CHEMISTRY

JEE (MAIN AND ADVANCED) CHEMISTRY

ELECTRONIC EFFECTS AND REACTION INTERMEDIATES

LECTURE SHEET - EXERCISE-I (Sraight Objective Type Questions)

1. $+I$ effect (inductive effect) is shown by

A. $-CH_3$

B. $-OH$

C. $-F$

D. $-C_6H_5$

Answer: A

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2. Shifting of electrons of a multiple bond under the influence of reagent is called

A. I-effect

B. M-effect

C. E-effect

D. T-effect

Answer: C

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3. Which of the following show electromeric effect?

A. Alkanes

B. Alkyl amines

C. Alkyl halides

D. Aldehydes

Answer: D

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4. Which of the following ions exhibit resonance ?

A. NO_3^-

B. CH_3COO^-

C. CO_3^{-2}

D. All of the above

Answer: D

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5. Mesomeric effect is a permanent effect in which π electrons are transferred from a

A. Multiple bond to an atom

B. Multiple bond to a single covalent bond

C. Both a and b

D. None

Answer: C

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6. $-CHO$ group is

A. $+ME$ and $+IE$ group

B. $-ME$ and $-IE$ group

C. $+ME$ and $-IE$ group

D. $-ME$ and $+IE$ group

Answer: B

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7. Which of the following alkyl groups is more powerful electron donating group when they are attached to unsaturated carbon

A. $-CH(CH_3)_2$

B. $-CH(CH_3)C_2H_5$

C. $-CH_3$

D. $-CH(CH_3)_3$

Answer: B

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8. Which of the following statements about inductive effect is correct?

A. It involves electrons in σ bond

B. The electron pairs is only slightly displaced during the I-effect

C. It is diminishing effect

D. All are correct

Answer: D

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9. In benzyl amine amino group is a

A. $-I$ group

B. $+M$ group

C. $+I$ group

D. both (a) and (b)

Answer: A

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10. Which of the following has maximum number of hyper conjugative structures?

A. Isopropyl carbonium ion

B. Tertiary butyl carbonium ion

C. n-propyl carbonium

D. Benzyl carbonium ion

Answer: B

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11. Arrange the following in the decreasing order of basic strength

i) pyrrole ii) pyridine iii) aniline

A. $i > ii > iii$

B. $ii > iii > i$

C. $ii = iii = i$

D. $iii > ii > i$

Answer: B

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12. Which of the following is strongest $-I$ group

A. $-F$

B. $-CI$

C. $-Br$

D. $-I$

Answer: A

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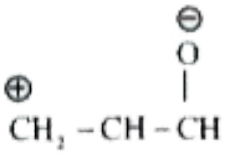
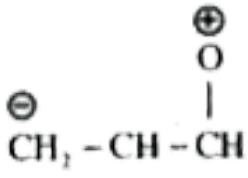
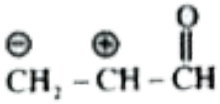
13. The common name of $CH_3 - CH = CH - CHO$

A. 

B. 

C. 

D. All are equally stable

Answer: B

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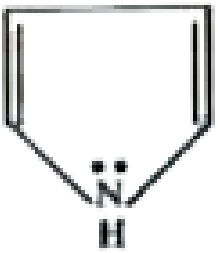
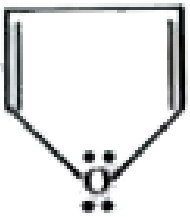
14. Which of the following possess highest melting point

A. 

B. 

C. 

D. 

Answer: A

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15. Inductive effect refers to

A. Electron displacement along a carbon chain through sigma-bonds

B. Complete transfer of one of the shared pair of electrons to one of the atoms joined by a double bond

C. Complete transfer of unshared electrons

D. None of the above

Answer: A

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16. Polarization of electrons in acrolein may be written as

A. $H_2^{\delta^-} C = CH - CH = O^{\delta^-}$

B. $H_2^{\delta^-} C = CH - C^{\delta^-} H = O$

C. $H_2^{\delta^-} C = C^{\delta^-} H - CH = O$

D. $H_2^{\delta^-} C = CH - CH = O^{\delta^+}$

Answer: A

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17. Which of the following statements regarding the resonance energy of benzene is correct ?

A. It is the energy required to break the C-H bond in benzene

B. It is the energy required to break the C-C bond in benzene

C. It is a measure of stability of benzene

D. It is the energy required to convert 

Answer: C

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18. In $HCOO-$ ion, the two carbon-oxygen bonds are found to be equal length, what is the reason for it?

A. The C = O bond is weaker than the C - O bond

B. The anion $HCOO^-$ has two resonating structures

C. The electronic orbital's of carbon atom are hybridized

D. The anion is obtained by removal of a proton from the acid molecule

Answer: B

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19. Hyper conjugation involves overlap of the following orbitals

A. $\sigma - \sigma$

B. $\sigma - p$

C. $p - p$

D. $\pi - \pi$

Answer: B

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20. Mesomeric effect involves the delocalization of

A. Protons

B. pi electrons

C. Sigma electrons

D. None of these

Answer: C

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21. Which among the following statements are true with respect to electronic displacement in a covalent bond?

I) Inductive effect operates through a $\pi -$ bond

II) Resonance effect operates through a $\sigma -$ bond

III) Inductive effect operates through a $\sigma -$ bond

IV) Resonance effect operates through a $\pi -$ bond

V) Resonance and inductive effects operate through a $\sigma -$ bond

A. I and II

B. I and III

C. II and III

D. III and IV

Answer: D

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22. The correct stability order of the following resonance structures is

$$\underset{(I)}{H_2C=\overset{+}{N}=\overset{-}{N}H_2} \quad \underset{(II)}{\overset{+}{C}-N=\overset{-}{N}H_2} \quad \underset{(III)}{\overset{-}{C}-\overset{+}{N}\equiv NH_2} \quad \underset{(IV)}{C\overset{-}{C}-N=\overset{+}{N}}$$

A. $I > II > IV > III$

B. $I > III > II > IV$

C. $II > I > III > IV$

D. $III > I > IV > II$

Answer: B

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23. Which of the following statements is wrong :

A. Hyper conjugation is the simultaneous shift of sigma and π electrons at 1, 3-positions without the movement of any atom

B. Mesomeric effect is the delocalization of π electrons with lone pair π electrons in conjugation

C. Inductive effective is the permanent shifting of sigma electrons towards most electronegative atom

D. Tautomerism is shifting atoms at 1,3-positions without the shifting of π and πe^-

Answer: D

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LECTURE SHEET - EXERCISE-I (More than One correct answer Type Questions)

1. The $-I$ effect is shown by ?

A. $-COOH$

B. $-OCH_3$

C. $-CH_3CH_2$

D. $-F$

Answer: A::B::C::D

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2. The bond length is affected by

A. Hybridisation

B. Delocalisation

C. Electronegativity

D. Hyperconjugation

Answer: A::B::C::D

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3. Mark the true statement concerning mesomeric effect ?

A. It occurs in systems having conjugate double bonds in compounds

B. It involves electrons of π bonds

C. The electron pair is transferred completely

D. It involves lone pair of electrons

Answer: A::B::D

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4. Pick up the correct statements

A. Mesomeric effect occurs in compounds having conjugate system of double bonds

B. Inductive effect is transmitted over to few carbon atoms

C. Due to mesomeric effect, electron pair is transferred completely

D. Inductive effect is a polarisability effect

Answer: A::B::C

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5. Resonating structures of a molecule should have

A. Identical arragment of atoms

B. Nearly the same energy content

C. The same number of paired electrons

D. The same number of unpaired electrons

Answer: A::B::C::D

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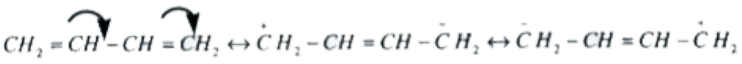
LECTURE SHEET - EXERCISE-I (Linked Comprehension Type Questions)

1. If a compound contains conjugated system, the measured bond lengths differ form the expected bond length but 1, 3 diene contains following resonance structures



The bond length between $C_2 - C_3$ carbon is

A. $1.20A^\circ$

B. $1.34A^\circ$

C. $1.54A^\circ$

D. In between $1.34A^\circ$ and $1.54A^\circ$

Answer: D

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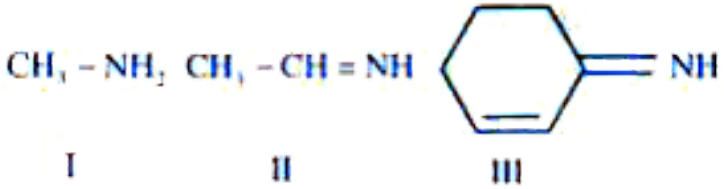
2. If a compound contains conjugated system, the measured bond lengths differ form the expected bond length but 1, 3 diene contains following resonance structures

$CH_2 = \overset{\curvearrowright}{CH} - CH = \overset{\curvearrowright}{CH_2} \leftrightarrow \dot{C}H_2 - CH = CH - \bar{C}H_2 \leftrightarrow \bar{C}H_2 - CH = CH - \dot{C}H_2$

Increasing order of bond length between carbon and nitrogen is



I II III

A. $II < III < I$

B. $I < II < III$

C. $III < II < I$

D. $II < I < III$

Answer: A

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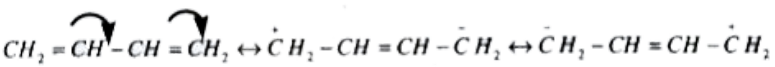
3. If a compound contains conjugated system, the measured bond lengths differ form the expected bond length but 1, 3 diene contains following resonance structures



Which of the following is correct

A. In 1,3 - butadiene all C-atoms are sp^2

B. Bond lengths between $C_2 - C_3$ is higher than $C_1 - C_2$

C. Butadiene exhibits 1,4-addition as well as 1,2 - addition

D. All the above

Answer: D

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4. Hyperconjugation describes the orbital interactions between the p-systems and the adjacent s-bond of the substituent group(s) in organic compounds. Hyperconjugation is also called as Baker and Nathen effect. The necessary and sufficient condition for the hyperconjugation are :

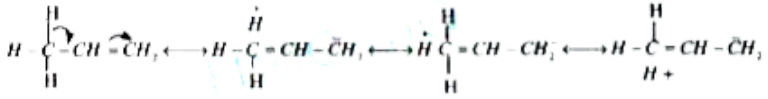
i) Compound should have at least on sp2 hybrid carbon of either alkene, carbocation or alkyl free radical.

ii) A-carbon with respect to sp2 hybrid carbon should have at least one hydrogen. Hyperconjugation are of three types: (i) s(C-H), p-conjugation.

(iii) s(C-H), positive charge conjugation

iv) s(C-H), odd electron conjugation

The hyperconjugation may be represented as



Number of resonating structures due to hyperconjugation = (n + 1) where n is the number of a-hydrogen.

Greater is the number of such forms, more is the stability of the species under considersation.

Hyperconjugation is possible in which of the following species ?

A. $CH_3 - \overline{C}H - CH_3$

B. $C_6H_5 - CH_3$

C. $H_2C = CH_2$

D. $H_3C - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}} - CH = CH_2$

Answer: B

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5. Hyperconjugation describes the orbital interactions between the p-systems and the adjacent s-bond of the substituent group(s) in organic compounds. Hyperconjugation is also called as Baker and Nathen effect. The necessary and sufficient condition for the hyperconjugation are :

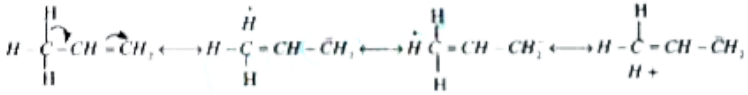
i) Compound should have at least on sp2 hybrid carbon of either alkene, carbocation or alkyl free radical.

ii) A-carbon with respect to sp2 hybrid carbon should have at least one hydrogen. Hyperconjugation are of three types: (i) s(C-H), p-conjugation.

(iii) s(C-H), positive charge conjugation

iv) s(C-H), odd electron conjugation

The hyperconjugation may be represented as



Number of resonating structures due to hyperconjugation = (n + 1) where n is the number of a-hydrogen.

Greater is the number of such forms, more is the stability of the species

under considersation.

Which of the following carbocations will show highest number of Hyperconjugation forms?

A. $CH_3 - \overset{+}{C}H_2$

B. $H_3C - \overset{+}{C}H$ with CH_3 below

C. $H_3C - \overset{CH_3}{\underset{CH_3}{C^+}}$

D. $H_3C - CH_2 - \overset{CH_3}{\underset{CH_3}{C^+}}$

Answer: C

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6. Hyperconjugation describes the orbital interactions between the p-systems and the adjacent s-bond of the substituent group(s) in organic compounds. Hyperconjugation is also called as Baker and Nathen effect. The necessary and sufficient condition for the hyperconjugation are :

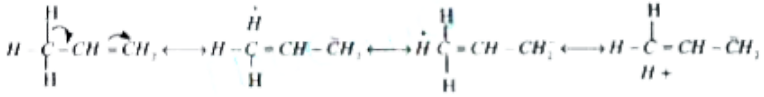
i) Compound should have at least on sp2 hybrid carbon of either alkene, carbocation or alkyl free radical.

ii) A-carbon with respect to sp2 hybrid carbon should have at least one hydrogen. Hyperconjugation are of three types: (i) s(C-H), p-conjugation.

(iii) s(C-H), positive charge conjugation

iv) s(C-H), odd electron conjugation

The hyperconjugation may be represented as



Number of resonating structures due to hyperconjugation = (n + 1) where n is the number of a-hydrogen.

Greater is the number of such forms, more is the stability of the species under considersation.

Stability of saturated alkyl carbocations can be explained by

A. inductive effect

B. hyperconjugation

C. both inductive effect and hyperconjugation

D. electromeric effect

Answer: A

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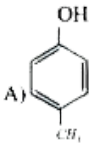
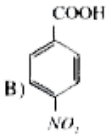
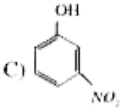
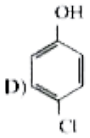
LECTURE SHEET - EXERCISE-I (Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) +M effect
B) 	Q) –M effect
C) 	R) +I effect
D) 	S) –I effect
	T) Hyperconjugation

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	Column-I	Column-II
	A) $CH_2 = CH - Cl$	P) +I effect
2.	B) $CH_3 - CH = CH - O - CH_3$	Q) -I effect
	C) $CH_3CH_2CH_2 - Cl$	R) Hyperconjugation
	D) $CH_3 - CH_2 - CH_2 - CH_3$	S) Resonance

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LECTURE SHEET - EXERCISE-I (Integer Type Questions)

1. Number of possible resonance structures of

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2. Total number of no bond resonance structures in tertiary pentyl cation is

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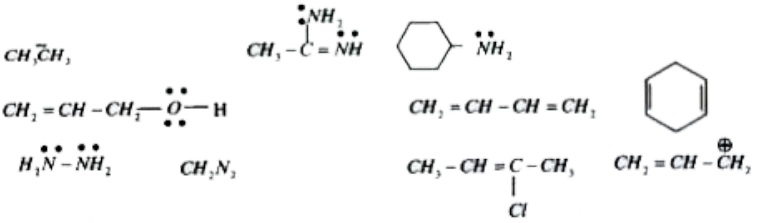
3. Total number of species which exhibit mesomersim (Conjugation) in the following species are



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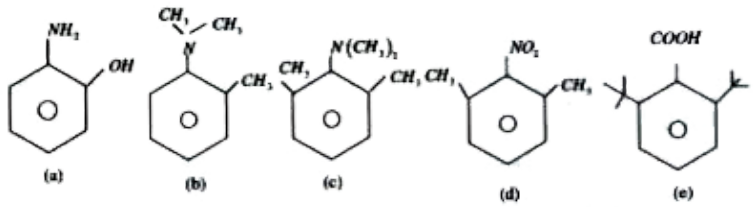
4. Number of molecules in which steric inhibition of resonance is observed is



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5. Total number of groups which can have higher-I effect than -F

$-NR_3^{\oplus} \ -SR_2^{\oplus} \ -NO_2 \ -SO_2R \ -CN, \ -OR \ -OH \ -NH_2 \ -Cl \ -CO$

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LECTURE SHEET - EXERCISE-II (Straight Objective Type Questions)

1. Which of the following is not a nucleophile ?

A. OH-

B. HSO_3^-

C. NH_3

D. BF_3

Answer: D

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2. Which of the following is a free radical?

A. NO_2^-

B. Cl^-

C. $Cl^{\cdot}$

D. Cl^+

Answer: C

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3. Shape of methyl carbanion is

A. Planar

B. Pyramidal

C. Tetrahedral

D. Linear

Answer: B

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4. Free radical reactions

A. occur in gas phases

B. are initiated by light or peroxides

C. are often chain reactions

D. All are correct

Answer: D

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5. Which of the following occurs reaction intermediate?

A. Free radicals

B. Carbocations

C. Carbanions

D. All

Answer: D

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6. Which of the following is a more stable carbocation?

A. Sec. pentyl carbocation

B. Tert. Pentyl carbocation

C. Isopentyl carbocation

D. Neopentyl carbocation

Answer: C

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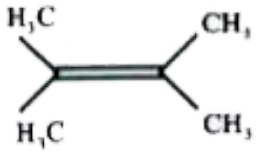
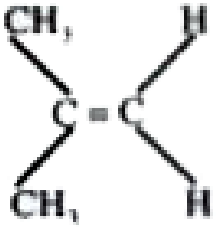
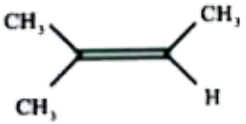
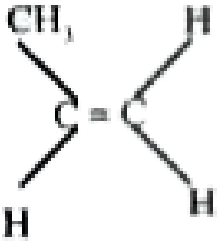
7. The most stable alkene among the following is

A. 

B. 

C. 

D. 

Answer: A

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8. Which of the following free radicals is the least stable ?

A. $\cdot CH_3$

B. $\cdot CH_2 - CH_3$

C. $CH_3 - \dot{C}H - CH_3$

D. $CH_3 - \underset{\underset{CH_3}{|}}{\dot{C}} - CH_3$

Answer: A

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9. Homolytic fission of C - C bond in ethane gives an intermediate in which carbon is

A. sp^3-hybridized

B. $sp^2 -$ hybridized

C. $sp -$ hybridized

D. sp^3d- hybridized

Answer: C

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10. The order of decreasing stability of the carbanions

I) $C\overline{H}_3$ II) $CH_3-C\overline{H}_2$ III) $CH_3-C\overline{H}-CH_3$ IV) $\overset{CH_3-\overline{C}-CH_3}{\underset{|}{C}H_3}$

A. $I>II>III>IV$

B. $IV>III>II>I$

C. $IV>I>II>III$

D. $I>II>IV>III$

Answer: A

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11. Benzyl cation is stabilized by

A. Resonance

B. hyperconjugation

C. both (a) & (b)

D. inductive

Answer: A

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12. Match List-1 (ion/radical) with List-II (stabilisation) and select the correct answer using the codes given below the lists

List-I	List-II
A) $C(CH_3)_3$ (Free radical)	1) Inductive effect
B) PHO^-	2) Hyperconjugation
C) $^+CH_2C(CH_3)_3$	3) Resonance

A. A-1, B-2, C-3

B. A-2,B-1,C-3

C. A-3,B-1,C-2

D. A-2,B-3,C-1

Answer: D

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13. Which of the following is stabilised by mesomeric effect ?

A. $CH_3 - \overset{\oplus}{C}H_2$

B. $CH_2 - \overset{\oplus}{C}H$

C. $CH_2 = CH - \overset{\oplus}{C}H_2$

D. $\begin{matrix} CH_2 - CH_2^{\oplus} \\ | \\ NO_2 \end{matrix}$

Answer: C

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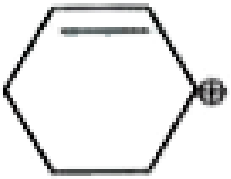
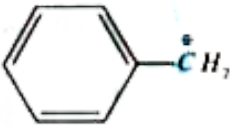
14. Which of the following carbocations is most stable



A.

B. $CH_2 = \overset{\oplus}{C}H$

C. $(CH_3)_3C^{\oplus}$



D.

Answer: D

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15. Which of the following is a Lewis acid ?

A. Carbanion

B. Free radical

C. Carbocation

D. None

Answer: C

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16. The paramagnetic species is

A. Carbonium ion

B. Carbanion

C. Free Raical

D. None

Answer: C

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17. Which of the following species is electron defficient

A. Carbonium ion

B. Carbanion

C. Free Raical

D. both a & c

Answer: D

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18. Pick out the most stable carbonium ion

A. $C_6H_5-\overset{+}{C}(C_6H_5)-C_6H_5$

B. $CH_3-\overset{+}{C}(CH_3)-CH_3$

C. $CH_3-\overset{+}{C}H-CH_3$

D. $CH_3-CH_2-\overset{+}{C}H_2$

Answer: A

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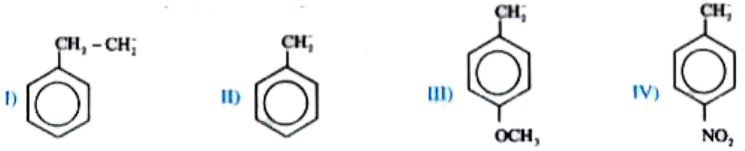
19. The order of stability of the following carbanions is



A. $I > II > III > IV$

B. $IV > II > III > I$

C. $I > III > II > IV$

D. $I > II > IV > III$

Answer: D

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20. The order of stability of the following carbanions

(I) o-nitrobenzyl carbanion (II) m-nitrobenzyl carbanion

(III) p-nitrobenzyl carbanion (IV) Benzyl carbanion

A. $I > II > III > IV$

B. $IV > II > III > I$

C. $I > III > II > IV$

D. $I > II > IV > III$

Answer: C

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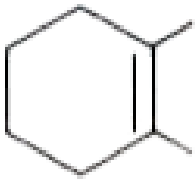
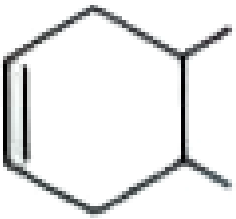
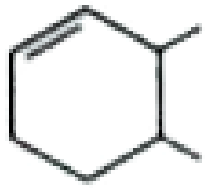
21. The most stable alkene among the following is

A. 

B.



C.



D.

Answer: A

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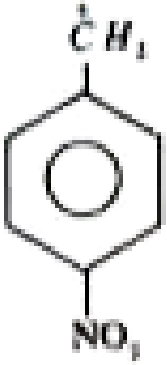
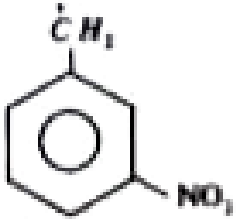
LECTURE SHEET - EXERCISE-II (More than One correct answer Type Questions)

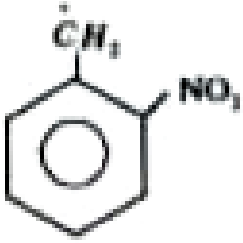
1. Which of the following is the most stable carbocation



A.



B.



C.

D. All are equally stable

Answer: B

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2. Which free radical is the most stable ?

A. $\dot{C}H_3$

B. $CH_3\dot{C}H_2$

C. $CH\dot{C}H - CH_3$

D. $(CH_3)_3\dot{C}$

Answer: D

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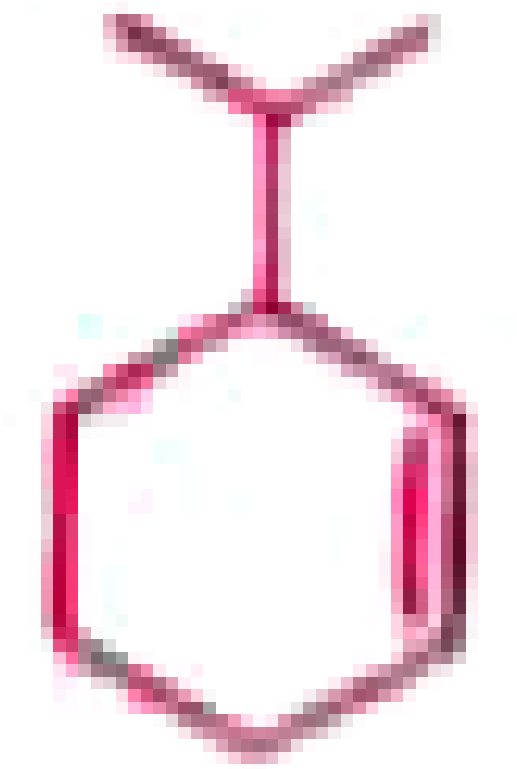
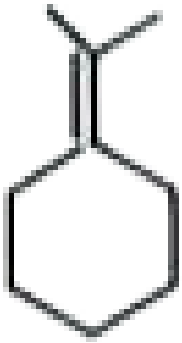
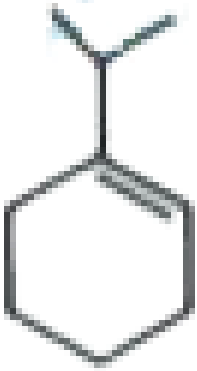
3. Which of the following alkenes are more stable than

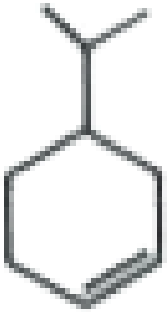




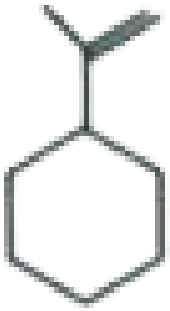
A.



B.



C.



D.

Answer: A::B::C::D

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4. Which of the following carbocation is more stable

A. $\overset{+}{C}H_3$

B. $CH_3\overset{+}{C}H_2$

C. $CH_3\overset{+}{C}H - CH_3$

D. $(CH_3)_3\overset{+}{C}$

Answer: D

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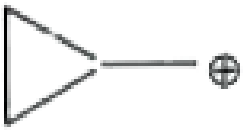
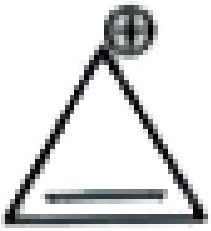
5. Among the following which is/are more stable $C_6H_5\overset{\oplus}{C}H_2$

A. 

B. $(CH_3)_3C^+$

C. 

D. 

Answer: A::C

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6. Among the following which is/are more stable than $\dot{C}H_3$

A. $\dot{C}H_2 - OCH_3$

B. $\dot{C}H_2 - NO_2$

C. $CH_2 = CH - \dot{C}H_2$

D. $(CH_3)_3\dot{C}$

Answer: C::D

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LECTURE SHEET - EXERCISE-II (Linked Comprehension Type Questions)

1. The delocalisation of σ electrons with P-orbital is known as Hyperconjugation. It is also known as $\sigma - \pi$ conjugation 'or' No bond resonance. Presence of atleast one $'\alpha'$ hydrogen at saturated carbon in an alkene, carbocation and free radical involves hyper conjucation. More

is the no. of hyper conjugative structures more stable is the alkene. Bond lengths, dipolemoments are also effected by hyperconjugation.

Hyper conjugation involves the

A. σ bond

B. π bond

C. Both σ and π bond

D. none of these

Answer: A

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2. The delocalisation of σ electrons with P-orbital is known as Hyperconjugation. It is also known as $\sigma - \pi$ conjugation 'or' No bond resonance. Presence of atleast one $'\alpha'$ hydrogen at saturated carbon in an alkene, carbocation and free radical involves hyper conjucation. More is the no. of hyper conjugative structures more stable is the alkene. Bond

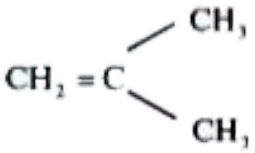
lengths, dipolemoments are also effected by hyperconjugation.

Which of the following molecule has longest C = C bond length

A. $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - CH = CH_2$

B. $CH_3 - CH = CH_2$

C. $CH_3 - \overset{\overset{CH_3}{|}}{C} = \underset{\underset{CH_3}{|}}{C} - CH_3$

D. 

Answer: C

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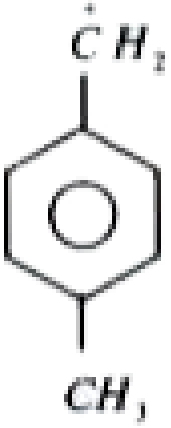
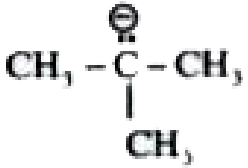
3. The delocalisation of σ electrons with P-orbital is known as Hyperconjugation. It is also known as $\sigma - \pi$ conjugation 'or' No bond resonance. Presence of atleast one $'\alpha'$ hydrogen at saturated carbon in an alkene, carbocation and free radical involves hyper conjucation. More

is the no. of hyper conjugative structures more stable is the alkene. Bond lengths, dipolemoments are also effected by hyperconjugation.

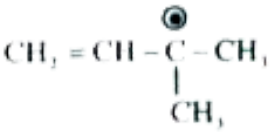
No bond resonance is not possible in



A.



B.



C.

D. $CH_2 = \overset{Cl}{\underset{Cl}{CH}} - C - CH_3$

Answer: B

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4. Carbocations are species in which central carbon carries positive charge. If the charge on the carbocations gets cocentrated or lo-calized the carbocation becomes unstable. The two factors which account for stability of carbocations are inductive effect and hyper conjugation (no bond resonance). Inductive effect is minor factor and hyper conjugation is major factor.

Which is most stable carbocation

A. $\overset{+}{C}H_3$

B. $CH_3C\overset{+}{H}_2$

C. $(CH_3)_2\overset{+}{C}H$

D. $(CH_3)_3\overset{+}{C}$

Answer: D

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5. Carbocations are species in which central carbon carries positive charge. If the charge on the carbocations gets cocentrated or lo-calized the carbocation becomes unstable. The two factors which account for stability of carbocations are inductive effect and hyper conjugation (no bond resonance). Inductive effect is minor factor and hyper conjugation is major factor.

n-propyl carbocation rearranges to isopropyl carbocation by shift of

A. Proton

B. Hydride ion

C. Electron

D. Methyl group

Answer: B

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6. Carbocations are species in which central carbon carries positive charge. If the charge on the carbocations gets cocentrated or lo-calized the carbocation becomes unstable. The two factors which account for stability of carbocations are inductive effect and hyper conjugation (no bond resonance). Inductive effect is minor factor and hyper conjugation is major factor.

Hybridisation of carbon in carbocation is

A. sp

B. sp^2

C. sp^3

D. dsp^2

Answer: B

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LECTURE SHEET - EXERCISE-II (Matrix Matching Type Questions)

1.

Column-I	Column-II
A) CH_3^+	P) Electrically neutral
B) CH_3^-	Q) having $6e^-$ in the outer shell
C) $CH_3^{\cdot}$	R) sp_2
D) $:CH_2$	S) sp^3

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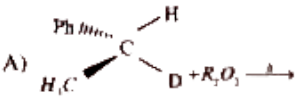
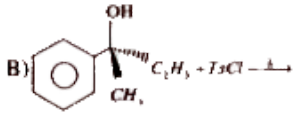
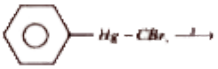
2. Match the following columns

Column-I	Column-II
A) 	P) Carbanion
B) 	Q) Free radicals
C) 	R) Carbene
D) 	S) Carbocation

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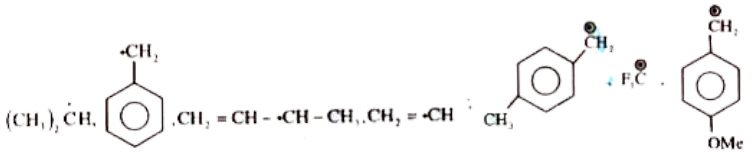
LECTURE SHEET - EXERCISE-II (Integer Type Questions)

1. How many of the following species are more stable than $(CH_3)_3\dot{C}$



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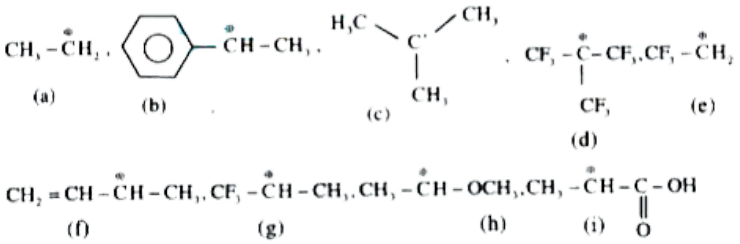
2. Among the following how many of them is/are more stable than

$CH_3 - CH - CH_3$



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LECTURE SHEET - EXERCISE-III (Straight Objective Type Questions)

1. Which of the following is the strongest acid ?

A. $O_2N - CH_2COOH$

B. $HO - CH_2 - COOH$

C. $NC - CH_2COOH$

D. $H_3CO - CH_2COOH$

Answer: A

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2. Which of the following is the weakest base ?

A. NH_3

B. CH_3NH_2

C. $(CH_3)_2NH$

D. $(CH_3)_3N$

Answer: A

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3. The strongest base among the following

A. $C_6H_5NH_2$

B. $(CH_3)_2NH$

C. CH_3NH_2

D. $(CH_2)_3N$

Answer: B

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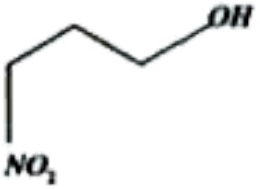
4. Which of the following alcohols is the most acidic

A.

B. 

C. 

D. 

Answer: A

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5. The most acidic compound is

A. CH_3COOH

B. C_6H_5COOH

C. $O_2NC_6H_4CO_2H$

D. C_6H_6OH

Answer: C

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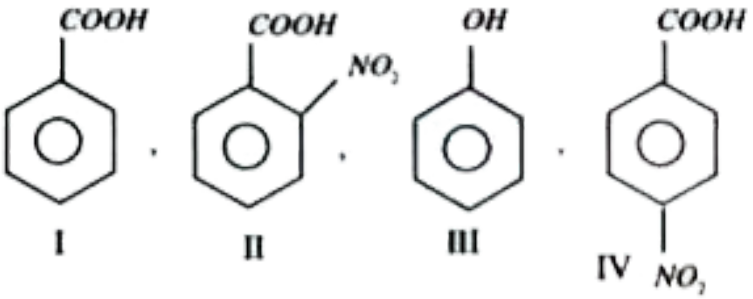
6. Arrange the following in the decreasing order of acidic strength



A. $II > IV > I > III$

B. $III > IV > II > I$

C. $I > II > IIIIV$

D. $II > III > I > IV$

Answer: A

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7. Which of the following acids has the smallest dissociation constant ?

A. $CH_3CHFCOOH$

B. FCH_2CH_2COOH

C. $BrCH_2CH_2COOH$

D. $CH_3CHBrCOOH$

Answer: C

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8. Acetic acid is weaker acid than formic acid. This is explained by

A. Mesomeric effect

B. Inductive effect

C. Hyper conjugation

D. electromeric effect

Answer: B

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9. Arrange the following in the decreasing order of basic strength

A. $II > I > III > II$

B. $I > II > III > IV$

C. $IV > III > II > I$

D. $II > III > I > IV$

Answer: B

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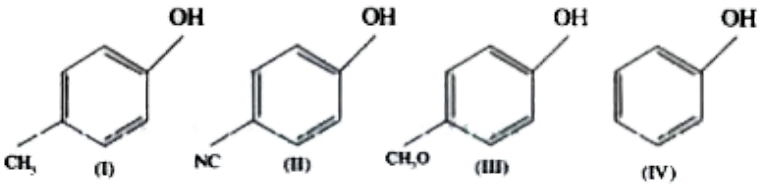
10. Decreasing order of acidic strength of the following compounds is



A. $I > III > I > IV$

B. $II > I > IV > III$

C. $I > III > IV > II$

D. $II > IV > I > III$

Answer: D

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11. Which is the decreasing order of acidity in,

I) HCOOH

II) CH_4COOH III) CH_3CH_2COOH IV) C_6H_5COOH

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $IV > I > II > III$

D. $I > IV > II > III$

Answer: D

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12. Which one of the following is the strongest base in liquid phase?

A. $(C_2H_5)_3N$

B. $(C_2H_5)_2NH$

C. $C_2H_5NH_2$

D. NH_3

Answer: B

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13. Among the following the strongest base is

A. $C_6H_5NH_2$

B. $p - NO_2 - C_6H_4NH_2$

C. $m - NO_2 - C_6H_4NH_2$

D. $C_6H_5CH_2NH_2$

Answer: D

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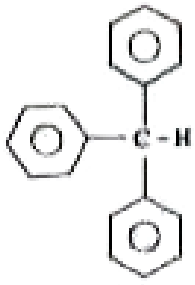
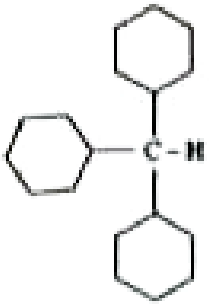
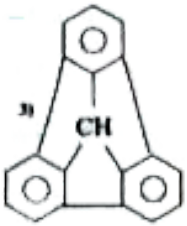
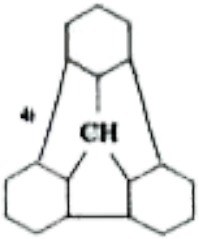
14. Which of the following has the most acidic hydrogen?

A.



B. 

C. 

D. 

Answer: C

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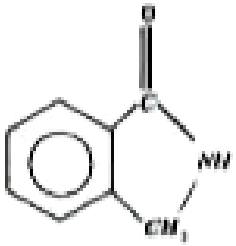
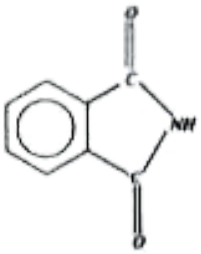
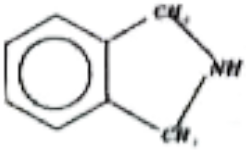
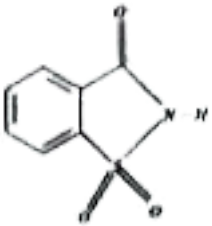
15. Which one of the following contains most acidic hydrogen atom.

A. 

B. 

C. 

D. 

Answer: D

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16. Correct gradation of basic character

A. $NH_3 > CH_3NH_2 > NF_3$

B. $CH_3NH_2 > NH_3 > NF_3$

C. $NF_3 > CH_3NH_2 > NH_3$

D. $CH_3NH_2 > NF_3 > NH_3$

Answer: B

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17. Which of the following is more appropriate reason of aniline being less basic than aliphatic amines ?

A. hyper conjugation

B. Steric hindrance

C. Delocalisation of lone pair

D. Negative inductive effect of $-NH_2$ group

Answer: C

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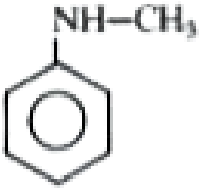
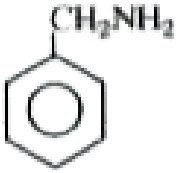
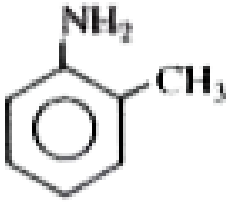
18. Among the following which is the most basic in nature?

A. 

B. 

C. 



D.

Answer: C

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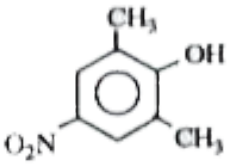
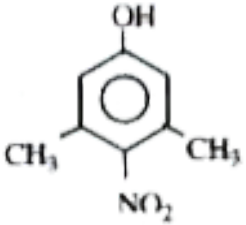
19. Which one of the following phenols will show the highest acidity?

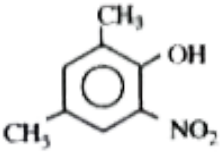


A.

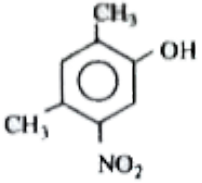


B.

C.



D.



Answer: B

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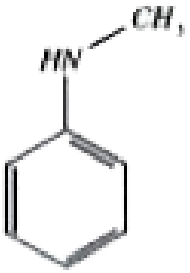
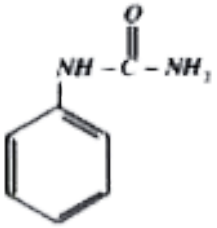
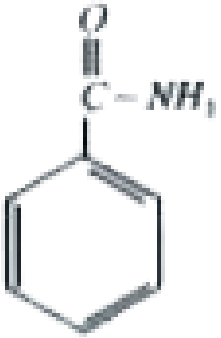
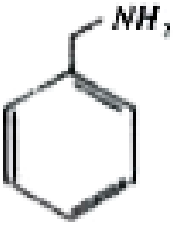
20. The most basic one is

A.



B. 

C. 

D. 

Answer: D

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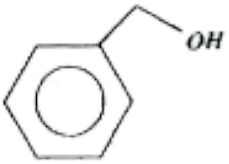
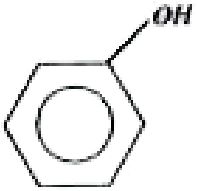
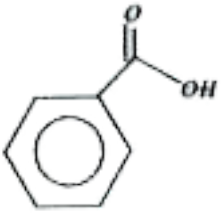
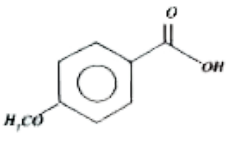
21. Which of the following is most acidic?

A. 

B. 

C. 

D. 

