CHEMISTRY

JEE MAIN AND ADVANCED

ORGANIC CHEMISTRY: SOME BASIC PRINCIPLE AND TECHNIQUES

Example

1. How many sigma and pi bonds are present in

(a) $CH_3 - C \equiv N$

(b) $CH_2 = C = O$

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2. What is the type of hybridisation of each carbon in the following compounds?

(a) $CH_3 - CH_3$

(ii) $(CH_3)_2CO$

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3. Write the condensed formula and bond line formula for

(a) $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_2 - OH$

(b) $NH_2 - CH_2 - CH_2 - CH_2 - CH_2 - COOH$

(c) $CH_3 - CH_2 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_2 - CH_2 - CH_2$

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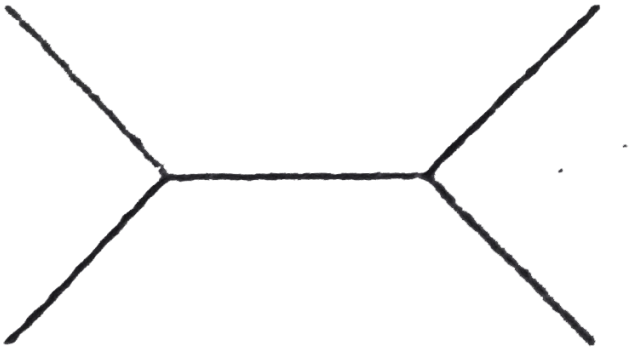
4. Expand the structure



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5. Write three-dimensional (wedge-darked wedge fine) representation for the methyl chloride (CH_3Cl)

compound

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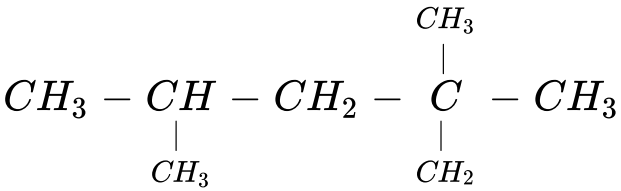
6. Write its IUPAC name



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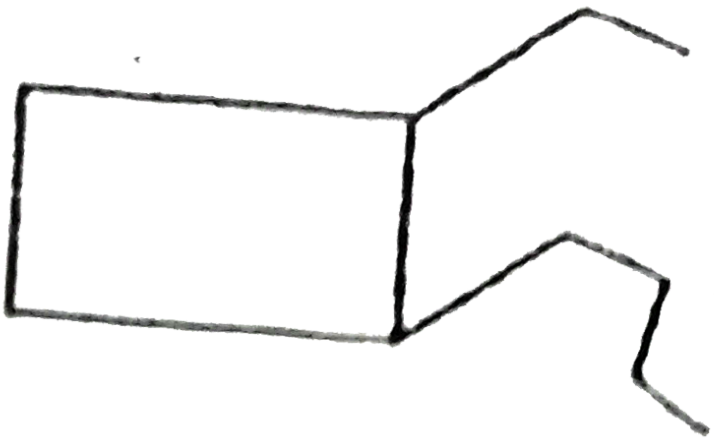
7. Give its IUPAC name



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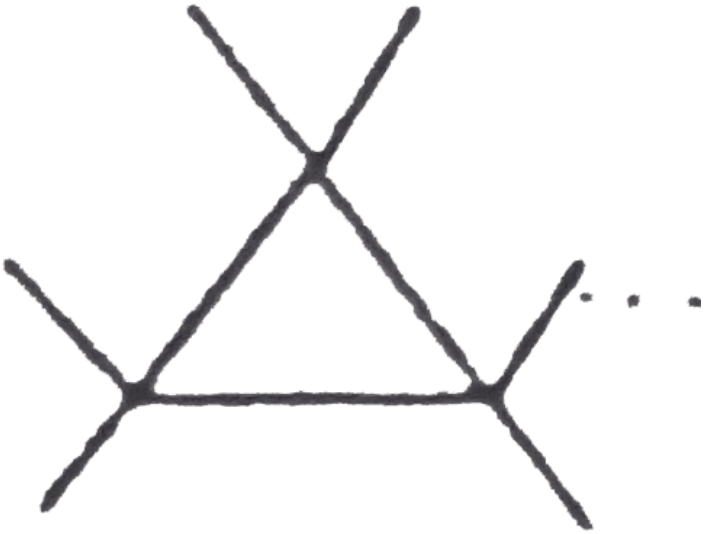
8. Give its IUPAC name



