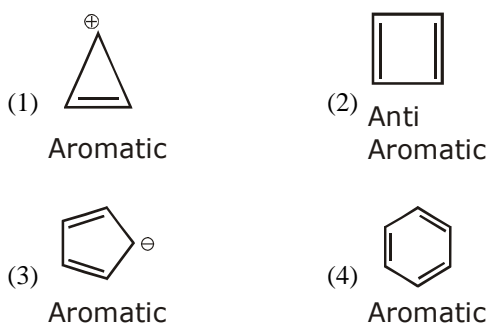
Q.47 (1)



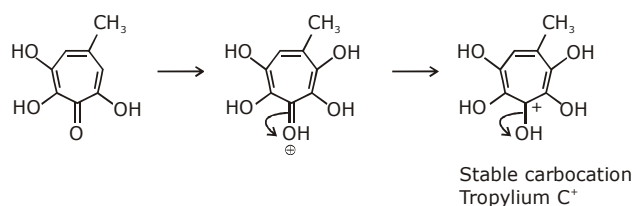
Q.48 (3)



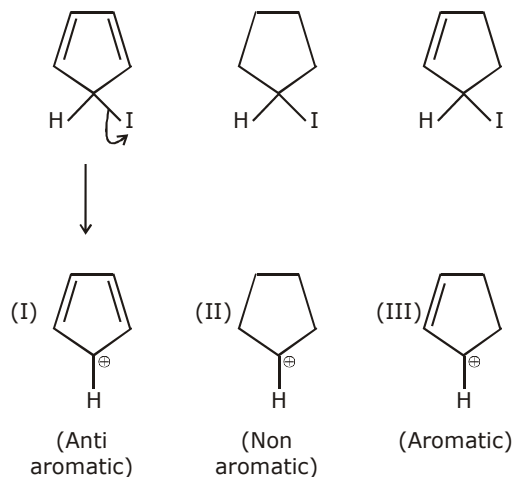
Q.49 (2)



Q.50 (3)

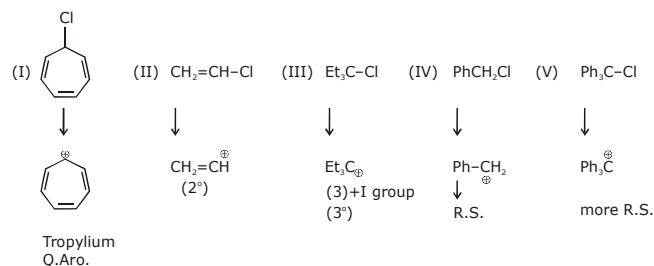


Q.51 (3)



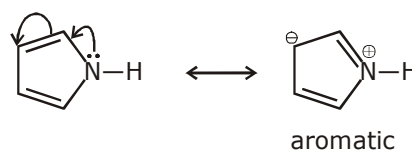
(III) > (II) > (I)

Q.52 (1)

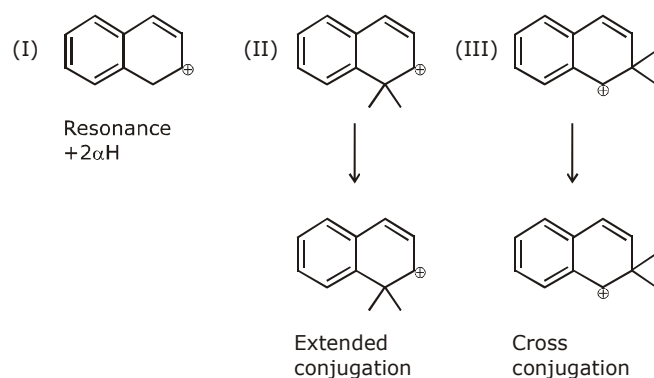


(1) I > V > IV > III > II

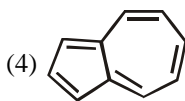
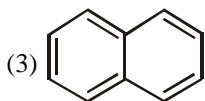
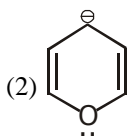
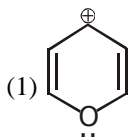
Q.53 (4)



Q.54 (1)



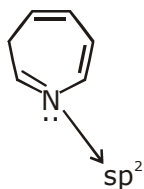
Q.55 (2)



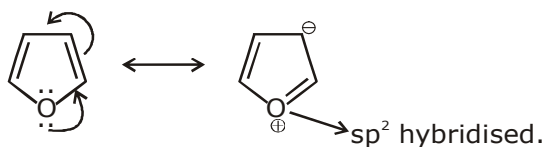
$6\pi^-$
 $8\pi^-$
(aromatic)
aromatic

$10\pi^-$ (aromatic) $10\pi^-$
Anti aromatic
(Not aromatic)

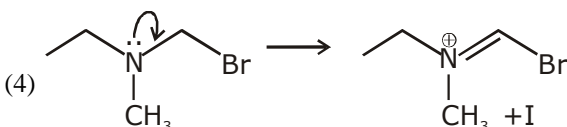
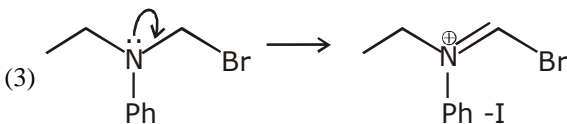
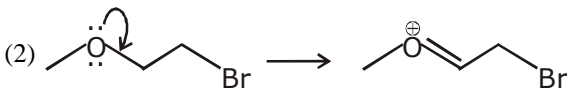
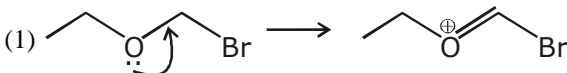
Q.56 (2)



Q.57 (2)



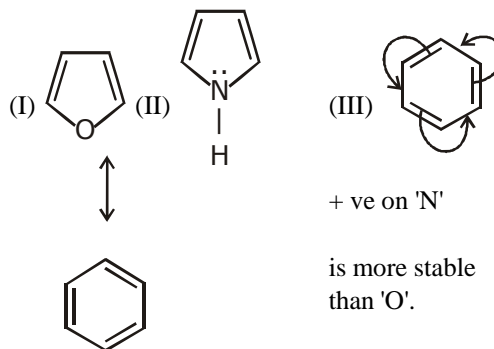
Q.58 (4)



Hyperconjugation

(stable)

Q.59 (3)

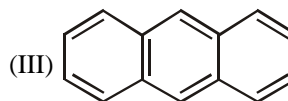
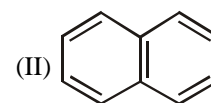
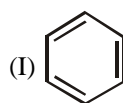


+ ve on 'N'

is more stable
than 'O'.

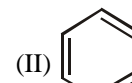
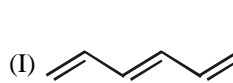
Both R.S. are neutral & equivalent type
R.S. so more resonance energy.
order of resonance energy. III > II > I.

Q.60 (1)



Fries Rule – More the Benzenoid Structure, more
 \Rightarrow Order of R.E. per Ring \Rightarrow I > II > III
will be the Resonance energy

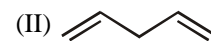
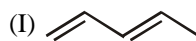
Q.61 (2)



Non Aromatic
R.E. order

Aromatic
II > I

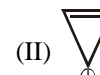
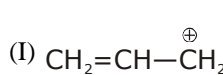
Q.62 (1)



Resonance
present

No Resonance
R.E. order I > II

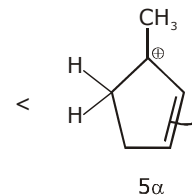
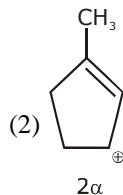
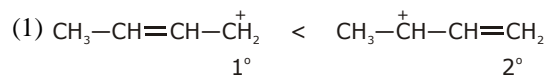
Q.63 (2)

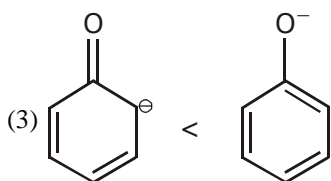


Non aromatic
R.E. order - II > I

Resonance
aromatic

Q.64 (4)





Q.65 (4)

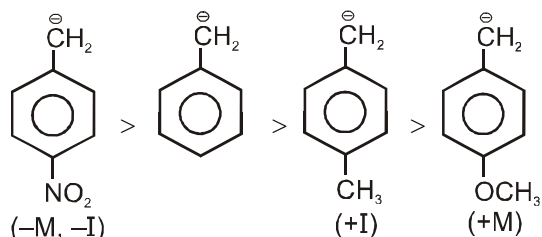
Q.66 (1)

Q.67 (4)
 $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$ has two α -hydrogen for hyperconjugation.

Q.68 (4)
 (4) has maximum number of hyperconjugation structure.

Q.69 (2)
 (I) & (III) has delocalisation (III has better delocalisation)
 (II) & (IV) has hyperconjugation. (II has better hyperconjugation).

Q.70 (4)



destabilising factor for carbanion [+M > +I]

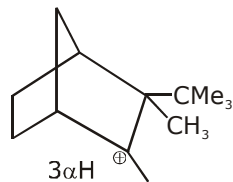
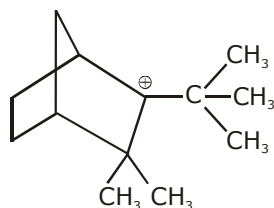
Q.71 (3)
 $\text{CH}_2 - \overset{\oplus}{\text{C}} - \text{H}$ most unstable due to strong -I effect of

-CHO group.

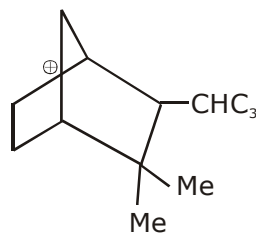
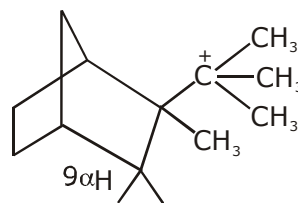
Q.72 (2)
 3° Carbocation is more stable.

Q.73 (3)
 hyperconjugation and delocalisation with +I effect.