Answer: C

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22. Which of the following is the strongest base

A. CH_3COO^-

B. $ClCH_2COO^-$

C. $Cl_2CH \quad COO^-$

D. Cl_3CCOO^-

Answer: A

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23. Which of the following is more basic in gaseous phase

A. CH_3NH_2

B. $(CH_3)_2NH$

C. $(CH_3)_3N$

D. NH_3

Answer: C

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24. Which of the following carbanion is most stable

A. $CH_3CH_2^-$

B. $CH_2 = CH^-$

C. $CH \equiv C^-$

D. CH_3

Answer: C

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25. Least acidic is

A. $F - CH_2 - CH_2 - OH$

B. $Me_3N - CH_2 - CH_2 - OH$

C. H_2O

D. CH_3OH

Answer: D

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26. The weakest acid among the following

A. CH_3COOH

B. CH_3CO_2OH

C. $Cl - CH_2 - COOH$

D. $CH_3 - CH_2 - COOH$

Answer: B

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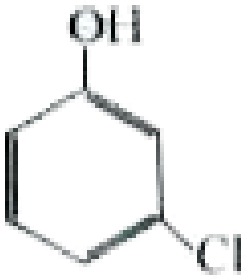
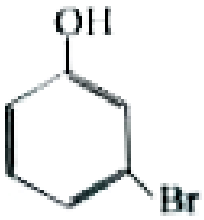
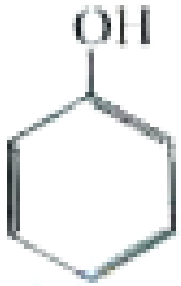
27. The strongest acid among the following is



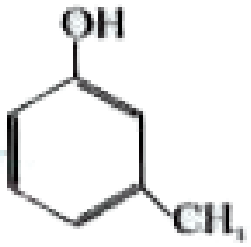
A.



B.



C.



D.

Answer: A

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28. Among $OH^-, CH_3O^\oplus, CH_3-CH_2-OH, CH_3-OH$ which solution in water has maximum pH value

A. OH-

B.

C. CH_3-CH_2-OH

D. CH_3-OH

Answer: B

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29. Which has maximum pKa value

A. $MeO - CH_2 - COOH$

B. $CH_3 - CH_2 - COOH$

C. $Cl - CH_2 - COOH$

D. $HO - CH_2 - COOH$

Answer: A

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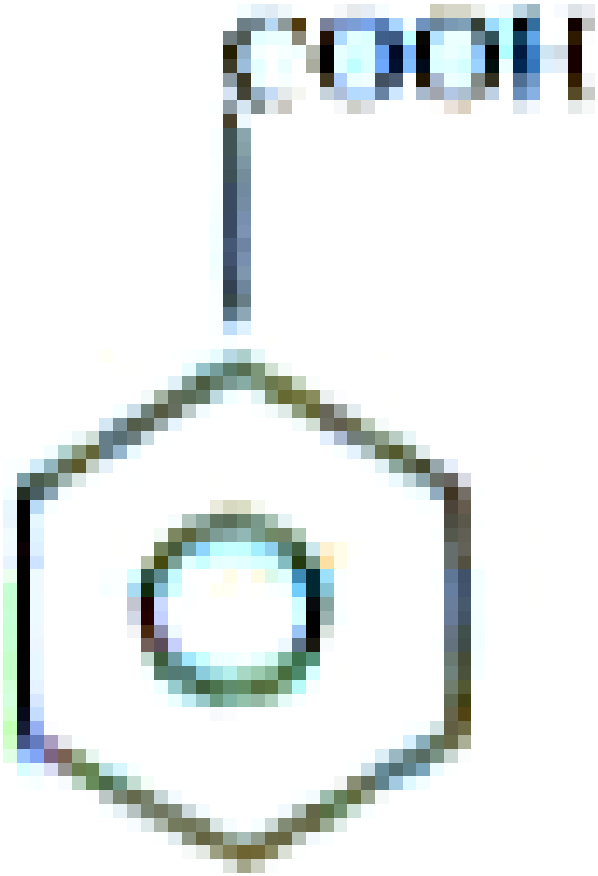
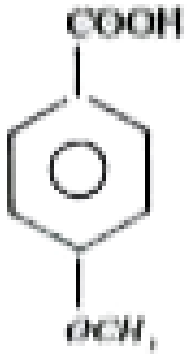
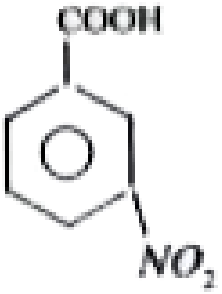
LECTURE SHEET - EXERCISE-III (More than correct answer Type Questions)

1. The following are more acidic than

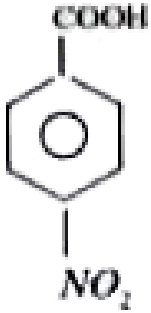




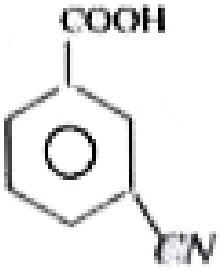
A.



B.



C.



D.

Answer: B::C::D

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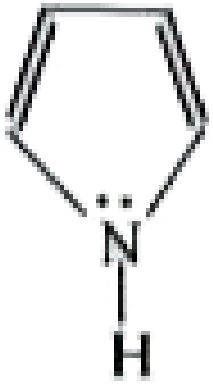
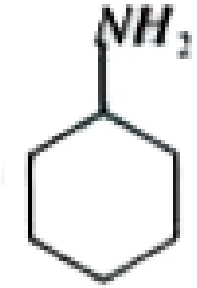
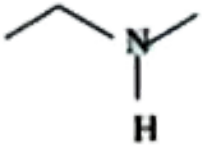
2. Write chemical equations for the following conversions :

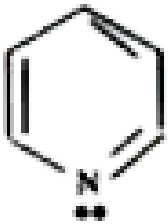
$C_6H_5 - CH_2 - Cl$ into $C_6H_5 - CH_2 - CH_2 - NH_2$



A.

B. 

C. 

D. 

Answer: B::C::D

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3. Which of the following is the strongest acid

A. Formic acid

B. Benzoic acid

C. Acetic acid

D. Chloroacetic acid

Answer: D

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4. Which of the following statements is true

A. Electron donating groups stabilize a positively charged species

B. Chloroacetic acid is a more acidic than acetic acid

C. Greater the number of resonance structures for a species, greater is its stability

D. The order of stability of carbanions is

$(CH_3)_3C^- > (CH_3)_2CH^- > CH_3CH_2^- > CH_3$

Answer: A::B::C

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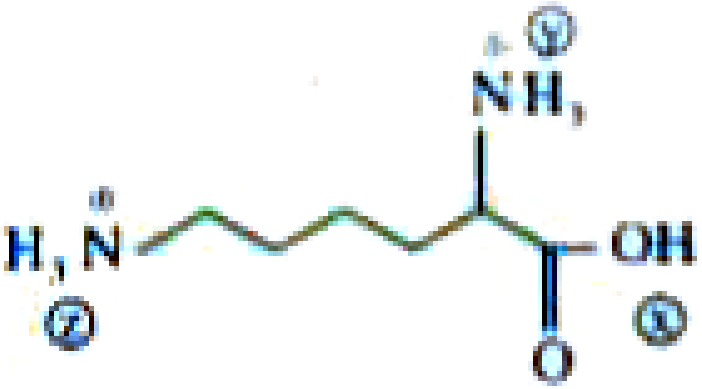

5. correct

acidity order of x, y and z is

A. $x > y > z$

B. $y > z > x$

C. $z > x > y$

D. $x > z > y$

Answer: A

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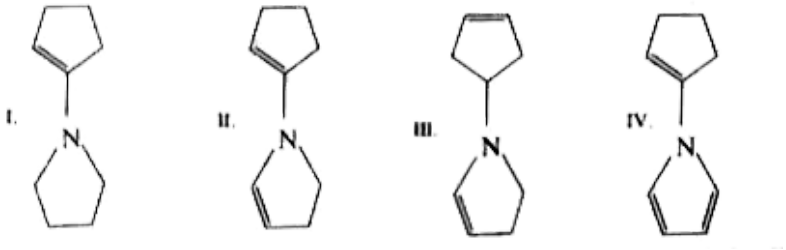
6. Rank the order of pKa values for each of the compound below



A. $IV > II > I > III$

B. $I > III > II > IV$

C. $IV > II > III > I$

D. $I > II > IV > II$

Answer: B

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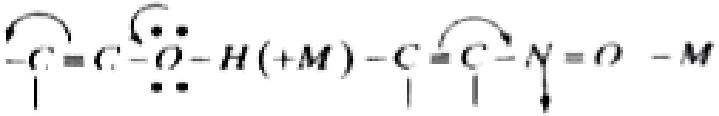
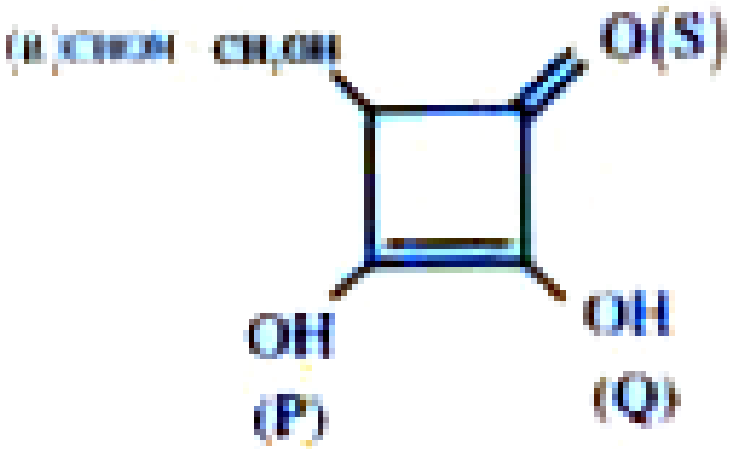
LECTURE SHEET - EXERCISE-III (Linked Comprehension Type Questions)

1. Mesomerism is extended resonance. Atoms or groups with lone pairs of electrons release electrons when connected to doubly bonded carbons. It is +M effect. Unsaturated groups when connected to doubly bonded carbons withdraw π electrons from the doubly bonded carbons. It is -M effect. Here the double bond is the unsaturated group should be between less electronegative atom and more electronegative atom.



Mesomeric effect stabilizes or destabilizes the conjugate base of an acid. As a result the acid may be strong or weak



has 4(OH) groups. Which -OH is a strong acid?

A. S

B. R

C. Q

D. P

Answer: D

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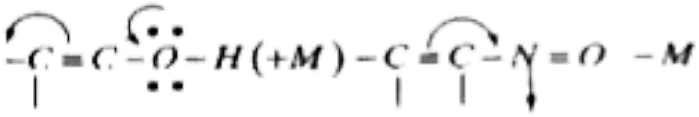
2. Mesomerism is extended resonance. Atoms or groups with lone pairs of electrons release electrons when connected to doubly bonded carbons. It is +M effect. Unsaturated groups when connected to doubly bonded carbons withdraw π electrons from the doubly bonded carbons. It is -M effect. Here the double bond is the unsaturated group should be between less electronegative atom and more electronegative atom.



Which of the following is most stable?

A. $CH_2 = CH - CH = CH_2$

B. $CH_2 = C = CHCH_3$

C. $CH_2 = CH - CH_2 - CH = CH_2 - CH_3$

D. All are equally stable

Answer: A

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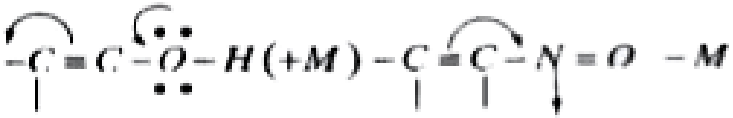
3. Mesomerism is extended resonance. Atoms or groups with lone pairs of electrons release electrons when connected to doubly bonded carbons. It is +M effect. Unsaturated groups when connected to doubly bonded carbons withdraw π electrons from the doubly bonded carbons. It is -M effect. Here the double bond is the unsaturated group should be between less electronegative atom and more electronegative atom.



Which of the following statements is right?

A. Aniline is weaker base than Ammonia

B. P-Nitrophenol is stronger acid than m-nitrophenol

C. P-chlorobenzoic acid is stronger than p-fluorobenzoic acid

D. All of the above

Answer: D

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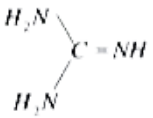
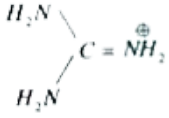
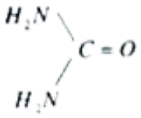
4. Guanidine (I) and its conjugate acid (II) are given below along with urea(III) and its conjugate base (IV)



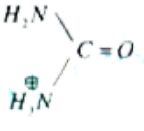
(I)



(II)



(III)



(IV)

Basic properties of I & II compounds are mainly influenced by resonance and the acidity of the bases depends upon lone pair of electrons.

Urea is mono basic because

A. It contain only one lone pair which can accept proton

B. It is mainly due to inductive effect of $-NH_2$ and C = O groups

C. It is mainly due to lone pair and π bond conjugation

D. All of the above

Answer: C

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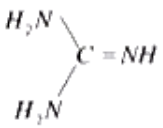
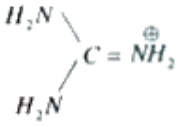
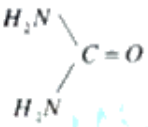
5. Guanidine (I) and its conjugate acid (II) are given below along with urea(III) and its conjugate base (IV)



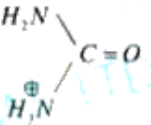
(I)



(II)



(III)



(IV)

Basic properties of I & II compounds are mainly influenced by resonance and the acidity of the bases depends upon lone pair of electrons.

The strongest base of the following is

A. Guanidine

B. Urea

C. $(CH_3)_2NH$

D. $:NH_3$

Answer: A

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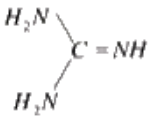
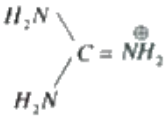
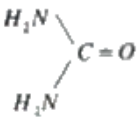
6. Guanidine (I) and its conjugate acid (II) are given below along with urea(III) and its conjugate base (IV)



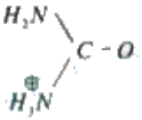
(I)



(II)



(III)



(IV)

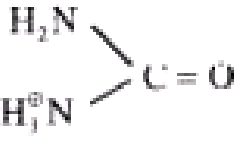
Basic properties of I & II compounds are mainly influenced by resonance and the acidity of the bases depends upon lone pair of electrons.

Which of the following is more resonance stabilized

A. $(NH_2)_2C = NH$

B. $(NH_2)_2C = \overset{\oplus}{N}H_2$

C. $(H_2N)_2C - O$

D. 

Answer: B

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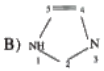
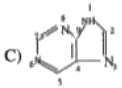
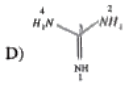
LECTURE SHEET - EXERCISE-III (Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) All nitrogens are not equally basic
B) 	Q) All nitrogens are equally basic
C)  others	R) Nitrogen labeled 1 is less basic than
D) 	S) Nitrogen labeled 1 is more basic than others

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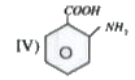
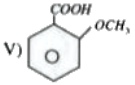
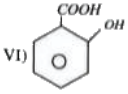
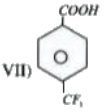
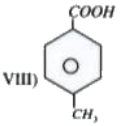
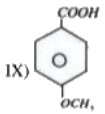
LECTURE SHEET - EXERCISE-III (Integer Type Questions)

1. How many of the following acids are more acidic than benzoic acid?

I) HCOOH II) $CH_3-C\equiv C-COOH$ III) CF_3-COOH  

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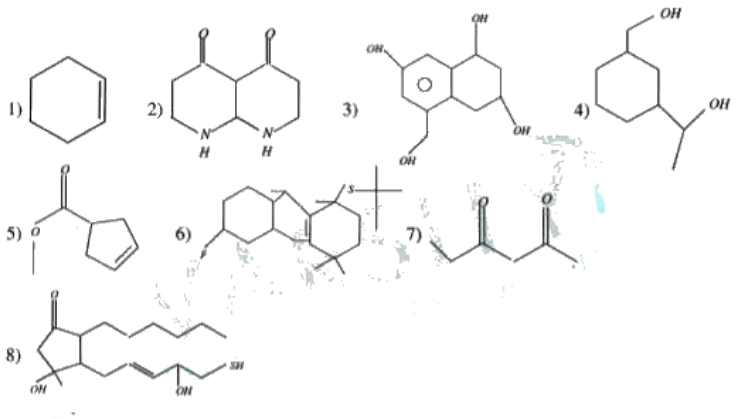
2. Number of compounds having relatively more acidic hydrogen than Me_3C-H



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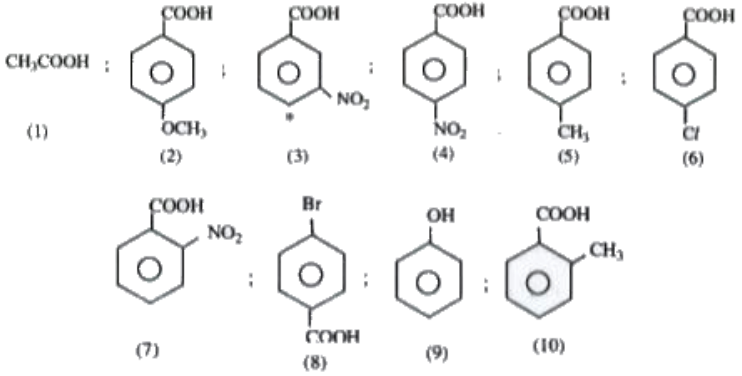
3. The number of acids which are more acidic than benzoic acid.



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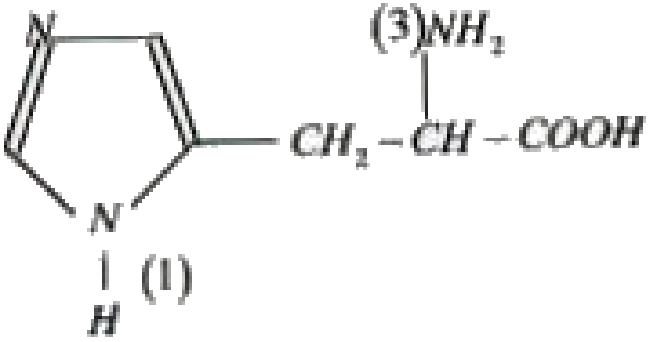
4. Which numbered nitrogen atom gets protonated first at relatively higher pH in the following



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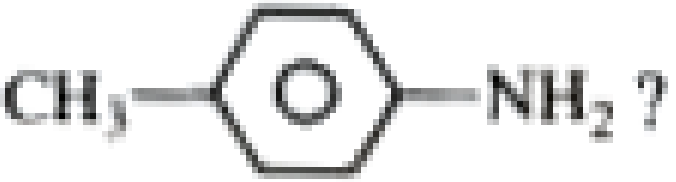
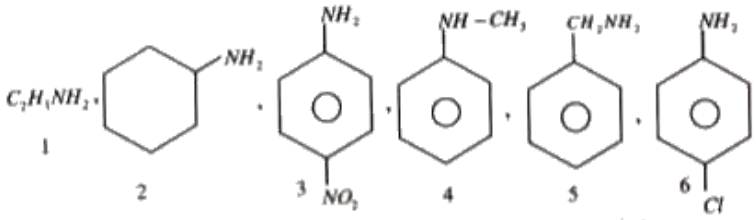
5. How many of the following compounds are more basic than



?



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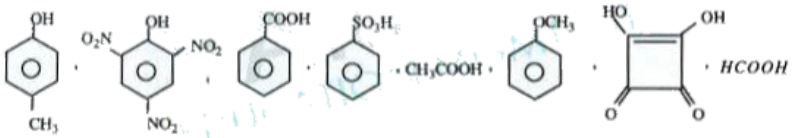
6. How many of the following compounds are soluble in aqueous solutions of $NaHCO_3$



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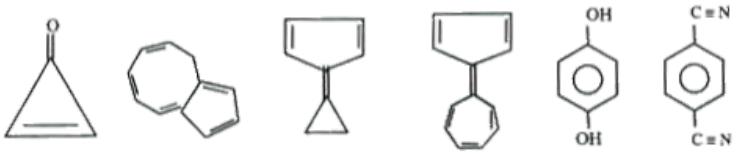
7. How many of the following species have dipolement?



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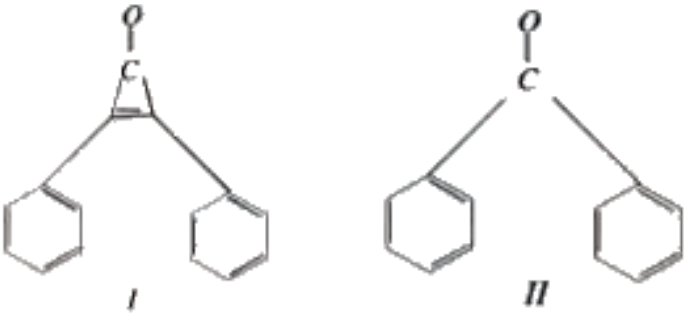
8. How many of the following statements are correct?

i) In cyclobutadiene two unpaired π electrons are Present in π nonbonding molecular orbitals which are responsible for destabilization of cyclobutadiene.

ii) Cyclopentadiene pKa value is less than that of cycloheptatriene

iii) Dipole moment of I^{st} Structure is more than II^{nd} Structure in the following



I II

iv) Cycloheptatrienyl bromide is less soluble in H_2O than in non-polar solvent

v) Due to anti aromatic nature [4]-annulene is less stable than [6]-annulene

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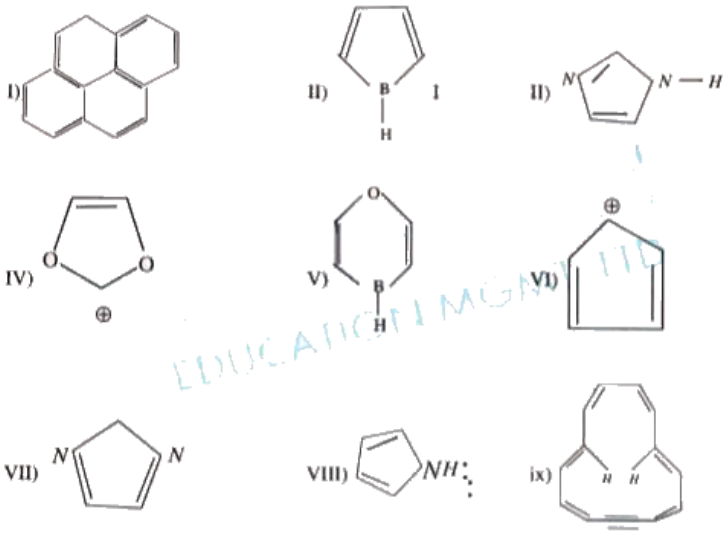
9. In the following aromatic, anti-aromatic and non-aromatic compounds are present. In that aromatic compounds are X and Y are anti-aromatic. Find the (X-Y) value



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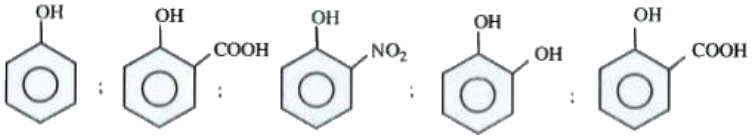
10. The number of acids which are more acidic than water.

$CH_3 - OH, C_2H_5OH, CH_3 - COOH, H_2CO_3, C_2H_2$



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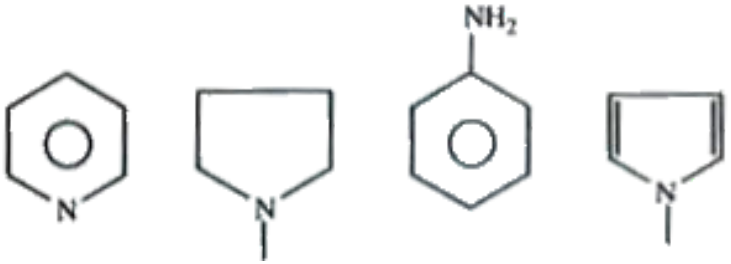
11. How many statements are correct of the following compounds



I is more basic than IV, III is more basic than IV, III is less basic than IV, I is more basic than II. II is more basic than I and IV, II is more basic than I, III and IV.

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PRACTICE SHEET - EXERCISE-I (LEVEL-I Straight Objective Type Questions)

1. Which of the following groups has the highest inductive effect?

A. $-CH_3$

B. CH_3CH_2-

C. $(CH_3)_2CH-$

D. $(CH_3)_3C-$

Answer: D

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2. The group which exhibits -M effect is

A. $-CHO$

B. $-C\equiv N$

C. $-NO_2$

D. All

Answer: B

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3. Which of the following statements is right regarding $CH_3-, CH_3CH_2-, (CH_3)_2CH-, (CH_3)_3C-$

A. Increasing hyper conjugation left to right

B. Decreasing hyper conjugation from left right

C. Decreasing inductive effect from L to R

D. Both (a) & (b)

Answer: A

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4. Which is the following shows maximum $-I$ effect?

A. $-CH_3$

B. $-OCH_3$

C. $-NO_2$

D. $-Cl$

Answer: C

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5. The kind of delocalization involving sigma bond and hybrid orbital's is called

A. inductive effect

B. Electrometric effect

C. Hyper conjugation

D. Mesomeric effect

Answer: B

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6. In which of the following, resonance is possible

A. $CH_2 = CH - CH_2 - CHO$

B. CH_3COCH_3

C. $CH_2 = CH - CH = O$

D. $CH_2 = CH - CH_2 - CH = CH_2$

Answer: B

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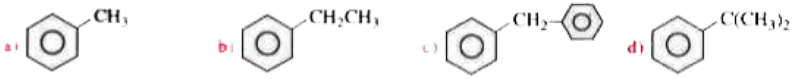
7. Arrange the following decreasing order of hyper conjugative structures



A. $1 > 2 > 3 > 4$

B. $1 > 3 > 4 > 2$

C. $2 > 3 > 1 > 4$

D. $4 > 1 > 3 > 2$

Answer: A

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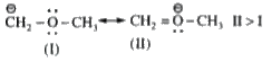
8. Which of the following is not the correct order of stability of the given pairs

A. $\overset{\ominus}{C}H_2 - \underset{(I)}{\overset{\overset{O}{||}}{C} - H} \leftrightarrow CH_2 = \underset{(II)}{\overset{\overset{O^-}{|}}{C} - H} \quad II > I$

B. $Br - CH - \underset{(I)}{\overset{\ominus}{N}H_2} \leftrightarrow \underset{(II)}{\overset{\ominus}{Br} = CH - NH_2} \quad I > II$

C. 

D. $CH_3 - \underset{(I)}{\overset{\ominus}{C}} - O \leftrightarrow CH_3 - C = \underset{(II)}{\overset{\ominus}{O}} \quad I < II$

Answer: B

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9. Which of the following is not the correct order of stability?

A. $CH_3 - \overset{\oplus}{C}H_2 > CH_2 = \overset{\oplus}{C}H$

B. $CH_3 - \overline{C}H_2 < CH_2 = \overline{C}H < HC \equiv \overline{C}$

C. $R_2N - \overset{\oplus}{C}H_2 > R - NH - \overset{\oplus}{C}H_2$

D. $R - O - \overset{\oplus}{C}H_2 < R - S - \overset{\oplus}{C}H_2$

Answer: D

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10. Hyper conjugation phenomenon is possible in:

A. $H_2C = CH_2$

B. $C_6H_5CH = CH_2$

C. $CH_3CH_2 - CH = CH_2$

D. $(CH_3)_3C - CH = CH_2$

Answer: B

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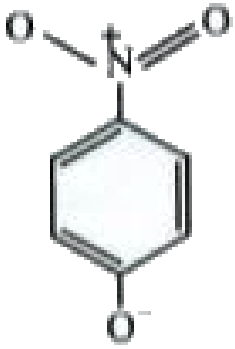
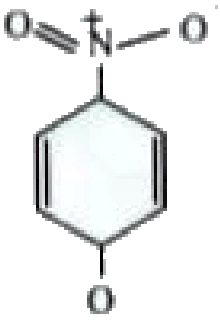
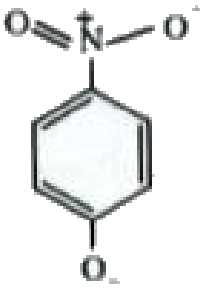
PRACTICE SHEET - EXERCISE-I (LEVEL-II Straight Objective Type Questions)

1. Which of the following is not be correct representation of resonance structure of p-nitrophenoixde ion :

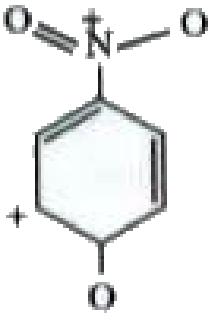
A. 

B. 

C.



D.



Answer: D

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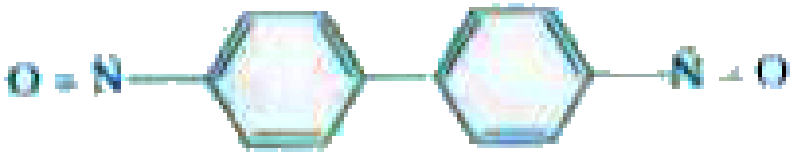
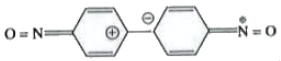
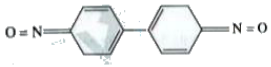
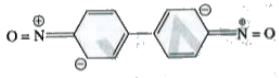
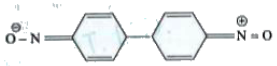
2. The most stable resonating structure of following compound is



A. 

B. 

C. 

D. 

Answer: D

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3. The stability of 2,3-dimethyl but-2-ene is more than 2-butene. This can best be explained in terms of

A. Steric effect

B. hyper conjugation

C. electrometric effect

D. inductive effect

Answer: B

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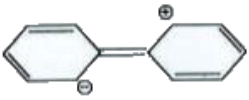
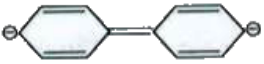
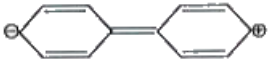
4. Which of the following does not represent the resonating structure of

A. 

B. 

C. 

D. 

Answer: B

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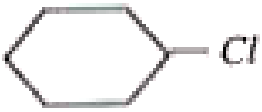
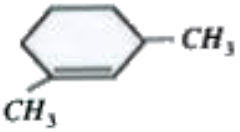
5. Which one of the following molecules has all the effects, namely inductive, mesomeric and hyperconjugative?

A. 

B. 

C. 

D. 

Answer: C

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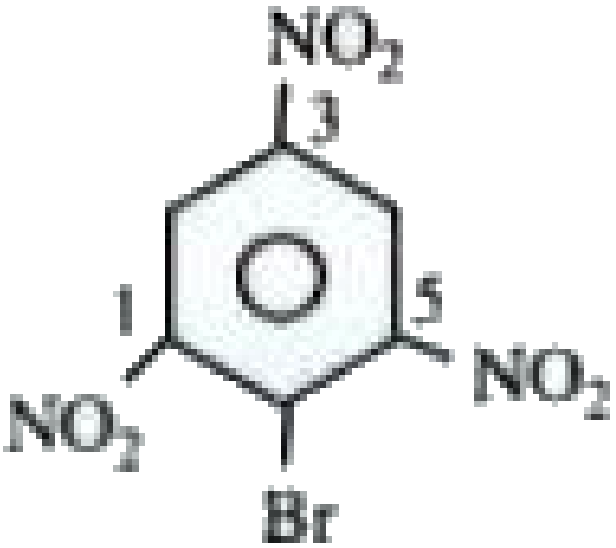
6. Which of the following statements would be correct about this compound



A. a. All three C-N bonds are of same length

B. b. C1-N and C3-N bonds are of same length

C. c. C1-N and C5-N bonds are of same length

D. d. C3-N and C5-N bonds are of same length

Answer: C

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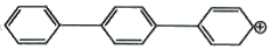
7. The most stable carbocation is

A. 

B. 

C. 

D. 

Answer: A

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PRACTICE SHEET - EXERCISE-I (LEVEL-II More than One correct answer Type Questions)

1. Which of the following substituents has +M (Mesomeric) effect ?

A. $-CN$

B. $-NR_2$

C. $-NH_2$

D. $-NHR$

Answer: B::C::D

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2. Which of the following statements about resonance is not correct?

A. The different resonance structures of a molecule have fixed arrangement of atomic nuclei.

B. The different resonance structures of a molecule should have same number of unpaired electrons

C. The hybrid structure has equal contribution from all the resonating structures

D. None of the individual resonating structures explains the various characteristics of the molecule

Answer: A::B::D

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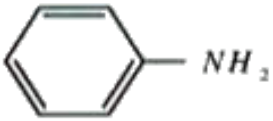
3. Which of the following compounds cannot exhibit mesomeric effect

A. $CH_3 - CH_2 = CH - \overset{\oplus}{C}H - CH_3$

B. 

C. $CH_2 = CH - CH_2 - \overline{N}H_2$

D. $CH_3 - O - CH_2 - CH_3$

Answer: C::D

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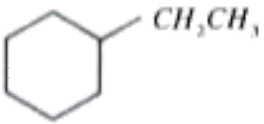
4. In which of the following hyperconjugation is involved

A. $CH_3CH_2 - CH = CH_2$

B. 

C. $CH_3 - CH = CH_2$

D. 

Answer: A::B::C

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5. Compare the three N - O bond lengths X, Y and Z in the given molecule.

A. $x > y > z$

B. $X = Y < Z$

C. $X < Y < Z$

D. $X = Y > Z$

Answer: B

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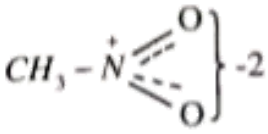
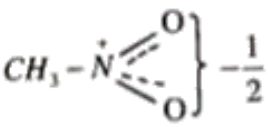
PRACTICE SHEET - EXERCISE-I (LEVEL-II Linked Comprehension Type Questions)

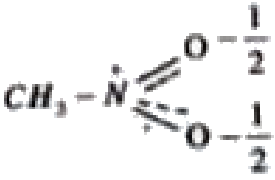
1. Following criteria should be taken in consideration for resonance. The major contributor is the one with the lower energy good contributors generally have all octets satisfied, as many bonds are possible andas little charge separation as possible negative charges are more stable on the more electronegative atoms. Resonance stabilization is most important when it serves to delocalize a charge over two or more atoms

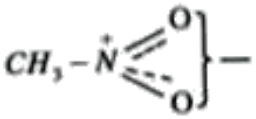
The two important resonating structures of nitromethane are

The resonance hybrid of nitromethane can be written as

A. 

B. 

C. 

D. 

Answer: C

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2. Following criteria should be taken in consideration for resonance. The major contributor is the one with the lower energy. Good contributors generally have all octets satisfied, as many bonds as possible and as little charge separation as possible. Negative charges are more stable on the more electronegative atoms. Resonance stabilization is most important when it serves to delocalize a charge over two or more atoms

Observe the following structures $H_2C = \underset{I}{^+NH_2} \leftrightarrow \underset{II}{^+CH_2} - NH_2$

A. Structure - I is major contributor in the two resonating structures

B. Structure - II is major contributor in the two resonating structures

C. Both are equal stable

D. Resonance is not possible

Answer: B

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3. Following criteria should be taken in consideration for resonance. The major contributor is the one with the lower energy good contributors generally have all octets satisfied, as many bonds are possible andas little charge separation as possible negative charges are more stable on the more electronegative atoms. Resonance stabilization is most important when it serves to delocalize a charge over two or more atoms

How many resonating structures can be drawn for 2, 4-pentadienyl radical

A. 1

B. 2

C. 3

D. 4

Answer: C

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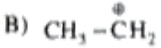
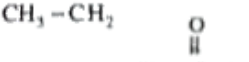
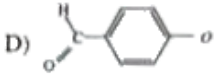
PRACTICE SHEET - EXERCISE-I (LEVEL-II Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) Resonance
B) 	Q) Hyperconjugation
C) 	R) + I effect
D) 	S) –I effect

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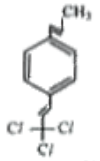
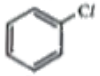
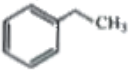
2. Match the following columns

Column-I	Column-II
A) 	P) Resonance
B) 	Q) Aromatic
C) 	R) Hyperconjugation
D) 	S) Reverse hyperconjugation

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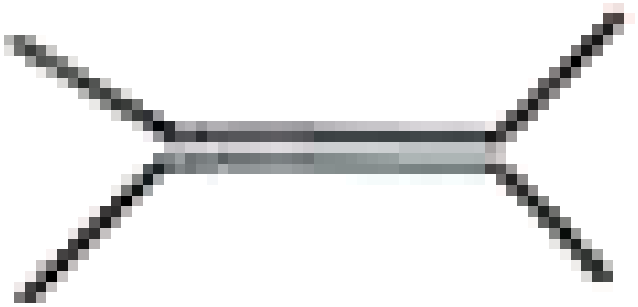
PRACTICE SHEET - EXERCISE-I (LEVEL-II Integer Type Questions)

1. 

The number of possible hyper conjugated structures is equal to 10 + x, then x is?

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2. Pka of $O_2N - CH_2COOH$ is 1.68. How many compounds given below have a pKa value greater than 1.68

$$\underset{(I)}{CH_3COOH} \qquad \underset{(II)}{Cl - CH_2COOH} \qquad \underset{(III)}{Cl - \overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}} - COOH} \qquad O_2N - C$$

View Text Solution

3. How many resonance structures are possible for phenoxide ion

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4. The number of resonance structures for anilinium ion is

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5. Number of resonance structures possible for phenol

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6. In how many of the following the concept of resonance can be observed

$CH_2 = CH - Cl, CH_3 - O - \overset{+}{C}H - CH_3$

$CH_3 - O - CH_2\overset{+}{C}H, CH_3 - NH - CH_2 - CH - CH_3$

$CH_3 - CH = CH - NH_2, CH_3 - CH_2 = CH_NH - CH_3$

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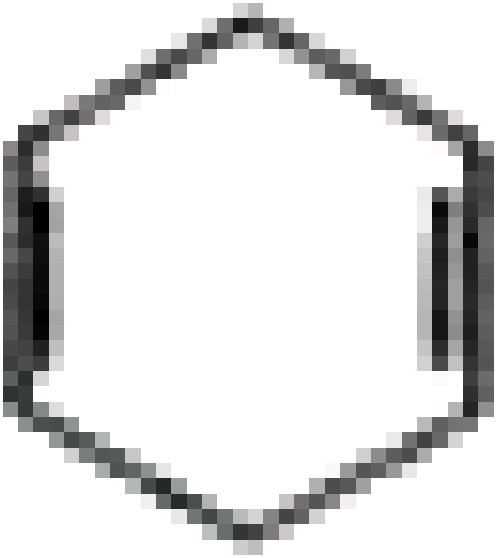
7. Number of resonance structures possible for



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PRACTICE SHEET - EXERCISE-II (Staight Objective Type Questions)

1. What are electrophiles ? Explain with two examples

A. Electron attracting species

B. Nucleus attracting species

C. Electron repelling species

D. Nucleus repelling species

Answer: A

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2. The species having trigonal planar shape is

A. CH_3^+

B. $\overline{C}H_3$

C. BF_4^-

D. SiH_4

Answer: A

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3. Which of the following free radical is the most stable?

A. Tertiary

B. Secondary

C. Primary

D. Methyl

Answer: A

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4. In carbocation the carbon bearing the positive charge is

A. sp^2 hybridized

B. sp^3 hybridized

C. dsp^3 hybridized

D. sp hybridized

Answer: A

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5. Shape of the methyl carbonium ion is

A. Planar

B. Linear

C. Octahedral

D. Tetrahedral

Answer: A

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6. The cleavage of covalent bond $A - B \rightarrow A^{\cdot} + B^{\cdot}$ is known as

A. Heterolytic fission

B. Carbanion formation

C. Homolytic fission

D. Carbocation formation

Answer: B

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7. The hybridization of central carbon atom in trimethyl free radical is

A. sp

B. sp^2

C. sp^3

D. may be or sp^2 or sp

Answer: B

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8. A carbocation in which dispersal of charge does not take place

A. $R_3C^{\oplus}$

B. $R_3CH^{\oplus}$

C. $RCH_2^{\oplus}$

D. $^{\oplus}CH_3$

Answer: D

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9. The most stable electrophile is

A. $R_3\overset{\oplus}{C}$

B. $C_6H\overset{\oplus}{C}H_2$

C. $(C_6H_5)_3\overset{\oplus}{C}$

D. $(CH_3)_2\overset{\oplus}{C}(H)$

Answer: C

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10. Which of the following carbocation is more stable

A. $C_6H_5\overset{+}{C}H_2$

B. $(CH_3)_3\overset{+}{C}$

C. $(CH_3)_3\overset{+}{C}H$

D. $\overset{+}{C}H_3$

Answer: A

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PRACTICE SHEET - EXERCISE-II (LEVEL - II Straight Objective Type Questions)

1. Which one of the following is the most stable alkene?

A. Isobutylene

B. 2-Methyl-2-butene

C. 2,3-dimethyl-2-butene

D. ethylene

Answer: C

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2. Which of the following is the least stable carbonium ion ?

A. $\overset{\oplus}{C}F_3$

B. $\overset{\oplus}{C}Cl_3$

C. $\overset{+}{C}(NO_2)_3$

D. $\overset{\oplus}{C}H_3$

Answer: C

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3. Which of the following compounds will produce the most stable carbonium ion when heterolytic cleavage of C-O bond take place ?

A. $CH_3CH - \underset{\displaystyle CH_3}{\underset{|}{CH_2}} - OH$

B. $CH_3 - \overset{\displaystyle CH_3}{\overset{|}{\underset{\displaystyle CH_3}{\underset{|}{C}}}} - OH$

C. $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CH_3$

D. $CH_3 - CH_2 - CH_2 - CH_2 - OH$

Answer: B

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4. Heterolysis of C-Cl bond produces

A. Two carbanions

B. Two carbonium ions

C. Two free radical

D. one cation and one anion

Answer: D

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5. Which of the following is the most stable ion ?