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9. Give the IUPAC name

$$CH_3 - \underset{\underset{C_2H_5}{|}}{CH} - CH_2 = \underset{\underset{C_2H_5}{|}}{CH} - CH_3$$

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10. Write the IUPAC names of the following compounds.

(i)

$$CH_3 - CH_2 - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_2 - \underset{\underset{CH_3}{|}}{CH} - CH_2 - CH_3$$

(ii) $CH \equiv C - CH = CH - CH = CH_2$

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11. Derive the structure of (i) 2-Chlorohexane, (ii) Pent-4-en-2-ol, (iii) 3- Nitrocyclohexene, (iv) Cyclohex-2-en-1-ol, (v) 6-Hydroxy- heptanal.

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12. Total number of isomers of C_4H_9Cl are

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13. Draw the polygon formulae for all the possible structural isomers having the molecular formula C_5H_{10}.

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14. Classify the reagents shown in bold in the following equations as nucleophiles or electrophiles.

(a) $CH_3COOH + OH^- \rightarrow CH_2COO^- + H_2O$

(b) $CH_3CH_2Br + SH^- \rightarrow CH_3CH_2SH + Br$

(c) $C_6H_6 + CH_3CO \rightarrow C_6H_5COCH_3$

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15. Draw resonance structures for the $C_6H_5NH_2$

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16. The stability of given free radicals in decreasing order is

(i) $CH_3 - \dot{C}H_2$, (ii) $CH_3 - C\dot{H} - CH_3$

(iii) $CH_3 - \underset{\underset{CH_3}{|}}{\dot{C}} - CH_3$, (iv) $\dot{C}H_3$

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17. 0.2475g of an organic compound gave on combustion 0.4950 of CO_2 and 0.2025g of H_2O calculate the $\%$ of C $\&$ H in it.

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18. An organic compound contains $69\,\%$ carbon and $4.8\,\%$ hydrogen, the remainder being oxygen. Calculate the masses of carbon dioxide and water produced when 0.20 gm of this substance is subjected to complete combustion.

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19. In Dumas' method for estimation of nitrogen, $0.3g$ of an organic compound released $50mL$ of nitrgen gas collected under $715mmHg$ and at $300K$. If aqueous tension at $300K$ is $15mmHg$, calculate the percentage composition of nitrogen in the organic compound.

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20. During estimation of nitrogen present in an organic compound by Kjeldahl's method, the ammonia evolved from 0.5 g of the compound in Kjeldahl's estimation of nitrogen, neutralized 10 mL of 1 M H_2SO_4. Find out the percentage of nitrogen in the compound.

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21. 0.35 g of an organic susbtance was Kjeldahilsed and the ammonia obtained was passed into 100ml of M/ $10 H_2SO_4$ The excess acid required 154 ml of $M/10 NaOH$ for neurtralisation, calculate the % of nitrogen in the compound.

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22. 0.185 g of an organic substance when treated with conc HNO_3 gave 0.32 g of silver bromide. Calculate the % of bromine in the compound.

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23. If 0.189 g of a chlorine containing organic compound gave 0.287 g of silver chloride, then the percentage of chorine in the organic compound is

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24. 0.2585g of an organic compound contaning iodine was heated with excess of strong nitric acid and silver nitrate in a carius tube. The precipitate of silver iodide was fiterred, washed and dried its weight was found to be 0.3894g . Calculate the % of iodine in the compound.