Q.74 (2)



(I) No alpha hydrogen
 (II)



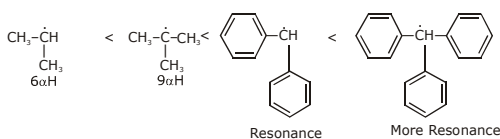
(III)
 (IV)
 $\text{III} > \text{II} > \text{I} > \text{IV}$
 Bredt rule

Q.75

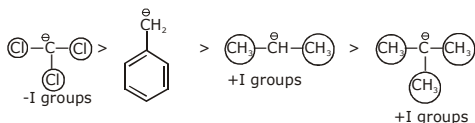
(1)
 (A) Most Stable
 non-bonding e⁻ Bonding

(B)
 (C)
 (D)

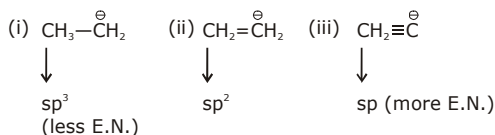
Q.76 (4)



Q.77 (2)

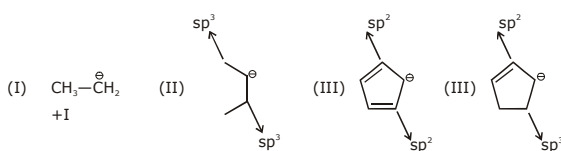


Q.78 (3)



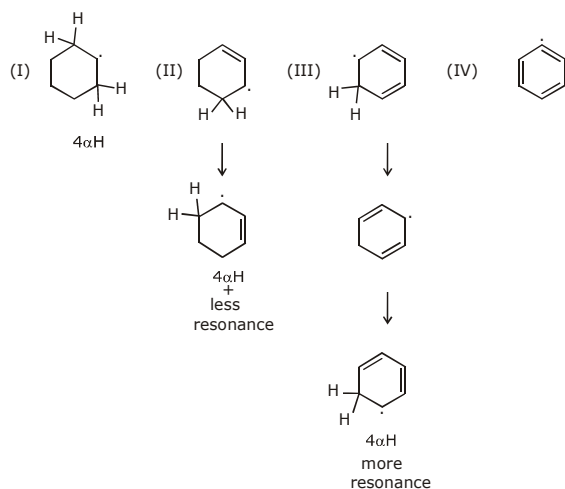
Stability order iii > ii > i

Q.79 (4)



(4) III > IV > I > II

Q.80 (1)



order

(1) III > II > I > IV

Q.81 (4)

Conjugate base of (4) has negative charge on oxygen.

Q.82 (1)

On the basis of I effect.

Q.83

(1)
On the basis of I effect.

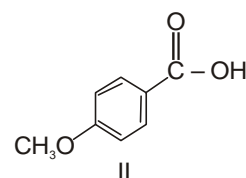
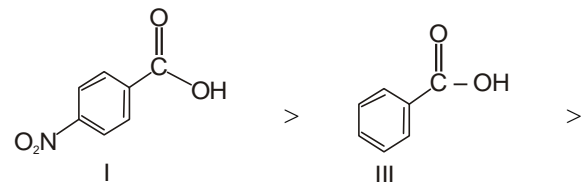
Q.84

(2)
 $\text{H}_3\text{N}^{\oplus} - (\text{CH}_2)_2 - \text{COOH}$ has strongest acid due to strong -I effect of $-\text{NH}_3^{\oplus}$.

Q.85

(1)
On the basis of I effect.

Q.86



(Strong -I, -M effect of $-\text{NO}_2$ group) (+M effect of $-\text{OCH}_3$ group)

Q.87

(2)
Conjugate base of (2) has three equivalent resonating structures.

Q.88

(2)
(1) has negative charge on carbon which is not in delocalisation.
(2) has negative charge on oxygen which is not in delocalisation.
(3) has negative charge on oxygen which is in delocalisation also.

Q.89

(1)
Anionic bases are stronger than neutral bases (2° Amine > 3° Amine > 1° > NH_3) (Basicity order)

Q.90

(1)
II \rightarrow Hyperconjugation
III \rightarrow -M effect
Due to Hyperconjugation basicity increases and due to -M basicity decreases

Q.91

(2)
I \rightarrow -I effect
II \rightarrow -M effect
III \rightarrow Hyperconjugation

Q.92 (1)
 I → Delocalisation (better).
 II → Delocalisation
 III → +I effect

Q.93 (1)
 Due to electronegativity

Q.94 (1)
 Due to electronegativity

Q.95 (D)
 (III) Delocalisation, (IV) Aromaticity, (I) sp²'N' no delocalisation, (II) sp³'N' + I effect

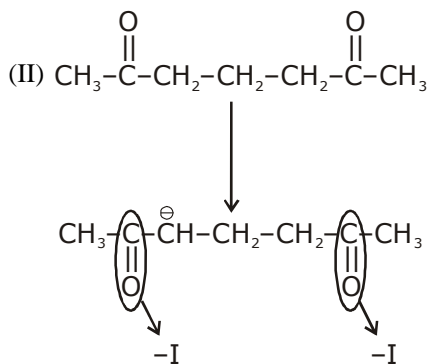
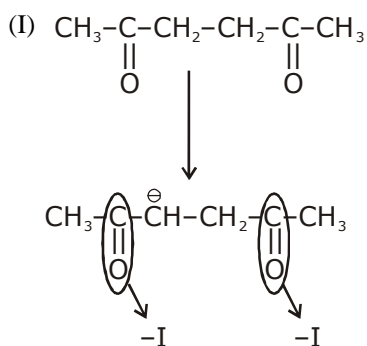
Q.96 (1)
 Basicity is inversely related to stability of anions.

Q.97 (4)
 II → + M effect
 III → - NO₂ (-M effect)
 IV → - I effect

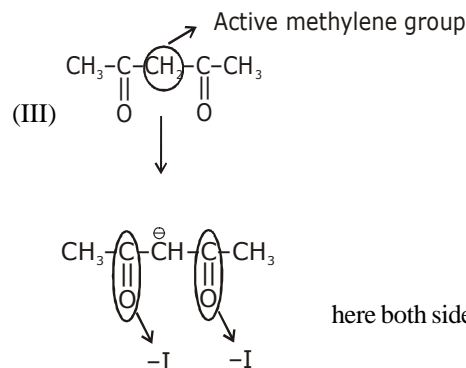
Q.98 (3)
 Basicity is inversely related to stability of anions.

Q.99 (4)
 (I) sp³'N', (III) sp³'N' - I effect, (II) sp²'N', (IV) Aromaticity

Q.100 (2)

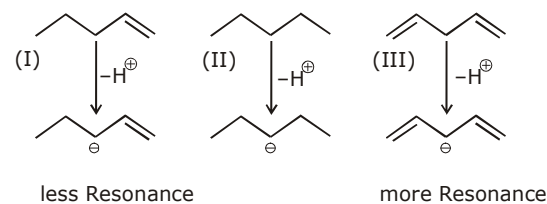


This is at more distance so least stable.

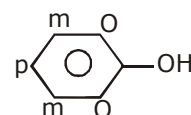


(2) Ans. III > I > II

Q.101 (3)

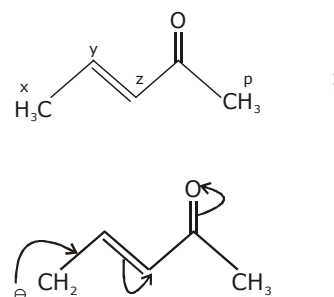


Q.102 (2)



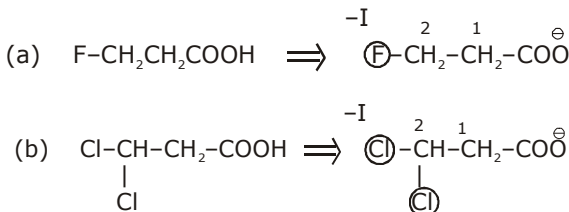
-ve charge comes at ortho & para position so π -e⁻ density is maximum on ortho & para position.

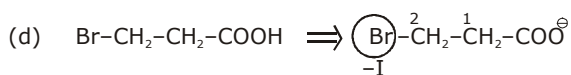
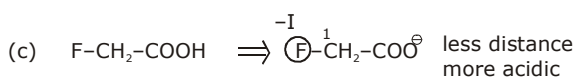
Q.103 (1)



long Resonance
 more stabilize so abstraction of proton will be fastest at x position.

Q.104 (3)





$$\text{acidity} \propto K_a \propto \frac{1}{\text{PK}_a} \propto \text{Pkb}$$

acidity order = $c > b > a > d$

PK_a order = $d > a > b > c$

Q.105 (1)

$$\text{Nucleophilicity} \propto \frac{1}{\text{electronegativity}} \text{ (in a period).}$$

Q.106 (1)

Nucleophilicity \propto size (in a group).

Q.107 (4)

As increases delocalisation of negative charge nucleophilicity decreases.

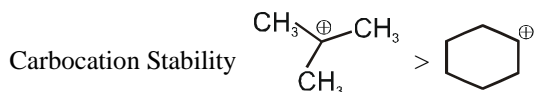
Q.108 (2)

Nucleophilicity \propto Size (in group)

Q.109 (3)

Weaker bases are better leaving group.

Q.110 (3)



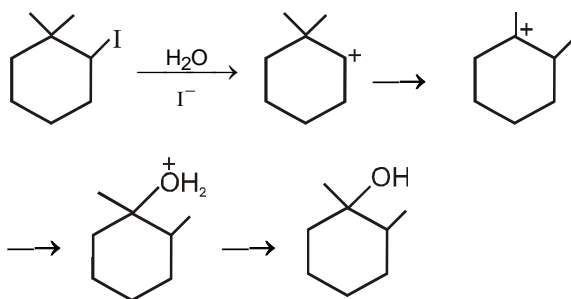
leaving group ability is $\text{Br}^\ominus > \text{Cl}^\ominus$

over all reaction order $r_1 > r_3 > r_2$

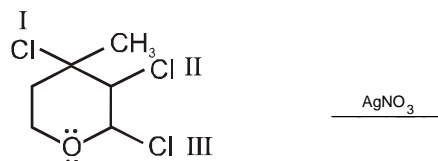
Q.111 (3)

On the basis of carbocation stability.

Q.112 (A)



Q.113 (2)



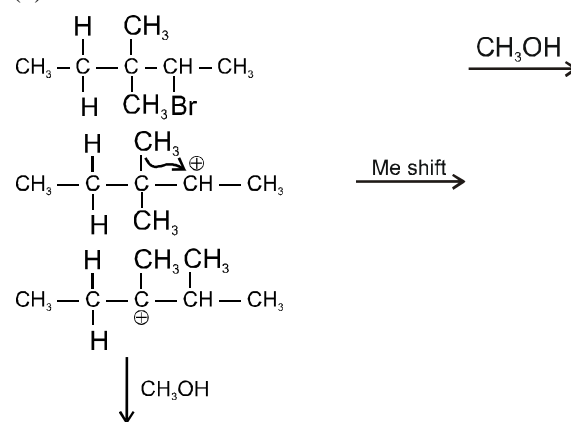
$\text{S}_{\text{N}}1$ Reaction

Reaction Intermediate — Carbocation :

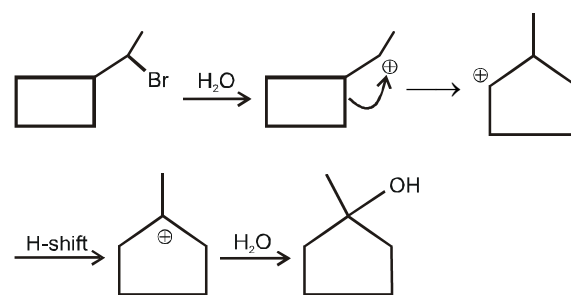
III will give most stable carbocation \Rightarrow stabilised by +m effect of $-\ddot{\text{O}}-$

I will give stable carbocation \longrightarrow 3° carbocation so order of reaction = $\text{III} > \text{I} > \text{II}$.