A. $CH_3 - CH_2 - CH_2 - \overset{\oplus}{C}H_2$

B. $CH_3 - CH_2 - \overset{\oplus}{C}H - CH_3$

C. $CH_3 - \underset{CH_3}{\overset{+}{C}} - CH_3$

D. $\overset{+}{C}H_3$

Answer: C

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6. The most stable free radical among the following is

A. $C_6H_5 - CH_2 - \dot{C}H_2$

B. $C_6H_5\dot{C}HCH_3$

C. $CH_3 - \dot{C}H_2$

D. $CH_3 - \dot{C}H - CH_3$

Answer: B

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7. Which of the following is the least stable ?

A. $CH_3 - CH_2 - \overset{+}{C}H_2$

B. $CH_3 - \overset{+}{C}H - CH_2 - CH_3$

C. $CH_3 - \underset{CH_3}{\overset{+}{C}} - CH_3$

D. $CH_3 - \underset{CH_3}{\overset{CH_3}{C}} - \overset{+}{C}H - CH_3$

Answer: A

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8. Reactivity of H-atoms bonded to different types of C-atoms in alkanes in the order

A. $3^0 > 1^0 > 2^0$

B. $1^0 > 2^0 > 3^0$

C. $3^0 > 2^0 > 1^0$

D. $2^0 > 3^0 > 1^0$

Answer: C

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9. Which of the following alkene is the most stable

A. $CH_3 - CH = CH_2$

B. $CH_3 - CH = CH - CH_2$

C. $(CH_3)C = CHCH_3$

D. $(CH_3)_2C = C(CH_3)_2$

Answer: D

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PRACTICE SHEET - EXERCISE-II (LEVEL - II More than One correct answer Type Questions)

1. Which of the following is the correct order of strength of necleophiles in polar aprotic solvents

A. $C_2H_5\overline{O}$

B. $(CH_3)_3C\overline{O} < CH_3\overline{O}$

C. $CH_3\overline{O} > \overline{O}H$

D. $RCO\overline{O} > RCOOH$

Answer: A::B::C::D

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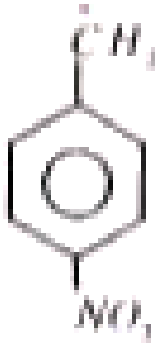
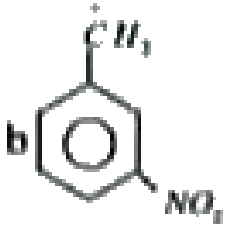
2. Which of the following is the most stable carbocation

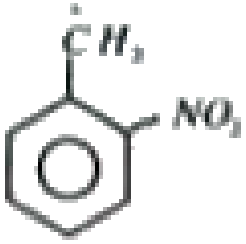
A.



B.



C.



D. All are equally stable

Answer: B

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3. In which of the following rearrangement is not possible ?

A. $(CH_3)_3\overset{\oplus}{C} - CH_2 - O - CH_3$

B. $CH_2 = CH - CH_2 - \overset{\oplus}{CH_2}$

C. $C_6H_5CH_2\overset{\oplus}{C}H_2$

D. 

Answer: D

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4. Among the following intermediates, which is/are electron deficient

A. Carbocation

B. Nitrene

C. Carbene

D. Free radical

Answer: A::B::C::D

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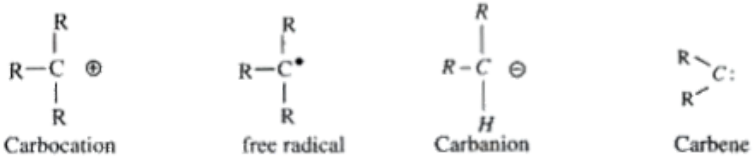
PRACTICE SHEET - EXERCISE-II (LEVEL - II Linked Comprehension Type Questions)

1. The products of bond breaking, shown below, are not stable, and cannot be isolated for prolonged study. Such species are referred to as reactive intermediate, and are belived to be transient intermediates in many reactions. The general structures and names of four such

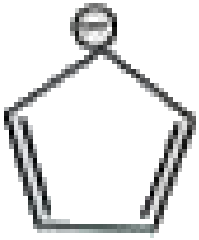
intermediates are, Charged Intermediates Uncharged Intermediates

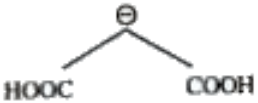


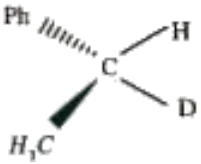
Carbocations (called carbonium ions in the older literature) are electrophiles and carbananions are nucleophiles. Carbenes have only a valence shell sextet of electrons and are therefore electron deficient. In this sense they are elecrophiles, but the non-bonding electron pair also gives carbenes nucleophilic character. As a rule, the electrophilic character dominates carbene reactivity. Carbon radicals have only seven valence electrons, and may be considered electron deficient, however, they do not in general bond to nucleophilic electron pair, so their chemistry exhibits differences from that of conventional electrophiles. Radical intermediates are often called free radicals. Intermediates are in general stabilised with conjugation, electron donating and electron with drawing groups.

Which of the following is relatively an unstable intermediate compared to rest ?

A. 

B. 

C. 

D. 

Answer: A

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2. The products of bond breaking, shown below, are not stable, and cannot be isolated for prolonged study. Such species are referred to as reactive intermediate, and are belived to be transient intermediates in

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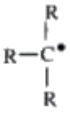
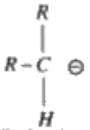
Carbocation


free radical


Carbanion


Carbene

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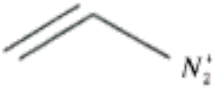
$R - N^+ \equiv N \quad Cl^- \rightarrow R^+ + N_2 + Cl^-$ based on the above, which of the following from R^+ most readily

A. 

B. 

C. 

D. 

Answer: C

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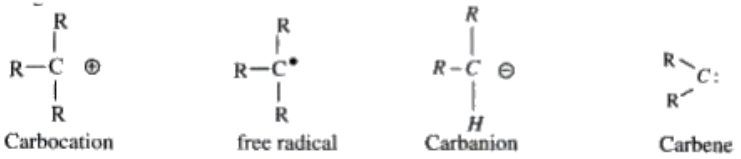
3. The products of bond breaking, shown below, are not stable, and cannot be isolated for prolonged study. Such species are referred to as reactive intermediate, and are belived to be transient intermediates in many reactions. The general structures and names of four such intermediates are, Charged Intermediates Uncharged Intermediates



Carbocations (called carbonium ions in the older literature) are electrophiles and carbananions are nucleophiles. Carbenes have only a valence shell sextet of electrons and are therefore electron deficient. In this sense they are elecrophiles, but the non-bonding electron pair also gives carbenes nucleophilic character. As a rule, the electrophilic character dominates carbene reactivity. Carbon radicals have only seven valence electrons, and may be considered electron deficient, however, they do not in general bond to nucleophilic electron pair, so their chemistry exhibits differences from that of conventional electrophiles. Radical intermediates are often called free radicals. Intermediates are in general stabilised with conjugation, electron donating and electron with drawing groups.

Which of the following carbo cations is more stable?

A. $CH_2 = \overset{\oplus}{C}H$

B. $C_6H_5 - \overset{\oplus}{C}H_2$

C. $C_6\overset{\oplus}{H}_5$

D. $CH_3 - \underset{CH_3}{\overset{\oplus}{C}} - CH_3$

Answer: B

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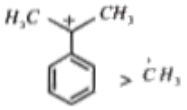
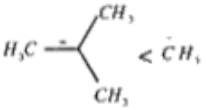
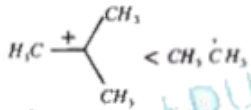
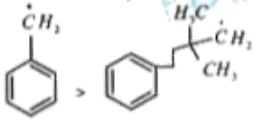
PRACTICE SHEET - EXERCISE-II (LEVEL - II Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) Inductive effect
B) 	Q) Resonance
C) 	R) Hyper conjugation
D) 	S) steric hindrance

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2.

Column-I (Reaction intermediate)	$Column - II$ (Electronic configuration and valence state)
A) Carbocation	P) Sextet and bivalent
B) Carbanion	Q) Sextet and trivalent
C) Free radicals	R) Octet and trivalent
D) Carbene	S) Heptet and trivalent

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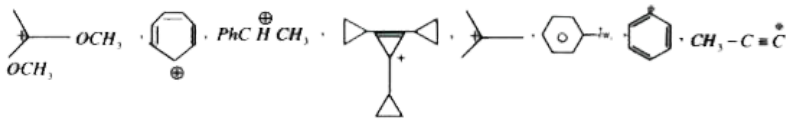
PRACTICE SHEET - EXERCISE-II (LEVEL - II Integer Type Questions)

1. How many of the following carbocations are more stable than cyclopropyl methyl carbocation



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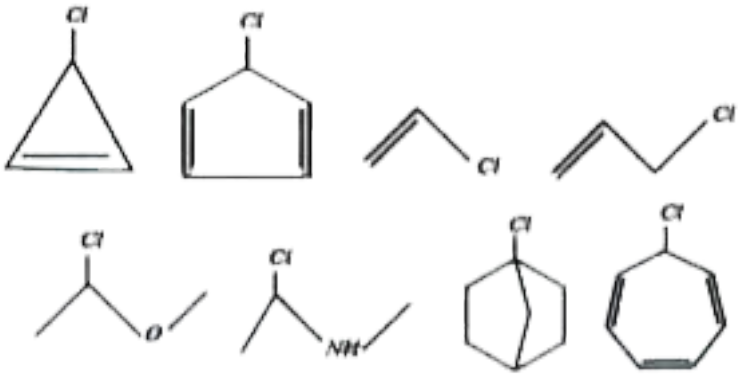
2. How many of the following compounds will give white ppt with $AgNO_3$ solution?



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3. How many of the following carbanions are more stable than mythyl carbanion?

$$CH_3 - \overline{C}H_2, Ph - \overline{C}H - Ph, Ph - \underset{\underset{Ph}{|}}{\overline{C}} - Ph, Ph - \overline{C}H_2, CH_3 - \overline{C}H -$$

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PRACTICE SHEET - EXERCISE-III (Straight Objective Type Questions)

1. Identify the strongest acid among the following

A. CH_3CN

B. $CH \equiv CH$

C. $CH \equiv CH$

D. $(CH_3)_3CH$

Answer: C

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2. It was experimentally found that formic acid is stronger acid than acetic acid. Which of the following effects is useful to explain this?

A. Inductive

B. hyper conjugation

C. mesomeric effect

D. electromeric effect

Answer: D

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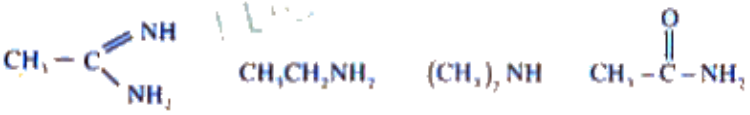
3. The correct order of basicity of the following compounds is



A. $2 > 1 > 3 > 4$

B. $1 > 3 > 2 > 4$

C. $3 > 1 > 2 > 4$

D. $1 > 2 > 3 > 4$

Answer: B

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4. Which one of the following is the weakest base?

A. $(C_2H_5)_3N$

B. $(C_2H_5)_2NH$

C. $C_2H_5NH_2$

D. NH_3

Answer: D

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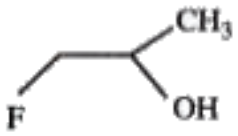
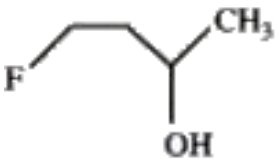
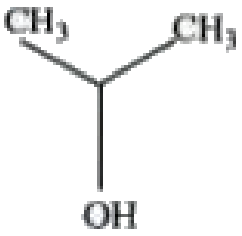
5. Among the following compounds, the strongest acid is:

A.



B.



C. 

D. 

Answer: A

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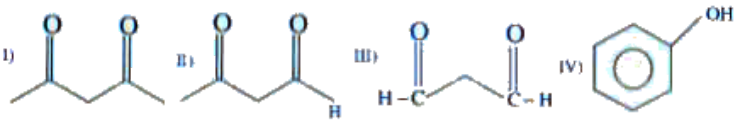
6. Select the correct pKa orders for the following compounds



A. $IV < II < III < I$

B. $III < IV < II < I$

C. $III < II < I < IV$

D. $IV < III < II < I$

Answer: D

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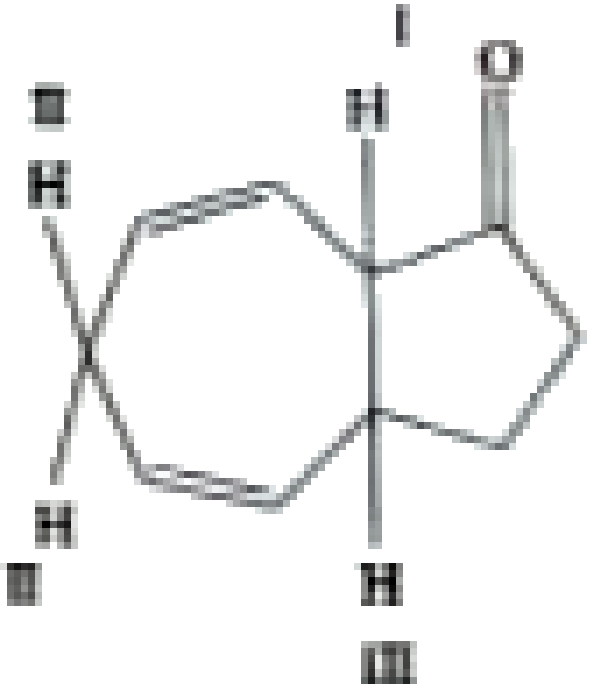
7. The correct order of acidic nature of protons in the following compound is



A. $I < II < III$

B. $III < I < II$

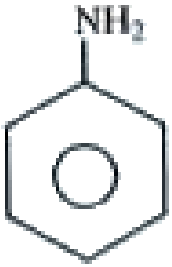
C. $II < III < I$

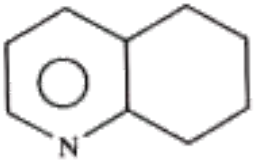
D. $III < II < I$

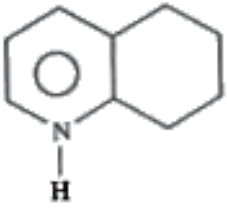
Answer: D

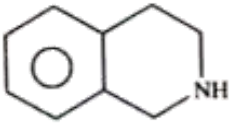
Watch Video Solution

8. Choose the strongest base among the following:

A. 

B. 

C. 

D. 

Answer: D

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9. Among the following anions, the order of basic strength is

A) CH_3^- B) NH_2 C) $OH-$ D) $F-$

A. $A > B > C > D$

B. $B > A > C > D$

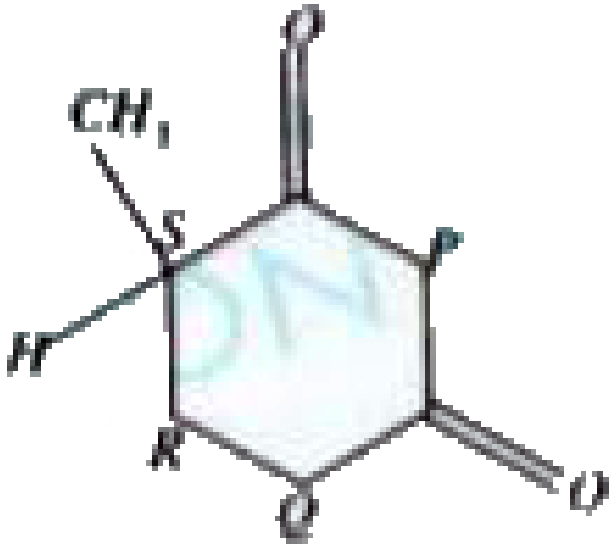
C. $C > B > A > D$

D. $C > A > B > D$

Answer: A

Watch Video Solution

10. If the following compound mixed with NaOH solution. Acid base reaction occurs and OH- snatches H^+ from organic molecule. Which carbon will lose H^+ ion easily?



A. P

B. Q

C. R

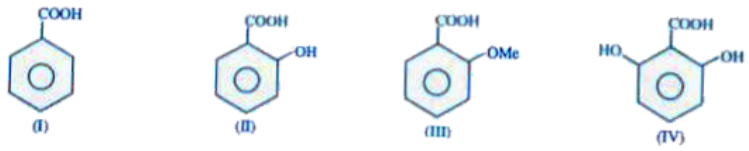
D. S

Answer: A

Watch Video Solution

PRACTICE SHEET - EXERCISE-III (LEVEL - II Straight Objective Type Questions)

1. The correct order of an acidic nature of following Carboxylic acids is



A. $I > II > III > IV$

B. $IV > II > III > I$

C. $I > III > II > IV$

D. $III > II > I > IV$

Answer: B

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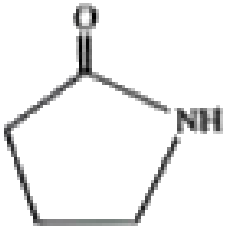
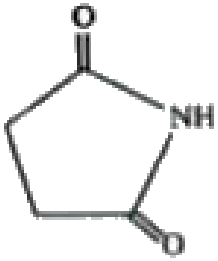
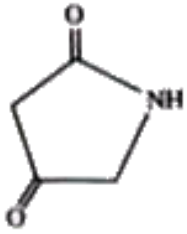
2. Most acidic one is :

A. 

B. 

C. 

D. 

Answer: C

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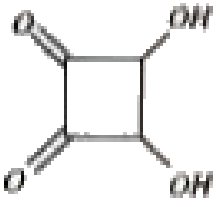
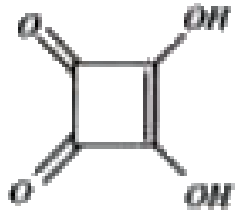
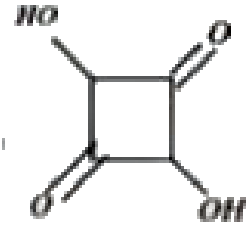
3. Which of the following contains most acidic hydrogen

A. 

B. 

C. 

D. 

Answer: B

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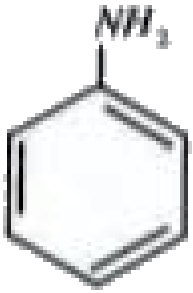
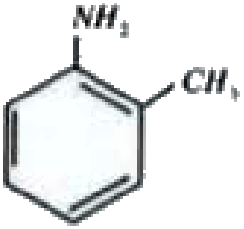
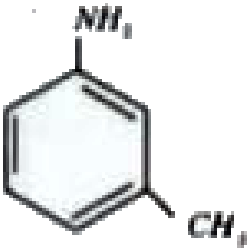
4. The most basic one is :

A. 

B. 

C. 

D. 

Answer: D

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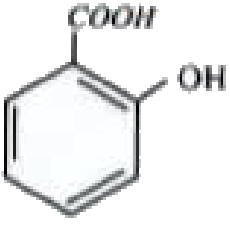
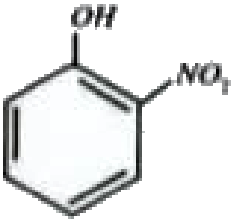
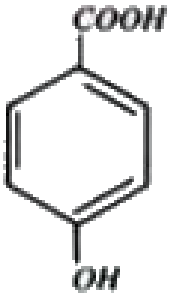
5. Most acidic one is :

A. 

B. 

C. 

D. 

Answer: A

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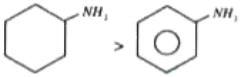
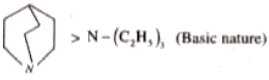
6. Which of the following order(s) is correct

A. 

B. $HCOOH > CH_3COOH$ (Acidic nature)

C. 

D. All the above

Answer: D

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7. Which of the following is the most stable

A. F_3C^-

B. Cl_3Cl^-

C. Both are equally stable

D. Cannot be predicted

Answer: B

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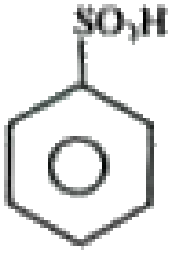
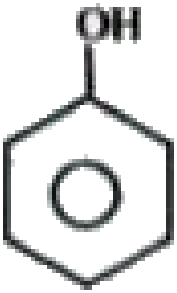
8. Amongst the following compounds the strongest acid is :

A.

B. 

C. 

D. 

Answer: B

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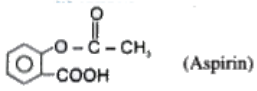
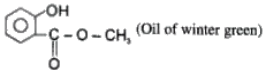
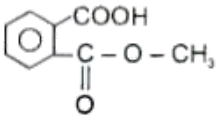
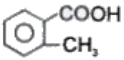
9. Amongst the following compounds the strongest acid is :

A. 

(Aspirin)

B.  (Oil of winter green)

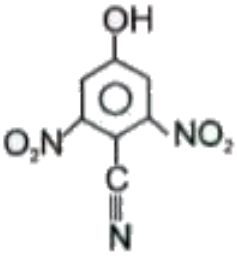
C. 

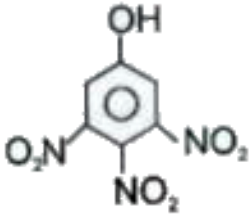
D.  (O-Toluic acid)

Answer: C

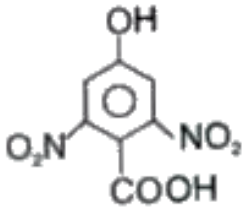
Watch Video Solution

10. Amongst the following compounds the strongest acid is :

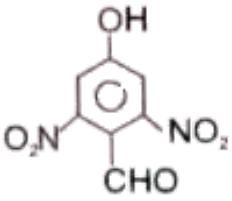
A. 

B. 

C.



D.



Answer: C

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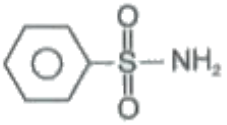
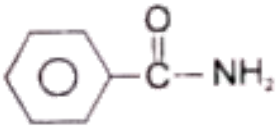
11. Amongst the following compounds the strongest acid is :

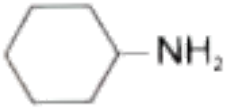
A.



B.



C. 

D. 

Answer: A

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12. The most acidic compound is

A. H_2S

B. H_2Te

C. H_2O

D. H_2Se

Answer: B

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PRACTICE SHEET - EXERCISE-III (LEVEL - II More than One correct answer Type Questions)

1. Which of the following are stronger bases than ammonia

A. $(CH_3)_2NH$

B. CH_3NH_2

C. $C_6H_5NH_2$

D. $C_2H_5NH_2$

Answer: A::B::D

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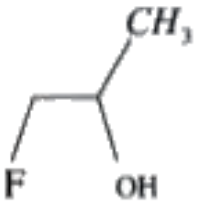
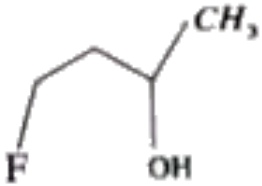
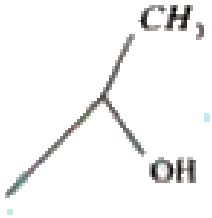
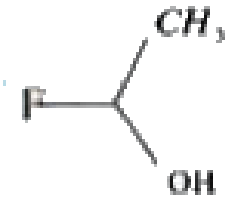
2. Which of the following alcohols are stronger acids than ethyl alcohol

A. 

B. 

C. 

D. 

Answer: A::B::D

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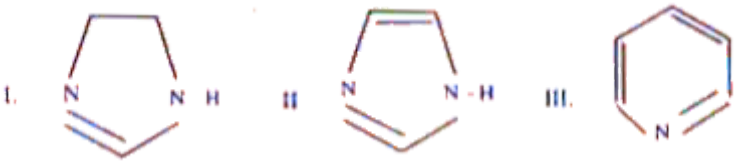
3. Choose the correct P^{Ka} order of the following compounds



A. $II > I > III$

B. $III > II > I$

C. $I > II > III$

D. $I > III > II$

Answer: D

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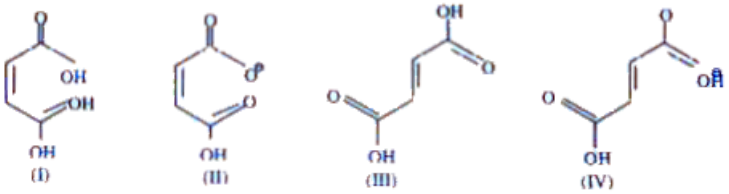
4. Select the correct statement(s) about the following species.



A. $Ka_1(I) > Ka_1(III)$

B. $Ka_2(II) < Ka_2(IV)$

C. $Ka_2(I) < Ka_2(III)$

D. $pKa_1(I) < pKa_1(II)$

Answer: A::B::C::D

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PRACTICE SHEET - EXERCISE-III (LEVEL - II Linked Comprehension Type Questions)

1. Inductive effect influences the basic strength as well as acidic strength. -I effect increases acidic strength where as +I effect increases basic strength as they stabilize conjugate base and acid respectively.

Which is a stronger acid among the following

A. O_2NCH_2COOH

B. $\underset{\underset{OH}{|}}{CH_2}COOH$

C. $\underset{\underset{CN}{|}}{CH_2}COOH$

D. $\underset{\underset{OCH_3}{|}}{CH_2}(COOH)$

Answer: A

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2. Inductive effect influences the basic strength as well as acidic strength. -I effect increases acidic strength where as +I effect increases basic strength as they stabilize conjugate base and acid respectively.

Identify the strongest base.

A. CH_3NH_2

B. $(CH_3)_2NH$

C. $(CH_3)_3N$

D. $C_6H_5NH_2$

Answer: B

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3. Inductive effect influences the basic strength as well as acidic strength. -I effect increases acidic strength where as +I effect increases basic strength as they stabilize conjugate base and acid respectively.

Which of the following is the strongest acid

A. HCOOH

B. CH_3COOH

C. CH_3CH_2COOH

D. $CH_3CH_2CH_2COOH$

Answer: A

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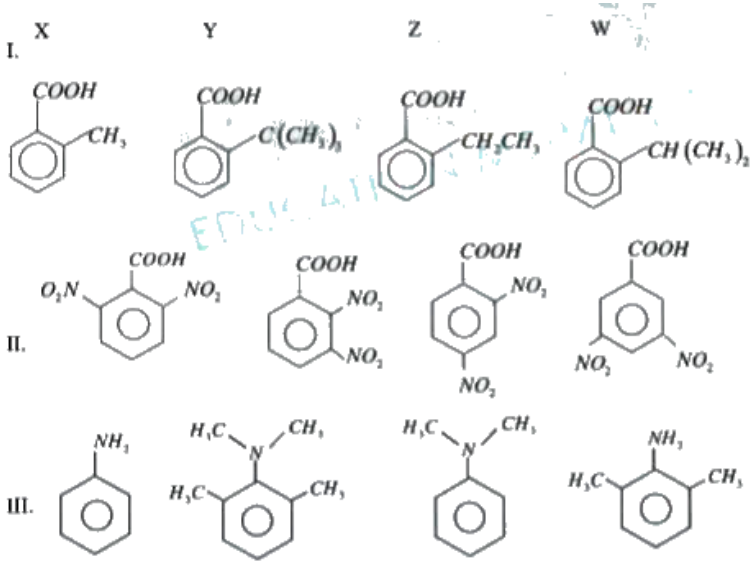
4.



The most acidic compound in I is

A. Y

B. W

C. X

D. Z

Answer: A

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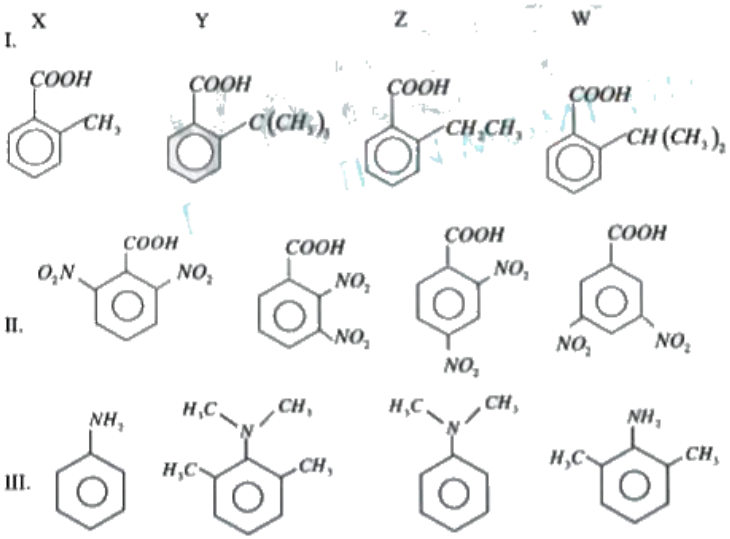
5.



The least acidic compound in II is

A. X

B. W

C. Z

D. Y

Answer: B

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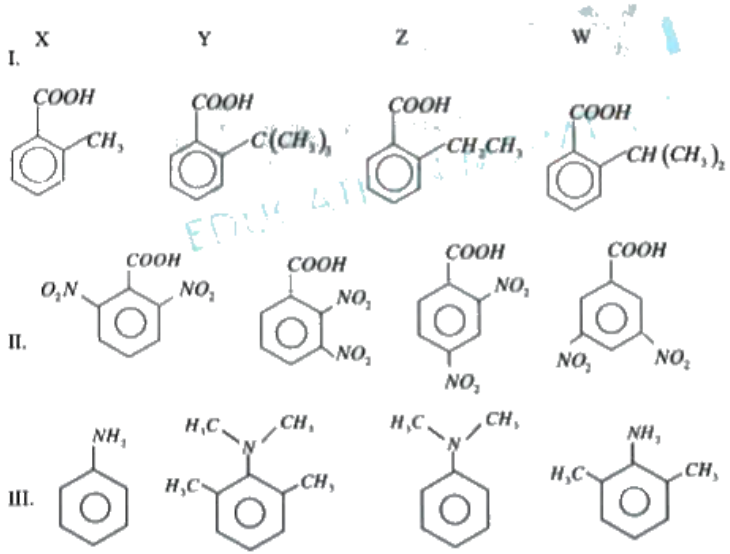
6.



The strongest base in III is

A. X

B. Z

C. Y

D. W

Answer: C

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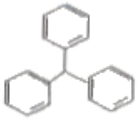
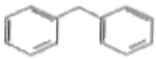
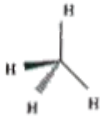
PRACTICE SHEET - EXERCISE-III (LEVEL - II Matrix Matching Type Questions)

1. Match the following columns

Column-I (molecule)	Column-I (P^{K_a})
A) 	P) 40
B) 	Q) 48
C) 	R) 33
D) 	S) 32

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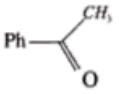
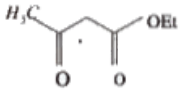
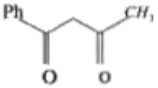
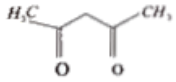
2. Match the following columns

Column-I (compound)	Column-II (Enol content)
A) 	P) 89.2
B) 	Q) 1.1×10-6
C) 	R) 80
D) 	S) 8.4

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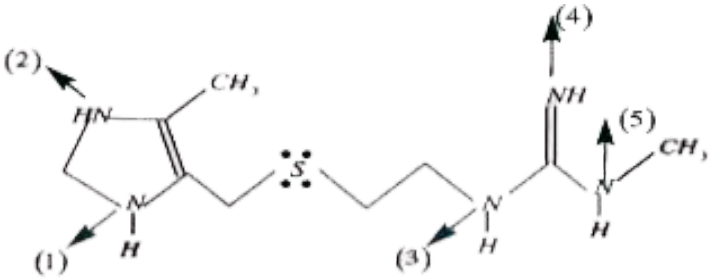
PRACTICE SHEET - EXERCISE-III (LEVEL - II Integer Type Questions)

1. On mono protonation which nitrogen of the following compound can be protonated.



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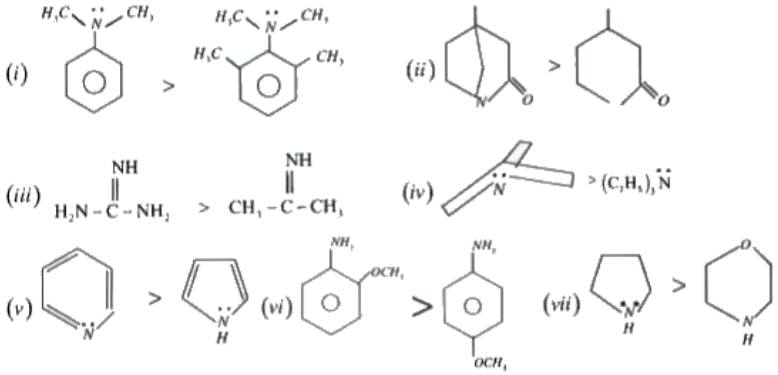
2. How many of the following are incorrect order of basic strength



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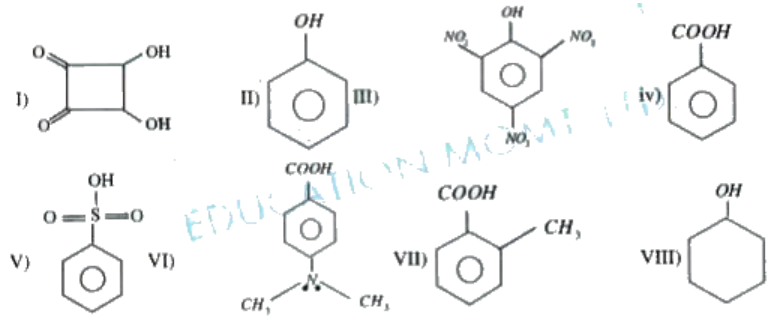
3. How many of the following acids react with the $NaHCO_3$?



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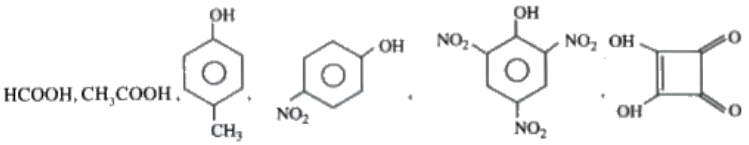
4. How many of the following are stronger acids than carbolic acid



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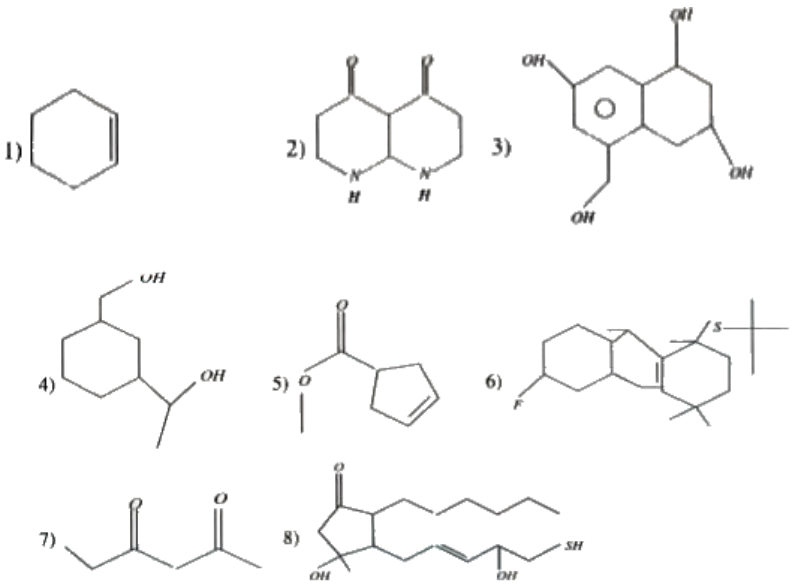
5. Number of compounds having relatively more acidic hydrogen than $Me_3 - OH$



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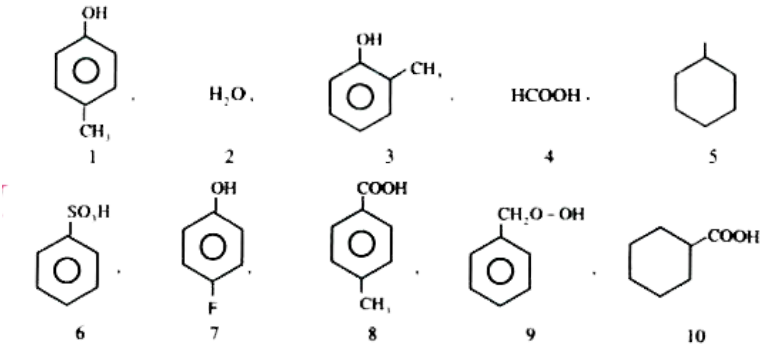
6. How many among the given is more acidic than phenol.



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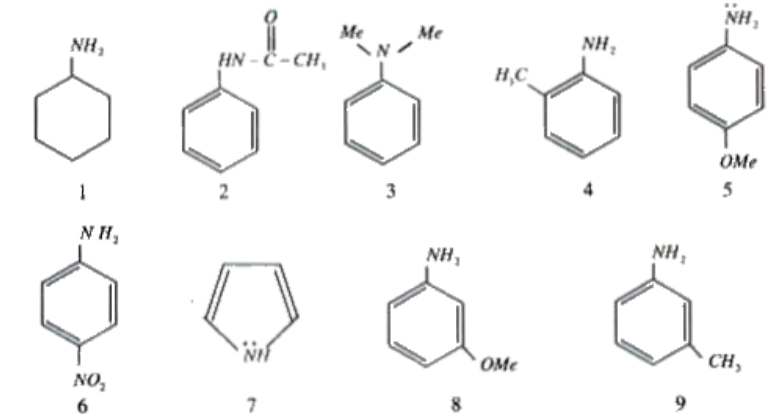
7. Among the following compounds how mnay of them is more basic than aniline?



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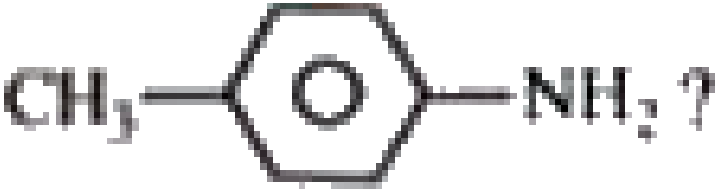
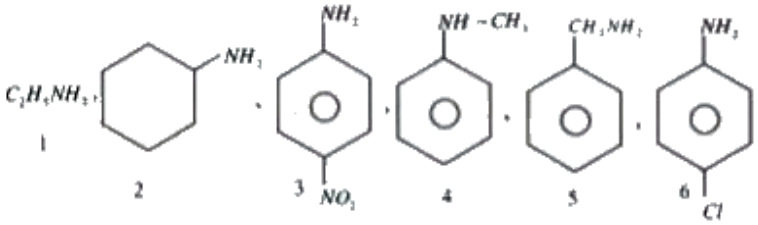
8. How many of the following compounds are more basic than



?



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ADDITIONAL PRACTICE EXERCISE (LEVEL - I (MAIN) Straight Objective Type Questions)

1. Which order is correct regarding stability of intermediates.

(I) $CH_3 - CH_2^-$, (II) $CH_2 = CH^-$ (III) $CH \equiv C^-$

A. a. $I = II = III$

B. b. $I < II < III$

C. c. $III = II > I$

D. d. $I > II > III$

Answer: D

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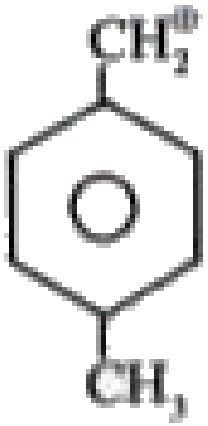
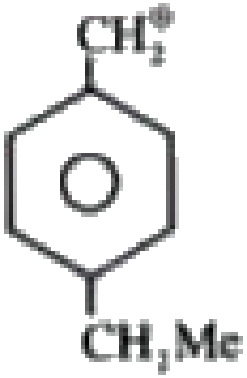
2. Select the most stable intermediate.

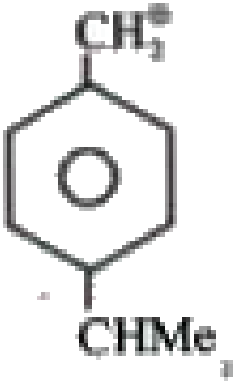


A.

B.



C.



D.

Answer: A

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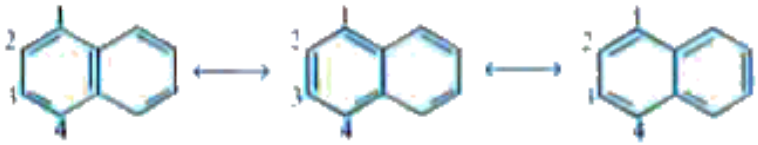
3. 

These are three canonical structures of napthalene. Examine them and find correct statement among the following :

A. All C - C bonds are of same length

B. $C_1 - C_2$ bond is shorter than $C_2 - C_3$ bond.

C. $C_1 - C_2$ bond is longer than $C_2 - C_3$ bond

D. None of these

Answer: B

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4. $CH_2 = \underset{(I)}{CH} - CH = CH - CH_3$ is more stable than $CH_3 - \underset{(II)}{CH} = C = CH - CH_3$ because

A. there is resonance in I but not in II

B. there is tautomerism in I but not in II

C. there is hyperconjugation in I but not in II

D. II has more canonical structures than I.

Answer: A

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5. In which of the following molecules $\pi -$ electron density in ring is maximum :

A. 

B. 

C. 

D. 

Answer: B

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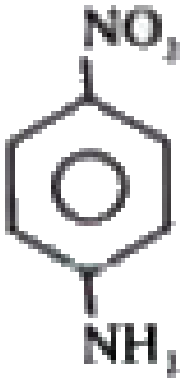
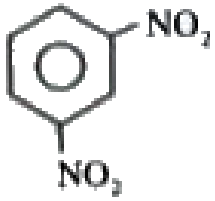
6. In which of the following molecules $\pi -$ electron density in ring is minimum

A. 

B. 

C. 

D. 