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25. 0.16 g of an organic substance was heated in carius tube and the sulphuric acid formed was precipitated as $BaSO_4$ with $BaCl_2$. The weight of the dry $BaSO_4$ was 0.35g Find the % of sulphur

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26. 0.40g of an organic compound containing phosphorus gave 0.555 g of $Mg_2P_2O_7$ by usual analysis calculate the % of phosphorus in the organic compound

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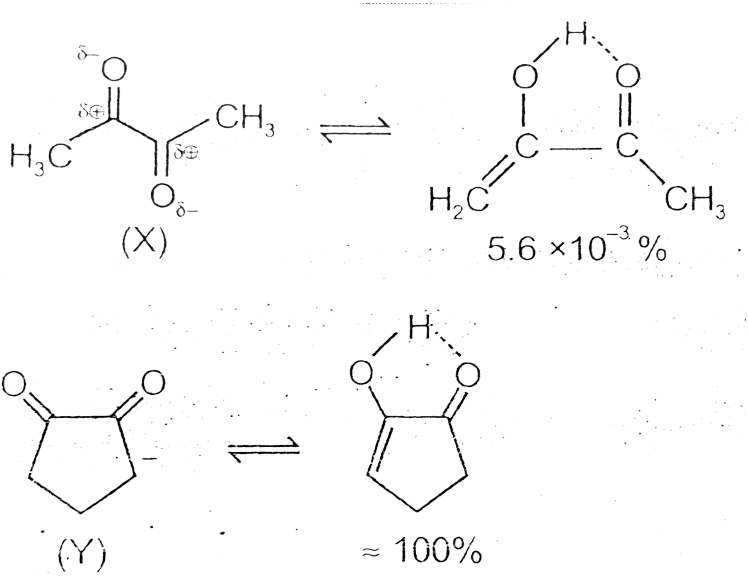
Illustration

1.



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2. Explain [8] -annulene and [10] -annulenes are nonaromatic.

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3. Which of the following is expected to generate more stable carbocation on the heterolysis of C-I bond?

$$CH_3 - O - CH_2 - 1, CH_3 - \overset{\overset{H}{|}}{N} - CH_2 - 1$$

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Assignment Section A Competition Level Questions

1. Which of the following is unsaturated compound?

A. C_6H_{14}

B. C_4H_8

C. C_3H_7OH

D. CH_3OH

Answer: B

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2. The IUPAC name of the compound $CH_2 = CH - CH(CH_3)_2$ is:

A. 1,1-Dimethylprop-2-ene

B. 3-Methylbut-1-ene

C. 2-Vinylpropane

D. 1-Isopropylethylene

Answer: B

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3. The $IUPAC$ name of the compound

$$CH_3\underset{\underset{OH}{|}}{C}HCH_2 - \overset{\overset{CH_3}{|4}}{\underset{\underset{OH}{|}}{C}} - CH_3$$

is

A. 1,1-Dimethyl butane-1,3,dial-2-ene

B. 4-Methylpentane-2,4-diol

C. 2-Methypentane-2,4-diol

D. 1,3,3-Trimethyl propane-1,3 diol

Answer: C

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4. Which of the following molecular belongs to alkyne series?

A. C_7H_{18}

B. $C_{10}H_{22}$

C. C_9H_{16}

D. $C_{16}H_{32}$

Answer: C

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5. Alicyclic compounds are

A. Aromatic compounds

B. Aliphatic cyclic compounds

C. Heterocyclic compounds

D. None of these

Answer: B

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6. The structure of 4-Methylpent-2-en-1-ol is

A. $CH_3CH_2CH = CH - CH_2 - OH$

B. $(CH_3)_2CH = CHCH_2CH_2OH$

C. $(CH_3)_2CHCH = CHCH_2OH$

D. $CH_3CH(OH)CH - CH = C(CH_3)_2$

Answer: C

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7. Which of the following has neither secondary nor tertiary hydrogen?