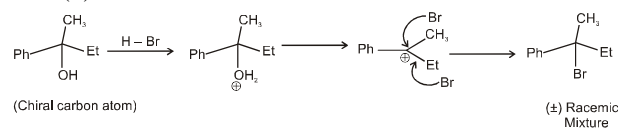
Q.114 (3)



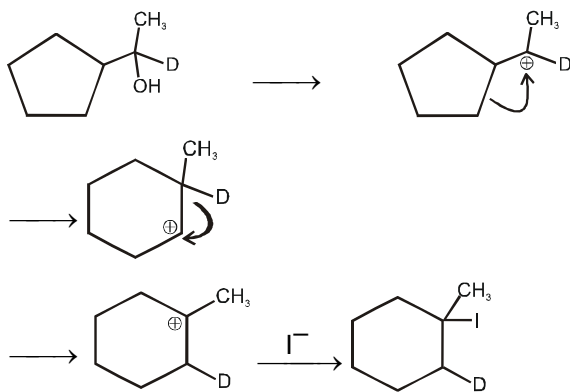
Q.115 (3)



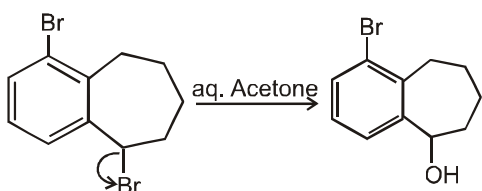
Q.116 (3)



Q.117 (1)



Q.118 (1)



In aryl halides the C-X bond has partial double bond character due to resonance so it will not give S_N reaction.

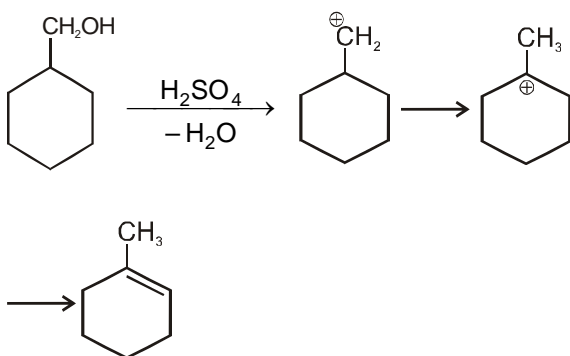
Q.119 (1)

According to stability of carbocation.

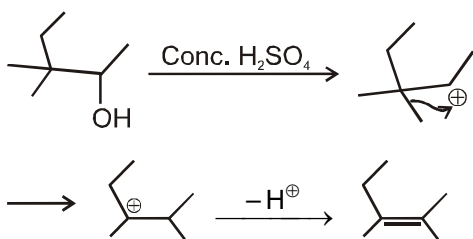
Q.120 (2)

Ring expansion so q will migrate.

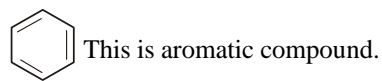
Q.121 (2)



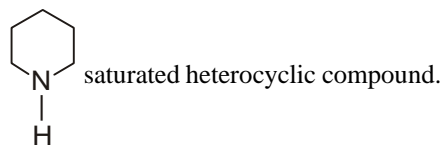
Q.122 (3)



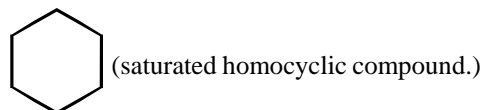
Q.123 (1)



Q.124 (3)



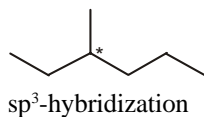
Q.125 (3)



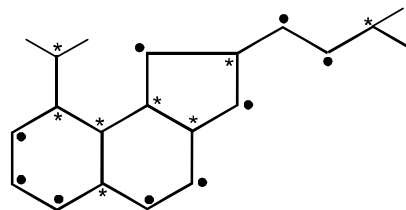
Q.126 (2)

$HC\equiv C-C\equiv CH$ all carbon atoms are sp hybridized.

Q.127 (3)

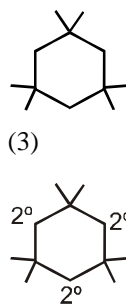


Q.128

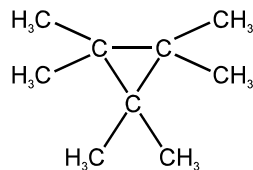


* = 3° carbon, • = 2° carbon

Q.129

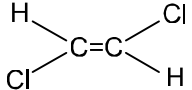


Q.130 (2)



This structures has 1° H-atoms and all are identical.

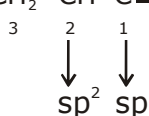
Q.131 (A)
Carbon skeleton is different in both compounds.

Q.132 (2)
 has zero dipole moment.

Q.133 (2)
Dipole moment, boiling point and water solubility are greater for II(cis) but melting point is greater for I(trans) isomer.

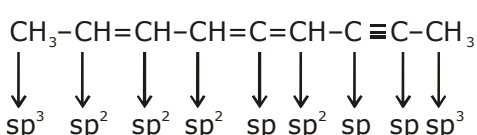
Q.134 (1)
Bond Formation is-
(1) Always exothermic
In Bond formation heat always release.

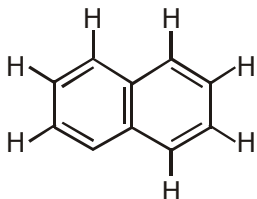
Q.135 (3)

$$\text{CH}_2=\text{CH}-\text{CN} \longrightarrow \text{CH}_2=\text{CH}-\text{C}\equiv\text{N}$$


$sp^2 - sp$ overlap

Q.136 (1)

$$\text{CH}_3-\text{CH}=\text{CH}-\text{CH}=\text{C}=\text{CH}-\text{C}\equiv\text{C}-\text{CH}_3$$


Q.137 (3)

 $\sigma \text{ Bond} = 19$
 $\pi \text{ Bond} = 5$

JEE-ADVANCED OBJECTIVE QUESTIONS

Q.1 (A)
 NH_4^+ is nonplanar cation due to sp^3 hybridization.

Q.2 (A)

Q.3 (A)

$$\text{H}-\text{N}=\text{C}=\text{O} \quad > \quad \text{H}-\overset{\oplus}{\text{N}}\equiv\text{C}-\overset{\ominus}{\text{O}} \quad >$$

I III
(Uncharged species is most stable) (–ve charge is more stable on high E.N. atom)

$$\text{H}-\overset{\ominus}{\text{N}}-\text{C}\equiv\overset{\oplus}{\text{O}}$$

II
(–ve charge less stable on less E.N. atom)

Q.4 (A)
In (A) negative charge and lone pair on adjacent position.

Q.5 (C)
In (C) two positive charge on adjacent position.

Q.6 (C)
In (C) two positive charge on adjacent position.

Q.7 (D)
In (D) negative charge and lone pair on adjacent position.

Q.8 (A)

Q.9 (D)
On the basis of electronic effect.

Q.10 (D)
On the basis of electronic effect.

Q.11 (D)
On the basis of number of resonating structures.

Q.12 (C)
Due to SIR effect.

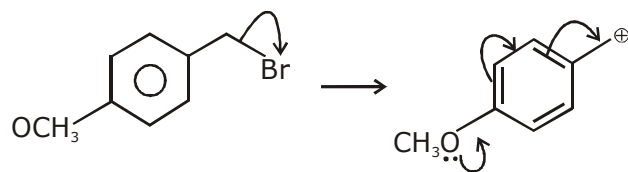
Q.13 (C)
Positive charge and δ^+ of (C=O) are at adjacent atoms.

Q.14 (C)
 $-\text{CHO} > -\overset{\ominus}{\text{C}}-$

$\ominus\text{CH}_2-\text{CHO} < \text{CH}_3-\overset{\ominus}{\text{C}}(\text{O})-\overset{\oplus}{\text{C}}\text{H}(\text{O})-\text{C}(\text{O})-\text{CH}_3$
(–M effect of one –CHO group) < (–M effect of two –CO– group)

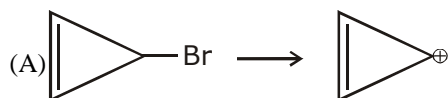
$\text{H}-\overset{\oplus}{\text{C}}(\text{O})-\overset{\oplus}{\text{C}}\text{H}(\text{O})-\text{C}(\text{O})-\text{H} < \text{OHC}-\overset{\oplus}{\text{C}}(\text{O})-\text{CHO}$
(–M effect of two –CHO group) < (–M effect of three –CHO group)

Q.15 (C)



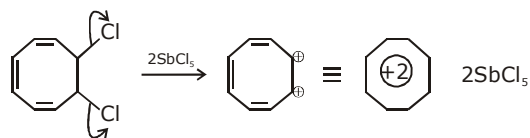
more stable the carbocation more easy the ionization

Q.16 (A)



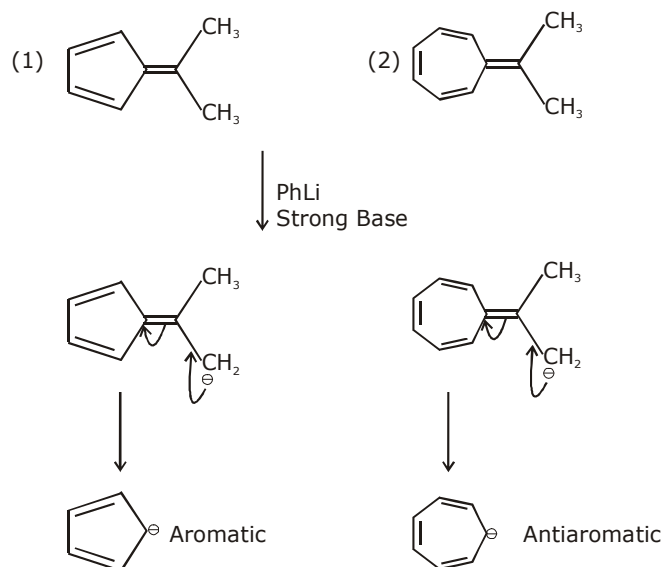
Quasi aromatic so more ease ionisation.