Answer: D

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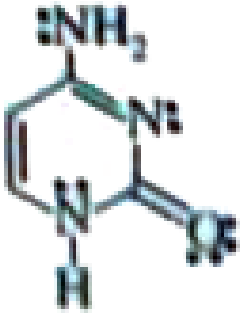
7. Which of the following compound is non aromatic?

A.

B.

C.

D.



Answer: B

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8. Among the following molecules, the correct order of C - C bond length is

A. $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$

B. $C_2H_6 > C_6H_6 > C_2H_4 > C_2H_2$

C. $C_2H_4 > C_2H_6 > C_2H_2 > C_6H_6$

D. $C_2H_6 > C_2H_4 > C_2H_2 > C_6H_6$

Answer: B

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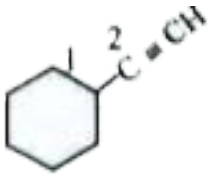
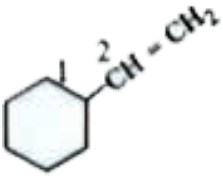
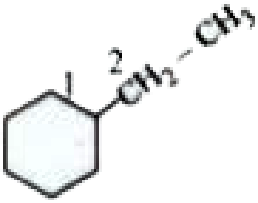
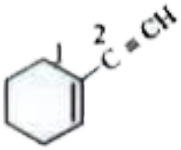
9. $C_1 - C_2$ bond is shortest in

A. 

B. 

C. 

D. 

Answer: B

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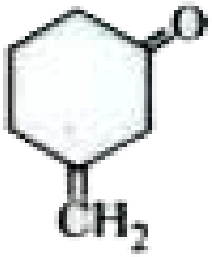
10. Which of the following has the longest C - O bond ?

A.

B.

C.



D.

Answer: B

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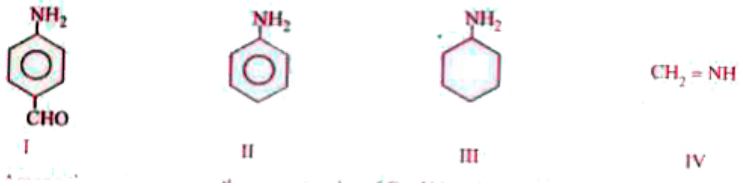
11. 

Among these compounds, the correct order of C - N bond lengths is

A. $IV > I > II > III$

B. $III > I > II > IV$

C. $III > II > I > IV$

D. $III > I > IV > II$

Answer: B

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12. (I) $CH_3O - CH = CH - NO_2$ (II) $CH_2 = CH - NO_2$
(III) $CH_2 = CH - Cl$ (IV) $CH_2 = CH_2$

Which of the following is the correct order of C - C bond lengths among these compounds :

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $I > III > II > IV$

D. $II > III > I > IV$

Answer: C

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13. Select the least acidic compound.

A. $NO_2 - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

B. $F - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

C. $Ph - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

D. $CH_3 - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

Answer: D

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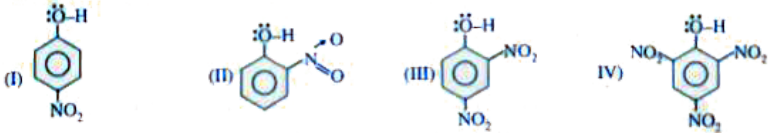
14. Write correct order of acidic strength of following compounds



A. $IV > III > I > II$

B. $III > II > I > IV$

C. $IV > I > II > III$

D. $I > II > III > IV$

Answer: A

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15. Arrange the given phenols in their decreasing order of acidity

Select the correct answer from the given

A. $IV > III > I > II$

B. $IV > II > III > I$

C. $IV > III > II > I$

D. $IV > I > III > II$

Answer: C

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16. Which one of the following is the most acidic?

A. 

B.

C.

D. $CH_2 = CH - CH_3$

Answer: B

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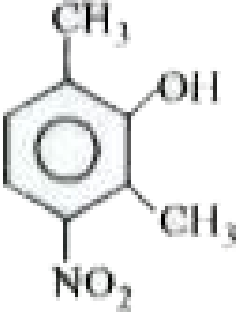
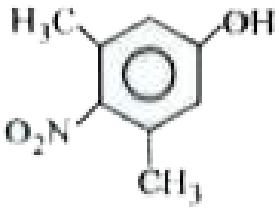
17. Which one of the following phenols will show the highest acidity?

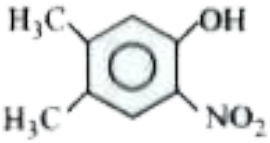
A.



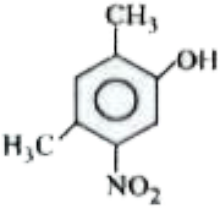
B.



C.



D.



Answer: B

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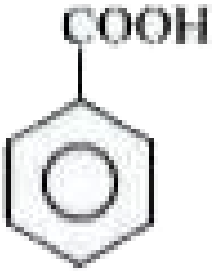
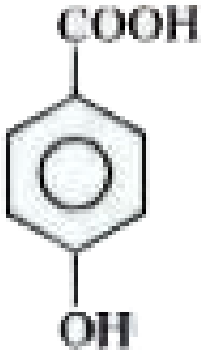
18. Which of the following is the weakest acid?

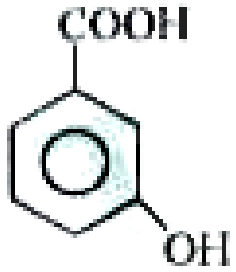
A.

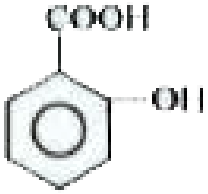


B.



C.





D.

Answer: B

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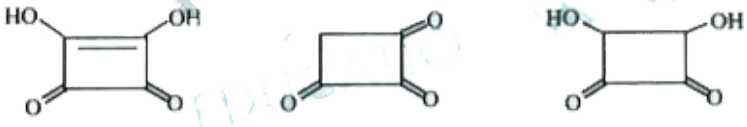
19. The correct pKa order of the following acids is



A. $I > II > III$

B. $III > II > I$

C. $III > I > II$

D. $I > III > II$

Answer: A

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20. Which of the following compound is having the highest P^{ka} value

A. Phenol

B. Ethyl alcohol

C. Formic acid

D. Benzoic acid

Answer: B

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II LECTURE SHEET (ADVANCED) Straight ObjectiveType Questions)

1. Consider the basicity of the following aromatic amines:

(I) aniline (II) p-nitroaniline (III) p-methoxyaniline (IV) p-

methylaniline

The correct order of decreasing basicity is:

A. $III > IV > I > II$

B. $III > IV > II > I$

C. $I > II > III > IV$

D. $IV > III > II > I$

Answer: A

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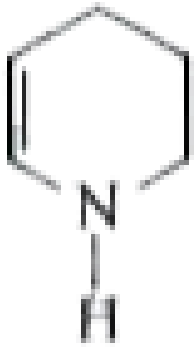
2. Which one of the following is least basic in character?

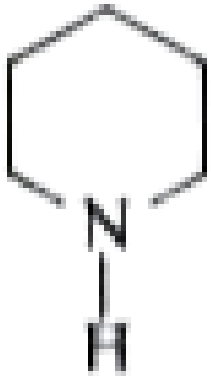
A. 

B.

C.



D.



Answer: A

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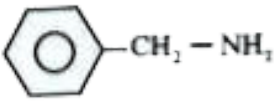
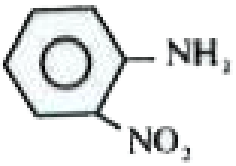
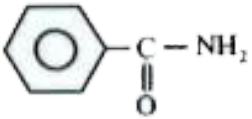
3. Select the least basic compound.

A. 

B. 

C. 

D. 

Answer: D

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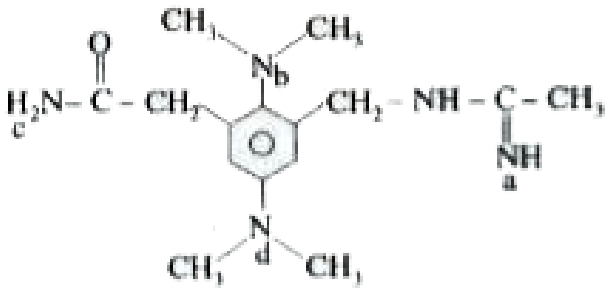
4. Basicity order of N in the following compound is :



A. $b > d > a > c$

B. $a > b > d > c$

C. $a > b > c > d$

D. $a > c > b > d$

Answer: B

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5. Consider the following base

(I) o-nitroaniline (II) m-nitroaniline (III) p-nitroaniline

The decreasing order of basicity is:

A. $II > III > I$

B. $II > I > III$

C. $I > II > III$

D. $I > III > II$

Answer: A

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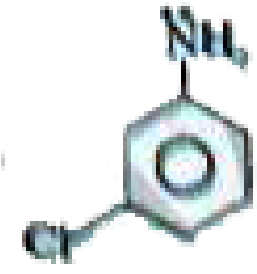
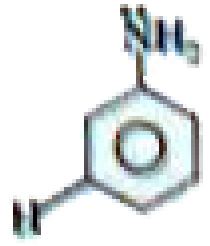
6. Select the most basic compound.

A. 

B. 

C. 

D. 

Answer: C

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7. Which one of the following molecules has all the effects, namely inductive, mesomeric and hyperconjugative?

A. CH_3Cl

B. $CH_3 - CH = CH_2$

C. $CH_3 - CH = CH - \overset{\overset{O}{||}}{C} - CH_3$

D. $CH_2 = CH - CH = CH_2$

Answer: C

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8. Hyperconjugation is best described as:

A. Delocalisation of π electrons into a nearby empty orbital.

B. Delocalisation of σ electrons into a nearby empty orbital.

C. The effect of alkyl groups donating a small amount of electron density inductively into a carbocation.

D. The migration of a carbon or hydrogen from one carbocation to another.

Answer: B

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9. Select the correct statement.

(i) Delocalisation of $\sigma -$ electron is hyperconjugation. (ii) Delocalisation of $\pi -$ electron is resonance.

(iii) Partial displacement of $\sigma -$ electron is inductive effect.

A. i & iii

B. ii & iii

C. i & ii

D. i, ii, iii

Answer: D

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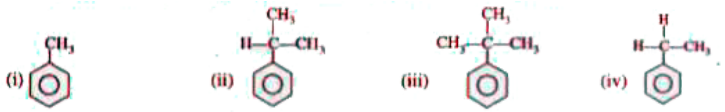
10. Arrange the following compounds in decreasing order of electrophilic substitution.



A. $i > ii > iii > iv$

B. $iii > iv > ii > i$

C. $i > iv > ii > iii$

D. $i > ii > iv > iii$

Answer: C

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11. Resonance energy of benzene is

A. canonical strutures are equivalent than if canonical structures are non-equivalent.

B. molecule is aromatic than if molecule is not aromatic.

C. more number of p-bonds are involved in resonance than less number of p-bonds are involved.

D. Resonance with 2p-2p overlapping than resonance with 3p-2p overlapping.

Answer: A::B::C::D

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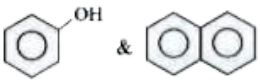
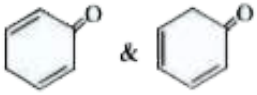
12. In which of the following pairs IInd compound has higher resonance energy :

A. 

B. 

C. 

D. $CH_2 = CH - OH \& CH_2 = CH - CH = CH - OH$

Answer: A::C::D

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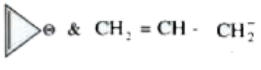
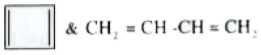
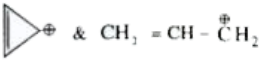
13. In which of the following pairs IInd compound has less resonance energy :

A. $CO_3^{2-}\ \&\ HCOO^-$

B. 

C. 

D. 

Answer: A::D

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14. Identify electron - withdrawing groups in resonance among the following :

A. $-COOH$

B. $-CONHCH_3$

C. $-COCl$

D. $-CN$

Answer: A::B::C::D

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15. Which of the following groups can neither donate a pair of electrons in resonance

A. $-NO_2$

B. $-NO$

C. $-CH=CH_2$

D. $-CHO$

Answer: B::C

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16. Which of the following group can participate in resonance with other suitable group :

A. $CH_2 = \overset{\oplus}{O} -$

B. $-CH_2 - \overline{C}H_2$

C. $-CH_2 - \overset{\oplus}{C}H_2$

D. 

Answer: A

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17. Which one of the following pairs of structures represent the phenomenon of resonance?

A. $H_2C = CH - \overset{O}{\overset{||}{C}} - H, C\overset{+}{H}_2 - CH = \overset{O^-}{\overset{|}{C}} - H$

B. $CH_2 = CH - \overset{+}{C}HCl, \quad C\overset{+}{H}_2 - CH = CH - Cl$

C. $(CH_3)_2CH-\overset{O}{\overset{||}{C}}-O^-, (CH_3)_2CH-\overset{O^-}{\overset{|}{C}}=O$

D. $CH_3-CH_2-\overset{O}{\overset{||}{C}}-CH_3, CH_3-CH=\overset{O^-}{\overset{|}{C}}-CH_3$

Answer: A::B::C

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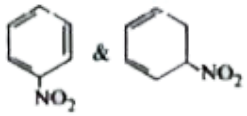
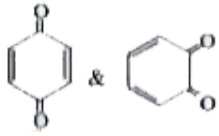
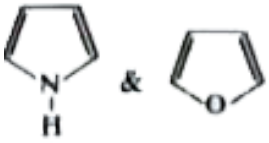
18. In which of the following pairs IInd compound has less resonance energy :

A. 

B. 

C. 

D. 

Answer: A::B::C::D

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19. In which of the following is (are) the correct order of bond lengths :

A. $C-C>C=C>C\equiv C>C\equiv N$

B. $C=N>C=O>C=C$

C. $C=C>C=N>C=O$

D. $C-C>C=C>C\equiv C>C-H$

Answer: A::C::D

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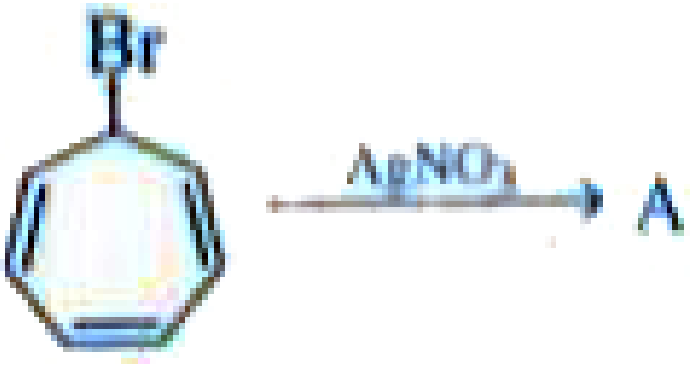
20. 

Select the correct statement about product A.

A. Product is aromatic

B. Product has high dipole moment.

C. Product has less resonance energy

D. Product is soluble in polar solvent.

Answer: A::B::D

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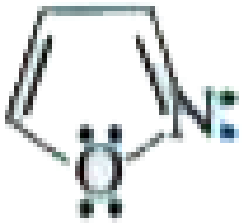
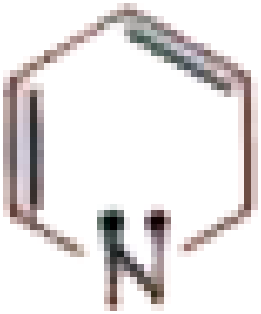
21. Which of the following compounds is aromatic?

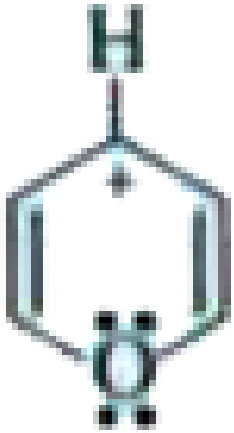


A.

B.



C.



D.

Answer: A::B::D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II LECTURE SHEET (ADVANCED) Linked Comprehension Type Questions)

1. When an electron withdrawing or electron releasing group is attached to carbon chain, polarity is induced on the carbon atom and on the substituent attach to it. This permanent polarity is due electron displacement due to difference in electronegativities this is called

inductive effect or I effect. The inducitve effect depends in the electronegativity of the substituent. The inductive effect is broadly classified as (i) negative inductive effect or -I effect. (ii) positive inductive effect or +I effect.

The group which exhibits the maximum -I effect

A. $-NO_2$

B. $-CN$

C. $-Cl$

D. $-OH$

Answer: A

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2. When an electron withdrawing or electron releasing group is attached to carbon chain, polarity is induced on the carbon atom and on the substituent attach to it. This permanent polarity is due electron displacement due to difference in electronegativities this is called

inductive effect or I effect. The inducitve effect depends in the electronegativity of the substituent. The inductive effect is broadly classified as (i) negative inductive effect or -I effect. (ii) positive inductive effect or +I effect.

Which of the following statements is correct about inductive effect ?

A. Polarization of a $\sigma -$ bond is called inductive effect.

B. Inductive effect is transmitted through $\sigma -$ bonds

C. Inductive effective is transmitted through $\pi -$ bond

D. Both a and b.

Answer: D

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3. When an electron withdrawing or electron releasing group is attached to carbon chain, polarity is induced on the carbon atom and on the substituent attach to it. This permanent polarity is due electron displacement due to difference in electronegativities this is called

inductive effect or I effect. The inducitve effect depends in the electronegativity of the substituent. The inductive effect is broadly classified as (i) negative inductive effect or -I effect. (ii) positive inductive effect or +I effect.

Stability of given anions in the decreasing order is

(i) $\overline{C}H_3$ (ii) $\overline{C}H_2 - NO_2$ (iii) $\overline{C}H_2Cl$ (iv) $CH_3 - \overline{C}H_2$

A. $i > ii > iii > iv$

B. $ii > iii > i > iv$

C. $ii > i > iii > iv$

D. $iv > i > iii > ii$

Answer: D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II LECTURE SHEET (ADVANCED) Integer Type Questions)

1. How many of the following statements is (are) true about resonance.

a) Resonance is an intramolecular process.

b) Resonance involves delocalization both of s and p electrons.

c) Resonance involves delocalization of π electrons only.

d) Resonance decreases potential energy of a molecule.

e) Resonance has no effect on the potential energy of a molecule.

f) Resonance is the only way to increase molecular stability.

g) Resonance is not the only way to increase molecular stability.

h) Any resonating molecule is always more stable than any nonresonating molecule.

i) The canonical struture explains all features of a molecule.

j) The resonance hybrid explains all features of a molecule.

k) Resonating structures are real and resonance hybrid is imaginary.

l) Resonance hybrid is real and resonating structures are imaginary.

m) Resonance hybrid is always more stable than all canonical structures.

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2. How many of the following lone-pair indicated is involved in resonance :

a) 

b) 

c) 

d) 

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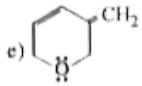
3. How many of the following lone-pair indicated is not involved in resonance :

a) $CH_2=CH-\ddot{N}H-CH_3$

b) $CH_2=CH-CH=\ddot{O}$

c) $CH_2=CH-\ddot{O}-CH=CH_2$

d) $CH_2=CH-C\equiv N:$

e) 

$CH_2=CH-CH=\ddot{N}H$

f) 

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4. Find the number of correct statement(s):

a) $CH_3\overset{\oplus}{O}CH_2$ is more stable than $CH_3\overset{\oplus}{C}H_2$

b) $Me_2\overset{\oplus}{C}H$ is more stable than $CH_3CH_2\overset{\oplus}{C}H_2$

c) $CH_2 = CH - \overset{\oplus}{C}H_2$ is more stable than $CH_3CH_2\overset{\oplus}{C}H_2$

d) $CH_2 = \overset{\oplus}{C}H$ is more stable than $CH_3\overset{\oplus}{C}H_2$

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ADDITIONAL PRACTICE EXERCISE (Practive Sheet (ADVANCED) Straight Objective Type Questions)

1. The bond between carbon atom (1) and carbon atom (2) in compound $N \equiv \overset{1}{C} - \overset{2}{C}H = CH_2$ involves the hybridization 1) spa and sp?

A. sp^2 and sp^2

B. sp^3 and sp

C. sp and sp^2

D. sp and sp

Answer: C

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2. Polarization of electrons in acrolein may be written as

A. $H_2^{\delta-}C=CH-\underset{\delta+}{\overset{O}{\overset{||}{C}}}-H$

B. $H_2^{\delta-}C=CH-\overset{\delta+}{\overset{O}{\overset{||}{C}}}-H$

C. $H_2^{\delta-}C=\overset{\delta+}{C}H-\overset{O}{\overset{||}{C}}-H$

D. `H_(2)^(delta+)C=

Answer: D

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3. The number of sigma and pi-bonds in 1-butene 3-yne are

A. 5 sigma and 5 pi

B. 7 sigma and 3 pi

C. 8 sigma and 2 pi

D. 6 sigma and 4 pi

Answer: B

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4. Amongst the following, the most basic compound is

A. benzylamine

B. aniline

C. acetanilide

D. p-nitroaniline

Answer: A

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5. The hybridisation of carbon atoms in C-C single bond $H-C\equiv C-CH_3$ is

A. $sp^3 - sp3$

B. $sp2 - sp3$

C. $sp - sp3$

D. $sp - sp3$

Answer: D

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6. What is the decreasing order of strength of the bases OH, NH_2 , H-C=C and CH_3, $-CH_2$,

A. $CH_3 - CH_2^- > NH_2^- > H - C \equiv C^- > OH^-$

B. $H - C \equiv C^- > CH_3 - CH_2^- > NH_2^- > OH^-$

C. $OH^- > NH_2^- > H - C \equiv C^- > CH_3 - CH_2^-$

D. $NH_2^- > H - C \equiv C^- > OH^- > CH_3 - CH_2^-$

Answer: A

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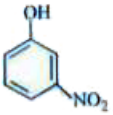
7. In the following compounds

(I)

(II)



(III)

(IV)

The order of acidity is:

A. $III > IV > I > II$

B. $I > IV > III > II$

C. $II > I > III > IV$

D. $IV > III > I > II$

Answer: D

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8. Among the following compounds, the strongest acid is

A. $HC^{\circ}CH$

B. C_6H_6

C. C_2H_6

D. CH_3OH

Answer: D

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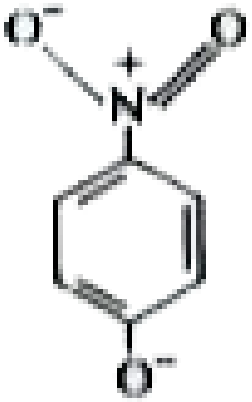
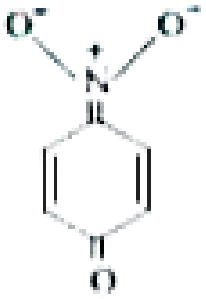
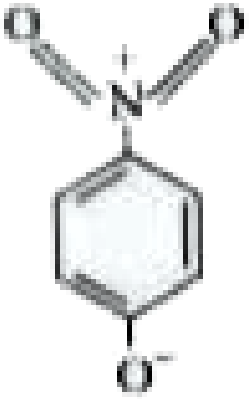
9. The most unlikely representation of resonance structure of P-nitrophenoxide .



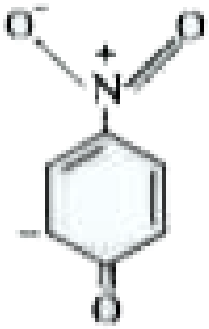
A.



B.



C.



D.

Answer: C

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10. The compound in which C uses only sp^3 hybrid orbitals for bond formation is

A. HCOOH

B. $(H_2N)_2CO$

C. $(CH_3)_3COH$

D. CH_3CHO

Answer: C

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11. Which of the following has the most acidic hydrogen?

A. 3-hexane

B. 2,4-hexanedione

C. 2,5-hexaedione

D. 2,3-hexaedione

Answer: B

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12. Among the following the strongest base is

A. $C_6H_5NH_2$

B. $p - O_2NC_6H_4NH_2$

C. $m - O_2NC_6H_4NH_2$

D. $C_6H_5CH_2NH_2$

Answer: D

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13. The correct order of basicities of the following compounds is:

1) 

A. $2 > 1 > 3 > 4$

B. $1 > 3 > 2 > 4$

C. $3 > 1 > 2 > 4$

D. $1 > 2 > 3 > 4$

Answer: B

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14. Which of the following hydrocarbons has the lowest dipole moment?

A. cis-2-butene

B. 2-butyne

C. 1-butyne

D. $H_2C = CH - C \equiv CH$

Answer: B

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15. Identify the correct order of boiling points of the following compounds.

1)

$CH_3CH_2CH_2CH_2OH$ 2) $CH_3CH_2CH_2CHO$ 3) $CH_3CH_2CH_2COOH$

A. $1 > 2 > 3$

B. $3 > 1 > 2$

C. $1 > 3 > 2$

D. $3 > 2 > 1$

Answer: B

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16. Which of the following acids has the smallest dissociation constant ?

A. $CH_3CHFCOOH$

B. FCH_2CH_2COOH

C. $BrCH_2CH_2COOH$

D. $CH_3CHBrCOOH$

Answer: C

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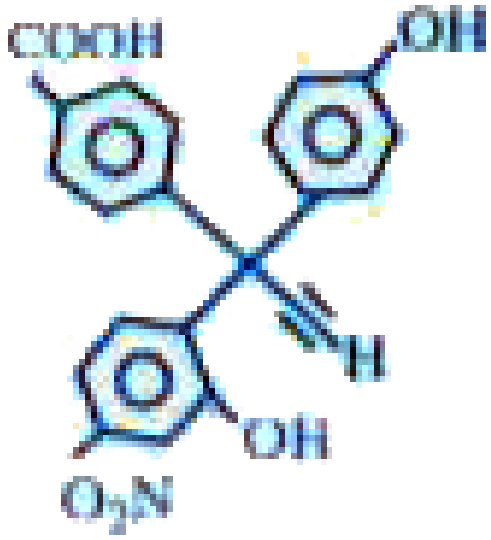
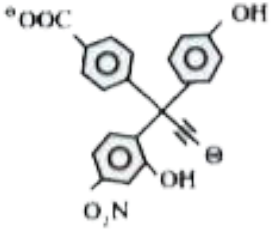
X is



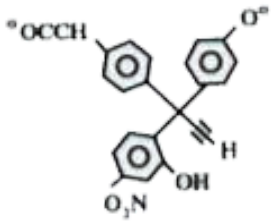
17.

When X is made to react with 2 e of $NaNH_1$ the product formed will be:

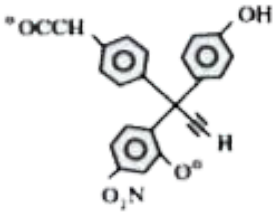
A.



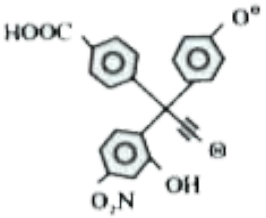
B.



C.



D.



Answer: C

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18. Which of the following represent the given mode of hybridisation sp2, sp2, sp, sp from left to right ?

A. $H_2C = CH - C \equiv N$

B. $H_2C = C = CH - CH_3$

C. $HC \equiv C - C \equiv CH$

D. $HC \equiv C - CH = CH_2$

Answer: A

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19. Maximum dipole moment will be of :

A. CCl_4

B. $CHCl_3$

C. CH_2Cl_2

D. CH_3Cl

Answer: D

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20. Correct order of acidic strength is:

A. $x > y > z$

B. $z > y > x$

C. $y > z > x$

D. $x > z > y$

Answer: D

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21. For 1-methoxy-1,3-butadiene, which of the following resonating structure is the least stable?

A. $H_2\overset{\ominus}{C} - \overset{\oplus}{C}H - CH = CH - O - CH_3$

B. $H_2\overset{\oplus}{C} - CH = CH - CH = \overset{\ominus}{O} - CH_3$

C. $H_2C = CH - \overset{\oplus}{C}H - \overset{\ominus}{C}H - O - CH_3$

D. $H_2C = CH - \overset{\ominus}{C}H - CH = \overset{\oplus}{O} - CH_3$

Answer: C

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22. When benzene sulfonic acid and p-nitrophenol are treated with $NaHCO_3$, the gases released respectively are

A. SO_2, NO_2

B. SO_2, NO

C. SO_2, CO_2

D. CO_2, CO_2

Answer: D

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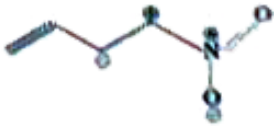
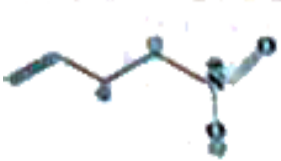
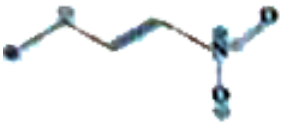
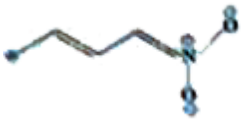
23. Among the following, the least stable resonance structure is

A. 

B. 

C. 

D. 

Answer: A

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24. The correct stability order of the following species is

a) (II) > (IV) > (I) > (III)
b) (I) > (II) > (III) > (IV)
c) (II) > (I) > (IV) > (III)
d) (I) > (III) > (II) > (IV)

A. $(II) > (IV) > (I) > (III)$

B. $(I) > (II) > (III) > (IV)$

C. $(II) > (I) > (IV) > (III)$

D. $(I) > (III) > (II) > (IV)$

Answer: D

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25. Hyper conjugation involves overlap of the following orbitals

A. s - s

B. s - p

C. p - p

D. p - p

Answer: B

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26. The correct acidity order of the following is :

a) (III) > (IV) > (II) > (I)
b) (IV) > (III) > (I) > (II)
c) (III) > (II) > (I) > (IV)
d) (II) > (III) > (IV) > (I)

A. $(III) > (IV) > (II) > (I)$

B. $(IV) > (III) > (I) > (II)$

C. $(III) > (II) > (I) > (IV)$

D. $(II) > (III) > (IV) > (I)$

Answer: A

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27. The correct stability order of the following resonance structure is :

I)

$H_2C = \overset{\oplus}{N} = \overset{\ominus}{N}$ II) $H_2\overset{\oplus}{C} - N = \overset{\ominus}{N}$ III) $H_2\overset{\oplus}{C} - N = \overset{\ominus}{N}$ IV) H_2C $\overset{\ominus}{}$

A. $(I) > (II) > (IV) > (III)$

B. $(I) > (III) > (II) > (IV)$

C. $(II) > (I) > (III) > (IV)$

D. $(III) > (I) > (IV) > (II)$

Answer: B

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28. Among the following compounds, the most acidic is

A. p-nitrophenol

B. p-hydroxybenzoic acid

C. o-hydroxybenzoic acid

D. p-toluic acid

Answer: C

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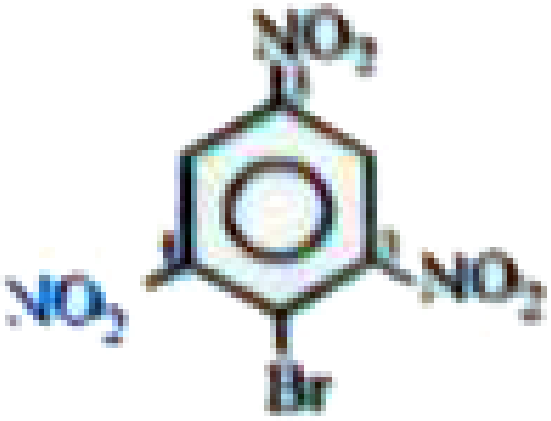
29. Which of the following statements would be false about this compound :



A. All three C - N bonds are of same length.

B. Cl - N and C3 - N bonds are of same length but shorter than C5 - N bond.

C. Cl - N and C3 - N bonds are of same length but longer than C5 - N bond.

D. Cl - N and C3 - N bonds are of different length but both are longer than C5 - N bond

Answer: A::B::D

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30. Which of the following statement is/are correct?

A. Contributing structures contributes to the resonance hybrid in proportion of their energies.

B. Equivalent contributing structure make the resonance very important.

C. Contributing structures represent hypothetical molecules having no real existance.

D. Contributing structures are less stable than the resonance hybrid.

Answer: B::C::D

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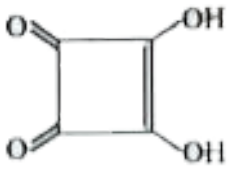
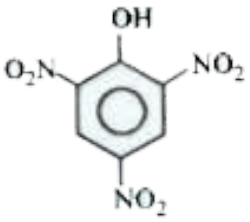
31. Which of the following compounds reacts with $NaHCO_3$ giving CO_2

A. 

B. 

C. $CH_3\overset{O}{\overset{||}{C}}COOH$



D.

Answer: A::B::C::D

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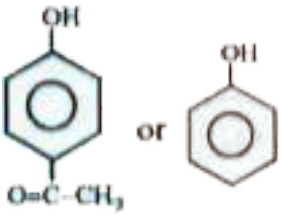
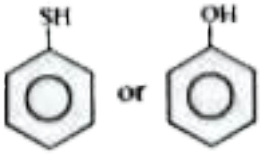
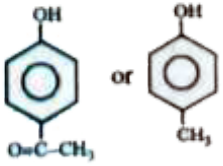
32. In which pair IInd compound is weak acids.



A.



B.

C. 

D. H_2O or CH_3OH

Answer: A::B::C

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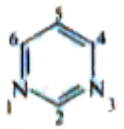
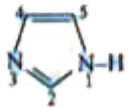
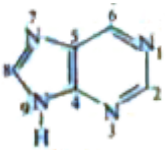
33. 
Pyrimidine


Imidazole


Purine

Among the following which statement(s) is/are true:

A. Both N of pyrimidine are of same basic strength

B. In imidazole protonation takes places on N-3.

C. Purine has 3 basic N.

D. Pyrimidine imidazole and purine all are aromatic

Answer: A::B::C::D

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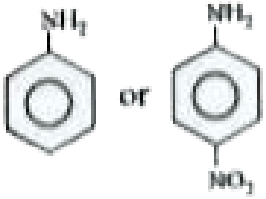
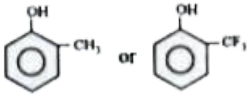
34. In which of the following pair IInd compound is weaker base.

A. 

B. $CH_2 = CH - CH = CH - \overset{\ominus}{C}H_2$ or $CH_2 = CH - \overset{\ominus}{C}H_2$

C. $O^- - \overset{O}{\overset{||}{C}} - \overset{O}{\overset{||}{C}} - OH$ or $HO - \overset{O}{\overset{||}{C}} - \overset{O}{\overset{||}{C}} - OH$

D. 

Answer: A::C::D

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35. Amongst the following statements, which is(are) correct ?

A. Cyanic acid $(H-O-C\equiv N)$ and isocyanic acid (H - N = C = O) are not separable in H_2O

B. Ka of formic acid is higher than IInd $Ka(Ka_2)$ of oxalic acid.

C. Acids which are weaker than H_2CO_3 will liberate CO_2 on treatment with $NaHCO_3$

D. In case of dicarboxylic acid Ka_1 (1st dissociation), is always greater then Ka_2 (IInd dissociation)

Answer: A::B::D

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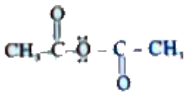
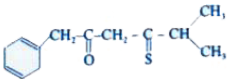
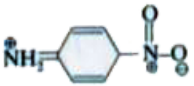
36. Among the following which one is having conjugated system :

A. 

B. 

C. 

D. 

Answer: B::D

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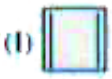
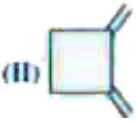
37. Choose the correct statement :

(I) 

(II) 

(III) 

A. Stability of $(II) > (III) > (I)$

B. stability of $(II) > (III) > (I)$

C. Stability of $(III) > (II) > (I)$

D. stability of $(I) > (II) > (III)$

Answer: A::B

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38. Select correct statement

A. $-NO_2$ and $-COOH$ group deactivates benzene nucleus for attack of E+ at o- and p- sites.

B. $-NH_2$ and $-OMe$ group activates benzene nucleous for attack of E+ at o- and p- sites.

C. $-NH_2$ and $-COOH$ group activates benzene nucleous for attack of E+ at o- and p- sites.

D. $-NO_2$ and $-OMe$ group activates benzene nucleous for attack of E+ at o- and p- sites.

Answer: A::B

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ADDITIONAL PRACTICE EXERCISE (Practive Sheet (ADVANCED) Linked Comprehension Type Questions)

1. Resonance phenomenon is generally involved when single valence bond structure could not represent the actual structure of the molecules or species. Based on the actual bond lengths, bond energies etc, of the molecules or species, resonance phenomenon will help to achieve at the correct structure of the species or molecules.

Which of the following is the correct resonance structure of

A.

B.

C.

D. Both (a) & (c)

Answer: D

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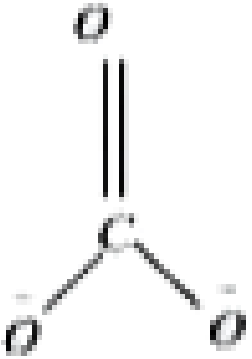
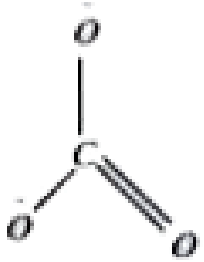
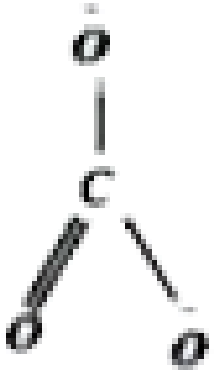
2. Resonance phenomenon is generally involved when single valence bond structure could not represent the actual structure of the molecules or species. Based on the actual bond lengths, bond energies etc, of the

molecules or species, resonance phenomenon will help to achieve at the correct structure of the species or molecules.

Which of the following is correct

A. 

B. 

C. 

D. All the above

Answer: D

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3. Resonance phenomenon is generally involved when single valence bond structure could not represent the actual structure of the molecules or species. Based on the actual bond lengths, bond energies etc, of the molecules or species, resonance phenomenon will help to achieve at the correct structure of the species or molecules.

Which of the following is correct

A. Reasonance hybrid is stabler than connonical structures

B. C annonical structures are not real structures of the molecules

C. Resonance structures differ in the distribution of electrons only

D. All the above

Answer: D

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ADDITIONAL PRACTICE EXERCISE (Practive Sheet (ADVANCED) Integer Type Questions)

1. How many of the following groups cannot participate in resonance with other suitable group :

a) $-COOH$ b) $-COO^{\rho}$ c) $-COCl$ d) $-\overset{\oplus}{N}H_3$

e) $-\overset{\oplus}{C}H_2$ f) $-\dot{C}H_2$ g) $\overset{CH_2=\overset{\oplus}{N}-}{\underset{|}{C}H_3}$

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2. Find the number of electron - donating groups in resonance among the following :

a) $-CONH_2$ b) $-NO_2$ c) $-OCOCH_3$ d) $-COOCH_3$

e) $-CHO$ f) $-NHCOCH_3$

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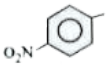
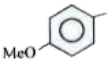
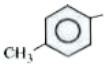
3. How many of the following groups can only withdraw a pair of electrons in resonance depending upon situation

a) – Ph

b) 

c) 

d) 

e) $-\overset{\oplus}{N}Me_3$ f) $-CONH_2$

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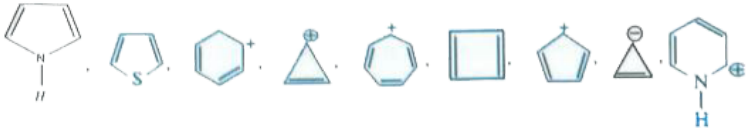
4. How many of the following compounds are aromatic?



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LECTURE SHEET (EXERCISE-I (LEVEL-I (MAIN)) (Sraight Objective Type Questions)

1. $+I$ effect (inductive effect) is shown by

A. $-CH_3$

B. $-OH$

C. $-F$

D. $-C_6H_5$

Answer: A

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2. Shifting of electrons of a multiple bond under the influence of reagent is called

A. I-effect

B. M-effect

C. E-effect

D. T-effect

Answer: C

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3. Which of the following show electromeric effect?

A. Alkanes

B. Alkyl amines

C. Alkyl halides

D. Aldehydes

Answer: D

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4. Which of the following ions exhibit resonance ?

A. NO_3^-

B. CH_3COO^-

C. CO_3^{-2}

D. All of the above

Answer: D

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5. Mesomeric effect is a permanent effect in which π electrons are transferred from a

A. Multiple bond to an atom

B. Multiple bond to a single covalent bond

C. Both 1 and 2

D. None

Answer: C

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6. $-CHO$ group is

A. $+ME$ and $+IE$ group

B. $-ME$ and $-IE$ group

C. $+ME$ and $-IE$ group

D. $-ME$ and $+IE$ group

Answer: B

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7. Which of the following alkyl groups is more powerful electron donating group when they are attached to unsaturated carbon

A. $-CH(CH_3)_2$

B. $-CH(CH_3)C_2H_5$

C. $-CH_3$

D. $-CH(CH_3)_3$

Answer: B

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8. Which of the following statements about inductive effect is correct?

A. It involves electrons in σ bond

B. The electron pairs is only slightly displaced during the I-effect

C. It is diminishing effect

D. All are correct

Answer: D

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9. In benzyl amine amino group is a

A. $-I$ group

B. $+M$ group

C. $+I$ group

D. both (a) and (b)

Answer: A

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10. Which of the following has maximum number of hyper conjugative structures?