A. Isobutane

B. Isopentane

C. Pentane

D. Neopentane

Answer: D

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8. The IUPAC name of the compound is

$$CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2 - CH(OH) - CH_2$$

A. 4-Methylhexan-3-ol

B. Heptan-2-ol

C. 4-Methylhexan-2-ol

D. None of these

Answer: C

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9. In graphite, electrons are

A. Localised on every third carbon

B. Present in antibonding orbital

C. Localised on each carbon

D. Spred out between the structures

Answer: D

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10. What is the IUPAC name of

$$H - \overset{\overset{O}{||}}{C} - CH_2 - CH_2 - OCH_3?$$

A. 2-Formylmethoxyethane

B. Methoxypropanal

C. 2-Methoxypropanal

D. 3-Methoxypropanal

Answer: D

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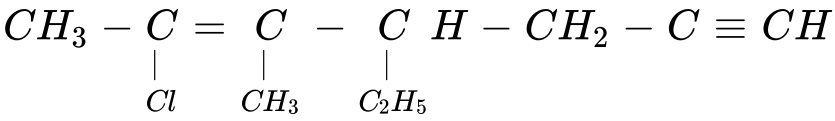
11. The IUPAC name of



A. 6-Chloro-4-ethyl-5-methylhept-5-en-1-yne

B. 6-Chloro-4-ethyl-5-methylhept-1-yne-5-ene

C. 2-Chloro-4-ethyl-3-methylhept-2-ene-6-yne

D. 2-Chloro-4-ethyl-3-methylhept-6-yne-2-ene

Answer: A

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12. The IUPAC name for the formula

$$CH_3 - \overset{\overset{CH_3}{|}}{C} = CH - COOH$$ is

A. 2-Methylbut-2-enoic acid

B. 3-Methylbut-3-ionic-acid

C. 3-Methylbut-2-enoic acid

D. 2-Methylbut-3-enoic acid

Answer: C

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13. Which of the following does not show electrical conductance?

A. Potassium

B. Graphite

C. Diamond

D. Sodium

Answer: C

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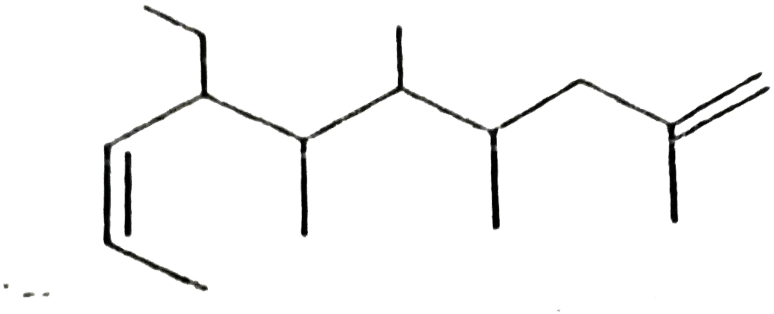
14. The IUPAC name of compound



A. 4-Ethyl-5,6,7,9-tetramethyl deca-2,9-diene

B. 7-Ethyl-2,4,5,6 -tetramethyldeca-1,8-diene

C. 7 Ethyl-2,4,5,6-tetramethyldeca-1,7-diene

D. 7(1-propenyl)-2,3,4,5-tetramethylnon-1-ene

Answer: B

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15. The bond between carbon atom (1) and carbon atom (2) in the compound $N \equiv C - CH = CH_2$ in involves the hybridisation as :

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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16. The number of σ and π-bonds in but-1-en-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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17. C-C bond length would be minimum in

A. $\equiv C - \overset{|}{\underset{|}{C}} -$

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

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

D. $\equiv C - C =$

Answer: D

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18. Which one of the following does not have sp^2 hybridised carbon ?

A. Acetone

B. Acetic acid

C. Acetonitrile

D. Acetamide

Answer: C

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19. Which of the following has a bond formed by overlap of $sp^3 - sp$, hybrid orbitals?

A. $CH_3 - C \equiv C - CH_3$

B. $CH_3 - CH = CH - CH_3$

C. $CH_2 = CH - CH = CH_2$

D. $CH_2 = CH_2$

Answer: A

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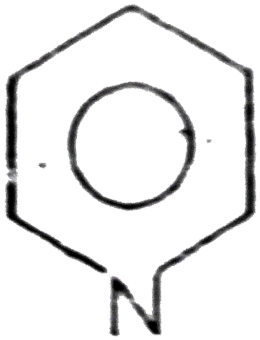
20. Hybridization of nitrogen atom in pyridine is



(Pyridine)

A. sp^3

B. sp^2

C. sp

D. sp^3d

Answer: B

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21. The compound in which underlined carbon uses only its sp^3-hybrid orbitals for bond formation is:

A. CH_3COOH

B. $CH_3 - CONH_2$

C. CH_3CH_2OH

D. $CH_3CH = CH_2$

Answer: C

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22. Which of the following series contains only electrophiles?