Q.17 (B)



Q.18 (B)

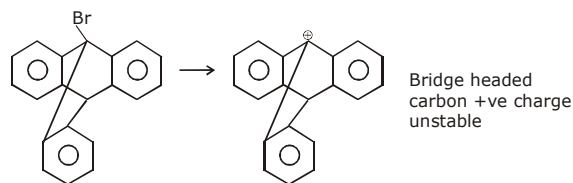
Q.19 (C)



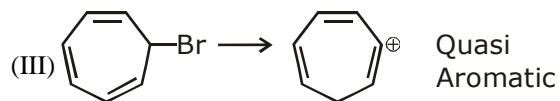
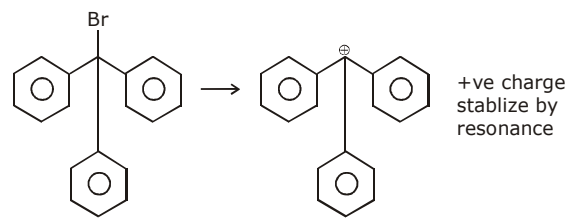
So phLi reacts readily with 1 But does not add to 2

Q.20 (A)

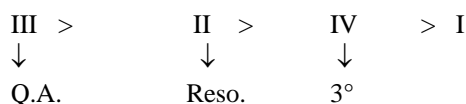
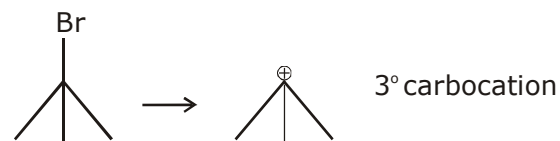
(I)



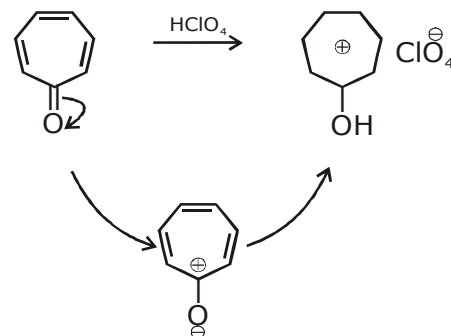
(II)



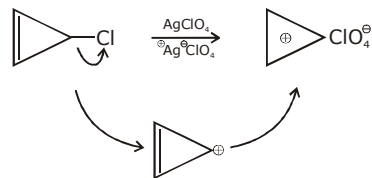
(IV)



Q.21 (A)



Q.22 (A)



Q.23 (A)

Stability ∝ Number of hyperconjugative H-atoms.

Q.24 (D)

Q.25 (C)

Due to ortho effect.

Q.26 (A)

On the basis of stability of conjugate base due to electronic effects.

(q)

(A) On the basis of stability of conjugate base due to electronic effects.

(r) (D)
On the basis of stability of conjugate base due to electronic effects.

(s) (B)
On the basis of stability of conjugate base due to electronic effects.

(t) (B)
On the basis of stability of conjugate base due to electronic effects.

(u) (A)
On the basis of stability of conjugate base due to electronic effects.

Q.27 (B)
On the basis of stability of conjugate base due to electronegativity.

Q.28 (C)
On the basis of stability of conjugate base due to electronic effects.

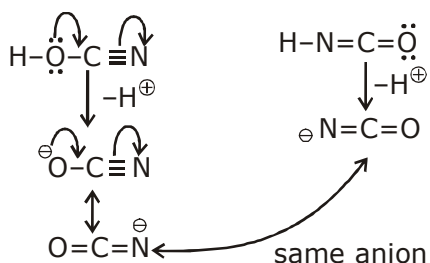
Q.29 (A)
III > II > I
The basicity order is inversely related to delocalisation of lone pair.

Q.30 (D)
(I) No delocalisation.
(II) Delocalisation (better).
(III) No delocalisation (but -I).
(IV) Delocalisation (but less effective than (II)).

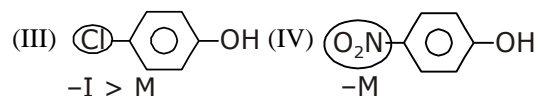
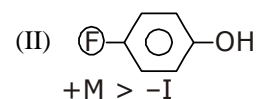
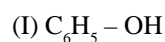
(q) (A)
On the basis of availability of electron pair.

(r) (A)
I → Guanidine derivative, II → +I effect,
III → Delocalisation, IV → Delocalisation (better)

Q.31 (A)

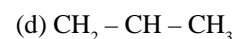
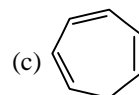
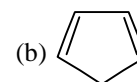


Q.32 (C)

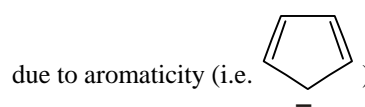


IV > III > II > I

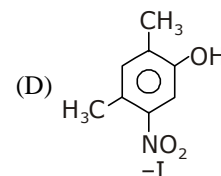
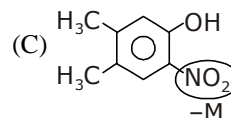
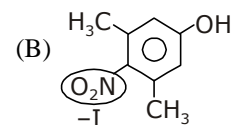
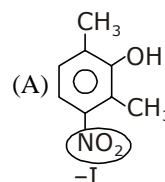
Q.33 (B)



The conjugate base of compound (b) is most stable

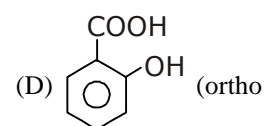
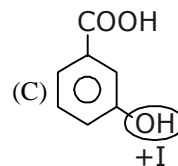
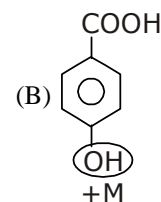
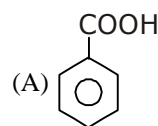


Q.34 (C)



Maximum acidity (C). Ans. (C)

Q.35 (B)



effect)

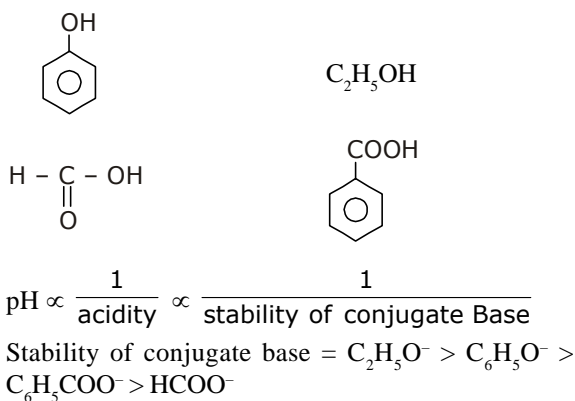
(most acidic)

Compound (B) is less acidic due to (+M) effect of -OH group because it is present on para position.

Q.36 (B)

(1) Phenol
(3) Formic acid

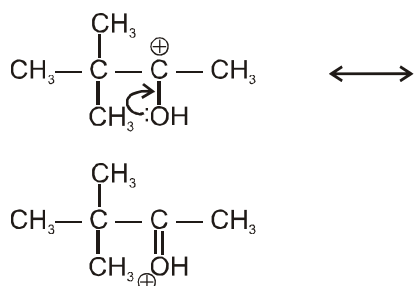
(2) Ethyl alcohol
(4) Benzoic acid



- Q.37** (A)
 (I) $\text{CH}_3-\text{NH}-\text{CH}_2-\text{CH}_2-\text{OH} \longrightarrow \text{CH}_3-\text{NH}-\text{CH}_2-\text{CH}_2-\text{O}^-$
 (II) $\text{CH}_3-\text{NH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH} \longrightarrow \text{CH}_3-\text{NH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{O}^-$
 (III) $(\text{CH}_3)_3\text{N}^+-\text{CH}_2-\text{CH}_2-\text{OH} \longrightarrow \text{N}^+(\text{CH}_3)_3-\text{CH}_2-\text{CH}_2-\text{O}^-$
 Strong -I effect
 Acidity order = III > I > II
- Q.38** (D)
 In 4th negative charge is not taking part in conjugation.
- Q.39** (B)
 1°, 2° & 3° H's are that which is attach at 1°, 2° & 3° carbon respectively.

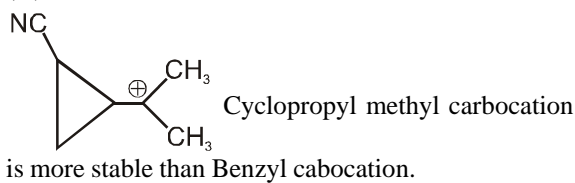
Q.40 (C)

Q.41 (A)

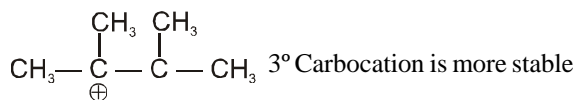


+ M effect of —OH group stabilises carbocation (Complete octet).

Q.42 (D)



Q.43 (C)



intermediate.

Q.44 (A)

Q.45 (D)

If both +M group are present on benzene ring then electrophilic attack in the influence of more +M group.

Q.46 (C)

$$\text{Heat of combustion} \propto \frac{1}{\text{stability of alkene}}$$

Q.47 (A)

Stability depends on hyperconjugation which further depends on total number of αH .

JEE-ADVANCED

MCQ/COMPREHENSION/COLUMN MATCHING

Q.1 (ABD)

Self explanatory.

Q.2 (ABC)

Self explanatory.

Q.3 (ACD)

Self explanatory.

Q.4 (BC)

Self explanatory.

Q.5 (BD)

Self explanatory.

Q.6 (ABCD)

Self explanatory.

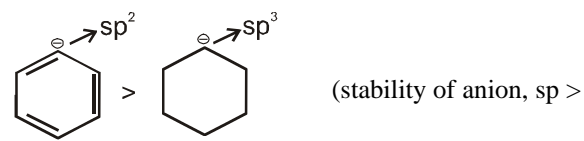
Q.7 (BD)

On the basis of electronic effect.

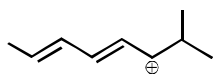
Q.8 (BC)

$\bar{\text{C}}\text{F}_3 < \bar{\text{C}}\text{Cl}_3$ (due to $p\pi-d\pi$ back bonding).

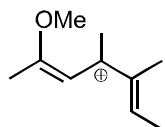
$\text{HC}\equiv\bar{\text{C}} > \text{CH}_2=\text{CH}^\ominus$ (sp^2 hybridised).

 (stability of anion, $\text{sp}^2 > \text{sp}^3$)
 $(\text{CH}_3)_3\bar{\text{C}} < \bar{\text{C}}\text{H}_3$ (stability order of carbocation inversely related to +I)

Q.9 (BCD)

(B)  has extended conjugation.