A. Isopropyl carbonium ion

B. Tertiary butyl carbonium ion

C. n-propyl carbonium

D. Benzyl carbonium ion

Answer: B

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11. Arrange the following in the decreasing order of basic strength

i) pyrrole ii) pyridine iii) aniline

A. $i > ii > iii$

B. $ii > iii > i$

C. $ii = iii = i$

D. $iii > ii > i$

Answer: B

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12. Which of the following is strongest $-I$ group

A. $-F$

B. $-CI$

C. $-Br$

D. $-I$

Answer: A

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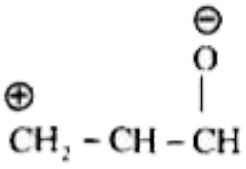
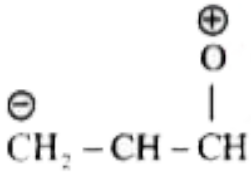
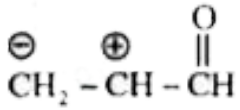
13. Which of the following is the least stable resonance structure of $CH_2 = CH - CHO$

A. 

B. 

C. 

D. All are equally stable

Answer: B

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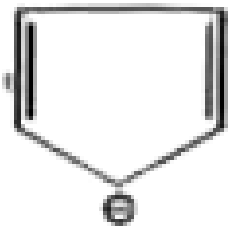
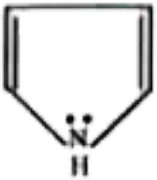
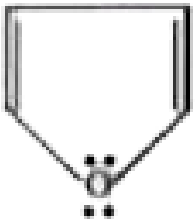
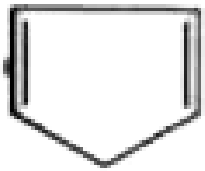
14. Which of the following possesses highest resonance energy

A. 

B. 

C. 

D. 

Answer: A

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15. Inductive effect refers to

A. Electron displacement along a carbon chain through sigma-bonds

B. Complete transfer of one of the shared pair of electrons to one of the atoms joined by a double bond

C. Complete transfer of unshared electrons

D. None of the above

Answer: A

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LECTURE SHEET (EXERCISE-I (LEVEL-II (ADVANCED)) (Sraight Objective Type Questions)

1. Polarization of electrons in acrolein may be written as

A. $H_2^{\delta^-} C = CH - CH = O^{\delta^-}$

B. $H_2^{\delta^-} C = CH - C^{\delta^-} H = O$

C. $H_2^{\delta^-} C = C^{\delta^-} H - CH = O$

D. $H_2^{\delta^-} C = CH - CH = O^{\delta^+}$

Answer: A

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2. Which of the following statements regarding the resonance energy of benzene is correct ?

A. It is the energy required to break the C-H bond in benzene

B. It is the energy required to break the C-C bond in benzene

C. It is a measure of stability of benzene

D. It is the energy required to convert 

Answer: C

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3. In $HCOO-$ ion, the two carbon-oxygen bonds are found to be equal length, what is the reason for it?

A. The C = O bond is weaker than the C - O bond

B. The anion $HCOO^-$ has two resonating structures

C. The electronic orbital's of carbon atom are hybridized

D. The anion is obtained by removal of a proton from the acid molecule

Answer: B

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4. Hyper conjugation involves overlap of the following orbitals

A. $\sigma - \sigma$

B. $\sigma - p$

C. $p - p$

D. $\pi - \pi$

Answer: B

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5. Mesomeric effect involves the delocalization of

A. Protons

B. pi electrons

C. Sigma electrons

D. None of these

Answer: C

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6. Which among the following statements are true with respect to electronic displacement in a covalent bond?

I) Inductive effect operates through a $\pi -$ bond

II) Resonance effect operates through a $\sigma -$ bond

III) Inductive effect operates through a $\sigma -$ bond

IV) Resonance effect operates through a $\pi -$ bond

V) Resonance and inductive effects operate through a $\sigma -$ bond

A. I and II

B. I and III

C. II and III

D. III and IV

Answer: D

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7. The correct stability order of the following resonance structures is

$$\underset{(I)}{H_2C=\overset{+}{N}=\overset{-}{N}H_2} \quad \underset{(II)}{\overset{+}{C}-N=\overset{-}{N}H_2} \quad \underset{(III)}{\overset{-}{C}-\overset{+}{N}\equiv NH_2} \quad \underset{(IV)}{C\overset{-}{C}-N=\overset{+}{N}}$$

A. $I > II > IV > III$

B. $I > III > II > IV$

C. $II > I > III > IV$

D. $III > I > IV > II$

Answer: B

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8. Which of the following statements is wrong :

A. A. Hyper conjugation is the simultaneous shift of sigma and π electrons at 1, 3-positions without the movement of any atom

B. B. Mesomeric effect is the delocalization of π electrons with lone pair π electrons in conjugation

C. C. Inductive effective is the permanent shifting of sigma electrons towards most electronegative atom

D. D. Tautomerism is shifting atoms at 1,3-positions without the shifting of $\pi \quad \text{and} \quad \pi e^-$

Answer: D

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LECTURE SHEET (EXERCISE-I (LEVEL-II (ADVANCED)) (More than One correct answer Type Questions)

1. The $-I$ effect is shown by ?

A. $-COOH$

B. $-OCH_3$

C. $-CH_3CH_2$

D. $-F$

Answer: A::B::C::D

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2. The bond length is affected by

A. Hybridisation

B. Delocalisation

C. Electronegativity

D. Hyperconjugation

Answer: A::B::C::D

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3. Mark the true statement concerning mesomeric effect ?

A. It occurs in systems having conjugate double bonds in compounds

B. It involves electrons of π bonds

C. The electron pair is transferred completely

D. It involves lone pair of electrons

Answer: A::B::D

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4. Pick up the correct statements

A. Mesomeric effect occurs in compounds having conjugate system of double bonds

B. Inductive effect is transmitted over to few carbon atoms

C. Due to mesomeric effect, electron pair is transferred completely

D. Inductive effect is a polarisability effect

Answer: A::B::C

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5. Resonating structures of a molecule should have

A. Identical arragment of atoms

B. Nearly the same energy content

C. The same number of paired electrons

D. The same number of unpaired electrons

Answer: A::B::C::D

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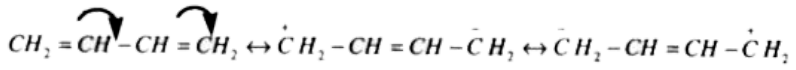
LECTURE SHEET (EXERCISE-I (LEVEL-II (ADVANCED)) (Linked Comprehension Type Questions)

1. If a compound contains conjugated system, the measured bond lengths differ form the expected bond length but 1, 3 diene contains following resonance structures



The bond length between $C_2 - C_3$ carbon is

A. $1.20A^\circ$

B. $1.34A^\circ$

C. $1.54A^\circ$

D. In between $1.34A^\circ$ and $1.54A^\circ$

Answer: D

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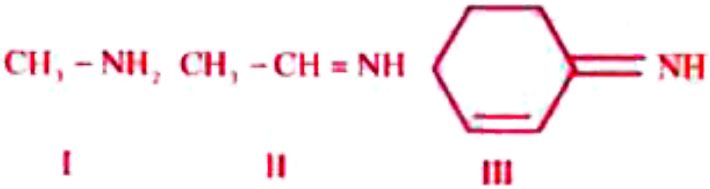
2. If a compound contains conjugated system, the measured bond lengths differ form the expected bond length but 1, 3 diene contains following resonance structures

$CH_2=CH-CH=CH_2 \leftrightarrow \dot{C}H_2-CH=CH-\bar{C}H_2 \leftrightarrow \bar{C}H_2-CH=CH-\dot{C}H_2$

Increasing order of bond length between carbon and nitrogen is



I II III

A. $II < III < I$

B. $I < II < III$

C. $III < II < I$

D. $II < I < III$

Answer: A

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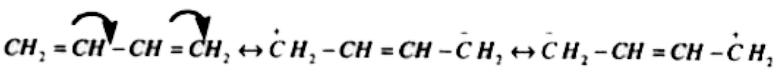
3. If a compound contains conjugated system, the measured bond lengths differ form the expected bond length but 1, 3 diene contains following resonance structures



Which of the following is correct

A. In 1,3 - butadiene all C-atoms are sp^2

B. Bond lengths between $C_2 - C_3$ is higher than $C_1 - C_2$

C. Butadiene exhibits 1,4-addition as well as 1,2 - addition

D. All the above

Answer: D

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4. Hyperconjugation describes the orbital interactions between the p-systems and the adjacent s-bond of the substituent group(s) in organic compounds. Hyperconjugation is also called as Baker and Nathen effect. The necessary and sufficient condition for the hyperconjugation are :

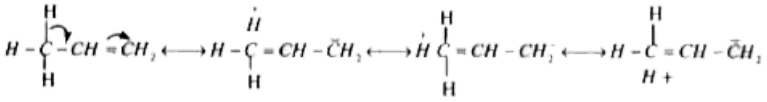
i) Compound should have at least on sp2 hybrid carbon of either alkene, carbocation or alkyl free radical.

ii) A-carbon with respect to sp2 hybrid carbon should have at least one hydrogen. Hyperconjugation are of three types: (i) s(C-H), p-conjugation.

(iii) s(C-H), positive charge conjugation

iv) s(C-H), odd electron conjugation

The hyperconjugation may be represented as



Number of resonating structures due to hyperconjugation = (n + 1) where n is the number of a-hydrogen.

Greater is the number of such forms, more is the stability of the species under considersation.

Hyperconjugation is possible in which of the following species ?

A. $CH_3 - \overline{C}H - CH_3$

B. $C_6H_5 - CH_3$

C. $H_2C = CH_2$

D. $H_3C - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}} - CH = CH_2$

Answer: B

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5. Hyperconjugation describes the orbital interactions between the p-systems and the adjacent s-bond of the substituent group(s) in organic compounds. Hyperconjugation is also called as Baker and Nathen effect. The necessary and sufficient condition for the hyperconjugation are :

i) Compound should have at least on sp2 hybrid carbon of either alkene, carbocation or alkyl free radical.

ii) A-carbon with respect to sp2 hybrid carbon should have at least one hydrogen. Hyperconjugation are of three types: (i) s(C-H), p-conjugation.

(iii) s(C-H), positive charge conjugation

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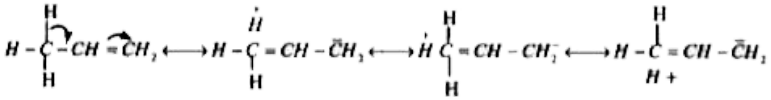
The hyperconjugation may be represented as



Number of resonating structures due to hyperconjugation = (n + 1) where n is the number of a-hydrogen.

Greater is the number of such forms, more is the stability of the species

under considersation.

Which of the following carbocations will show highest number of Hyperconjugation forms?

A. $CH_3 - \overset{+}{C}H_2$

B. $H_3C - \overset{+}{C}H$ with CH_3 below

C. $H_3C - \overset{CH_3}{\underset{CH_3}{C^+}}$

D. $H_3C - CH_2 - \overset{CH_3}{\underset{CH_3}{C^+}}$

Answer: C

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6. Hyperconjugation describes the orbital interactions between the p-systems and the adjacent s-bond of the substituent group(s) in organic compounds. Hyperconjugation is also called as Baker and Nathen effect. The necessary and sufficient condition for the hyperconjugation are :

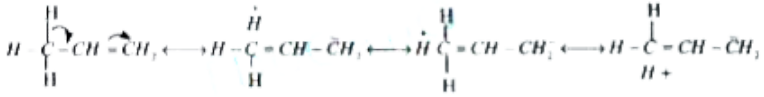
i) Compound should have at least on sp2 hybrid carbon of either alkene, carbocation or alkyl free radical.

ii) A-carbon with respect to sp2 hybrid carbon should have at least one hydrogen. Hyperconjugation are of three types: (i) s(C-H), p-conjugation.

(iii) s(C-H), positive charge conjugation

iv) s(C-H), odd electron conjugation

The hyperconjugation may be represented as



Number of resonating structures due to hyperconjugation = (n + 1) where n is the number of a-hydrogen.

Greater is the number of such forms, more is the stability of the species under considersation.

Stability of saturated alkyl carbocations can be explained by

A. inductive effect

B. hyperconjugation

C. both inductive effect and hyperconjugation

D. electromeric effect

Answer: A

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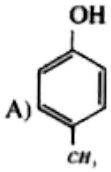
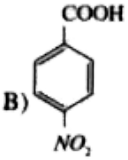
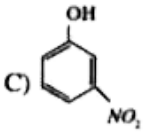
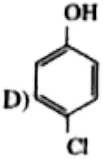
LECTURE SHEET (EXERCISE-I (LEVEL-II (ADVANCED)) (Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) +M effect
B) 	Q –M effect
C) 	R) +I effect
D) 	S) –I effect
	T) Hyperconjugation

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	Column-I	Column-II
	A) $CH_2 = CH - Cl$	P) +I effect
2.	B) $CH_3 - CH = CH - O - CH_3$	Q) -I effect
	C) $CH_3CH_2CH_2 - Cl$	R) Hyperconjugation
	D) $CH_3 - CH_2 - CH_2 - CH_3$	S) Resonance

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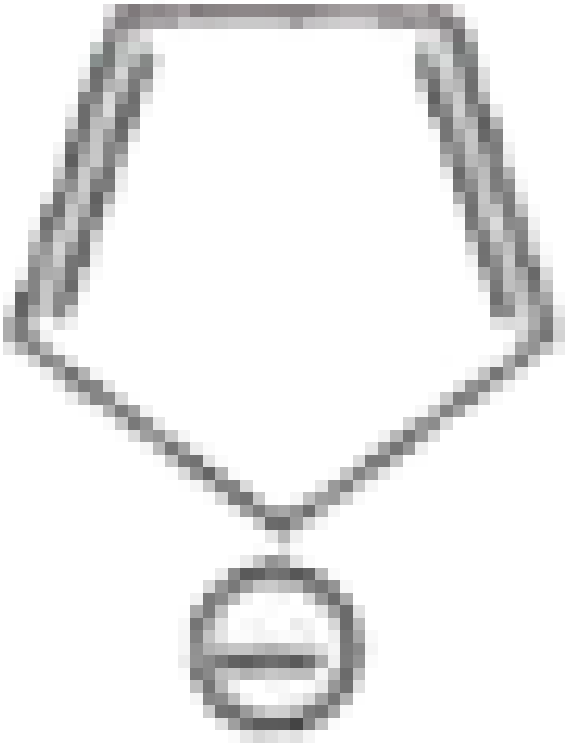
LECTURE SHEET (EXERCISE-I (LEVEL-II (ADVANCED)) (Integer Type Questions)

1. Number of possible resonance structures of



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2. Total number of no bond resonance structures in tertiary pentyl cation is

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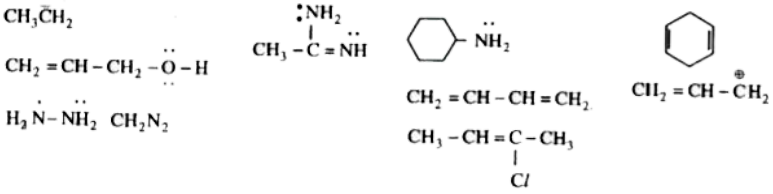
3. Total number of species which exhibit mesomersim (Conjugation) in the following species are



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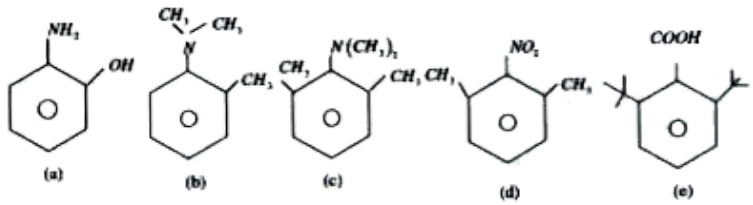
4. Number of molecules in which steric inhibition of resonance is observed is



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5. Total number of groups which can have higher-I effect than -F

$-NR_3^{\oplus} \ -SR_2^{\oplus} \ -NO_2 \ -SO_2R \ -CN, \ -OR \ -OH \ -NH_2 \ -Cl \ -CO$

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LECTURE SHEET (EXERCISE-II (LEVEL-I (MAIN)) (Straight Objective Type Questions)

1. Which of the following is not a nucleophile ?

A. OH^-

B. HSO_3^-

C. NH_3

D. BF_3

Answer: D

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2. Which of the following is a free radical?

A. NO_2^-

B. Cl^-

C. $Cl^{\cdot}$

D. Cl^+

Answer: C

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3. Shape of methyl carbanion is

A. Planar

B. Pyramidal

C. Tetrahedral

D. Linear

Answer: B

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4. Free radical reactions

A. occur in gas phases

B. are initiated by light or peroxides

C. are often chain reactions

D. All are correct

Answer: D

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5. Which of the following occurs reaction intermediate?

A. Free radicals

B. Carbocations

C. Carbanions

D. All

Answer: D

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6. Which of the following is a more stable carbocation?

A. Sec. pentyl carbocation

B. Tert. Pentyl carbocation

C. Isopentyl carbocation

D. Neopentyl carbocation

Answer: C

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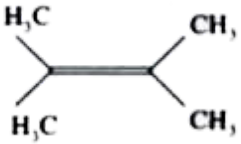
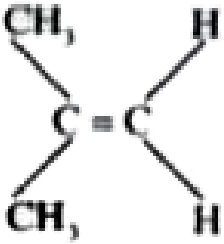
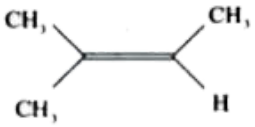
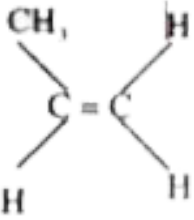
7. The most stable alkene among the following is

A. 

B. 

C. 

D. 

Answer: A

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8. Which of the following free radicals is the least stable ?

A. $\cdot CH_3$

B. $\cdot CH_2 - CH_3$

C. $CH_3 - C\dot{H} - CH_3$

D. $CH_3 - \underset{\underset{CH_3}{|}}{\dot{C}} - CH_3$

Answer: A

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9. Homolytic fission of C - C bond in ethane gives an intermediate in which carbon is

A. sp^3-hybridized

B. $sp^2 -$ hybridized

C. $sp -$ hybridized

D. sp^3d- hybridized

Answer: C

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10. The order of decreasing stability of the carbanions

I) $C\overline{H}_3$ II) $CH_3-C\overline{H}_2$ III) $CH_3-C\overline{H}-CH_3$ IV) $\overset{CH_3-\overline{C}-CH_3}{\underset{|}{C}H_3}$

A. $I>II>III>IV$

B. $IV>III>II>I$

C. $IV>I>II>III$

D. $I>II>IV>III$

Answer: A

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11. Benzyl cation is stabilized by

A. Resonance

B. hyperconjugation

C. both (a) & (b)

D. inductive

Answer: A

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12. Match List-1 (ion/radical) with List-II (stabilisation) and select the correct answer using the codes given below the lists

List-I	List-II
A) $C(CH_3)_3$ (Free radical)	1) Inductive effect
B) PHO^-	2) Hyperconjugation
C) $^+CH_2C(CH_3)_3$	3) Resonance

A. A-1, B-2, C-3

B. A-2,B-1,C-3

C. A-3,B-1,C-2

D. A-2,B-3,C-1

Answer: D

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13. Which of the following is stabilised by mesomeric effect ?

A. $CH_3 - \overset{\oplus}{C}H_2$

B. $CH_2 - \overset{\oplus}{C}H$

C. $CH_2 = CH - \overset{\oplus}{C}H_2$

D. $\begin{matrix} CH_2 - CH_2^{\oplus} \\ | \\ NO_2 \end{matrix}$

Answer: C

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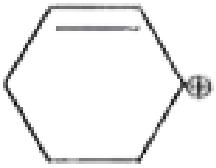
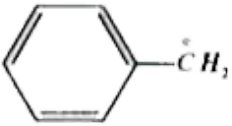
14. Which of the following carbocations is most stable

A. 

B. $CH_2 = \overset{\oplus}{C}H$

C. $(CH_3)_3C^{\oplus}$

D. 

Answer: D

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15. Which of the following is a Lewis acid ?

A. Carbanion

B. Free radical

C. Carbocation

D. None

Answer: C

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LECTURE SHEET (EXERCISE-II (LEVEL-II (ADVANCED)) (Straight Objective Type Questions)

1. The paramagnetic species is

A. Carbonium ion

B. Carbanion

C. Free Raical

D. None

Answer: C

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2. Which of the following species is electron defficient

A. Carbonium ion

B. Carbanion

C. Free Raical

D. both a & c

Answer: D

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3. Pick out the most stable carbonium ion

A. $C_6H_5-\overset{+}{C}(C_6H_5)-C_6H_5$

B. $CH_3-\overset{+}{C}(CH_3)-CH_3$

C. $CH_3 - \overset{+}{C}H - CH_3$

D. $CH_3 - CH_2 - \overset{+}{C}H_2$

Answer: A

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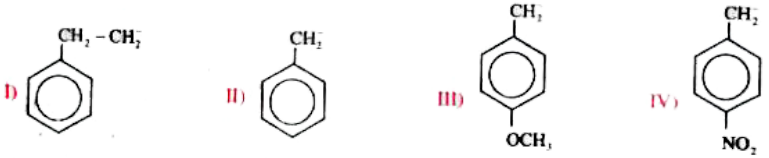
4. The order of stability of the following carbanions is



A. $I > II > III > IV$

B. $IV > II > III > I$

C. $I > III > II > IV$

D. $I > II > IV > III$

Answer: D

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5. The order of stability of the following carbanions

(I) o-nitrobenzyl carbanion (II) m-nitrobenzyl carbanion

(III) p-nitrobenzyl carbanion (IV) Benzyl carbanion

A. $I > II > III > IV$

B. $IV > II > III > I$

C. $I > III > II > IV$

D. $I > II > IV > III$

Answer: C

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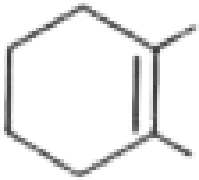
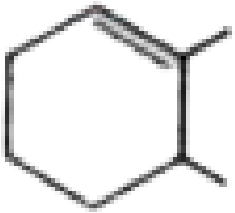
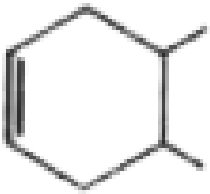
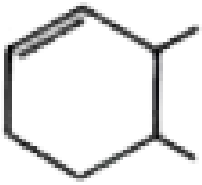
6. The most stable alkene among the following is

A. 

B. 

C. 

D. 

Answer: A

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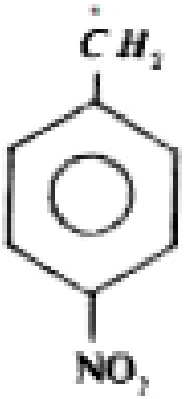
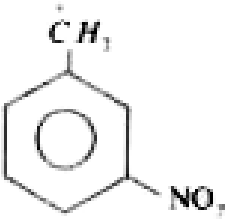
LECTURE SHEET (EXERCISE-II (LEVEL-II (ADVANCED)) (More than One correct answer Type Questions)

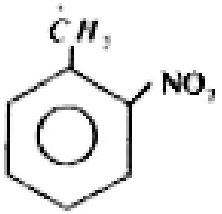
1. Which of the following is the most stable carbocation



A.



B.



C.

D. All are equally stable

Answer: B

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2. Which free radical is the most stable ?

A. $\dot{C}H_3$

B. $CH_3\dot{C}H_2$

C. $CH\dot{C}H - CH_3$

D. $(CH_3)_3\dot{C}$

Answer: D

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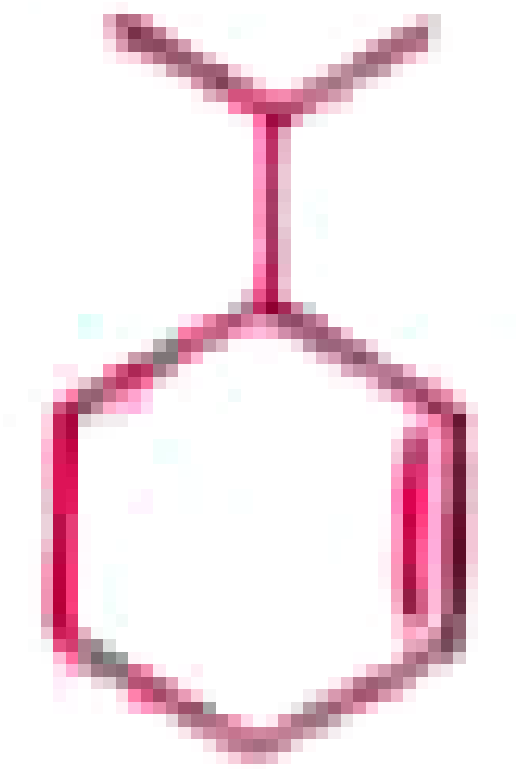
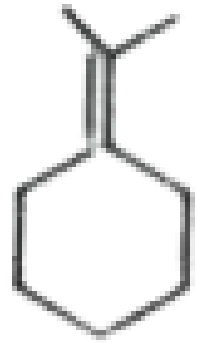
3. Which of the following alkenes are more stable than



A.



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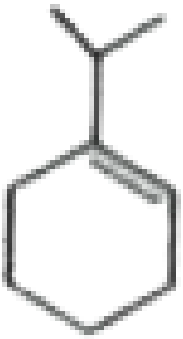
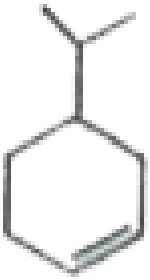
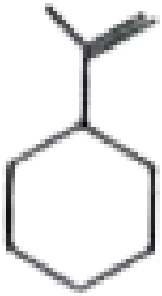


C.





D.

Answer: A::B::C::D

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4. Which of the following carbocation is more stable

A. $\overset{+}{C}H_3$

B. $CH_3\overset{+}{C}H_2$

C. $CH_3\overset{+}{C}H - CH_3$

D. $(CH_3)_3\overset{+}{C}$

Answer: D

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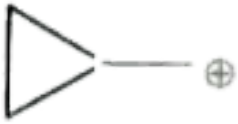
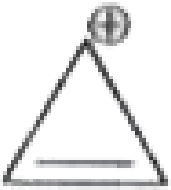
5. Among the following which is/are more stable $C_6H_5\overset{\oplus}{C}H_2$

A. 

B. $(CH_3)_3C^+$

C. 

D. 

Answer: A::C

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6. Among the following which is/are more stable than $\dot{C}H_3$

A. $\dot{C}H_2 - OCH_3$

B. $\dot{C}H_2 - NO_2$

C. $CH_2 = CH - \dot{C}H_2$

D. $(CH_3)_3\dot{C}$

Answer: C::D

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LECTURE SHEET (EXERCISE-II (LEVEL-II (ADVANCED)) (Linked Comprehension Type Questions)

1. The delocalisation of σ electrons with P-orbital is known as Hyperconjugation. It is also known as $\sigma - \pi$ conjugation 'or' No bond resonance. Presence of atleast one $'\alpha'$ hydrogen at saturated carbon in an alkene, carbocation and free radical involves hyper conjucation. More

is the no. of hyper conjugative structures more stable is the alkene. Bond lengths, dipolemoments are also effected by hyperconjugation.

Hyper conjugation involves the

A. σ bond

B. π bond

C. Both σ and π bond

D. none of these

Answer: A

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2. The delocalisation of σ electrons with P-orbital is known as Hyperconjugation. It is also known as $\sigma - \pi$ conjugation 'or' No bond resonance. Presence of atleast one $'\alpha'$ hydrogen at saturated carbon in an alkene, carbocation and free radical involves hyper conjucation. More is the no. of hyper conjugative structures more stable is the alkene. Bond

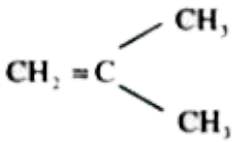
lengths, dipolemoments are also effected by hyperconjugation.

Which of the following molecule has longest C = C bond length

A. $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - CH = CH_2$

B. $CH_3 - CH = CH_2$

C. $CH_3 - \overset{\overset{CH_3}{|}}{C} = \underset{\underset{CH_3}{|}}{C} - CH_3$

D. 

Answer: C

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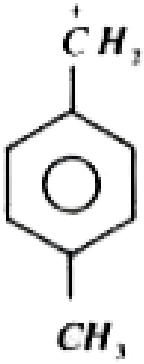
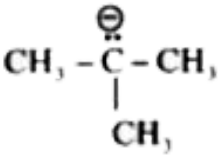
3. The delocalisation of σ electrons with P-orbital is known as Hyperconjugation. It is also known as $\sigma - \pi$ conjugation 'or' No bond resonance. Presence of atleast one $'\alpha'$ hydrogen at saturated carbon in an alkene, carbocation and free radical involves hyper conjucation. More

is the no. of hyper conjugative structures more stable is the alkene. Bond lengths, dipolemoments are also effected by hyperconjugation.

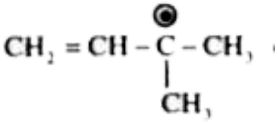
Hyper conjugation involves the



A.



B.



C.

D. $CH_2 = \overset{Cl}{\underset{Cl}{CH}} - C - CH_3$

Answer: B

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4. Carbocations are species in which central carbon carries positive charge. If the charge on the carbocations gets cocentrated or lo-calized the carbocation becomes unstable. The two factors which account for stability of carbocations are inductive effect and hyper conjugation (no bond resonance). Inductive effect is minor factor and hyper conjugation is major factor.

Which is most stable carbocation

A. $\overset{+}{C}H_3$

B. $CH_3C\overset{+}{H}_2$

C. $(CH_3)_2\overset{+}{C}H$

D. $(CH_3)_2\overset{+}{C}$

Answer: D

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5. Carbocations are species in which central carbon carries positive charge. If the charge on the carbocations gets cocentrated or lo-calized the carbocation becomes unstable. The two factors which account for stability of carbocations are inductive effect and hyper conjugation (no bond resonance). Inductive effect is minor factor and hyper conjugation is major factor.

n-propyl carbocation rearranges to isopropyl carbocation by shift of

A. Proton

B. Hydride ion

C. Electron

D. Methyl group

Answer: B

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6. Carbocations are species in which central carbon carries positive charge. If the charge on the carbocations gets cocentrated or lo-calized the carbocation becomes unstable. The two factors which account for stability of carbocations are inductive effect and hyper conjugation (no bond resonance). Inductive effect is minor factor and hyper conjugation is major factor.

Hybridisation of carbon in carbocation is

A. sp

B. sp^2

C. sp^3

D. dsp^2

Answer: B

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LECTURE SHEET (EXERCISE-II (LEVEL-II (ADVANCED)) (Matrix Matching Type Questions)

1.

Column-I	Column-II
A) CH_3^+	P) Electrically neutral
B) CH_3^-	Q) having $6e^-$ in the outer shell
C) $CH_3^{\cdot}$	R) sp_2
D) $:CH_2$	S) sp^3

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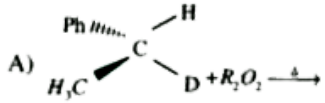
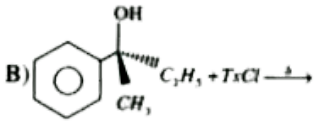
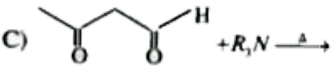
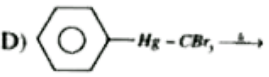
2. Match the following columns

Column-I	Column-II
A) 	P) Carbanion
B) 	Q) Free radicals
C) 	R) Carbene
D) 	S) Carbocation

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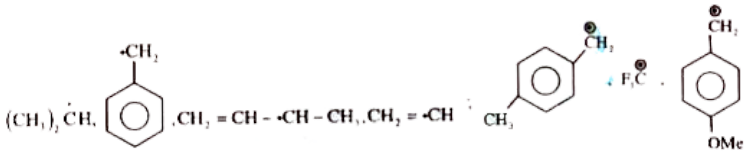
1. How many of the following species are more stable than $(CH_3)_3\dot{C}$



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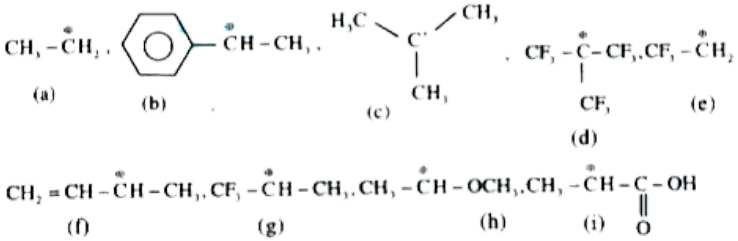
2. Among the following how many of them is/are more stable than

$CH_3 - CH - CH_3$



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LECTURE SHEET (EXERCISE-III (LEVEL-I (MAIN)) (Straight Objective Type Questions)

1. Which of the following is the strongest acid ?

A. $O_2N - CH_2COOH$

B. $HO - CH_2 - COOH$

C. $NC - CH_2COOH$

D. $H_3CO - CH_2COOH$

Answer: A

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2. Which of the following is the weakest base ?

A. NH_3

B. CH_3NH_2

C. $(CH_3)_2NH$

D. $(CH_3)_3N$

Answer: A

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3. The strongest base among the following

A. $C_6H_5NH_2$

B. $(CH_3)_2NH$

C. CH_3NH_2

D. $(CH_2)_3N$

Answer: B

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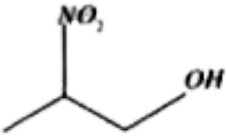
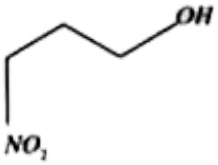
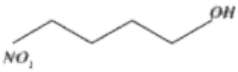
4. Which of the following alcohols is the most acidic

A. 

B. 

C. 

D. 

Answer: A

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5. The most acidic compound is

A. CH_3COOH

B. C_6H_5COOH

C. $O_2NC_6H_4CO_2H$

D. C_6H_6OH

Answer: C

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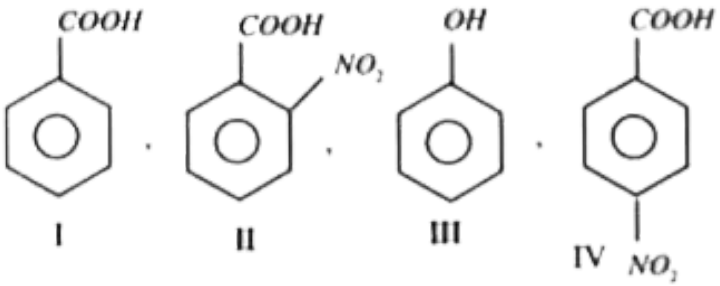
6. Arrange the following in the decreasing order of acidic strength



A. $II > IV > I > III$

B. $III > IV > II > I$

C. $I > II > IIIIV$

D. $II > III > I > IV$

Answer: A

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7. Which of the following acids has the smallest dissociation constant ?

A. $CH_3CHFCOOH$

B. FCH_2CH_2COOH

C. $BrCH_2CH_2COOH$

D. $CH_3CHBrCOOH$

Answer: C

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8. Acetic acid is weaker acid than formic acid. This is explained by

A. Mesomeric effect

B. Inductive effect

C. Hyper conjugation

D. electromeric effect

Answer: B

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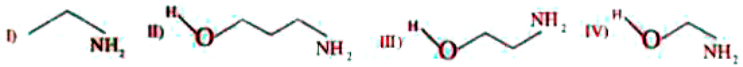
9. Arrange the following in the decreasing order of basic strength



A. $II > I > III > II$

B. $I > II > III > IV$

C. $IV > III > II > I$

D. $II > III > I > IV$

Answer: B

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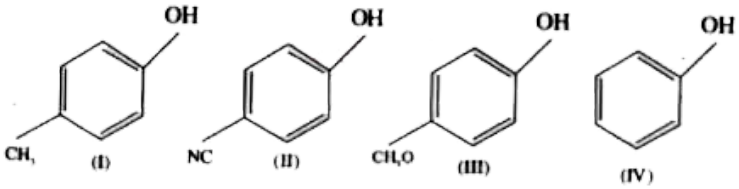
10. Decreasing order of acidic strength of the following compounds is



A. $I > III > I > IV$

B. $II > I > IV > III$

C. $I > III > IV > II$

D. $II > IV > I > III$

Answer: D

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11. Which is the decreasing order of acidity in,

I) HCOOH

II) CH_4COOH III) CH_3CH_2COOH IV) C_6H_5COOH

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $IV > I > II > III$

D. $I > IV > II > III$

Answer: D

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12. Which one of the following is the strongest base in liquid phase?

A. $(C_2H_5)_3N$

B. $(C_2H_5)_2NH$

C. $C_2H_5NH_2$

D. NH_3

Answer: B

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13. Among the following the strongest base is

A. $C_6H_5NH_2$

B. $p - NO_2 - C_6H_4NH_2$

C. $m - NO_2 - C_6H_4NH_2$

D. $C_6H_5CH_2NH_2$

Answer: D

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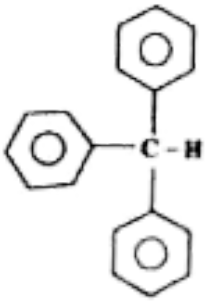
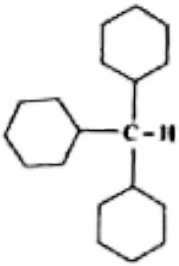
14. Which of the following has the most acidic hydrogen?

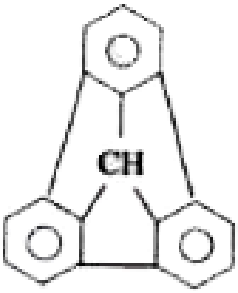
A.



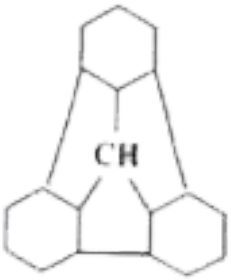
B.



C.



D.



Answer: C

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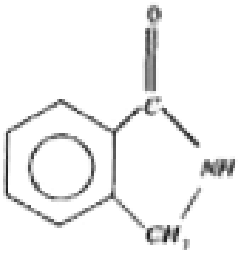
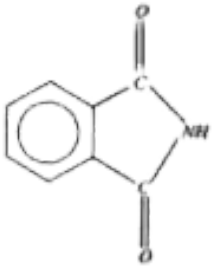
15. Which one of the following is most acidic?

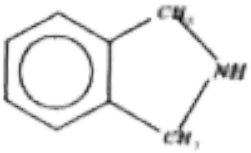
A.

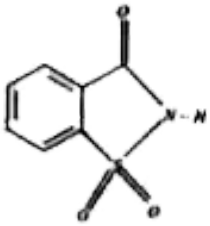


B.



C.





D.

Answer: D

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LECTURE SHEET (EXERCISE-III (LEVEL-II (ADVANCED)) (Straight Objective Type Questions)

1. Correct gradation of basic character

A. $NH_3 > CH_3NH_2 > NF_3$

B. $CH_3NH_2 > NH_3 > NF_3$

C. $NF_3 > CH_3NH_2 > NH_3$

D. $CH_3NH_2 > NF_3 > NH_3$

Answer: B

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2. Which of the following is more appropriate reason of aniline being less basic than aliphatic amines ?

A. hyper conjugation

B. Steric hindrance

C. Delocalisation of lone pair

D. Negative inductive effect of $-NH_2$ group

Answer: C

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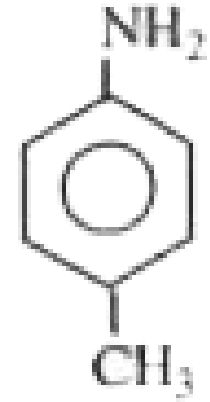
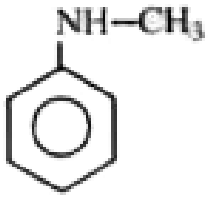
3. Among the following which is more basic

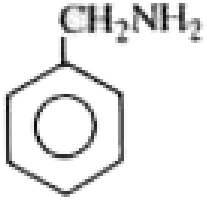
A.



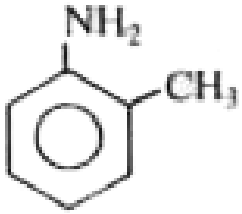
B.



C.



D.



Answer: C

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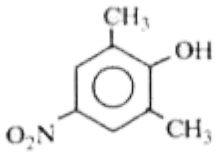
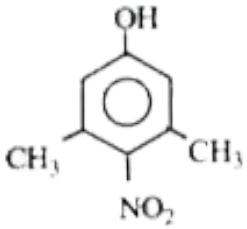
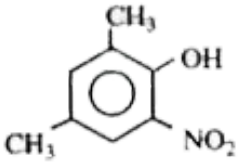
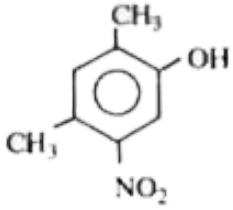
4. Which one of the following phenols will show the highest acidity?

A. 

B. 

C. 

D. 

Answer: B

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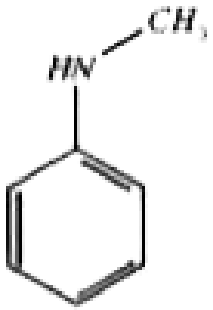
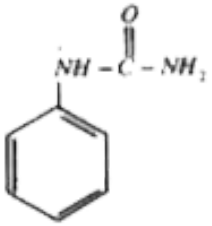
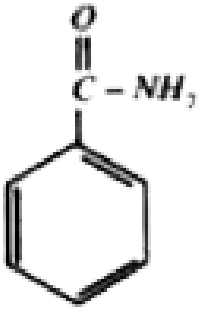
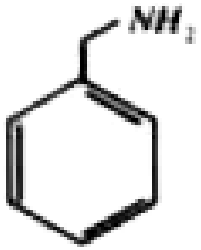
5. The most basic one is

A. 

B. 

C. 

D. 

Answer: D

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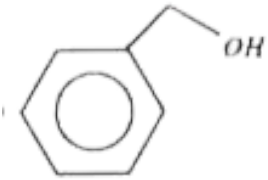
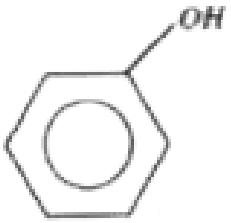
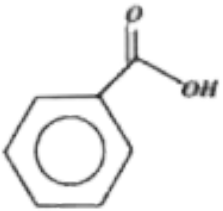
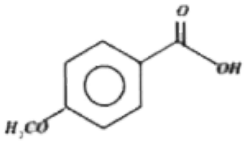
6. Which of the following is most acidic?