A. H_2O, SO_3, H_3O^+

B. $CH_3 - CONH_2$

C. CH_3CH_2OH

D. $CH_3CH = CH_2$

Answer: C

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23. The $IUPAC$ name of

$$CH_3 - \overset{\overset{O}{||}}{C} - CH_2 - \overset{\overset{OH}{|}}{C}H - CHO$$

is

A. 5-oxo-4-hydroxypenta-2-one

B. 4-Hydroxy-5-al-2pentane

C. 2-Hydroxy-4-oxopentanal

D. 1-al-4-oxo-pentan-2-al

Answer: C

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24. The IUPAC name of tertiary butyl chloride is

A. 4-Chlorobutane

B. 2-Chlorobutane

C. 1-Chloro-3-methyl propane

D. 2-Chloro-2-methyl propane

Answer: D

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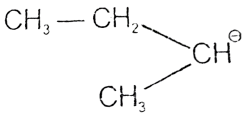
25. Most stable carbanion among the following is

A. $CH_3 - CH_2^-$

B. 

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

D. All of these

Answer: A

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26. In which of the following, homolytic bond fission takes place :

A. Alkaline hydrolysis of ethyl chloride

B. Addition of HBr to double bond

C. Photochlorination of methane

D. Nitration of benzene

Answer: C

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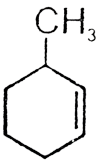
27. The IUPAC name of the  compound is

A. 3-Methylcyclohexene

B. 1-Methylcyclohex-2-ene

C. 1-Methylcyclohex-2-ene

D. 6-Methyl cyclohexene

Answer: A

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28. Aldehyde and ketones are

A. Homologous

B. Isomers

C. Geometrical

D. Conformational

Answer: B

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29. Diethyl ether and methyl n propyl ether are

A. Chain

B. Functional

C. Metamerism

D. Posotion

Answer: C

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30. $+I$ effect is shown by:

A. $-NO_2$

B. $-Cl$

C. $-Br$

D. $-CH_3$

Answer: D

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31. Electromeric effect:

A. Comes into play at the demand of attacking reagent

B. Involves displacement of electrons in a sigma bond

C. Comes into play in the molecule when at least one atom has unshared pair of electrons

D. Invovles the distortion of the electron cloud.

Answer: A

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32. The reaction intermediate produce by homolytic cleavage of bond is called,

A. Carbocation

B. Carbanion

C. Fee radicals

D. None of these

Answer: C

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33. Ammonia is iso-structural with:

A. Carbanion

B. Free radical

C. Carbocation

D. None of these

Answer: A

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34. A mixture of camphor and benzoic acid can be separated by

A. Sublimation

B. Chemical method

C. Fractional crystallisation

D. Extraction with solvent.

Answer: B

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35. In Kjeldahl's method, nitrogen present is estimated as :

A. N_2

B. NH_3

C. NO_2

D. NH_4OH

Answer: B

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36. In sodium fusion test of organic compounds, the nitrogen of an organic compound is converted to

A. Soda lime

B. Sodium cyanide

C. Sodium nitrite

D. Sodium nitrate.

Answer: B

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37. In Dumas' method, the gas (or vapor) which is collected in the nitrometer is

A. N_2

B. NO

C. NH_3

D. H_2

Answer: A

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38. 0.2 g of an organic compound on comptete combustion produces 0.18 g of water ,then the percentage of hydrogen in it is

A. 5

B. 10

C. 15

D. 20

Answer: B

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39. In a Lassaigne's test for sulphur in the organic compound with sodium nitroprusside solution the purple colour formed is due to