(C) $\text{CH}_3 - \text{O} - \overset{\oplus}{\text{C}}\text{H} - \text{CH}_3$ has +M effect of $-\text{OCH}_3$.

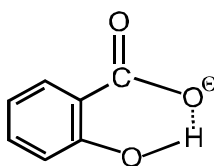
(D)  after delocalisation gets

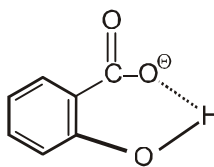
+M effect of $-\text{OMe}$.

Q.10 (AC)

Self explanatory.

Q.11 (CD)

(C)  Phthalic acid is stronger acid due to hydrogen bonding.

(D)  Salicylic acid is stronger acid due to H-bonding.

Q.12 (AC)

On the basis of electronic effect.

Q.13 (BCD)

Acidic strength is directly related to stability of conjugate base.

Q.14 (ABCD)

Acidic strength is directly related to stability of conjugate base.

Q.15 (AD)

On the basis of electronic effect.

Q.16 (ACD)

(A) $\text{CH}_3 - \overset{\text{O}}{\parallel}{\text{C}} - \text{O}^- > \text{H} - \overset{\text{O}}{\parallel}{\text{C}} - \text{O}^-$
(+I)

(C) $\text{CH}_2 = \overset{\ominus}{\text{C}}\text{H} \text{ sp}^2 > \text{H} - \text{C} \equiv \overset{\ominus}{\text{C}} \text{ sp}$

(D) $\text{CH}_3 - \overset{\cdot\cdot}{\text{N}}\text{H}_2 > \text{CH}_3 - \overset{\cdot\cdot}{\text{O}}\text{H}$

Q.17 (AB)

On the basis of electronic effect.

Q.18 (CD)

On the basis of availability of electron pair.

Q.19 (BC)

Anionic nucleophiles are better than their neutral nucleophiles.

Q.20 (AB)

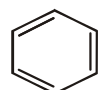
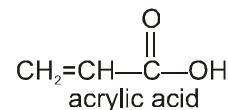
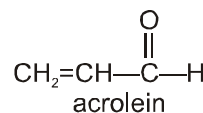
Leaving group ability \propto stability of anion.

Q.21 (ABCD)

$\text{C}_2\text{H}_5\text{OH}$ give $\text{S}_{\text{N}}1$ and $\text{E}1$ reaction so all products can be formed.

Comprehension # 1 (Q. No. 22 & 23)

But-1-ene (A) and Buta-1,3-diene (B) differ not only in the number of π bonds, but (B) also has σ and π bonds at alternate positions. This type of the system is called conjugated system. Following are some of the conjugate system



benzene

In such systems, π electron shifting result into permanent polarity. This type of π -electron shift in the conjugate systems is called mesomeric effect.

Rules for resonance forms :

(i) Individual resonating structures are imaginary, not real.

(ii) Resonance forms differ only in the position of their π electrons or nonbonding electrons.

(iii) Different resonating structures of a species don't have to be equivalent.

(iv) Resonating structures must be valid Lewis structures and obey normal rules of valency.

(v) The resonance hybrid is more stable than any individual resonating structures.

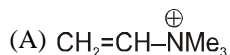
Rules for stability :

(i) Structures with more covalent bonds are more stable than other structures

(ii) Structures in which all of the atoms have a complete valence shell of electrons (i.e., the noble gas structure) are especially stable and make large contributions to the hybrid.

(iii) Structure that carry negative charge on a more electronegative atom and positive charge on less electronegative atom are comparatively more stable.

Q.22 In which of the following compound, delocalisation is not possible



Q.23 22. (A); 23. (C)

Sol. 22 Self explanatory.

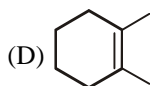
Sol. 23 Self explanatory.

Hyper conjugation : It is delocalisation of sigma electron with p-orbital. Also known as $\sigma \pi$ -conjugation or no bond resonance.

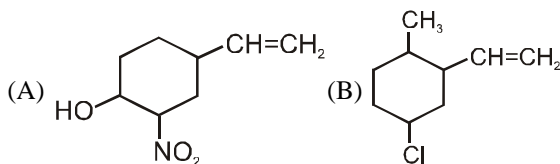
May takes place in alkene, alkynes, carbocation, free radical, benzene nucleus.

Necessary Condition : Presence of at least one hydrogen at saturated carbon which is α with respect to alkene, alkynes, carbocation, free radical, benzene nucleus.

Q.24 Which of the following alkenes have maximum number of hyper conjugation structure.



Q.25 In which of the following species hyperconjugation is not possible

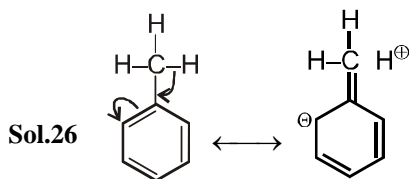


Q.26 (D*) $\text{C}_6\text{H}_5-\text{CH}_3$ does not show hyperconjugation.

Ans. 24. (D); 25. (C); 26. (D)

Sol.24 10 hyperconjugating structures.

Sol.25 (C) $\text{CH}_3-\ddot{\text{O}}-\text{CH}_2^{\oplus}$
There is no α -hydrogen for hyperconjugation.



It shows hyperconjugation.

Q.27 (A)
On the basis of ortho effect.

Q.28 (C)

On the basis of ortho effect and hydrogen bonding.

Q.29 (D)

On the basis of electronic effect.

Q.30 (C)

On the basis of electronic effect.

Q.31 (C)

On the basis of availability of electron pair and solvation in polar protic solvent.

Q.32 (D)

On the basis of I effect.

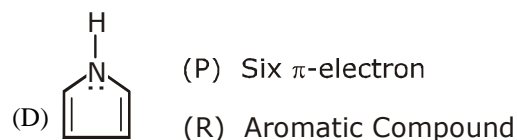
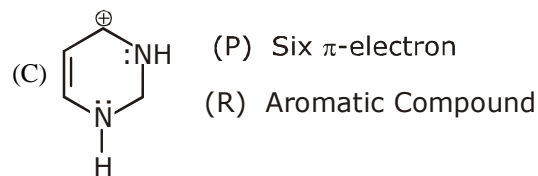
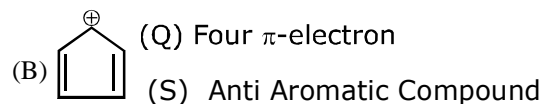
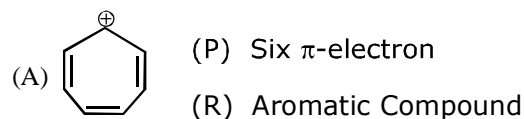
Q.33 (D)

On the basis of electronic effect.

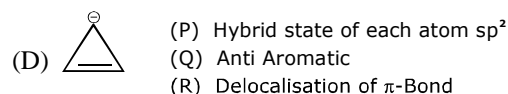
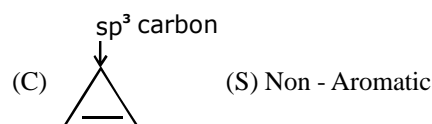
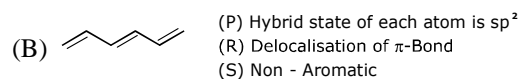
Q.34 (A)

On the basis of SIR effect.

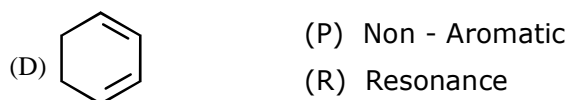
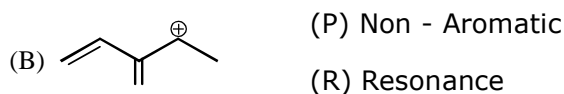
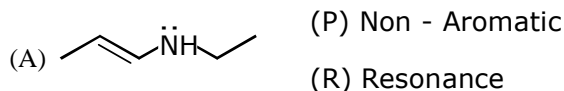
Q.35 (A) P, R; (B) Q, S; (c) P, R; (D) P, R



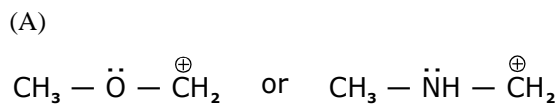
Q.36 (A) (P) Hybrid state of each atom sp^2
(R) delocalisation of π -bond
(T) Obeys huckel's Rule



Q.37 (A) P, R; (B) P, R; (C) R, S; (D) P, R

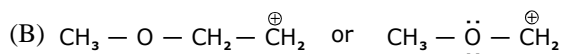


Q.38 (A) Q, R, S; (B) Q, R; (C) P, R; (D) P, R

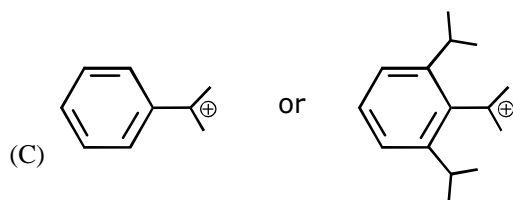


O atom is more E.N. atom than N -atom so O-atom can not denote the I.P easily from N-atom in Resonance so

- (Q) Second is more stable than first
(R) Not Resonating structure of each other
(S) Resonance is present in both carbocation

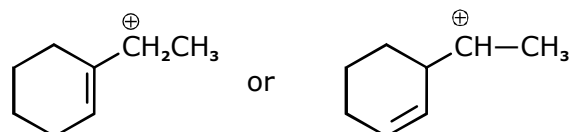


- (Q) Second is more stable than first
(R) Not Resonating structure of each other



- Reso. (SIR effect)
(P) First is more stable than second
(R) Not Resonating structure of each other

(D)



Reso.

- (P) First is more stable than second
(R) Not resonating structure of each other.

Q.39 (A) - W, S ; (B) - Z, R ; (C) - Y, Q ; (D) - X, P
(A) $\text{CH}_3 - \text{CH} = \text{CH}_2$ Number of $\alpha\text{-H} = 3$
C = C bond length = 1.39 Å

(B) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH}_2$ Number of $\alpha\text{-H} = 2$
C = C bond length = 1.37 Å

(C) $\text{CH}_3 - \underset{\text{CH}_3}{\text{C}} - \text{CH} = \text{CH}_2$ Number of $\alpha\text{-H} = 1$
C = C bond length = 1.35 Å

(D) $\text{CH}_3 - \underset{\text{CH}_3}{\overset{\text{CH}_3}{\text{C}}} - \text{CH} = \text{CH}_2$ Number of $\alpha\text{-H} = 0$
C = C bond length = 1.34 Å

Q.40 (A) - z ; (B) - w ; (C) - y ; (D) - x
On the basis of electronic effect.

Q.41 (A) - r ; (B) - p ; (C) - q
On the basis of electronic effect.