A. 

B. 

C. 

D. 

Answer: C

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7. Which of the following is the strongest base

A. CH_3COO^-

B. $ClCH_2COO^-$

C. $Cl_2CH \quad COO^-$

D. Cl_3CCOO^-

Answer: A

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8. Which of the following is more basic in gaseous phase

A. CH_3NH_2

B. $(CH_3)_2NH$

C. $(CH_3)_3N$

D. NH_3

Answer: C

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9. Which of the following carbanion is most stable

A. $CH_3CH_2^-$

B. $CH_2 = CH^-$

C. $CH \equiv C^-$

D. CH_3

Answer: C

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10. Least acidic is

A. $F - CH_2 - CH_2 - OH$

B. $Me_3N - CH_2 - CH_2 - OH$

C. H_2O

D. CH_3OH

Answer: D

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11. The weakest acid among the following

A. CH_3COOH

B. CH_3CO_2OH

C. $Cl - CH_2 - COOH$

D. $CH_3 - CH_2 - COOH$

Answer: B

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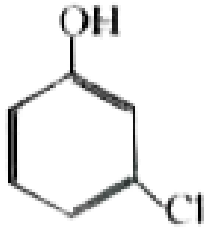
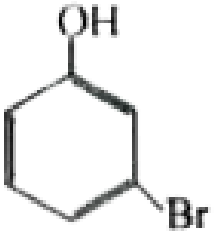
12. The strongest acid among the following is

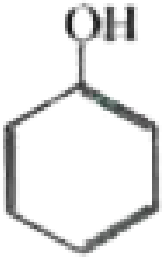
A.



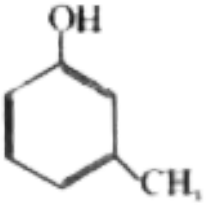
B.



C.



D.



Answer: A

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13. Among $OH^-, CH_3O^\oplus, CH_3-CH_2-OH, CH_3-OH$ which solution in water has maximum pH value

A. OH-

B. $CH_3-\ddot{O}^{\ominus}$

C. $CH_3 - CH_2 - OH$

D. $CH_3 - OH$

Answer: B

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14. Which has maximum pKa value

A. $MeO - CH_2 - COOH$

B. $CH_3 - CH_2 - COOH$

C. $Cl - CH_2 - COOH$

D. $HO - CH_2 - COOH$

Answer: A

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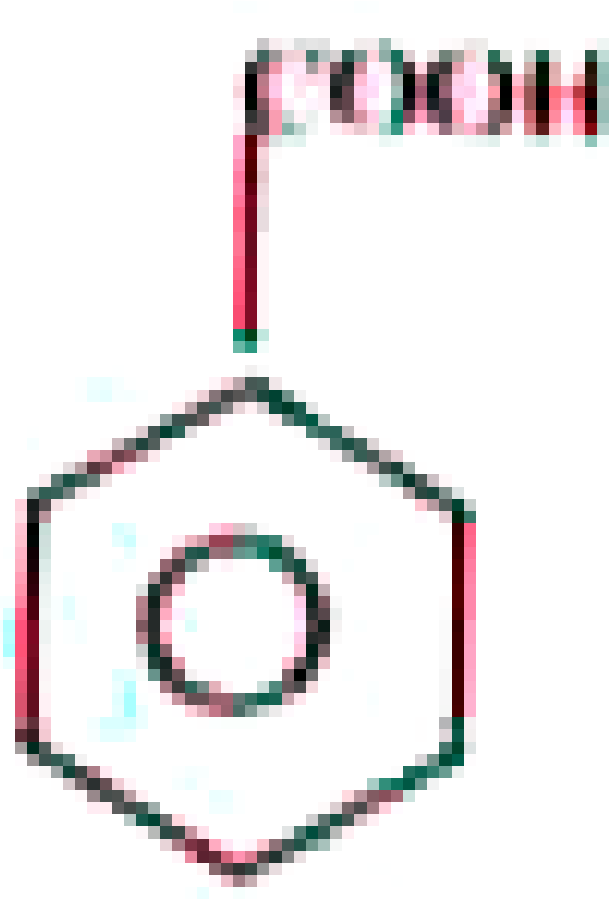
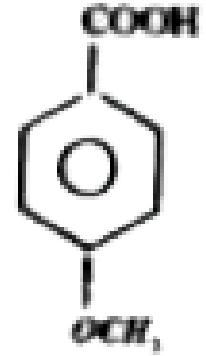
LECTURE SHEET (EXERCISE-III (LEVEL-II (ADVANCED)) (More than correct answer Type Questions)

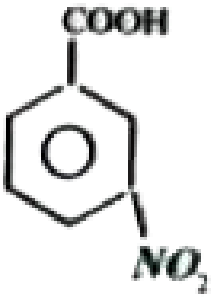
1. The following are more acidic than



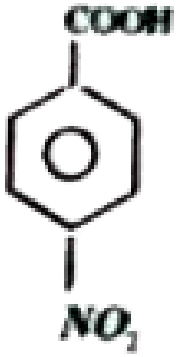
A.



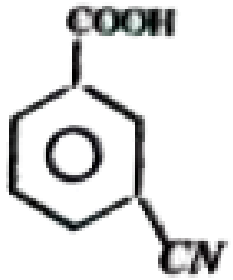
B.



C.



D.



Answer: B::C::D

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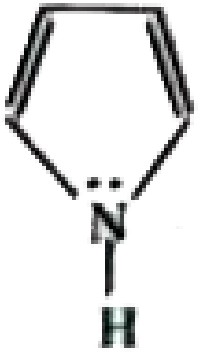
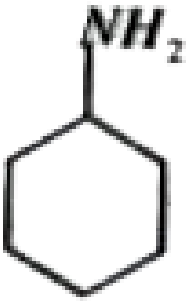
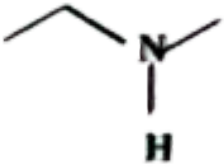
2. The following are more basic than $C_6H_5 - NH_2$

A.



B. 

C. 

D. 

Answer: B::C::D

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3. Which of the following is the strongest acid ?

A. Formic acid

B. Benzoic acid

C. Acetic acid

D. Chloroacetic acid

Answer: D

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4. Which of the following statements is true

A. Electron donating groups stabilize a positively charged species

B. Chloroacetic acid is a more acidic than acetic acid

C. Greater the number of resonance structures for a species, greater is its stability

D. The order of stability of carbanions is $(CH_3)_3C^- > (CH_3)_2CH^- > CH_3CH_2^- > CH_3$

Answer: A::B::C

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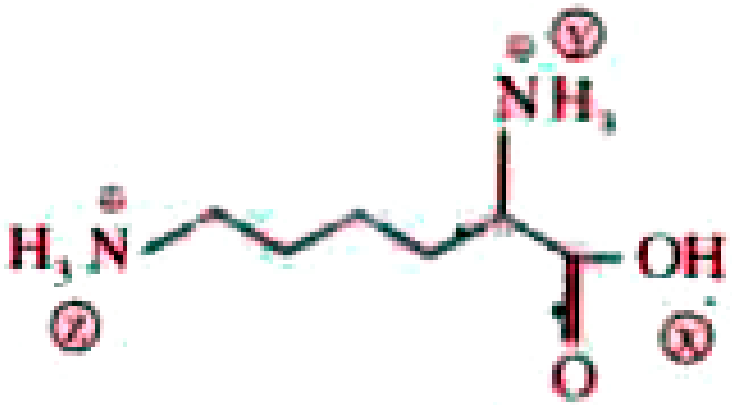

5. correct

acidity order of x, y and z is

A. $x > y > z$

B. $y > z > x$

C. $z > x > y$

D. $x > z > y$

Answer: A

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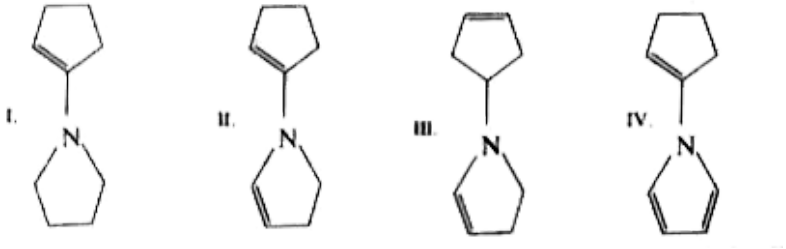
6. Rank the order of pKa values for each of the compound below



A. $IV > II > I > III$

B. $I > III > II > IV$

C. $IV > II > III > I$

D. $I > II > IV > II$

Answer: B

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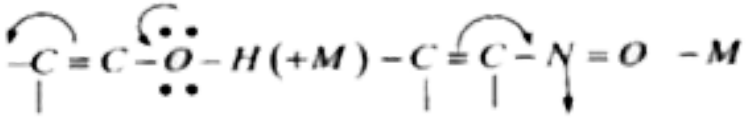
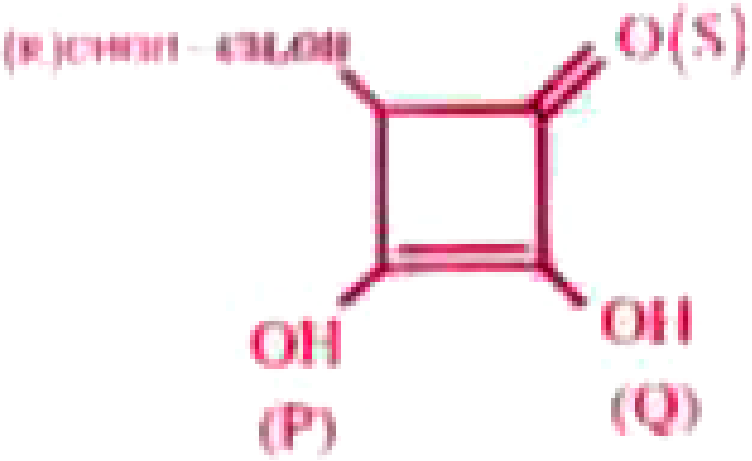
LECTURE SHEET (EXERCISE-III (LEVEL-II (ADVANCED)) (Linked Comprehension Type Questions)

1. Mesomerism is extended resonance. Atoms or groups with lone pairs of electrons release electrons when connected to doubly bonded carbons. It is +M effect. Unsaturated groups when connected to doubly bonded carbons withdraw π electrons from the doubly bonded carbons. It is -M effect. Here the double bond is the unsaturated group should be between less electronegative atom and more electronegative atom.



Mesomeric effect stabilizes or destabilizes the conjugate base of an acid. As a result the acid may be strong or weak



has 4(OH) groups. Which -OH is a strong acid?

A. S

B. R

C. Q

D. P

Answer: D

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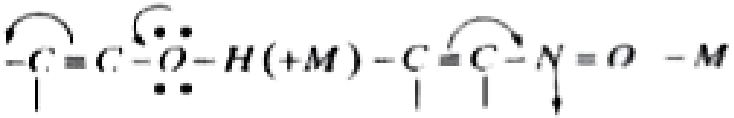
2. Mesomerism is extended resonance. Atoms or groups with lone pairs of electrons release electrons when connected to doubly bonded carbons. It is +M effect. Unsaturated groups when connected to doubly bonded carbons withdraw π electrons from the doubly bonded carbons. It is -M effect. Here the double bond is the unsaturated group should be between less electronegative atom and more electronegative atom.



Which of the following statements is right?

A. $CH_2 = CH - CH = CH_2$

B. $CH_2 = C = CHCH_3$

C. $CH_2 = CH - CH_2 - CH = CH_2 - CH_3$

D. All are equally stable

Answer: A

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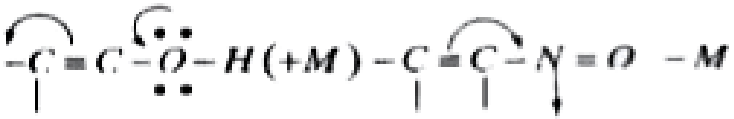
3. Mesomerism is extended resonance. Atoms or groups with lone pairs of electrons release electrons when connected to doubly bonded carbons. It is +M effect. Unsaturated groups when connected to doubly bonded carbons withdraw π electrons from the doubly bonded carbons. It is -M effect. Here the double bond is the unsaturated group should be

between less electronegative atom and more electronegative atom.



Which of the following statements is right?

A. Aniline is weaker base than Ammonia

B. P-Nitrophenol is stronger acid than m-nitrophenol

C. P-chlorobenzoic acid is stronger than p-fluorobenzoic acid

D. All of the above

Answer: D

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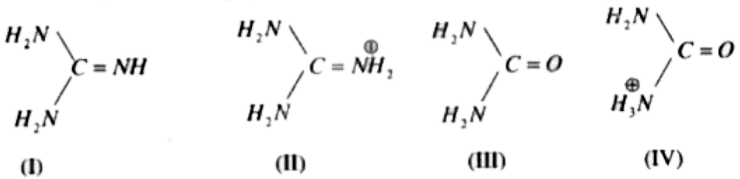
4. Guanidine (I) and its conjugate acid (II) are given below along with urea(III) and its conjugate base (IV)



(I) (II) (III) (IV)

Basic properties of I & II compounds are mainly influenced by resonance and the acidity of the bases depends upon lone pair of electrons.

Urea is mono basic because

A. It contain only one lone pair which can accept proton

B. It is mainly due to inductive effect of $-NH_2$ and C = O groups

C. It is mainly due to lone pair and π bond conjugation

D. All of the above

Answer: C

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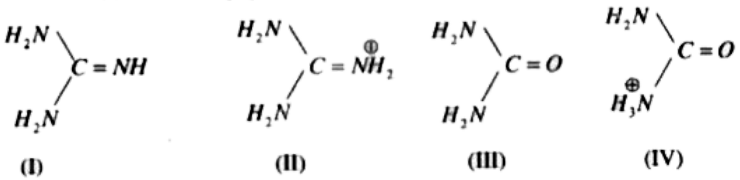
5. Guanidine (I) and its conjugate acid (II) are given below along with urea(III) and its conjugate base (IV)



Basic properties of I & II compounds are mainly influenced by resonance and the acidity of the bases depends upon lone pair of electrons.

The strongest base of the following is

A. Guanidine

B. Urea

C. $(CH_3)_2NH$

D. : NH_3

Answer: A

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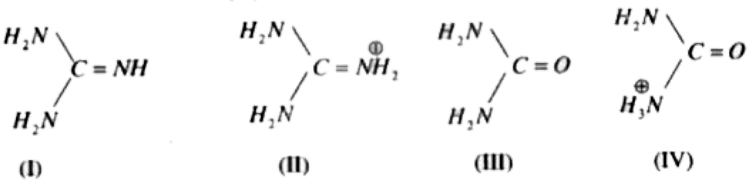
6. Guanidine (I) and its conjugate acid (II) are given below along with urea(III) and its conjugate base (IV)



(I) (II) (III) (IV)

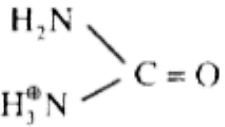
Basic properties of I & II compounds are mainly influenced by resonance and the acidity of the bases depends upon lone pair of electrons.

Which of the following is more resonance stabilized

A. $(NH_2)_2C = NH$

B. $(NH_2)_2C = \overset{\oplus}{N}H_2$

C. $(H_2N)_2C - O$

D. 

Answer: B

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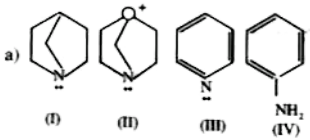
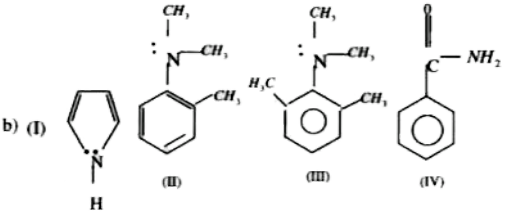
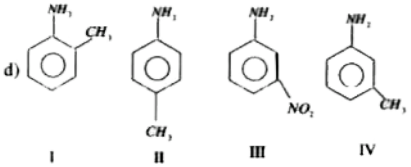
LECTURE SHEET (EXERCISE-III (LEVEL-II (ADVANCED)) (Matrix Matching Type Questions)

1. Match the following columns

Column-I (molecules)	Column-II Basic strength order)
a)  (I) (II) (III) (IV)	P) III < I < IV < II
b) (I)  (II) (III) (IV)	Q) IV < III < II < I
c) CH_3-NH_2; $(CH_3)_2NH$; $CH_3-\overset{O}{\overset{\|}{C}}-NH_2$; $CH_3-C\equiv N$ (I) (II) (III) (IV)	R) III > II > I > IV
d)  I II III IV	S) II > I > III > IV

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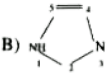
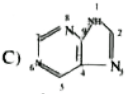
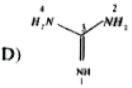
2. Match the following columns

Column-I	Column-II
A) 	P) All nitrogens are not equally basic
B) 	Q) All nitrogens are equally basic
C)  others	R) Nitrogen labeled 1 is less basic than
D) 	S) Nitrogen labeled 1 is more basic than others

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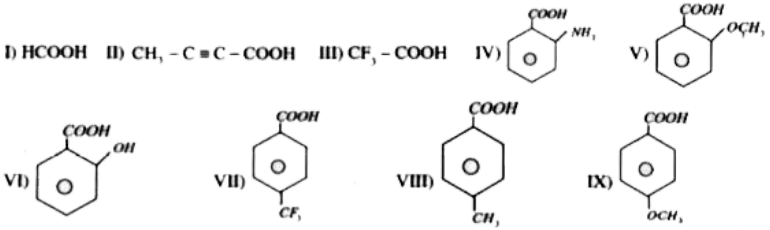
LECTURE SHEET (EXERCISE-III (LEVEL-II (ADVANCED)) (Integer Type Questions)

1. How many of the following acids are more acidic than benzoic acid?



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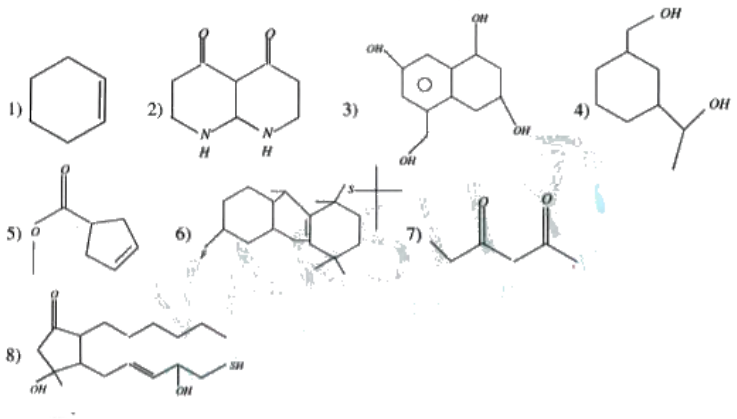
2. Number of compounds having relatively more acidic hydrogen than Me_3C-H



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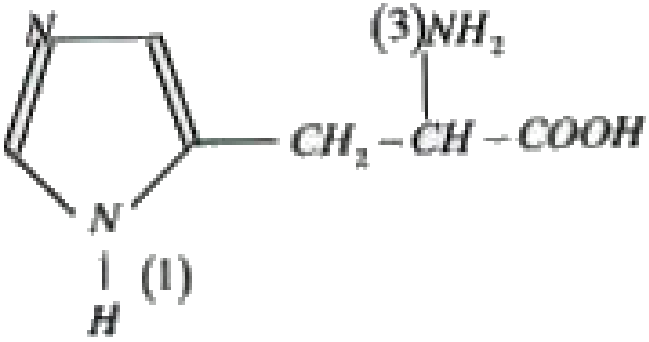
3. Which numbered nitrogen atom gets protonated first at relatively higher pH in the following



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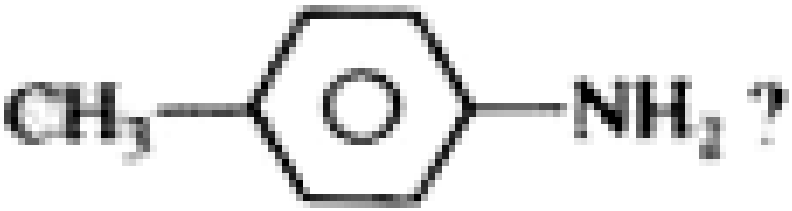
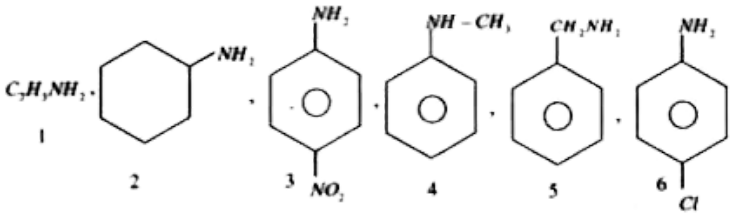
4. How many of the following compounds are more basic than



?



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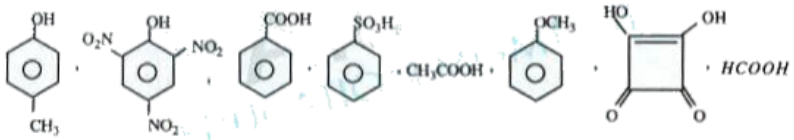
5. How many of the following compounds are soluble in aqueous solutions of $NaHCO_3$



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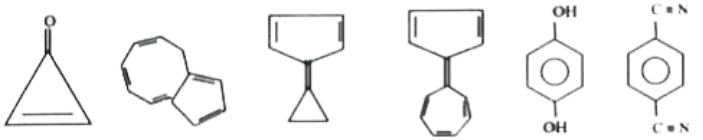
6. How many of the following species have dipolement?



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PRACTICE SHEET (EXERCISE-I (LEVEL-I (MAIN)) (Straight Objective Type Questions)

1. Which of the following groups has the highest inductive effect?

A. $-CH_3$

B. CH_3CH_2-

C. $(CH_3)_2CH-$

D. $(CH_3)_3C-$

Answer: D

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2. The group which exhibits -M effect is

A. $-CHO$

B. $-C\equiv N$

C. $-NO_2$

D. All

Answer: B

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3. Which of the following statements is right regarding $CH_3-, CH_3CH_2-, (CH_3)_2CH-, (CH_3)_3C-$

A. Increasing hyper conjugation left to right

B. Decreasing hyper conjugation from left right

C. Decreasing inductive effect from L to R

D. Both (a) & (b)

Answer: A

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4. Which is the following shows maximum $-I$ effect?

A. $-CH_3$

B. $-OCH_3$

C. $-NO_2$

D. $-Cl$

Answer: C

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5. The kind of delocalization involving sigma bond and hybrid orbital's is called

A. inductive effect

B. Electrometric effect

C. Hyper conjugation

D. Mesomeric effect

Answer: B

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6. In which of the following, resonance is possible

A. $CH_2 = CH - CH_2 - CHO$

B. CH_3COCH_3

C. $CH_2 = CH - CH = O$

D. $CH_2 = CH - CH_2 - CH = CH_2$

Answer: B

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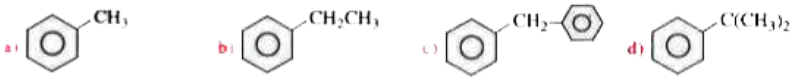
7. Arrange the following decreasing order of hyper conjugative structures



A. $1 > 2 > 3 > 4$

B. $1 > 3 > 4 > 2$

C. $2 > 3 > 1 > 4$

D. $4 > 1 > 3 > 2$

Answer: A

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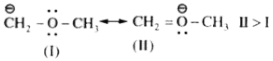
8. Which of the following is not the correct order of stability of the given pairs

A. $\underset{(I)}{\overset{\ominus}{C}H_2 - \overset{O}{\overset{||}{C}} - H} \leftrightarrow \underset{(II)}{CH_2 = \overset{O^-}{\overset{|}{C}} - H} \quad II > I$

B. $\underset{(I)}{Br - CH = \bar{N}H_2} \leftrightarrow \underset{(II)}{\bar{B}r = CH - NH_2} \quad I > II$

C. 

D. $\underset{(I)}{CH_3 - \overset{\ominus}{C} - O} \leftrightarrow \underset{(II)}{CH_3 - C = \overset{\ominus}{O}} \quad I < II$

Answer: B

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9. Which of the following is not the correct order of stability?

A. $CH_3 - \overset{\oplus}{C}H_2 > CH_2 = \overset{\oplus}{C}H$

B. $CH_3 - \overline{C}H_2 < CH_2 = \overline{C}H < HC \equiv \overline{C}$

C. $R_2N - \overset{\oplus}{C}H_2 > R - NH - \overset{\oplus}{C}H_2$

D. $R - O - \overset{\oplus}{C}H_2 < R - S - \overset{\oplus}{C}H_2$

Answer: D

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10. Hyper conjugation phenomenon is possible in:

A. $H_2C = CH_2$

B. $C_6H_5CH = CH_2$

C. $CH_3CH_2 - CH = CH_2$

D. $(CH_3)_3C - CH = CH_2$

Answer: B

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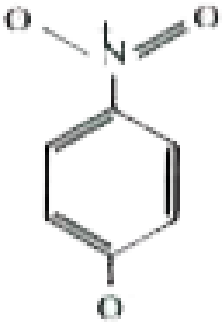
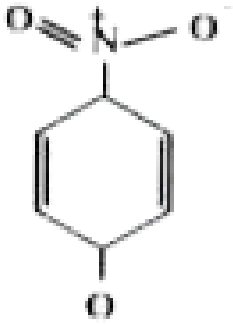
PRACTICE SHEET (EXERCISE-I (LEVEL-II (ADVANCE)) (Straight Objective Type Questions)

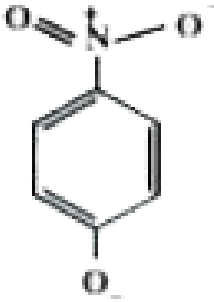
1. Which of the following is not be correct representation of resonance structure of p-nitrophenoixde ion :

A. 

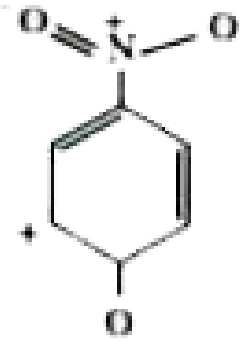
B.



C.



D.



Answer: D

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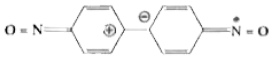
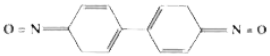
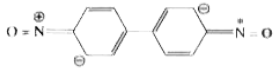
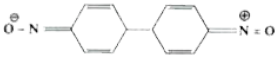
2. The most stable resonating structure of following compound is

A. 

B. 

C. 

D. 

Answer: D

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3. The stability of 2,3-dimethyl but-2-ene is more than 2-butene. This can best be explained in terms of

A. Steric effect

B. hyper conjugation

C. electrometric effect

D. inductive effect

Answer: B

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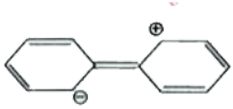
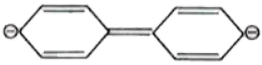
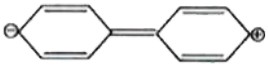
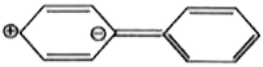
4. Which of the following does not represent the resonating structure of biphenyl

A. 

B. 

C. 

D. 

Answer: B

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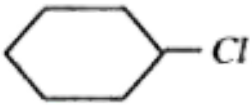
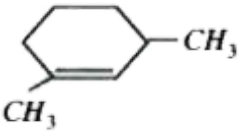
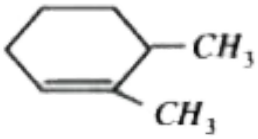
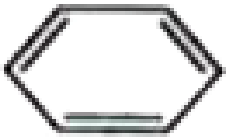
5. Which one of the following molecules has all the effects, namely inductive, mesomeric and hyperconjugative?

A. 

B. 

C. 

D. 

Answer: C

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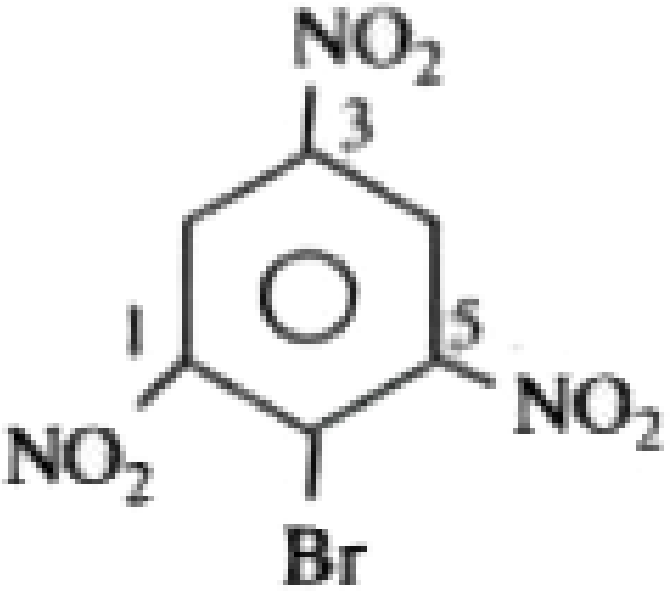
6. Which of the following statements would be correct about this compound



A. A. All three C-N bonds are of same length

B. B. C1-N and C3-N bonds are of same length but shorter than C5 – N bond

C. C. C1-N and C5-N bonds are of same length but longer than C3 – N bond

D. D. C1-N and C3-N bonds are of same length but both are longer than C5 – N bond.

Answer: C

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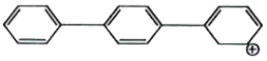
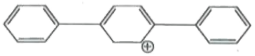
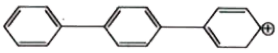
7. The most stable carbonium ion is

A. 

B. 

C. 

D. 

Answer: A

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PRACTICE SHEET (EXERCISE-I (LEVEL-II (ADVANCE)) (More than One correct answer Type Questions)

1. Which of the following substituents has +M (Mesomeric) effect ?

A. $-CN$

B. $-NR_2$

C. $-NH_2$

D. $-NHR$

Answer: B::C::D

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2. Which of the following statements about resonance is not correct?

A. The different resonance structures of a molecule have fixed arrangement of atomic nuclei.

B. The different resonance structures of a molecule should have same number of unpaired electrons

C. The hybrid structure has equal contribution from all the resonating structures

D. None of the individual resonating structures explains the various characteristics of the molecule

Answer: A::B::D

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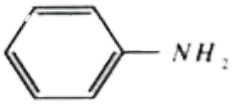
3. Which of the following compounds can exhibit geometrical isomerism?

A. $CH_3 - CH_2 = CH - \overset{\oplus}{C}H - CH_3$

B. 

C. $CH_2 = CH - CH_2 - \overline{N}H_2$

D. $CH_3 - O - CH_2 - CH_3$

Answer: C::D

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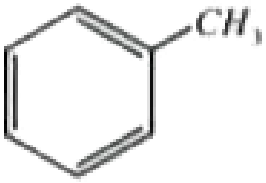
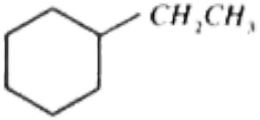
4. In which of the following hyperconjugation is involved

A. $CH_3CH_2 - CH = CH_2$

B. 

C. $CH_3 - CH = CH_2$

D. 

Answer: A::B::C

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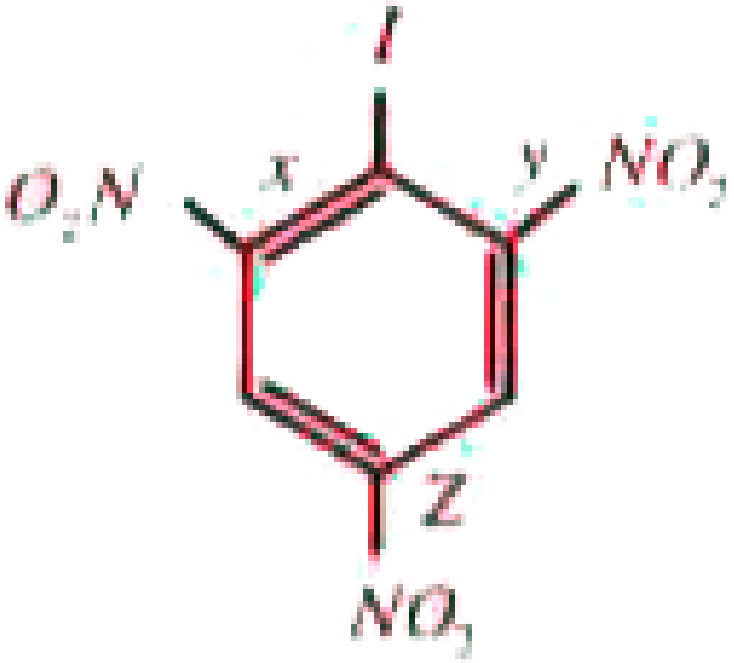

5. Compare the three N - O bond lengths X, Y and Z in the given molecule.

A. $x > y > z$

B. $X = Y > Z$

C. $X < Y < Z$

D. $X = Y < Z$

Answer: B

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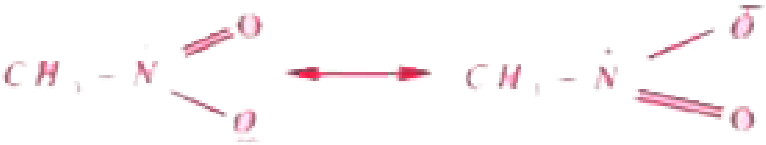
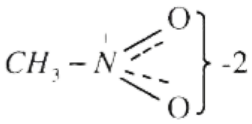
PRACTICE SHEET (EXERCISE-I (LEVEL-II (ADVANCE)) (Linked Comprehension Type Questions)

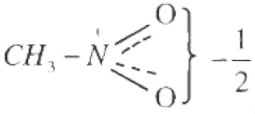
1. Following criteria should be taken in consideration for resonance. The major contributor is the one with the lower energy good contributors generally have all octets satisfied, as many bonds are possible andas little charge separation as possible negative charges are more stable on the more electronegative atoms. Resonance stabilization is most important when it serves to delocalize a charge over two or more atoms

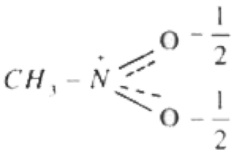
The two important resonating structures of nitromethane are

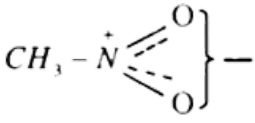


The resonance hybrid of nitromethane can be written as

A. 

B. 

C. 

D. 

Answer: C

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2. Following criteria should be taken in consideration for resonance. The major contributor is the one with the lower energy. Good contributors generally have all octets satisfied, as many bonds as possible and as little charge separation as possible. Negative charges are more stable on the more electronegative atoms. Resonance stabilization is most important when it serves to delocalize a charge over two or more atoms

Observe the following structures $H_2C = \underset{I}{^+NH_2} \leftrightarrow \underset{II}{^+CH_2} - NH_2$

A. Structure - I is major contributor in the two resonating structures

B. Structure - II is major contributor in the two resonating structures

C. Both are equal stable

D. Resonance is not possible

Answer: A

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3. Following criteria should be taken in consideration for resonance. The major contributor is the one with the lower energy good contributors generally have all octets satisfied, as many bonds are possible andas little charge separation as possible negative charges are more stable on the more electronegative atoms. Resonance stabilization is most important when it serves to delocalize a charge over two or more atoms

How many resonating structures can be drawn for 2, 4-pentadienyl radical

A. 1

B. 2

C. 3

D. 4

Answer: C

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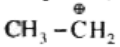
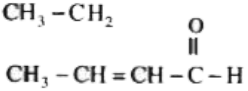
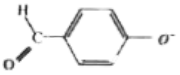
PRACTICE SHEET (EXERCISE-I (LEVEL-II (ADVANCE)) (Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) Resonance
B) 	Q) Hyperconjugation
C) 	R) + I effect
D) 	S) –I effect

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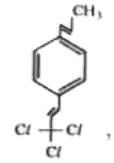
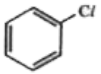
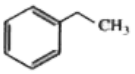
2. Match the following columns

Column-I	Column-II
A) 	P) Resonance
B) 	Q) Aromatic
C) 	R) Hyperconjugation
D) 	S) Reverse hyperconjugation

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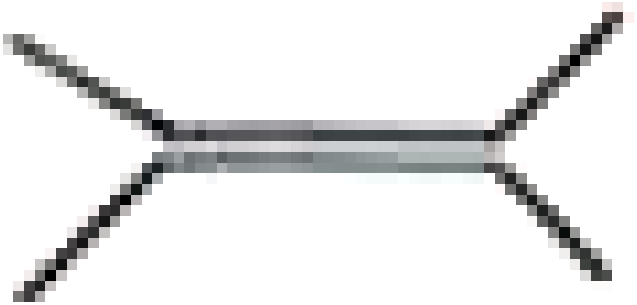
PRACTICE SHEET (EXERCISE-I (LEVEL-II (ADVANCE)) (Integer Type Questions)

1. 

The number of possible hyper conjugated structures is equal to 10 + x, then x is?

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2. P^{K_a} of $O_2N - CH_2COOH$ is 1.68. How many compounds given below have a pKa value greater than 1.68

$$\underset{(I)}{CH_3COOH} \qquad \underset{(II)}{Cl - CH_2COOH} \qquad \underset{(III)}{Cl - \overset{\overset{Cl}{|}}{\underset{\underset{Cl}{|}}{C}} - COOH} \qquad O_2N - C$$

`" "underset((V))(H_(3)C-overset(overset(O)(||))(C)-COOH)" "

(##AKS_ELT_AO_CHE_XI_V01_D_C03_E02_029_Q01.png" width="80%">

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3. How many resonance structures are possible for phenoxide ion

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4. The number of resonance structures for anilinium ion is

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5. Number of resonance structures possible for phenol

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6. In how many of the following the concept of resonance can be observed

$CH_2 = CH - Cl, CH_3 - O - \overset{+}{C}H - CH_3$

$CH_3 - O - CH_2\overset{+}{C}H, CH_3 - NH - CH_2 - CH - CH_3$

$CH_3 - CH = CH - NH_2, CH_3 - CH_2 = CH_NH - CH_3$

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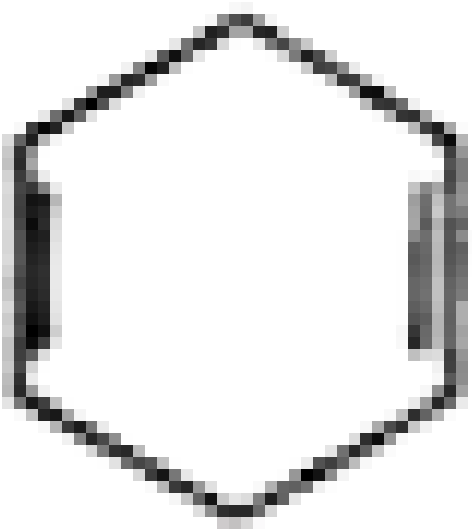
7. Number of resonance structures possible for



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PRACTICE SHEET (EXERCISE-II (LEVEL-I (MAIN)) (Straight Objective Type Questions)

1. Electrophiles are

A. Electron attracting species

B. Nucleus attracting species

C. Electron repelling species

D. Nucleus repelling species

Answer: A

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2. The species having trigonal planar shape is

A. CH_3^+

B. $\overline{C}H_3$

C. BF_4^-

D. SiH_4

Answer: A

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3. Which of the following free radical is the most stable?

A. Tertiary

B. Secondary

C. Primary

D. Methyl

Answer: A

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4. In carbocation the carbon bearing the positive charge is

A. sp^2 hybridized

B. sp^3 hybridized

C. dsp^3 hybridized

D. sp hybridized

Answer: A

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5. Shape of the methyl carbonium ion is

A. Planar

B. Linear

C. Octahedral

D. Tetrahedral

Answer: A

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6. The cleavage of covalent bond $A - B \rightarrow A^{\cdot} + B^{\cdot}$ is known as

A. Heterolytic fission

B. Carbanion formation

C. Homolytic fission

D. Carbocation formation

Answer: B

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7. The hybridization of central carbon atom in trimethyl free radical is

A. sp

B. sp^2

C. sp^3

D. may be or sp^2 or sp

Answer: B

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8. A carbocation in which dispersal of charge does not take place

A. $R_3C^{\oplus}$

B. $R_3CH^{\oplus}$

C. $RCH_2^{\oplus}$

D. $^{\oplus}CH_3$

Answer: D

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9. The most stable electrophile is

A. $R_3\overset{\oplus}{C}$

B. $C_6H\overset{\oplus}{C}H_2$

C. $(C_6H_5)_3\overset{\oplus}{C}$

D. $(CH_3)_2\overset{\oplus}{C}(H)$

Answer: C

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10. Which of the following carbocation is more stable

A. $C_6H_5\overset{+}{C}H_2$

B. $(CH_3)_3\overset{+}{C}$

C. $(CH_3)_3\overset{+}{C}H$

D. $\overset{+}{C}H_3$

Answer: A

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PRACTICE SHEET (EXERCISE-II (LEVEL-II (ADVANCE)) (Straight Objective Type Questions)

1. Which one of the following is the most stable alkene?

A. Isobutylene

B. 2-Methyl-2-butene

C. 2,3-dimethyl-2-butene

D. ethylene

Answer: C

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2. Which of the following is the least stable carbonium ion ?

A. $\overset{\oplus}{C}F_3$

B. $\overset{\oplus}{C}Cl_3$

C. $\overset{+}{C}(NO_2)_3$

D. $\overset{\oplus}{C}H_3$

Answer: C

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3. Which of the following compounds will produce the most stable carbonium ion when heterolytic cleavage of C-O bond take place ?

A. $CH_3CH - \underset{\underset{CH_3}{|}}{CH_2} - OH$

B. $CH_3 - \overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}} - OH$

C. $CH_3 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$

D. $CH_3 - CH_2 - CH_2 - CH_2 - OH$

Answer: B

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4. Heterolysis of C-Cl bond produces

A. Two carbanions

B. Two carbonium ions

C. Two free radical

D. one cation and one anion

Answer: D

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5. Which of the following is the most stable ion ?

A. $CH_3 - CH_2 - CH_2 - \overset{\oplus}{C}H_2$

B. $CH_3 - CH_2 - \overset{\oplus}{C}H - CH_3$

C. $CH_3 - \underset{CH_3}{\overset{+}{C}} - CH_3$

D. $\overset{+}{C}H_3$

Answer: C

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6. The most stable free radical among the following is

A. $C_6H_5 - CH_2 - \dot{C}H_2$

B. $C_6H_5\dot{C}HCH_3$

C. $CH_3 - \dot{C}H_2$

D. $CH_3 - \dot{C}H - CH_3$

Answer: B

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7. Which of the following is the least stable ?

A. $CH_3 - CH_2 - \overset{+}{C}H_2$

B. $CH_3 - \overset{+}{C}H - CH_2 - CH_3$

C. $CH_3 - \underset{CH_3}{\overset{+}{C}} - CH_3$

D. $CH_3 - \overset{CH_3}{\underset{CH_3}{\overset{|}{\underset{|}{C}}}} - \overset{+}{C}H - CH_3$

Answer: A

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8. Reactivity of H-atoms bonded to different types of C-atoms in alkanes in the order

A. $3^\circ > 1^\circ > 2^\circ$

B. $1^\circ > 2^\circ > 3^\circ$

C. $3^\circ > 2^\circ > 1^\circ$

D. $2^\circ > 3^\circ > 1^\circ$

Answer: C

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9. Which of the following alkene is the most stable

A. $CH_3 - CH = CH_2$

B. $CH_3 - CH = CH - CH_2$

C. $(CH_3)C = CHCH_3$

D. $(CH_3)_2C = C(CH_3)_2$

Answer: D

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PRACTICE SHEET (EXERCISE-II (LEVEL-II (ADVANCE)) (More than One correct answer Type Questions)

1. Which of the following is the correct order of strength of necleophiles in polar aprotic solvents

A. $C_2H_5\overline{O} > \overline{O}H$

B. $(CH_3)_3C\overline{O} < CH_3\overline{O}$

C. $CH_3\overline{O} > \overline{O}H$

D. $RCO\overline{O} > RCOOH$

Answer: A::B::C::D

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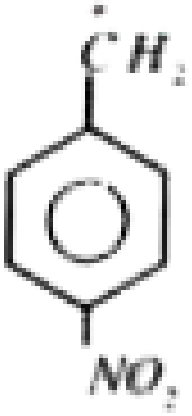
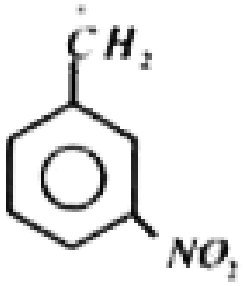
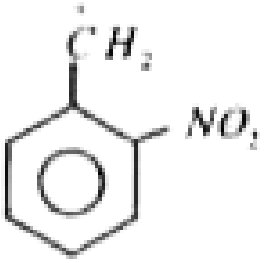
2. Which of the following is the most stable carbocation



A.

B. 

C. 

D. All are equally stable

Answer: B

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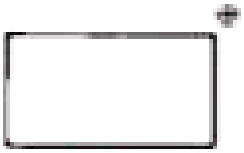
3. In which of the following rearrangement is not possible ?

A. $(CH_3)_3\overset{\oplus}{C} - CH_2 - O - CH_3$

B. $CH_2 = CH - CH_2 - \overset{\oplus}{CH_2}$

C. $C_6H_5CH_2\overset{\oplus}{C}H_2$

D. 

Answer: D

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4. Among the following intermediates, which is/are electron deficient

A. Carbocation

B. Nitrene

C. Carbene

D. Free radical

Answer: A::B::C::D

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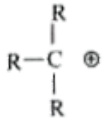
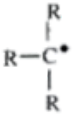
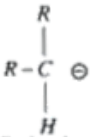
PRACTICE SHEET (EXERCISE-II (LEVEL-II (ADVANCE)) (Linked Comprehension Type Questions)

1. The products of bond breaking, shown below, are not stable, and cannot be isolated for prolonged study. Such species are referred to as reactive intermediate, and are belived to be transient intermediates in many reactions. The general structures and names of four such intermediates are, Charged Intermediates Uncharged Intermediates


Carbocation


free radical


Carbanion

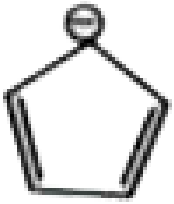

Carbene

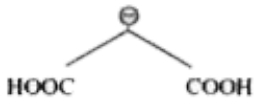
Carbocations (called carbonium ions in the older literature) are electrophiles and carbananions are nucleophiles. Carbenes have only a valence shell sextet of electrons and are therefore electron deficient. In this sense they are elecrophiles, but the non-bonding electron pair also gives carbenes nucleophilic character. As a rule, the electrophilic character dominates carbene reactivity. Carbon radicals have only seven valence electrons, and may be considered electron deficient, however, they do not in general bond to nucleophilic electron pair, so their

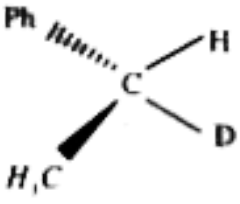
chemistry exhibits differences from that of conventional electrophiles. Radical intermediates are often called free radicals. Intermediates are in general stabilised with conjugation, electron donating and electron with drawing groups.

Which of the following is relatively an unstable intermediate compared to rest ?

A. 

B. 

C. 

D. 

Answer: A

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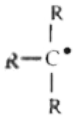
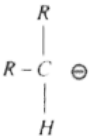
2. The products of bond breaking, shown below, are not stable, and cannot be isolated for prolonged study. Such species are referred to as reactive intermediate, and are belived to be transient intermediates in many reactions. The general structures and names of four such intermediates are, Charged Intermediates Uncharged Intermediates


Carbocation


free radical


Carbanion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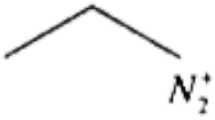
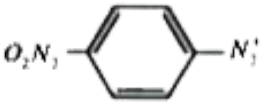
Radical intermediates are often called free radicals. Intermediates are in general stabilised with conjugation, electron donating and electron with drawing groups.

$R - N^+ \equiv N \quad Cl^- \rightarrow R^+ + N_2 + Cl^-$ based on the above, which of the following from R^+ most readily

A.



B.



C.

D.

Answer: C

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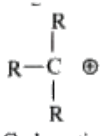
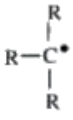
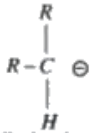
3. The products of bond breaking, shown below, are not stable, and cannot be isolated for prolonged study. Such species are referred to as reactive intermediate, and are belived to be transient intermediates in many reactions. The general structures and names of four such intermediates are, Charged Intermediates Uncharged Intermediates


Carbocation


free radical


Carbanion


Carbene

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drawing groups.

Which of the following carbo cations is more stable?

A. $CH_2 = \overset{\oplus}{C}H$

B. $C_6H_5 - \overset{\oplus}{C}H_2$

C. $C_6\overset{\oplus}{H}_5$

D. $CH_3 - \underset{CH_3}{\overset{\oplus}{C}} - CH_3$

Answer: B

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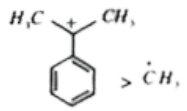
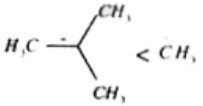
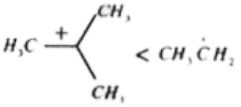
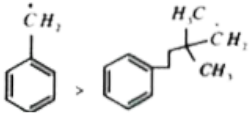
PRACTICE SHEET (EXERCISE-II (LEVEL-II (ADVANCE)) (Matrix Matching Type Questions)

1. Match the following columns

Column-I	Column-II
A) 	P) Inductive effect
B) 	Q) Resonance
C) 	R) Hyper conjugation
D) 	S) steric hindrance

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2.

Column-I (Reaction intermediate)	$Column - II$ (Electronic configuration and valence state)
A) Carbocation	P) Sextet and bivalent
B) Carbanion	Q) Sextet and trivalent
C) Free radicals	R) Octet and trivalent
D) Carbene	S) Heptet and trivalent

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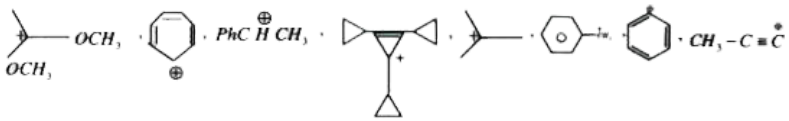
PRACTICE SHEET (EXERCISE-II (LEVEL-II (ADVANCE)) (Integer Type Questions)

1. How many of the following carbocations are more stable than cyclopropyl methyl carbocation



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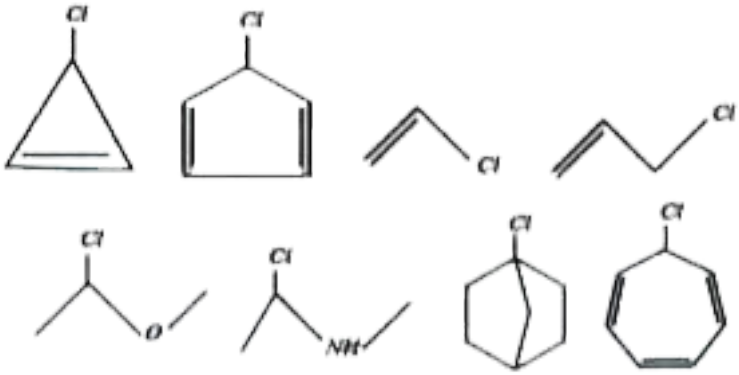
2. How many of the following compounds will give white ppt with $AgNO_3$ solution?



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3. How many of the following carbanions are more stable than mythyl carbanion?

$$CH_3 - \overline{C}H_2, Ph - \overline{C}H - Ph, Ph - \underset{\underset{Ph}{|}}{\overline{C}} - Ph, Ph - \overline{C}H_2, CH_3 - \overline{C}H -$$

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PRACTICE SHEET (EXERCISE-III (LEVEL-I (MAIN)) (Straight Objective Type Questions)

1. Identify the strongest acid among the following

A. CH_3CN

B. $CH \equiv CH$

C. $CH \equiv CH$

D. $(CH_3)_3CH$

Answer: C

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2. It was experimentally found that formic acid is stronger acid than acetic acid. Which of the following effects is useful to explain this?

A. Inductive

B. hyper conjugation

C. mesomeric effect

D. electromeric effect

Answer: D

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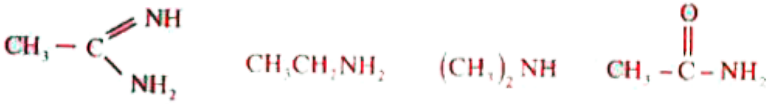
3. The correct order of basicity of the following compounds is



A. $2 > 1 > 3 > 4$

B. $1 > 3 > 2 > 4$

C. $3 > 1 > 2 > 4$

D. $1 > 2 > 3 > 4$

Answer: B

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4. Which one of the following is the weakest base?

A. $(C_2H_5)_3N$

B. $(C_2H_5)_2NH$

C. $C_2H_5NH_2$

D. NH_3

Answer: D

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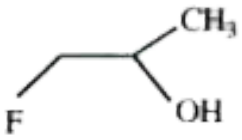
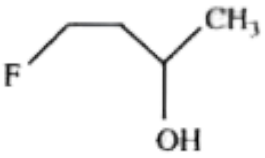
5. Among the following compounds, the strongest acid is

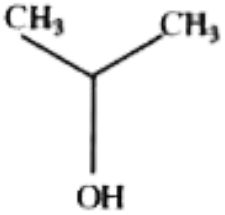
A.



B.



C.



D.

Answer: A

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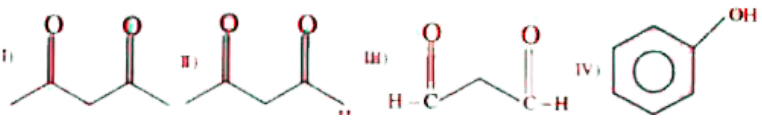
6. Select the correct pKa orders for the following compounds



A. $IV < II < III < I$

B. $III < IV < II < I$

C. $III < II < I < IV$

D. $IV < III < II < I$

Answer: D

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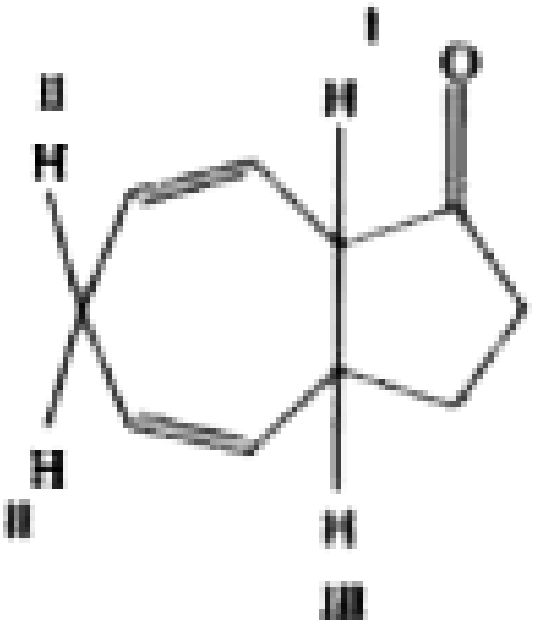
7. The correct order of acidic nature of protons in the following compound is



A. $I < II < III$

B. $III < I < II$

C. $II < III < I$

D. $III < II < I$

Answer: D

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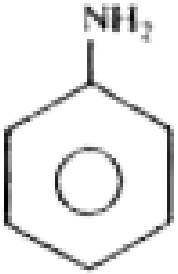
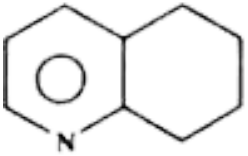
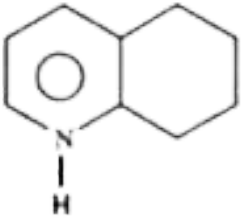
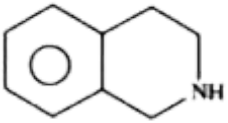
8. Choose the strongest base among the following:

A. 

B. 

C. 

D. 

Answer: D

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9. Among the following anions, the order of basic strength is

$\mathrm{A})CH_3^-$ $\mathrm{B})NH_2$ $\mathrm{C})OH-$ $\mathrm{D})F-$

A. $A > B > C > D$

B. $B > A > C > D$

C. $C > B > A > D$

D. $C > A > B > D$

Answer: A

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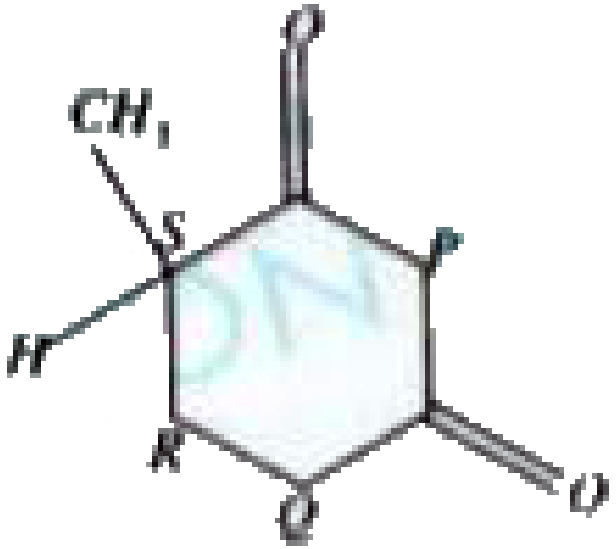
10. If the following compound mixed with NaOH solution. Acid base reaction occurs and OH- snatches H^+ from organic molecule. Which

carbon will lose H^+ ion easily?



A. P

B. Q

C. R

D. S

Answer: A

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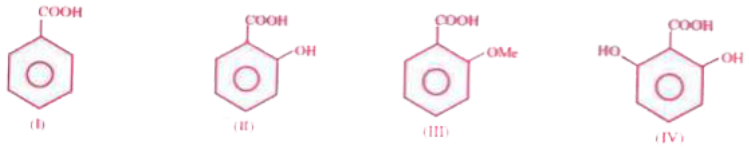
PRACTICE SHEET (EXERCISE-III (LEVEL-II (ADVANCE)) (Straight Objective Type Questions)

1. The correct order of an acidic nature of following Carboxylic acids is



A. $I > II > III > IV$

B. $IV > II > III > I$

C. $I > III > II > IV$

D. $III > II > I > IV$

Answer: B

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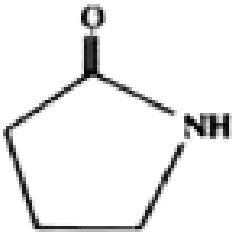
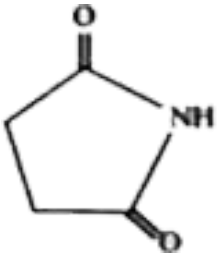
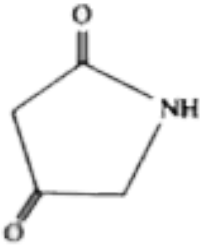
2. Most acidic one is :

A. 

B. 

C. 

D. 

Answer: C

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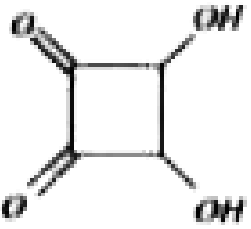
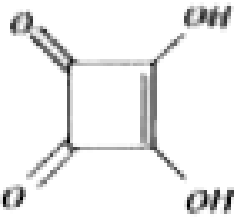
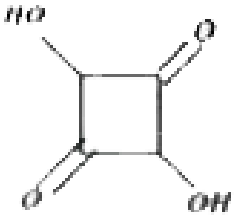
3. Which of the following contains most acidic hydrogen



A.



B.



C.

D.

Answer: B

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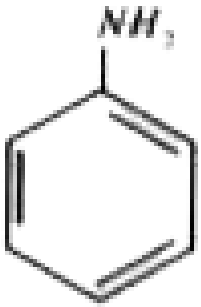
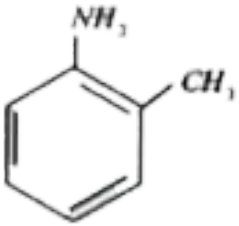
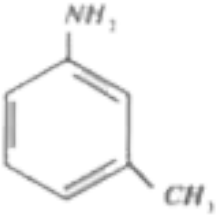
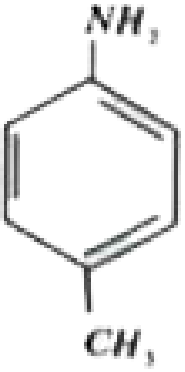
4. The most basic one is :

A. 

B. 

C. 

D. 

Answer: D

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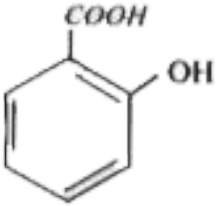
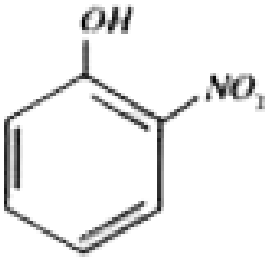
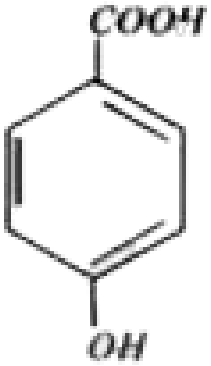
5. Among the following compounds, the most acidic is

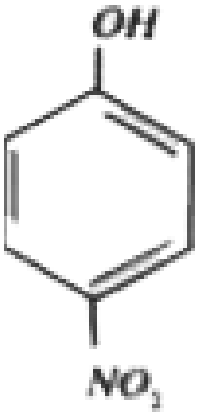
A. 

B. 

C.



D.



Answer: A

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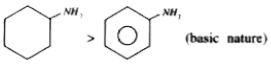
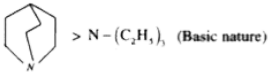
6. Which of the following order(s) is correct

A. 

B. $HCOOH > CH_3COOH$ (Acidic nature)

C. 

D. All the above

Answer: D

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7. Which of the following is the most stable

A. F_3C^-

B. Cl_3Cl^-

C. Both are equally stable

D. Cannot be predicted

Answer: B

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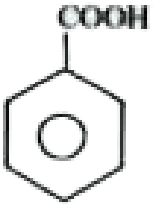
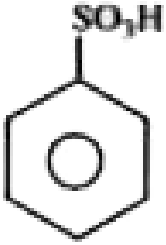
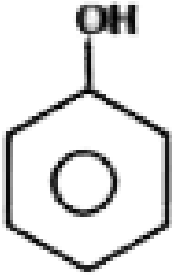
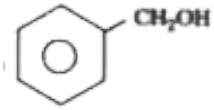
8. Among the following compounds, the strongest acid is

A. 

B. 

C. 

D. 

Answer: B

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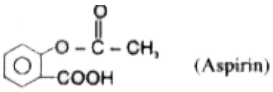
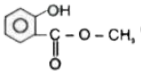
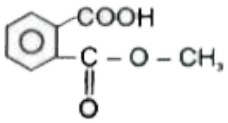
9. Amongst the following compounds the strongest acid is :

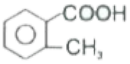
A. 

(Aspirin)

B. 

(Oil of winter green)

C. 

D. 

(O-Toluic acid)

Answer: C

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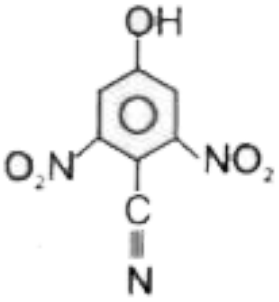
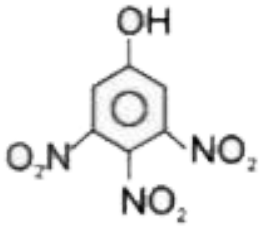
10. Among the following compounds, the strongest acid is

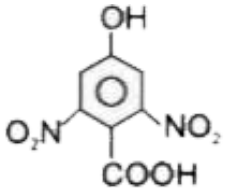
A.



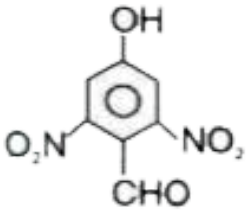
B.



C.



D.



Answer: C

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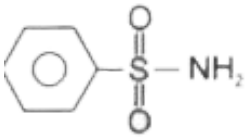
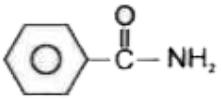
11. Among the following compounds, the strongest acid is

A. 

B. 

C. 

D. 

Answer: A

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12. The most acidic compound is

A. H_2S

B. H_2Te

C. H_2O

D. H_2Se

Answer: B

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PRACTICE SHEET (EXERCISE-III (LEVEL-II (ADVANCE)) (More than One correct answer Type Questions)

1. Which of the following are stronger bases than ammonia

A. $(CH_3)_2NH$

B. CH_3NH_2

C. $C_6H_5NH_2$

D. $C_2H_5NH_2$

Answer: A::B::D

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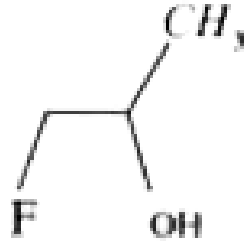
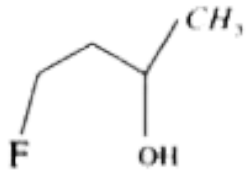
2. Which of the following is relatively stronger acid?

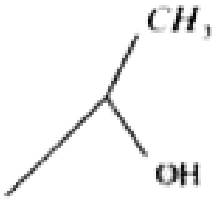
A.

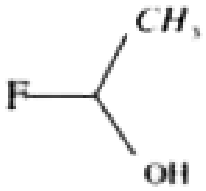


B.



C.





D.

Answer: A::B::D

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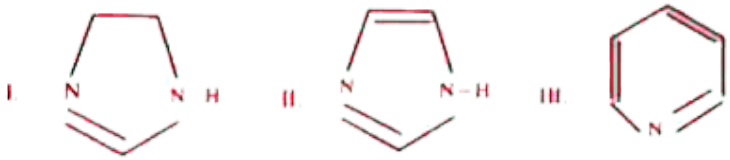
3. Choose the correct P^{Ka} order of the following compounds



A. $II > I > III$

B. $III > II > I$

C. $I > II > III$

D. $I > III > II$

Answer: D

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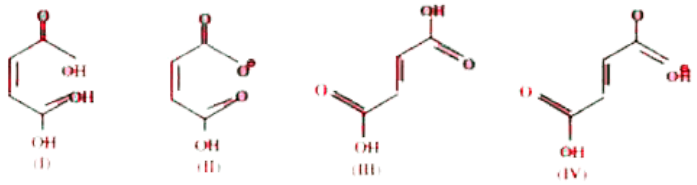
4. Select the correct statement(s) about the following species.



A. $Ka_1(I) > Ka_1(III)$

B. $Ka_2(II) < Ka_2(IV)$

C. $Ka_2(I) < Ka_2(III)$

D. $pKa_1(I) < pKa_1(II)$

Answer: A::B::C::D

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PRACTICE SHEET (EXERCISE-III (LEVEL-II (ADVANCE)) (Linked Comprehension Type Questions)

1. Inductive effect influences the basic strength as well as acidic strength. -I effect increases acidic strength where as +I effect increases basic strength as they stabilize conjugate base and acid respectively.

Which is a stronger acid among the following

A. O_2NCH_2COOH

B. $\underset{\underset{OH}{|}}{CH_2}COOH$

C. $\underset{\underset{CN}{|}}{CH_2}COOH$

D. $\underset{\underset{OCH_3}{|}}{CH_2}(COOH)$

Answer: A

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2. Inductive effect influences the basic strength as well as acidic strength. -I effect increases acidic strength where as +I effect increases basic strength as they stabilize conjugate base and acid respectively.

Identify the strongest base.

A. CH_3NH_2

B. $(CH_3)NH$

C. $(CH_3)_3N$

D. $C_6H_5NH_2$

Answer: B

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3. Inductive effect influences the basic strength as well as acidic strength. -I effect increases acidic strength where as +I effect increases basic strength as they stabilize conjugate base and acid respectively.

Which of the following is the strongest acid

A. HCOOH

B. CH_3COOH

C. CH_3CH_2COOH

D. $CH_3CH_2CH_2COOH$

Answer: A

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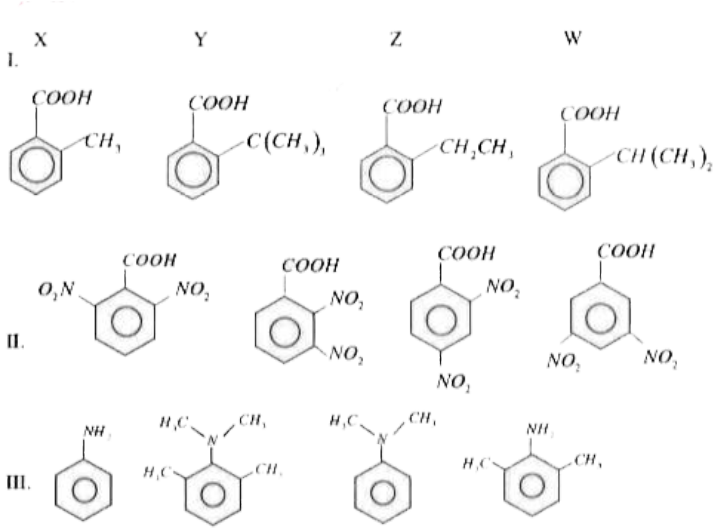
4.



The most acidic compound in I is

A. Y

B. W

C. X

D. Z

Answer: A

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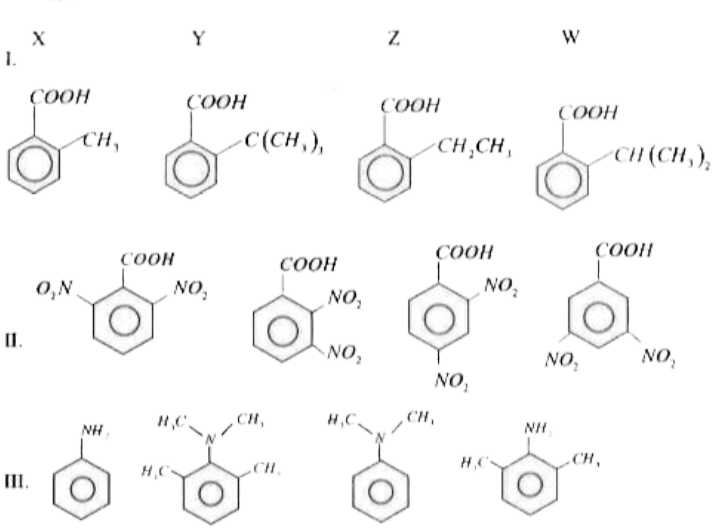
5.



The least acidic compound in II is

A. X

B. W

C. Z

D. Y

Answer: B

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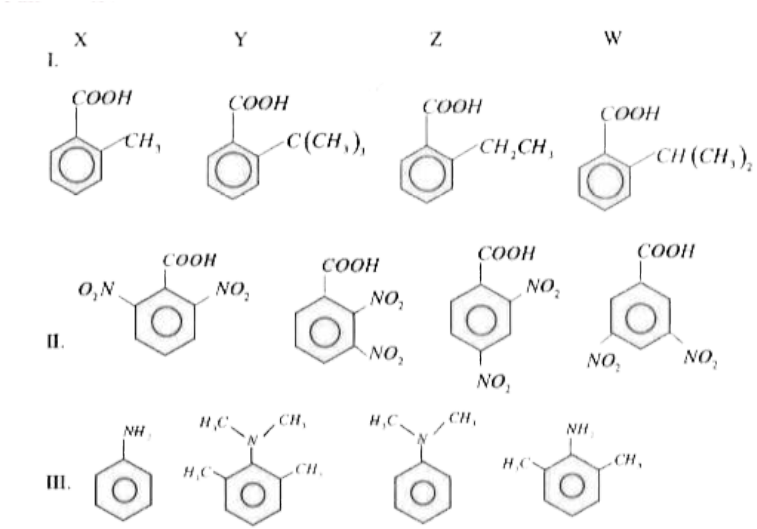

6.

The strongest base in III is

A. X

B. Z

C. Y

D. W

Answer: C

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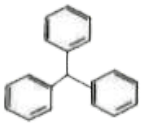
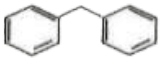
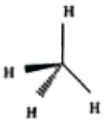
PRACTICE SHEET (EXERCISE-III (LEVEL-II (ADVANCE)) (Matrix Matching Type Questions)

1. Match the following columns

Column-I (molecule)	Column-I (P^{tau})
A) 	P) 40
B) 	Q) 48
C) 	R) 33
D) 	S) 32

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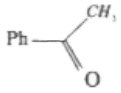
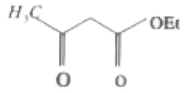
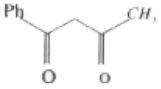
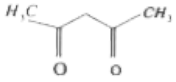
2. Match the following columns

Column-I (compound)	Column-II (Enol content)
A) 	P) 89.2
B) 	Q) 1.1×10^{-4}
C) 	R) 80
D) 	S) 8.4

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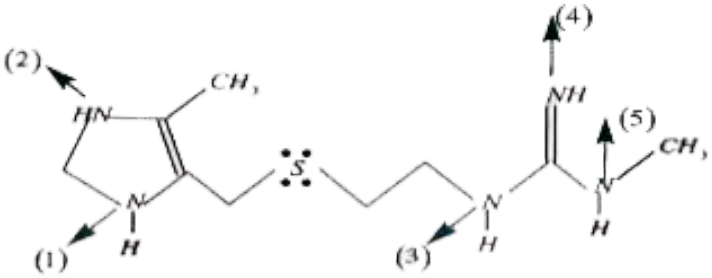
PRACTICE SHEET (EXERCISE-III (LEVEL-II (ADVANCE)) (Integer Type Questions)

1. On mono protonation which nitrogen of the following compound can be protonated.



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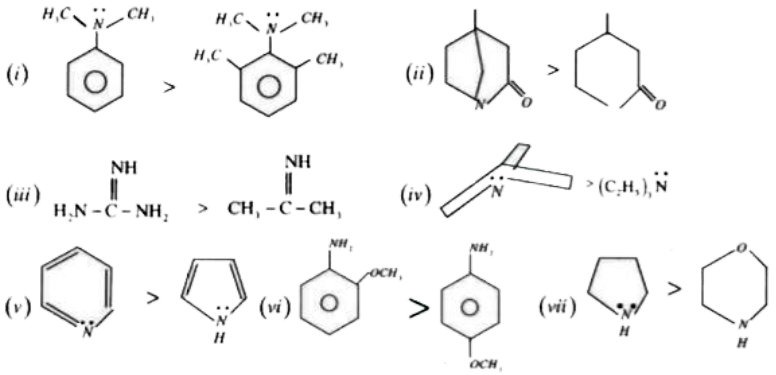
2. How many of the following are incorrect order of basic strength



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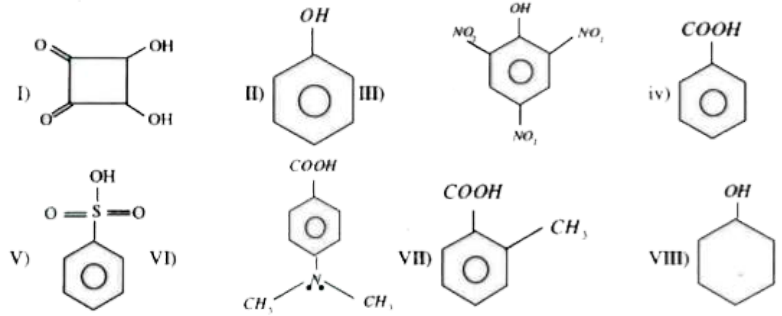
3. How many of the following acids react with the $NaHCO_3$?



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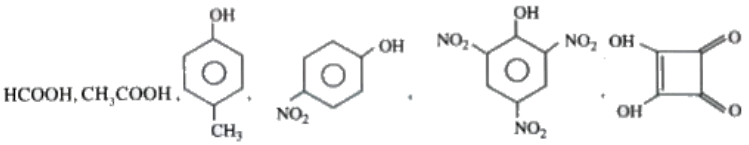
4. How many of the following are stronger acids than carbolic acid



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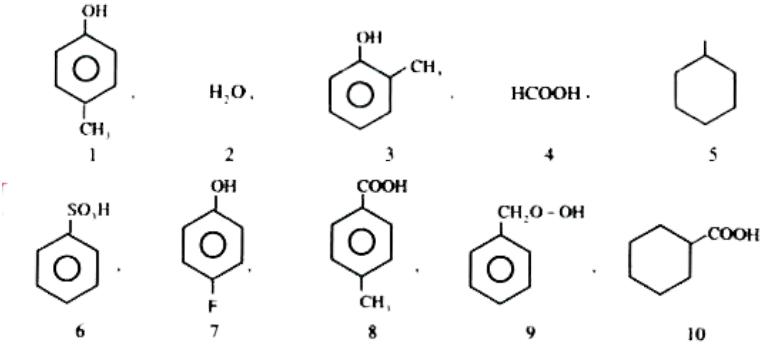
5. How many among the given is more acidic than phenol.



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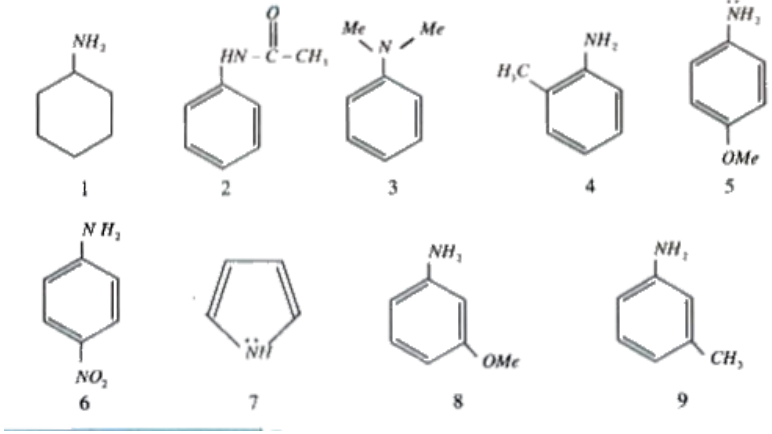
6. Among the following compounds how mnay of them is more basic than aniline?



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ADDITIONAL PRACTICE EXERCISE (LEVEL - I (MAIN)) (Straight Objective Type Questions)

1. Which of the following order is correct regarding stability

(I) $CH_3 - CH = C = CH - CH_3$ (II)

$CH_3 - CH = CH - CH = CH_2$

(III)$CH_2 = CH - CH_2 - CH = CH_2$

A. I = II = III

B. $I < II < III$

C. $III = II > I$

D. $I > II > III$

Answer: D

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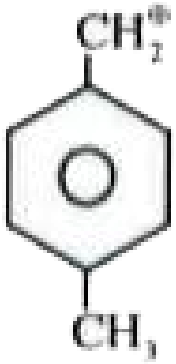
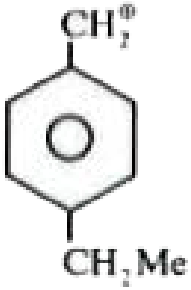
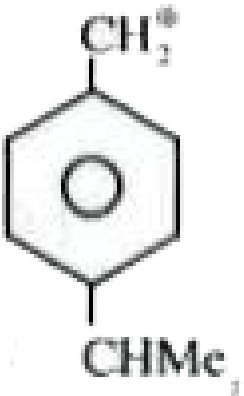
2. Select the most stable intermediate.

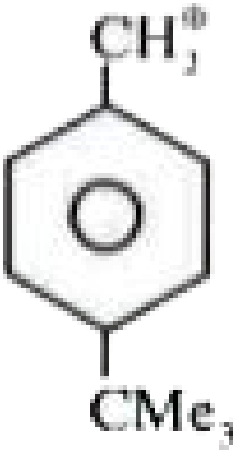
A. 

B. 

C.



D.



Answer: A

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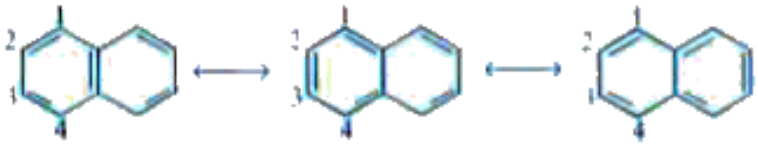
3. 

These are three canonical structures of napthalene. Examine them and find correct statement among the following :

A. All C - C bonds are of same length

B. $C_1 - C_2$ bond is shorter than $C_2 - C_3$ bond.

C. $C_1 - C_2$ bond is longer than $C_2 - C_3$ bond

D. None of these

Answer: B

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4. $\underset{(I)}{CH_2 = CH} - CH = CH - CH_3$ is more stable than $CH_3 - \underset{(II)}{CH = C} = CH - CH_3$ because

A. there is resonance in I but not in II

B. there is tautomerism in I but not in II

C. there is hyperconjugation in I but not in II

D. II has more canonical structures than I.

Answer: A

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5. In which of the following molecules $\pi -$ electron density in ring is maximum :

A. 

B. 

C. 

D. 

Answer: B

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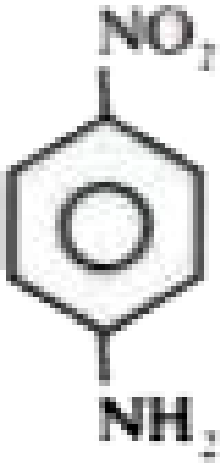
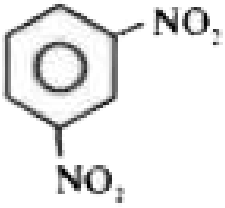
6. In which of the following molecules $\pi -$ electron density in ring is minimum

A. 

B. 



C.



D.

Answer: D

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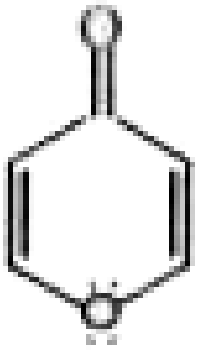
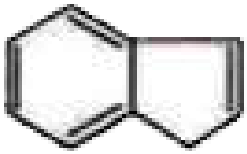
7. Which of the following compound is non aromatic?

A.

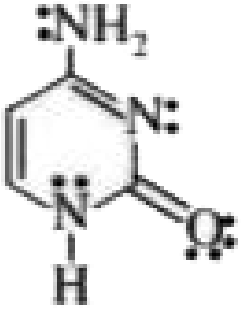


B.

C.



D.



Answer: B

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8. Among the following molecules, the correct order of C - C bond length is

A. $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$

B. $C_2H_6 > C_6H_6 > C_2H_4 > C_2H_2$

C. $C_2H_4 > C_2H_6 > C_2H_2 > C_6H_6$

D. $C_2H_6 > C_2H_4 > C_2H_2 > C_6H_6$

Answer: B

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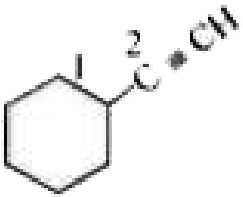
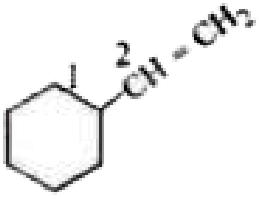
9. $C_1 - C_2$ bond is shortest in

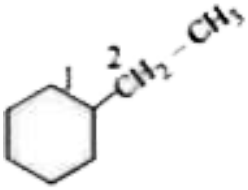
A. A.