NUMERICAL VALUE BASED

Q.1 [4]

Electrophiles = CO_2 , SnCl_2 , FeCl_3 , BF_3

Q.2 [4]

NO_2^+ , $:\text{CCl}_2^+$, AlCl_3 , SO_3 are electrophiles but
not NH_4^+ , $:\text{CCl}_3^-$

Q.3 [6]

In carbocation 6 α hydrogen atom are present so hyperconjugative structure will be 6.

Q.4 [6]

Q.5 [4].

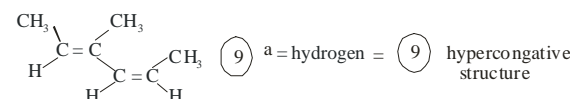
Q.6 [2]

Stronger acids are HCOOH and ClCH_2COOH .

Q.7 [3]

Q.8 [5]

Q.9 [9]



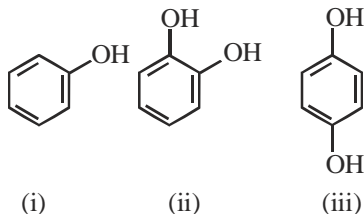
Q.10 [4]

Q.11 [2]

KVPY

PREVIOUS YEAR'S

Q.1 (C)



(iii) > (ii) > (i)

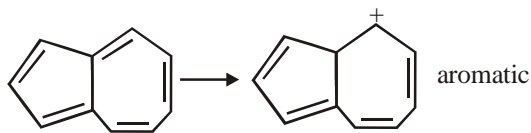
In (ii) Intra H-Bonding is not formed because ring formation is not stable

Q.2 (B)

(i) and (iv) are heteroaromatic compound.

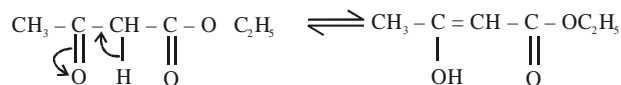
(ii) is non aromatic.

(i i i)



Q.3 (B)

Q.4 (A)



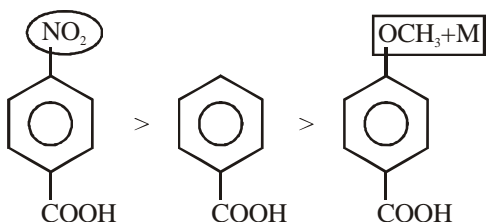
Aceto acetic ester has active methylene group.

Q.5 (3)

Acidic strength \propto -M, -H, -I (EWG)

$$\propto \frac{1}{+M} \frac{1}{+H} \frac{1}{+I}$$

-I, -M



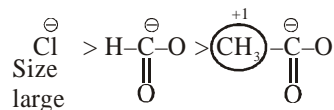
Q.6 (C)

$$\text{pH} = -\log[\text{H}^+]$$

$$\text{pH} \propto \frac{1}{[\text{H}^+]}$$

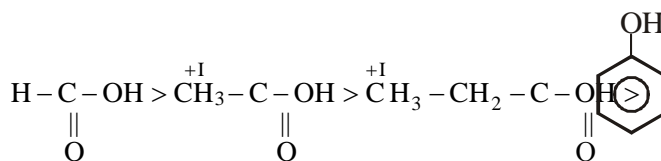
Order of pH $\text{CH}_3\text{COOH} > \text{HCOOH} > \text{HCl}$

Acidic strength \propto stability of Anion



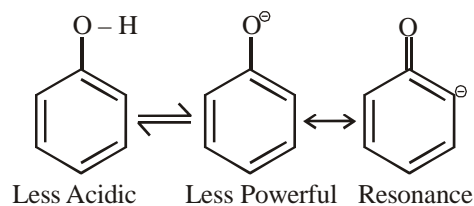
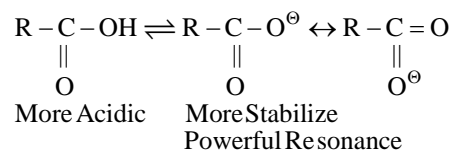
Q.7 (1)

Formic Acid is Strongest Acid.



\rightarrow +I decrease acidic strength

\rightarrow Carboxylic Acid are more acidic than phenol



Q.8 (B)

Acidic strength of acid is

$\text{HClO}_4 > \text{HClO}_3 > \text{HClO}_2 > \text{HClO}$

$[\text{H}^+] \uparrow \text{ka} \uparrow \text{pka} \downarrow$

$\therefore \text{pka order } \text{HClO}_4 < \text{HClO}_3 < \text{HClO}_2 < \text{HClO}$

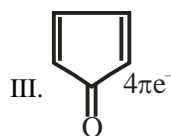
Q.9 (B)

(II) is most stable due to resonance then $3^\circ > 2^\circ > 1^\circ$ carbocation.

Q.10 (A)

Acetic acid is most acidic due to equivalent resonating structure.

Q.11 (B)

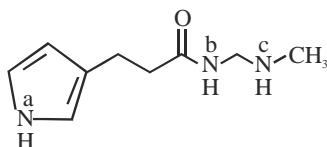


All C, sp^2 hybrid anti aromatic.



All C, sp^2 hybrid anti aromatic

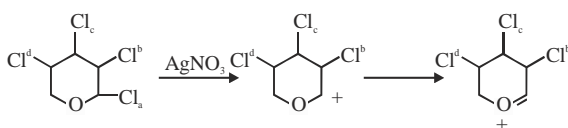
Q.12 (B)



Most acidic proton = "b" as the conjugate base is resonance stabilized and most nucleophilic nitrogen is "c" as the lone pair electron on nitrogen is localized in sp^3 hybrid orbital.

Q.13 (A)

The resulting carbocation formed by loss of $Cl^{(a)}$ is resonance stabilized.

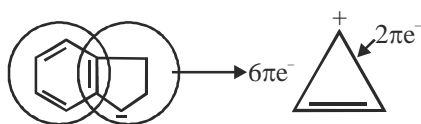


Q.14 (D)

tert-Butyl cation is more stable than isopropylcation because of better hyperconjugation (σ -vacant p orbital overlap), Whereas trans-butene is more stable than propene because of $\sigma - \pi^*$ orbital overlap.

Q.15 (D)

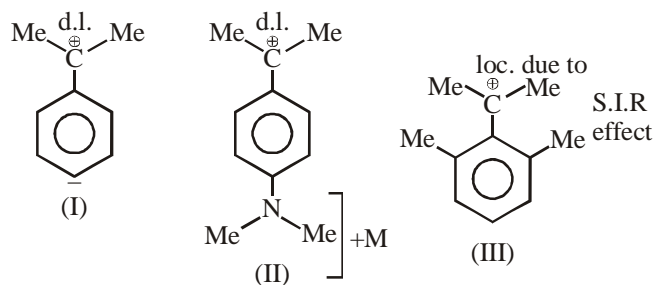
In option "D" both the ions are aromatic



Q.16 (B)

Aliphatic amines are more basic than aromatic amines. EWG decreases basic strength and EDG increases basic strength.

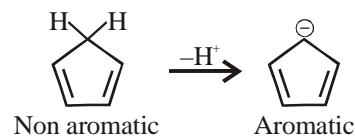
Q.17 (B)



stability : II > I > III

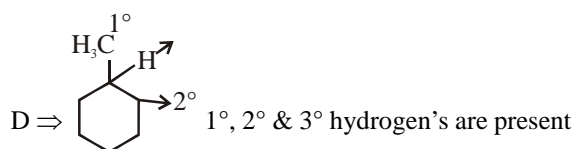
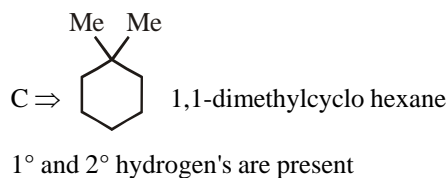
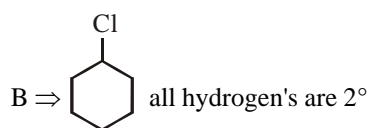
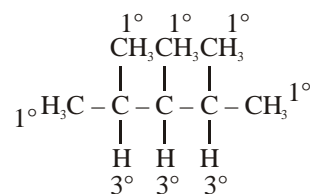
Note : In III carbocation is localised due to S.I.R. effect

Q.18 (B)

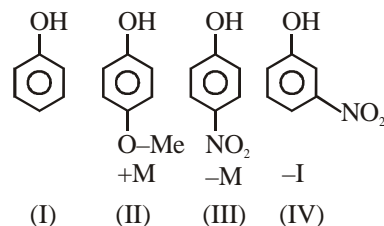


Q.19 (D)

A \Rightarrow 2,3,4-trimethylpentane
only 1° and 3° hydrogen's are present



Q.20 (C)



for acidic strength :

$-M > -HC > -I > - > +I > +HC > +M$

So III > IV > I > II

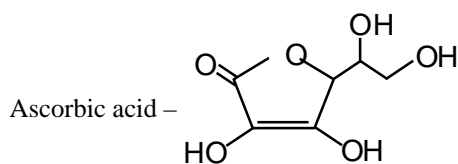
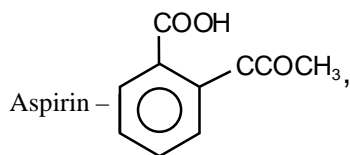
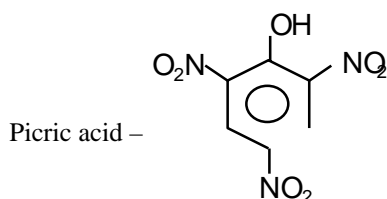
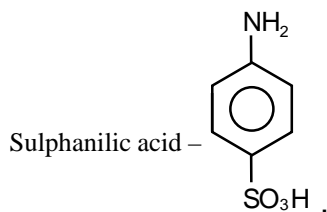
JEE-MAINS

PREVIOUS YEAR'S

Q.1 (1)

In phenyl methanamine lone pair of nitrogen is localised so it is most basic among the given amines. Benzenamine is least basic because lone pair of nitrogen is delocalised.