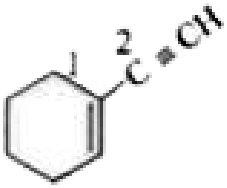
B. B.



C. C.



D. D.



Answer: B

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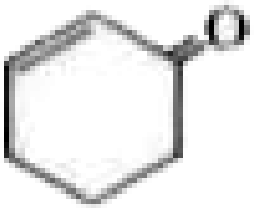
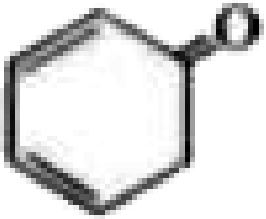
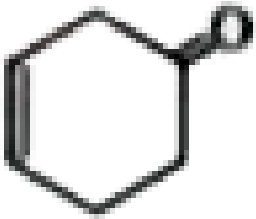
10. Which of the following has the longest C - O bond ?



A. A.



B. B.



C. C.

D. D.

Answer: B

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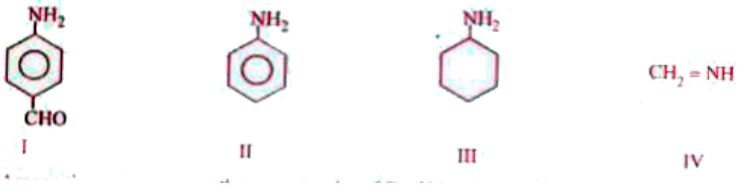
11. 

Among these compounds, the correct order of C - N bond lengths is

A. $IV > I > II > III$

B. $III > I > II > IV$

C. $III > II > I > IV$

D. $III > I > IV > II$

Answer: B

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12. (I) $CH_3O - CH = CH - NO_2$ (II) $CH_2 = CH - NO_2$
(III) $CH_2 = CH - Cl$ (IV) $CH_2 = CH_2$

Which of the following is the correct order of C - C bond lengths among these compounds :

A. $I > II > III > IV$

B. $IV > III > II > I$

C. $I > III > II > IV$

D. $II > III > I > IV$

Answer: C

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13. Select the least acidic compound.

A. $NO_2 - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

B. $F - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

C. $Ph - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

D. $CH_3 - CH_2 - \overset{O}{\overset{||}{C}} - O - H$

Answer: D

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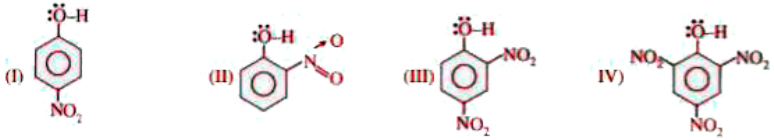
14. Write correct order of acidic strength of following compounds



A. $IV > III > I > II$

B. $III > II > I > IV$

C. $IV > I > II > III$

D. $I > II > III > IV$

Answer: A

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15. Arrange the given phenols in their decreasing order of acidity

Select the correct answer from the given

A. $IV > III > I > II$

B. $IV > II > III > I$

C. $IV > III > II > I$

D. $IV > I > III > II$

Answer: C

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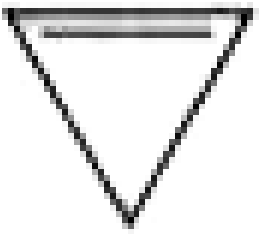
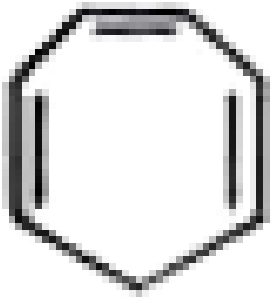
16. Which one of the following is the most acidic?

A. 

B. 

C. 

D. $CH_2 = CH - CH_3$

Answer: B

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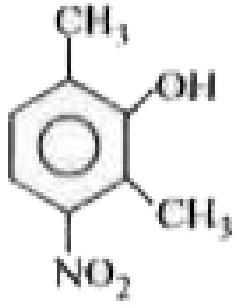
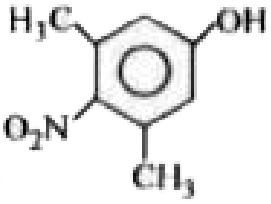
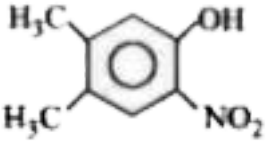
17. Which one of the following phenols will show the highest acidity?



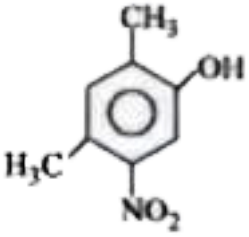
A.



B.



C.



D.

Answer: B

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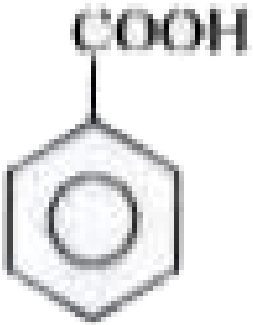
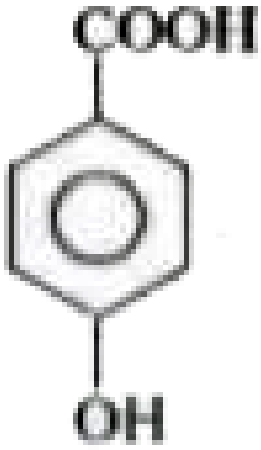
18. Which of the following is the weakest acid?

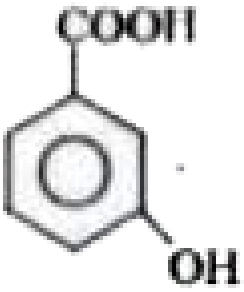
A.



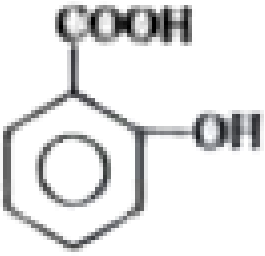
B.



C.



D.



Answer: B

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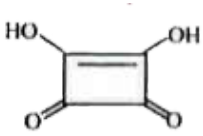
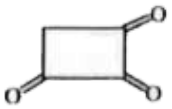
19. The correct pKa order of the following acids is



(I)



(II)

(III)

A. a. $I > II > III$

B. b. $III > II > I$

C. c. $III > I > II$

D. d. $I > III > II$

Answer: A

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20. Which of the following compound is having the highest P^{ka} value

A. Phenol

B. Ethyl alcohol

C. Formic acid

D. Benzoic acid

Answer: B

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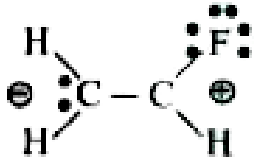
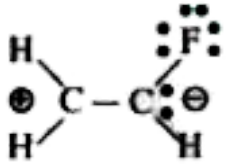
21. Which of the following represents the best resonance form for $H_2C = CHF$?

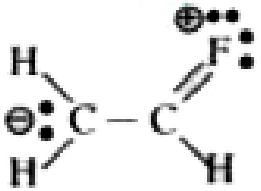
A.



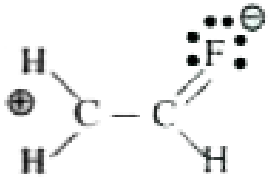
B.



C.



D.



Answer: C

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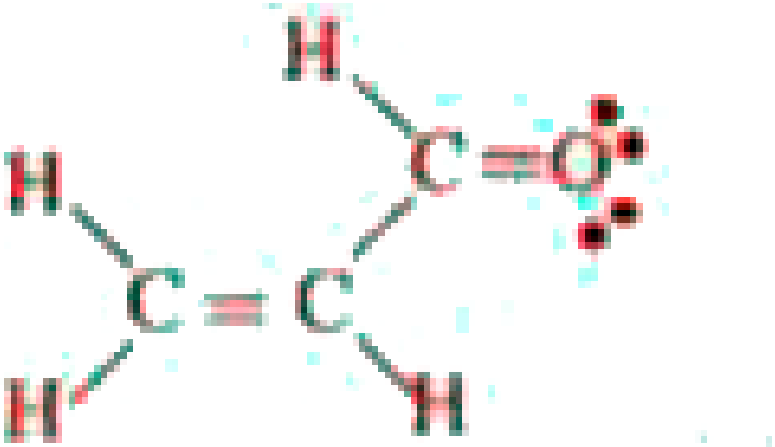
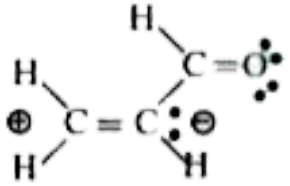
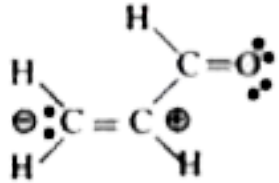
22. Which of the following structures respresent the best resonance form for the following compound ?



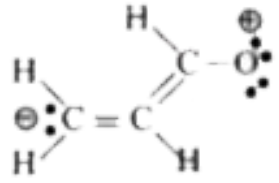
A.

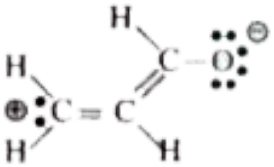


B.



C.



D. 

Answer: D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II (LECTURE SHEET ADVANCE)) (Straight ObjectiveType Questions)

1. Consider the basicity of the following aromatic amines:

(I) aniline (II) p-nitroaniline (III) p-methoxyaniline (IV) p-methylaniline

The correct order of decreasing basicity is:

A. $III > IV > I > II$

B. $III > IV > II > I$

C. $I > II > III > IV$

D. $IV > III > II > I$

Answer: A

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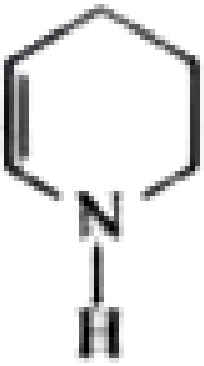
2. Which one of the following is least basic in character?

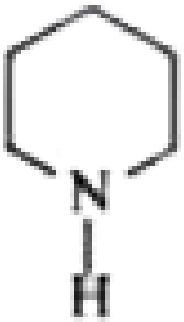
A.

B.

C.



D.



Answer: A

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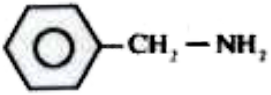
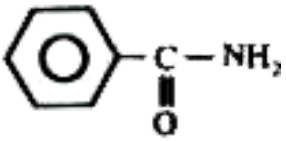
3. Select the least basic compound.

A. 

B. 

C. 

D. 

Answer: D

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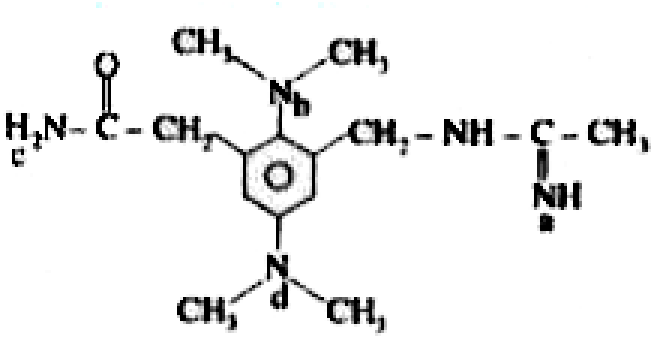
4. Basicity order of N in the following compound is :



A. $b > d > a > c$

B. $a > b > d > c$

C. $a > b > c > d$

D. $a > c > b > d$

Answer: B

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5. The order of stability of the following carbanions

(I) o-nitrobenzyl carbanion (II) m-nitrobenzyl carbanion

(III) p-nitrobenzyl carbanion (IV) Benzyl carbanion

A. $II > III > I$

B. $II > I > III$

C. $I > II > III$

D. $I > III > II$

Answer: A

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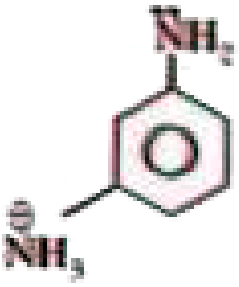
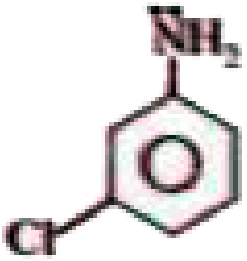
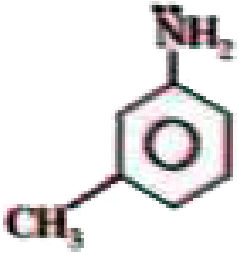
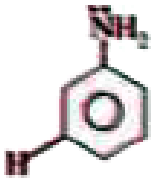
6. The most acidic compound is

A. 

B. 

C. 

D. 

Answer: C

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7. Which one of the following molecules has all the effects, namely inductive, mesomeric and hyperconjugative?

A. CH_3Cl

B. $CH_3 - CH = CH_2$

C. $CH_3 - CH = CH - \overset{\overset{O}{||}}{C} - CH_3$

D. $CH_2 = CH - CH = CH_2$

Answer: C

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8. Hyperconjugation is best described as:

A. Delocalisation of π electrons into a nearby empty orbital.

B. Delocalisation of σ electrons into a nearby empty orbital.

C. The effect of alkyl groups donating a small amount of electron density inductively into a carbocation.

D. The migration of a carbon or hydrogen from one carbocation to another.

Answer: B

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9. Select the correct statement.

(i) Delocalisation of $\sigma -$ electron is hyperconjugation. (ii) Delocalisation of $\pi -$ electron is resonance.

(iii) Partial displacement of $\sigma -$ electron is inductive effect.

A. i & iii

B. ii & iii

C. i & ii

D. i, ii, iii

Answer: D

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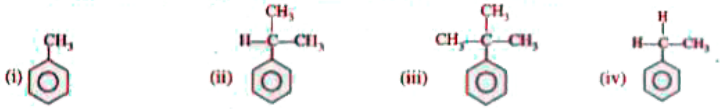
10. Arrange the following compounds in decreasing order of electrophilic substitution.



A. $i > ii > iii > iv$

B. $iii > iv > ii > i$

C. $i > iv > ii > iii$

D. $i > ii > iv > iii$

Answer: C

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II (LECTURE SHEET ADVANCE)) (More than One correct answer Type Questions)

1. Resonance energy will be more if

A. canonical strutures are equivalent than if canonical structures are non-equivalent.

B. molecule is aromatic than if molecule is not aromatic.

C. more number of p-bonds are involved in resonance than less number of p-bonds are involved.

D. Resonance with 2p-2p overlapping than resonance with 3p-2p overlapping.

Answer: A::B::C::D

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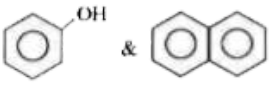
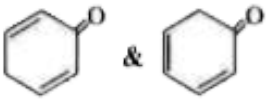
2. In which of the following pairs IInd compound has higher resonance energy :

A. 

B. 

C. 

D. $CH_2 = CH - OH \& CH_2 = CH - CH = CH - OH$

Answer: A::C::D

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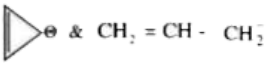
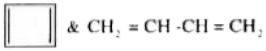
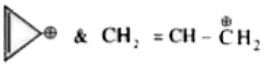
3. In which of the following pairs IInd compound has less resonance energy :

A. $CO_3^{2-} \& HCOO -$

B. 

C. 

D. 

Answer: A::D

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4. Identify electron - withdrawing groups in resonance among the following :

A. $-COOH$

B. $-CONHCH_3$

C. $-COCl$

D. $-CN$

Answer: A::B::C::D

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5. Which of the following groups can neither donate a pair of electrons in resonance

A. $-NO_2$

B. $-NO$

C. $-CH=CH_2$

D. $-CHO$

Answer: B::C

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6. Which of the following group can participate in resonance with other suitable group :

A. $CH_2=\overset{\oplus}{O}-$

B. $-CH_2-\overline{C}H_2$

C. $-CH_2-\overset{\oplus}{C}H_2$

D. 

Answer: A

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7. Which one of the following pairs of structures represent the phenomenon of resonance?

A. $H_2C = CH - \overset{O}{\overset{||}{C}} - H, \overset{+}{C}H_2 - CH = \overset{O^-}{\overset{|}{C}} - H$

B. $CH_2 = CH - \overset{+}{C}HCl, \quad \overset{+}{C}H_2 - CH = CH - Cl$

C. $(CH_3)_2CH - \overset{O}{\overset{||}{C}} - O^-, (CH_3)_2CH - \overset{O^-}{\overset{|}{C}} = O$

D. $CH_3 - CH_2 - \overset{O}{\overset{||}{C}} - CH_3, CH_3 - CH = \overset{O^-}{\overset{|}{C}} - CH_3$

Answer: A::B::C

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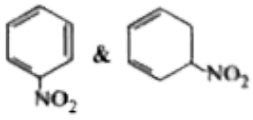
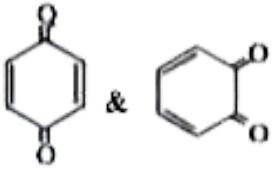
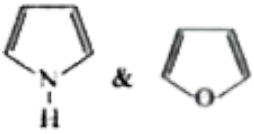
8. In which of the following pairs IInd compound has less resonance energy :

A. 

B. 

C. 

D. 

Answer: A::B::C::D

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9. In which of the following is (are) the correct order of bond lengths :

A. $C-C>C=C>C\equiv C>C\equiv N$

B. $C=N>C=O>C=C$

C. $C=C>C=N>C=O$

D. $C-C>C=C>C\equiv C>C-H$

Answer: A::C::D

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10.

Select the correct statement about product A.

A. Product is aromatic

B. Product has high dipole moment.

C. Product has less resonance energy

D. Product is soluble in polar solvent.

Answer: A::B::D

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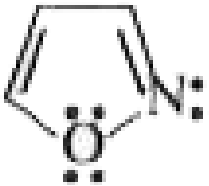
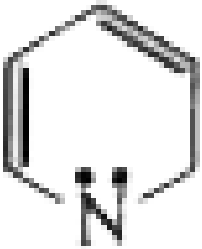
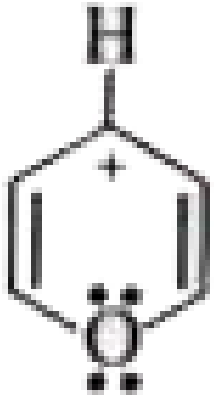
11. Which of the following compounds is aromatic?

A. 

B. 

C. 

D. 

Answer: A::B::D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II (LECTURE SHEET ADVANCE)) (Linked Comprehension Type Questions)

1. When an electron withdrawing or electron releasing group is attached to carbon chain, polarity is induced on the carbon atom and on the substituent attach to it. This permanent polarity is due electron displacement due to difference in electronegativities this is called inductive effect or I effect. The inducitve effect depends in the

electronegativity of the substituent. The inductive effect is broadly classified as (i) negative inductive effect or -I effect. (ii) positive inductive effect or +I effect.

The group which exhibits the maximum -I effect

A. $-NO_2$

B. $-CN$

C. $-Cl$

D. $-OH$

Answer: A

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2. When an electron withdrawing or electron releasing group is attached to carbon chain, polarity is induced on the carbon atom and on the substituent attach to it. This permanent polarity is due electron displacement due to difference in electronegativities this is called inductive effect or I effect. The inducitve effect depends in the

electronegativity of the substituent. The inductive effect is broadly classified as (i) negative inductive effect or -I effect. (ii) positive inductive effect or +I effect.

Which of the following statements is correct about inductive effect ?

A. Polarization of a $\sigma -$ bond is called inductive effect.

B. Inductive effect is transmitted through $\sigma -$ bonds

C. Inductive effective is transmitted through $\pi -$ bond

D. Both a and b.

Answer: D

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3. When an electron withdrawing or electron releasing group is attached to carbon chain, polarity is induced on the carbon atom and on the substituent attach to it. This permanent polarity is due electron displacement due to difference in electronegativities this is called inductive effect or I effect. The inducitve effect depends in the

electronegativity of the substituent. The inductive effect is broadly classified as (i) negative inductive effect or -I effect. (ii) positive inductive effect or +I effect.

Stability of given anions in the decreasing order is

(i) $\overline{C}H_3$ (ii) $\overline{C}H_2 - NO_2$ (iii) $\overline{C}H_2Cl$ (iv) $CH_3 - \overline{C}H_2$

A. $i > ii > iii > iv$

B. $ii > iii > i > iv$

C. $ii > i > iii > iv$

D. $iv > i > iii > ii$

Answer: D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II (LECTURE SHEET ADVANCE)) (Integer Type Questions)

1. How many of the following statements is (are) true about resonance.

a) Resonance is an intramolecular process.

b) Resonance involves delocalization both of s and p electrons.

c) Resonance involves delocalization of π electrons only.

d) Resonance decreases potential energy of a molecule.

e) Resonance has no effect on the potential energy of a molecule.

f) Resonance is the only way to increase molecular stability.

g) Resonance is not the only way to increase molecular stability.

h) Any resonating molecule is always more stable than any nonresonating molecule.

i) The canonical struture explains all features of a molecule.

j) The resonance hybrid explains all features of a molecule.

k) Resonating structures are real and resonance hybrid is imaginary.

l) Resonance hybrid is real and resonating structures are imaginary.

m) Resonance hybrid is always more stable than all canonical structures.

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2. How many of the following lone-pair indicated is involved in resonance :

a) 

b) 

c) 

d) 

e) $CH_2 = CH - \overset{\oplus}{C}H_2$

f) $CH_2 = CH - CH = \ddot{N}H$

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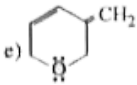
3. How many of the following lone-pair indicated is not involved in resonance :

a) $CH_2 = CH - \ddot{N}H - CH_3$

b) $CH_2 = CH - CH = \ddot{O}$

c) $CH_2 = CH - \ddot{O} - CH = CH_2$

d) $CH_2 = CH - C\equiv N:$

e) 

$CH_2 = CH - CH = \ddot{N}H$

f) 

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4. Find the number of correct statement(s):

a) $CH_3\overset{\oplus}{O}CH_2$ is more stable than $CH_3\overset{\oplus}{C}H_2$

b) $Me_2\overset{\oplus}{C}H$ is more stable than $CH_3CH_2\overset{\oplus}{C}H_2$

c) $CH_2 = CH - \overset{\oplus}{C}H_2$ is more stable than $CH_3CH_2\overset{\oplus}{C}H_2$

d) $CH_2 = \overset{\oplus}{C}H$ is more stable than $CH_3\overset{\oplus}{C}H_2$

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II (PRACTICE SHEET ADVANCE)) (Straight Objective Type Questions)

1. The bond between carbon atom (1) and carbon atom (2) in compound $N \equiv \overset{1}{C} - \overset{2}{C}H = CH_2$ involves the hybridization 1) spa and sp?

A. sp^2 and sp^2

B. sp^3 and sp

C. sp and sp^2

D. sp and sp

Answer: C

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2. Polarization of electrons in acrolein may be written as

A. $H_2^{\delta-}C=CH-\underset{\delta+}{\overset{O}{\overset{||}{C}}}-H$

B. $H_2^{\delta-}C=CH-\overset{\delta+}{\overset{O}{\overset{||}{C}}}-H$

C. $H_2^{\delta-}C=\overset{\delta+}{C}H-\overset{O}{\overset{||}{C}}-H$

D. `H_(2)^(delta+)C=

Answer: D

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3. The number of sigma and pi-bonds in 1-butene 3-yne are

A. 5 sigma and 5 pi

B. 7 sigma and 3 pi

C. 8 sigma and 2 pi

D. 6 sigma and 4 pi

Answer: B

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4. Amongst the following, the most basic compound is

A. benzylamine

B. aniline

C. acetanilide

D. p-nitroaniline

Answer: A

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5. The hybridisation of carbon atoms in C-C single bond $H - C \equiv CH = CH_2$ is

A. $sp^3 - sp^3$

B. $sp^2 - sp^3$

C. $sp - sp^3$

D. $sp - sp^2$

Answer: D

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6. What is the decreasing order of strength of the bases OH, NH_2 , H-C=C and CH_3, $-CH_2$,

A. $CH_3 - CH_2^- > NH_2^- > H - C \equiv C^- > OH^-$

B. $H - C \equiv C^- > CH_3 - CH_2^- > NH_2^- > OH^-$

C. $OH^- > NH_2^- > H - C \equiv C^- > CH_3 - CH_2^-$

D. $NH_2^- > H - C \equiv C^- > OH^- > CH_3 - CH_2^-$

Answer: A

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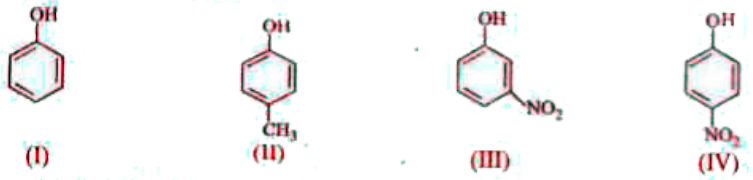
7. In the following compounds



The order of acidity is:

A. $III > IV > I > II$

B. $I > IV > III > II$

C. $II > I > III > IV$

D. $IV > III > I > II$

Answer: D

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8. Among the following compounds, the strongest acid is

A. $HC^{\circ}CH$

B. C_6H_6

C. C_2H_6

D. CH_3OH

Answer: D

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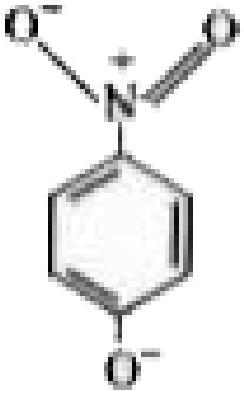
9. The most unlikely representation of resonance structure of P-nitrophenoxide .

A. 

B.

C.

D.

Answer: C

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10. The compound in which C uses only sp^3 hybrid orbitals for bond formation is

A. HCOOH

B. $(H_2N)_2CO$

C. $(CH_3)_3COH$

D. CH_3CHO

Answer: C

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11. Which of the following has the most acidic hydrogen?

A. 3-hexane

B. 2,4-hexanedione

C. 2,5-hexaedione

D. 2,3-hexaedione

Answer: B

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12. Among the following the strongest base is

A. $C_6H_5NH_2$

B. $p - O_2NC_6H_4NH_2$

C. $m - O_2NC_6H_4NH_2$

D. $C_6H_5CH_2NH_2$

Answer: D

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13. The correct order of basicities of the following compounds is:

1) 

A. $2 > 1 > 3 > 4$

B. $1 > 3 > 2 > 4$

C. $3 > 1 > 2 > 4$

D. $1 > 2 > 3 > 4$

Answer: B

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14. Which of the following hydrocarbons has the lowest dipole moment?

A. cis-2-butene

B. 2-butyne

C. 1-butyne

D. $H_2C = CH - C \equiv CH$

Answer: B

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15. Identify the correct order of boiling points of the following compounds.

1)

$CH_3CH_2CH_2CH_2OH$ 2) $CH_3CH_2CH_2CHO$ 3) $CH_3CH_2CH_2COOH$

A. $1 > 2 > 3$

B. $3 > 1 > 2$

C. $1 > 3 > 2$

D. $3 > 2 > 1$

Answer: B

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16. Which of the following acids has the smallest dissociation constant ?

A. $CH_3CHFCOOH$

B. FCH_2CH_2COOH

C. $BrCH_2CH_2COOH$

D. $CH_3CHBrCOOH$

Answer: C

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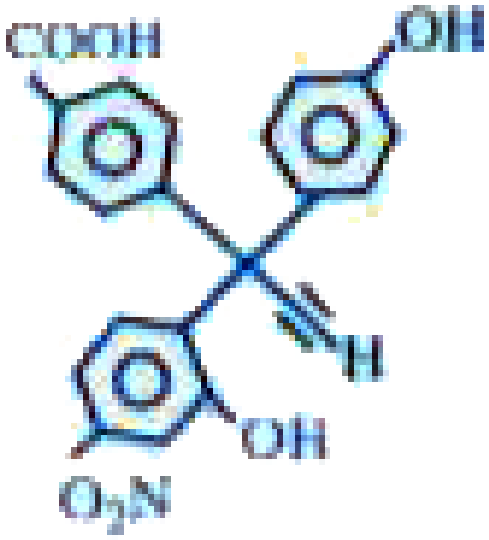
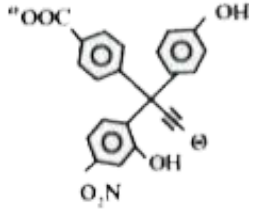
X is



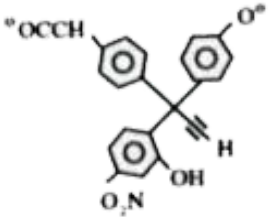
17.

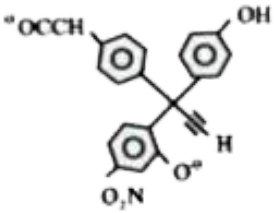
When X is made to react with 2 e of $NaNH_1$ the product formed will be:

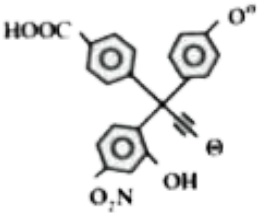
A.



B.



C. 

D. 

Answer: C

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18. Which of the following represent the given mode of hybridisation sp2, sp2, sp, sp from left to right ?

A. $H_2C = CH - C \equiv N$

B. $H_2C = C = CH - CH_3$

C. $HC \equiv C - C \equiv CH$

D. $HC \equiv C - CH = CH_2$

Answer: A

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19. Maximum dipole moment will be of :

A. CCl_4

B. $CHCl_3$

C. CH_2Cl_2

D. CH_3Cl

Answer: D

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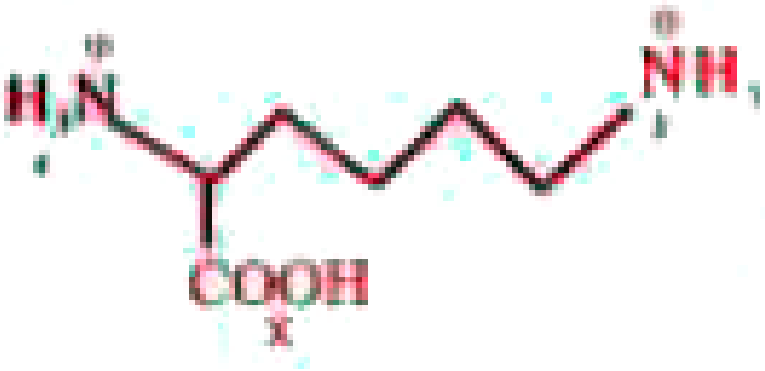

20. Correct order of acidic strength is:

A. $x > y > z$

B. $z > y > x$

C. $y > z > x$

D. $x > z > y$

Answer: D

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21. For 1-methoxy-1,3-butadiene, which of the following resonating structure is the least stable?

A. $H_2\overset{\ominus}{C} - \overset{\oplus}{C}H - CH = CH - O - CH_3$

B. $H_2\overset{\oplus}{C} - CH = CH - CH = \overset{\ominus}{O} - CH_3$

C. $H_2C = CH - \overset{\oplus}{C}H - \overset{\ominus}{C}H - O - CH_3$

D. $H_2C = CH - \overset{\ominus}{C}H - CH = \overset{\oplus}{O} - CH_3$

Answer: C

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22. When benzene sulfonic acid and p-nitrophenol are treated with $NaHCO_3$, the gases released respectively are

A. SO_2, NO_2

B. SO_2, NO

C. SO_2, CO_2

D. CO_2, CO_2

Answer: D

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23. The correct stability order of the following species is

A. $(II) > (IV) > (I) > (III)$

B. $(I) > (II) > (III) > (IV)$

C. $(II) > (I) > (IV) > (III)$

D. $(I) > (III) > (II) > (IV)$

Answer: D

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24. Hyper conjugation involves overlap of the following orbitals

A. s - s

B. s - p

C. p - p

D. p - p

Answer: B

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25. The correct acidity order of the following is :

A. $(III) > (IV) > (II) > (I)$

B. $(IV) > (III) > (I) > (II)$

C. $(III) > (II) > (I) > (IV)$

D. $(II) > (III) > (IV) > (I)$

Answer: A

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26. The correct stability order of the following resonance structures is

$$\underset{(I)}{H_2C=\overset{+}{N}=\overset{-}{N}H_2} \quad \underset{(II)}{\overset{+}{C}-N=\overset{-}{N}H_2} \quad \underset{(III)}{\overset{-}{C}-\overset{+}{N}\equiv NH_2} \quad \underset{(IV)}{C\overset{-}{C}-N=\overset{+}{N}}$$

A. $(I) > (II) > (IV) > (III)$

B. $(I) > (III) > (II) > (IV)$

C. $(II) > (I) > (III) > (IV)$

D. $(III) > (I) > (IV) > (II)$

Answer: B

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27. Among the following compounds, the most acidic is

A. p-nitrophenol

B. p-hydroxybenzoic acid

C. o-hydroxybenzoic acid

D. p-toluic acid

Answer: C

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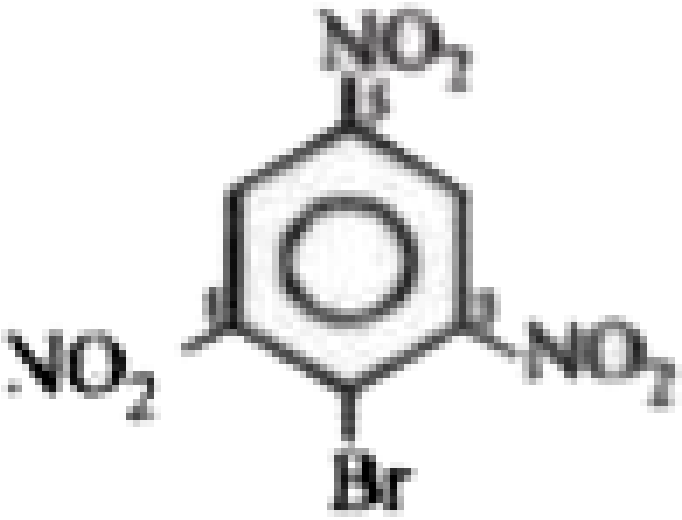
ADDITIONAL PRACTICE EXERCISE (LEVEL - II (PRACTICE SHEET ADVANCE)) (More than One correct answer Type Questions)

1. Which of the following statements would be false about this compound

:



A. All three C - N bonds are of same length.

B. Cl - N and C3 - N bonds are of same length but shorter than C5 - N bond.

C. Cl - N and C3 - N bonds are of same length but longer than C5 - N bond.

D. Cl - N and C3 - N bonds are of different length but both are longer than C5 - N bond

Answer: A::B::D

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2. Which of the following statement is/are correct ?

A. Contributing structures contributes to the resonance hybrid in proportion of their energies.

B. Equivalent contributing structure make the resonance very important.

C. Contributing structures represent hypothetical molecules having no real existance.

D. Contributing structures are less stable than the resonance hybrid.

Answer: B::C::D

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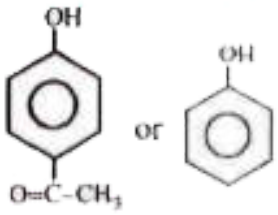
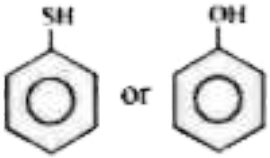
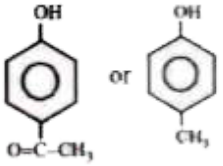
3. In which pair IInd compound is weak acids.

A. 

B. 

C. 

D. H_2O or CH_3OH

Answer: A::B::C

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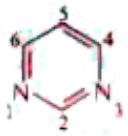
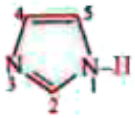
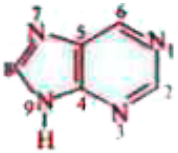
4. 
Pyrimidine


Imidazole


Purine

Among the following which statement(s) is/are true:

A. Both N of pyrimidine are of same basic strength

B. In imidazole protonation takes places on N-3.

C. Purine has 3 basic N.

D. Pyrimidine imidazole and purine all are aromatic

Answer: A::B::C::D

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5. Among the following statements which one is/are correct :

A. Cyanic acid $(H-O-C\equiv N)$ and isocyanic acid (H - N = C = O) are not separable in H_2O

B. Ka of formic acid is higher than IInd $Ka(Ka_2)$ of oxalic acid.

C. Acids which are weaker than H_2CO_3 will liberate CO_2 on treatment with $NaHCO_3$

D. In case of dicarboxylic acid Ka_1 (1st dissociation), is always greater then Ka_2 (IInd dissociation)

Answer: A::B::D

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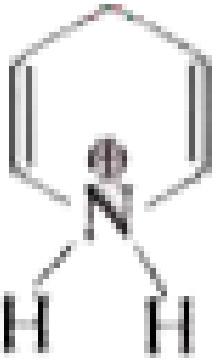
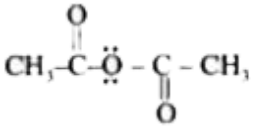
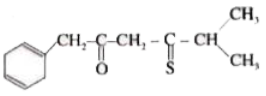
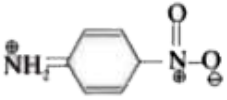
6. Among the following which one is having conjugated system :

A. 

B. 

C. 

D. 

Answer: B::D

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7. Choose the correct statement :

(I) 

(II) 

(III) 

A. Stability of $(II) > (III) > (I)$

B. stability of $(II) > (III) > (I)$

C. Stability of $(III) > (II) > (I)$

D. stability of $(I) > (II) > (III)$

Answer: A::B

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8. Select correct statement

A. $-NO_2$ and $-COOH$ group deactivates benzene nucleus for attack of E+ at o- and p- sites.

B. $-NH_2$ and $-OMe$ group activates benzene nucleous for attack of E+ at o- and p- sites.

C. $-NH_2$ and $-COOH$ group activates benzene nucleous for attack of E+ at o- and p- sites.

D. $-NH_2$ and $-OMe$ group activates benzene nucleous for attack of E+ at o- and p- sites.

Answer: A::B

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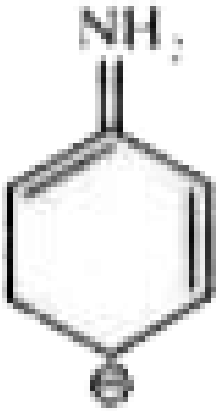
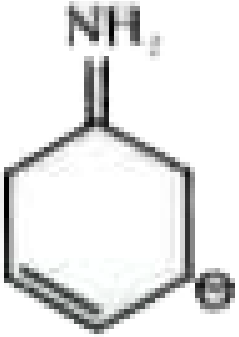
ADDITIONAL PRACTICE EXERCISE (LEVEL - II (PRACTICE SHEET ADVANCE)) (Linked Comprehension Type Questions)

1. Resonance phenomenon is generally involved when single valence bond structure could not represent the actual structure of the molecules or species. Based on the actual bond lengths, bond energies etc, of the molecules or species, resonance phenomenon will help to achieve at the correct structure of the species or molecules.

Which of the following is the correct resonance structure of



A.



B.

C.

D. None of the above

Answer: D

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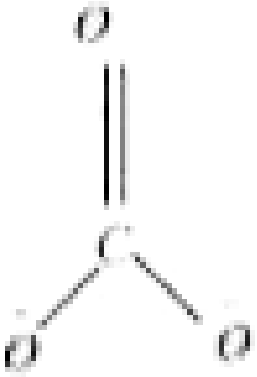
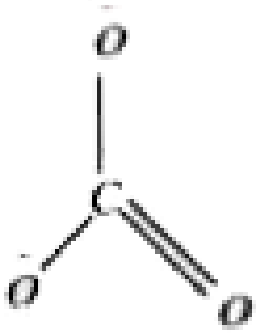
2. Resonance phenomenon is generally involved when single valence bond structure could not represent the actual structure of the molecules or species. Based on the actual bond lengths, bond energies etc, of the molecules or species, resonance phenomenon will help to achieve at the correct structure of the species or molecules.

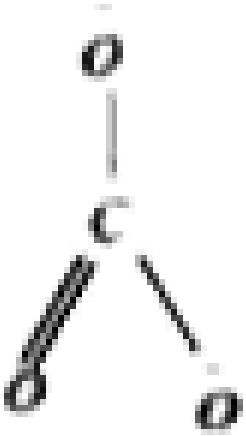
Which of the following is correct

A.





B.



C.

D. All the above

Answer: D

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3. Resonance phenomenon is generally involved when single valence bond structure could not represent the actual structure of the molecules or species. Based on the actual bond lengths, bond energies etc, of the molecules or species, resonance phenomenon will help to achieve at the correct structure of the species or molecules.

Which of the following is correct

A. Reasonance hybrid is stabler than connonical structures

B. C annonical structures are not real structures of the molecules

C. Resonance structures differ in the distribution of electrons only

D. All the above

Answer: D

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ADDITIONAL PRACTICE EXERCISE (LEVEL - II (PRACTICE SHEET ADVANCE)) (Integer Type Questions)

1. How many of the following groups cannot participate in resonance with other suitable group :

a) $-COOH$ b) $-COO^{\rho}$ c) $-COCl$ d) $-\overset{\oplus}{N}H_3$

e) $-\overset{\oplus}{C}H_2$ f) $-\dot{C}H_2$ g) $\overset{CH_2=\overset{\oplus}{N}-}{\underset{|}{C}H_3}$

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2. Find the number of electron - donating groups in resonance among the following :

a) $-CONH_2$ b) $-NO_2$ c) $-OCOCH_3$ d) $-COOCH_3$
e) $-CHO$ f) $-NHCOCH_3$

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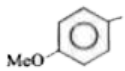
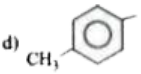
3. How many of the following groups can only withdraw a pair of electrons in resonance depending upon situation

a) – Ph b)  c)  d) 

e) $-\overset{\oplus}{N}Me_3$ f) $-CONH_2$

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