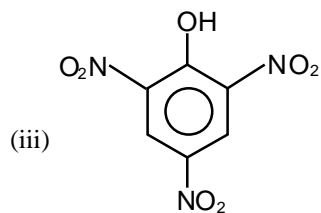
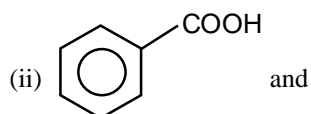
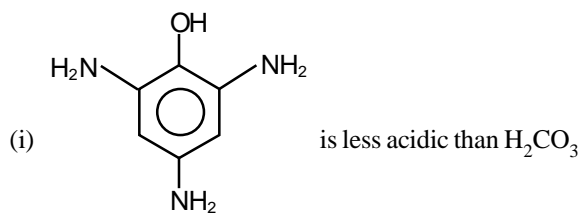
Q.2 (1)



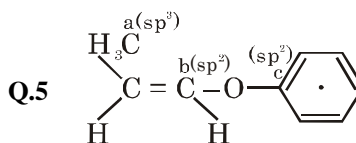
Q.3 (3)

Q.4 (3)

Compounds which are more acidic than H_2CO_3 give test with $NaHCO_3$.



are more acidic than H_2CO_3



Q.6 (1)

Q.7 (3)

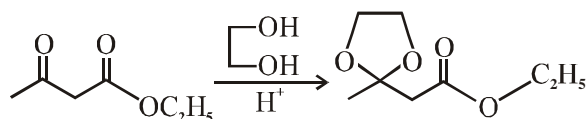
Ambident nucleophile

(A) KCN & $AgCN$

(C) $AgNO_2$ & KNO_2




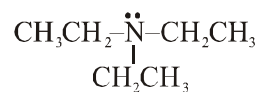
Q.9 (2)

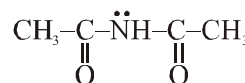


Q.10 (3)

For the given compounds :

(1)  ; L.P. on Nitrogen is delocalised.


(2)  ; L.P. on Nitrogen is localised.

(3)  ; L.P. on Nitrogen is

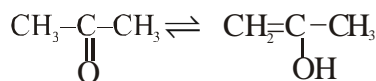
delocalised due to conjugation with both $\begin{matrix} -C- \\ || \\ O \end{matrix}$ (Hence least basic)

(4) $CH_3-CH_2-\ddot{N}H-CH_2-CH_3$; L.P. on Nitrogen is localised.

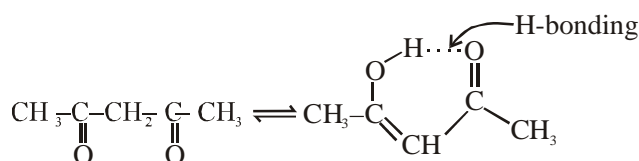
Q.11 (1) NaH (sodium Hydride) is used as a reducing reagent.

(2)  In pyridine, due to free electron on N atom, it is basic in nature. Hence statement I is false & II is true.

Q.12 (2)



(Keto form) (enol form)
enol form of acetone is very less (< 0.1 %)

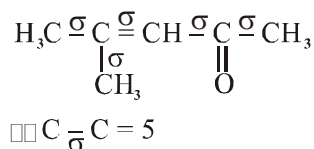


enol form (more than 50%)

Q.13 (A) Non-Aromatic
(C) Aromatic

(B) Aromatic
(D) Anti-Aromatic

Q.14 (5)
Mesityl oxide



Q.15 (3)

Q.16 (4)

Q.17 (1)

Q.18 (3)

Q.19 [108]

Q.20 (1)

Q.21 (2)

Q.22 (3)

Q.23 (3)

Q.24 (1,4)

JEE-ADVANCED PREVIOUS YEAR'S

Q.1 (B, C)

Anti-aromatic compounds are unstable at room temperature.

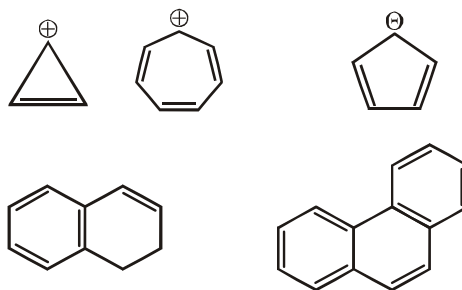
Q.2 (A,B,C,D)

Q.3 (A)

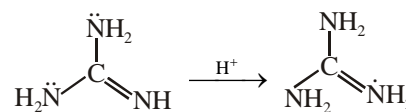
Q.4 (A,C,D)

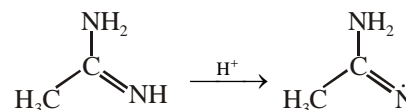
Q.5 (3)

Q.6 [5]

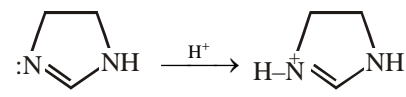


Q.7 (D)

 → The conjugate acid is stabilized by resonance with two different -NH₂ groups.

 → The conjugate acid is stabilized by resonance with one

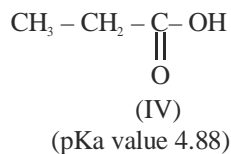
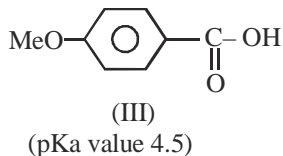
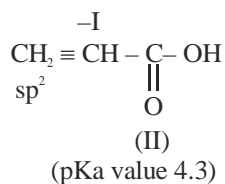
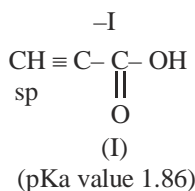
-NH₂ group and by hyperconjugation of -CH₃ group.

 → The conjugate acid is stabilized by resonance with only one NH₂ group.

(III) Least basic, as the LP is used in aromaticity.

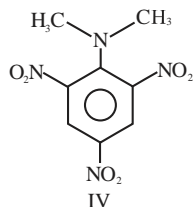
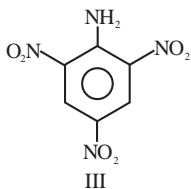
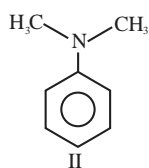
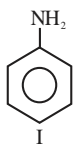
Q.8 (D)

I > II > III > IV



Q.9 (A,B,C)

Q.10 (C,D)



pK_b difference between I and II is 0.53 and that of III and IV is 4.6.

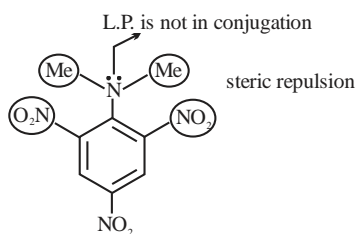
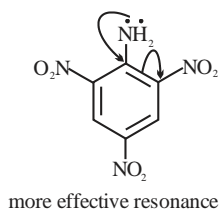
So option (B) is incorrect

Correct Statement (C), (D)

The most basic compound in the given option is (II) and least basic compound is (III)

In 2,4,6-trinitro aniline (III) due to strong -R effect of -NO₂ groups, the *l.p.* of -NH₂ is more involved with benzene ring hence it has least basic strength.

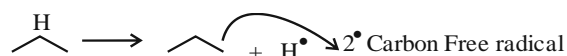
Whereas (IV) N,N-Dimethyl 2,4,6-trinitro aniline, due to steric inhibition to resonance (SIR) effect; the lone pair of nitrogen is not in the plane of benzene, hence make it (*l.p.*) more free to protonate



Q.11

A

Most stability of radiacal, less is the bond energy
(P)



**JEE-MAIN
OBJECTIVE QUESTIONS**

Q.1 (1)
Propane triol-1,2,3

Q.2 (D)
(a) is secondary and (b) is primary alcohol

Q.3 (B)
 $C_{n+1}H_{2n+3}NO_2$

Q.4 (1)
Acetonitrile

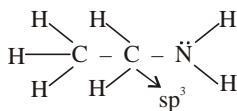
Q.5 (1) 1 and 4

Q.6 (C)

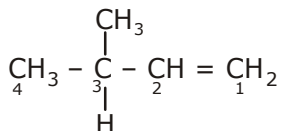
Q.7 (A)
(3, 21)

Q.8 (3)

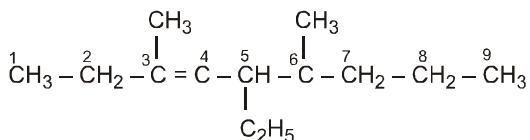
Q.9 (B)



Q.10 (3)
3-Methyl-1-butene



Q.11 (1)
5-ethyl-3, 6-dimethyl non-3-ene



Q.12 (3)

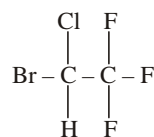
Q.13 (3)

Q.14 (2)

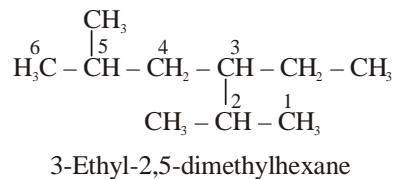
Q.15 (3)

Q.16 (1)
6-Chloro-4-ethyl-5-methyl-5-hepten-1-yne

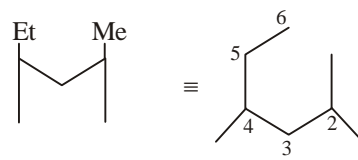
Q.17 (3)



Q.18 (3)

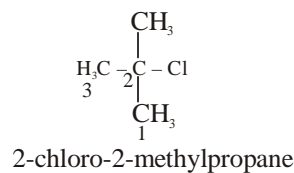


Q.19 (D)

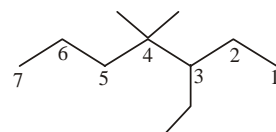


2, 4-dimethylhexane

Q.20 (4)

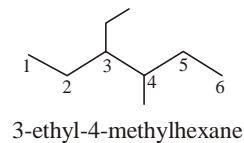


Q.21 (4)



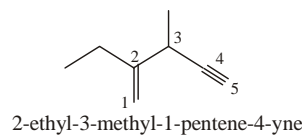
3-Ethyl-4, 4-dimethylheptane

Q.22 (2)



3-ethyl-4-methylhexane

Q.23 (1)

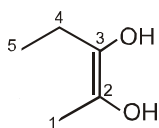


2-ethyl-3-methyl-1-pentene-4-yne

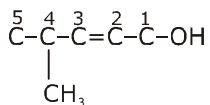
Q.24 (3)

Q.25 (2)

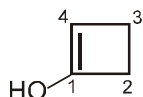
Pent-2-ene-2, 3-diol



Q.26 (4)
4-methyl pent-2-en-1-ol



Q.27 (1)



Q.28 (4)

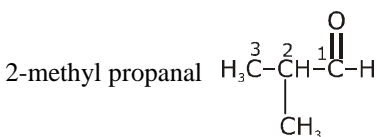
Q.29 (2)

-oic acid, chloro, hydroxy, methyl, oxo, 4-heptene

Q.30 (2)

N-Ethyl N-methyl propane 1-amine

Q.31 (1)

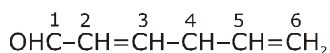


Q.32 (1)

2-ethoxy-4-methoxy pentan-3-one

Q.33 (1)

4-butyl-2,5-hexadien-1-al



Q.34 (3)

2-methyl-2,4-pentane diol

Q.35 (4)

Q.36 (C)

N-ethyl-N-methyl ethan amine

Q.37 (3)

3-phenyl prop-2-enoic acid

Q.38 (3)

Ethyl-2-methyl propanoate

Q.39 (3)

3-amino-4-chloro-2-methyl-2-pentenoic acid

Q.40 (3)

2-phenyl ethanamine

Q.41 (2)

N, 4-dimethyl pentan-2-amine

Q.42 (4)

2-methyl-2, 4-pentanediol

Q.43 (1)

N, N, 4-trimethylpentanamide

Q.44 (3)

3-ethyl-2, 4-dimethylpentanenitrile

Q.45 (2)

2, 3, 6-trimethyl-1-heptene-1, 7-dioic acid

Q.46 (1)

2-Bromo-2-chloro-2-fluoroethanal

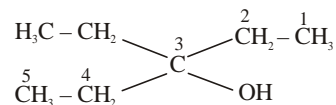
Q.47 (1)

2-cyclobutyl propanal

Q.48 (1)

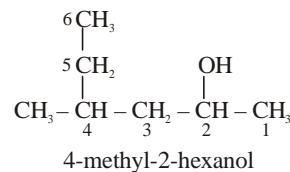
3-chloro-2-(1-propenyl)-2,4-hexa-di-enoic acid

Q.49 (3)

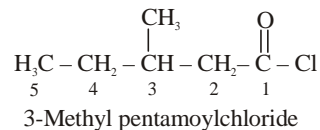


3-Ethylpentane-3-ol

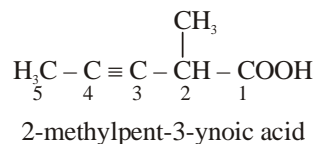
Q.50 (3)



Q.51 (1)



Q.52 (2)



Q.53 (3)

Q.54 (1)

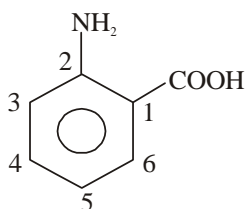
Q.55 (1)

1-cyclohexyl-3-methyl-1-pentene

Q.56 (3)

1-ethynylcyclohexanol

Q.57 (4)



2-aminobenzenecarboxylic acid

Q.58 (3)

Q.59 (3)

Q.60 (3)

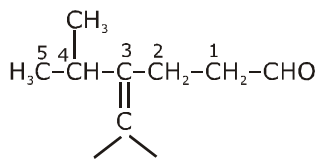
Q.61 (1)

JEE-ADVANCED**OBJECTIVE QUESTIONS**

Q.1 (B)

Q.2 (C)

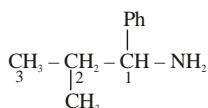
Q.3 (A)



Q.4 (B)

Q.5 (B)

Q.6 (B)



2-methyl-1-phenyl propane-1- amine

Q.7 (C)

Q.8 (B)

Q.9 (A)

Q.10 (C)

Q.11 (A)

Q.12 (B)

Q.13 (B)

Q.14 (C)

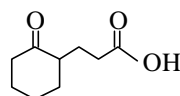
Q.15 (B)

Q.16 (B)

Q.17 (D)

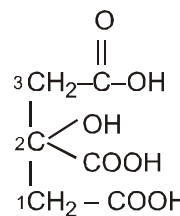
Q.18 (D)

Q.19 (B)



Q.20 (B)

2-hydroxy propane-1,2,3 tricarboxylic acid



Q.21 (C)

Q.22 (C)

Q.23 (A)

Q.24 (D)

Q.25 (D)

Q.26 (C)

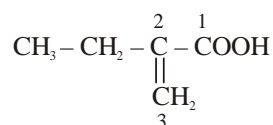
Q.27 (D)

Q.28 (A)

Q.29 (D)

Q.30 (C)

Q.31 (B)



2-ethyl-2-propenoic acid

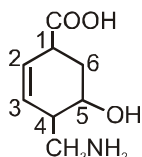
Q.32 (C)

Q.33 (C)

Q.34 (C)

Q.35 (B)

Q.36 (C)



4-Aminomethyl-5-hydroxycyclohex-2-ene-1-carboxylic acid

Q.37 (D)

Q.38 (A)

Q.39 (B)

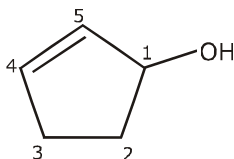
Q.40 (C)

Q.41 (B)

Q.42 (A)

Q.43 (C)

Q.44 (D)



Q.45 (B)

Q.46 (C)

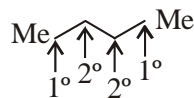
Q.47 (C)

JEE-ADVANCED**MCQ/COMPREHENSION/COLUMN MATCHING**

Q.1 (A,B,C)

- (A) The general formula of alkane is C_nH_{2n+2} .
 (B) They have different physical properties, but same chemical properties
 (C) International Union of Pure and Applied Chemistry

(D) It is correct



Q.2 (A,B,C)

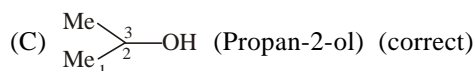
- (A), (B) and (C) are self explanatory
 (D) is wrong; alkyne consists of one triple bond

Q.3 (A,B,C)

- (A) It is common name
 (B) It is a saturated compound since it does not have (C = C) or (C ° C) bonds
 (C) They are used in trivial system
 (D) It is correct

Q.4 (C,D)

- (A) It is a saturated compound
 (B) It contains one 4° C atom



(D) $CH_3^2 - ^1C^{\circ} N$ (Ethane nitrile)

Q.5 (A,B,C,D)

Q.6 (A,B,C,D)

Q.7 (A,B,C,D)

Q.8 (A,B,D)

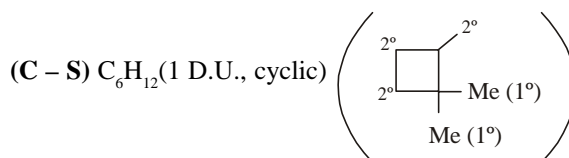
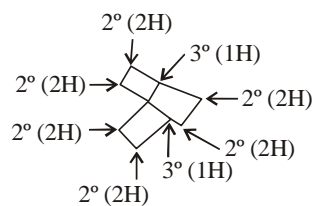
Q.9 (A,B,C,D)

Q.10 (A,B,C,D)

Q.11 (A) Q; (B) R; (C) S; (D) P

(A – Q) C_8H_{18} , saturated alkane.

(B – R) C_6H_{12} (1 D.U. means alkene or cyclic) It can be only (r).

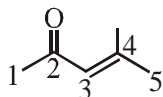
(D – P) C_8H_{14} (1 D.U., cyclic) 2° (12 H) 1° (H)

Q.12 (A) R, Q; (B) P; (C) S

Q.13 (A) Q, R; (B) R, S; (C) P

Q.14 (A) Q; (B) R; (C) P; (D) T; (E) S

Q.1 (4)



Mesityloxide

IUPAC [4-Methylpent-3-en-2-one]

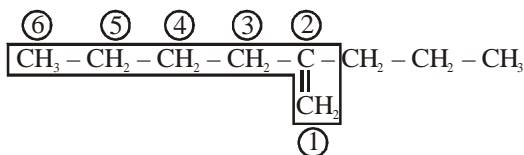
Q.2 (10)

Q.3 (3)

KVPY

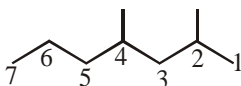
PREVIOUS YEAR'S

Q.1 (1)

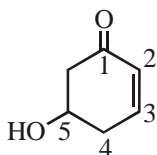


2 propyl hex - 1 ene

Q.2 (C)



Q.3 (D)



5-hydroxycyclohex-2-en-1-one

JEE-ADVANCED

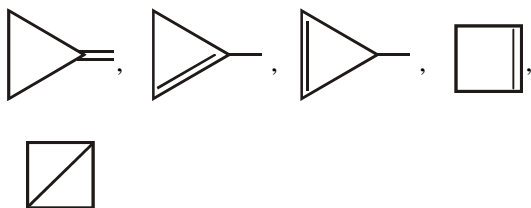
PREVIOUS YEAR'S

Q.1 5

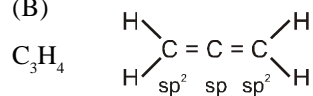
The DU of $C_4H_6 = 2$.

It can have (a) two rings (b) one double bond and one ring.

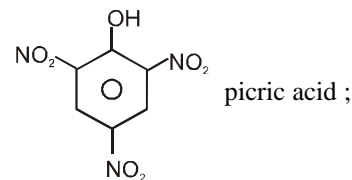
C_4H_6 DU = 2.



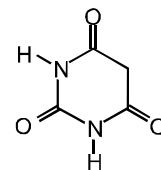
Q.2 (B)



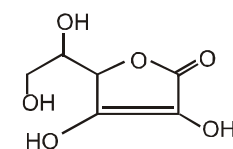
Q.3 (D)



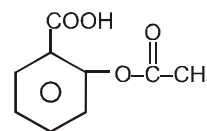
picric acid ;



barbituric acid

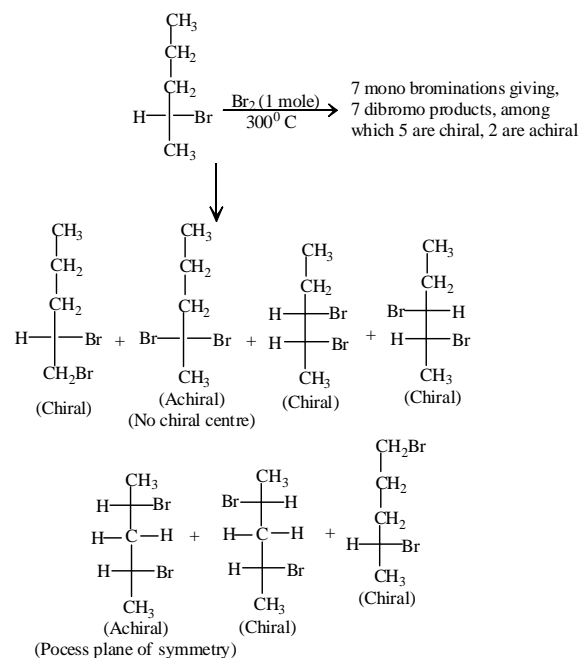


ascorbic acid ;



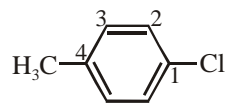
aspirin

Q.4 [5]



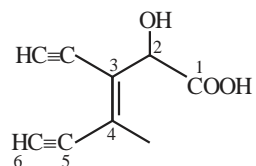
Q.5 (A)
Ortho effect decreases the basicity of

Q.6 (BC)



- (C) 1-chloro-4-methylbenzene
(B) 4-chlorotoluene

Q.7 (D)



3-ethynyl-2-hydroxy-4-methyl-hex-3-en-5-ynoic acid.