A. $Na_2\left(Fe(CN)_5\right)NOS\right)$

B. $Na_3\left(Fe(CN)_5S\right)$

C. $Na_2\left(Fe(CN)_5NOS\right)$

D. $Na_3\left(Fe(CN)_6\right)$

Answer: A

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40. Lassaigne's test for the detection of nitrogen will fail in case of :

A. NH_2CONH_2

B. CH_3CONH_2

C. NH_2NH_2

D. $C_6H_5NH_2$

Answer: C

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41. The Lassaigne's extract is boiled with dil. HNO_3 before testing for halogens because

A. Silver halides are soluble in HNO_3

B. Na_2S and NaCN are decomposed by HNO_3

C. Ag_2S is soluble in HNO_3

D. $AgCN$ is soluble in HNO_3

Answer: B

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42. The purity of an organic compound is determined by

A. Density

B. Melting point

C. Mixed melting point

D. Molecular mass

Answer: B

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43. 0.32 g of an organic compound gave 0.233 g of $BaSO_4$. Determine the percentage of sulphur in the

compound (Atomic mass of $Ba = 137, S = 32, O = 16$

)

A. 1.0

B. 10.0

C. 23.5

D. 32.4

Answer: B

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44. Hyperconjugation is most useful for stabilizing which of the following carbocations?

A. Neo-pentyl

B. Tert. Butyl

C. Iso propyl

D. Ethyl

Answer: B

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45. Resonance in a molecule results in

A. Destabilisation

B. Stabilisation

C. Change in bond length

D. Both 2 and 3

Answer: D

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46. Hyperconjugation involves overlap of which of the following orbitals?

A. $\sigma - \sigma$

B. $\sigma - \pi$

C. $\pi - \pi$

D. None of these

Answer: B

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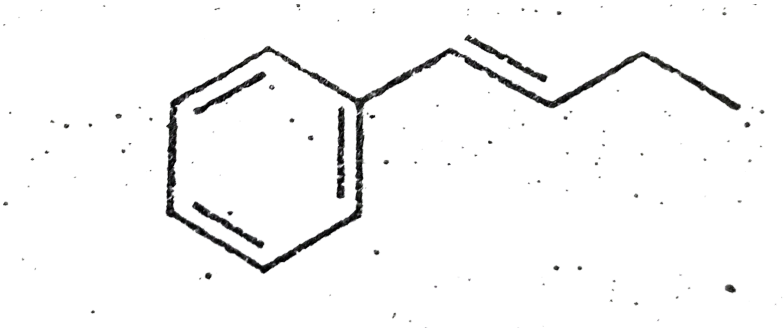
47. How many bonds are there in



A. 14σ and 8π

B. 18σ and 8π

C. 22σ and 4π

D. 14σ and 2π

Answer: C

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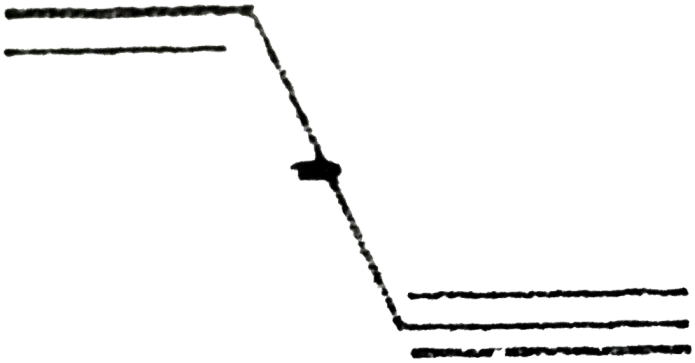

48. this hydrocarbon has hybridization

A. sp, sp^2, sp^3

B. sp, sp^2

C. sp^2, sp^3

D. sp, sp^3

Answer: B

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49. Considering the state of hybridization of carbon atoms, find out the molecule among the following which is linear?

A. $CH_3CH = CH - CH_3$

B. $CH_3 - C \equiv C - CH_3$

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

D. $CH_3 - CH_2 - CH_2 - CH_3$

Answer: B

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50. The best and latest technique for isolation, purification and separation of organic compound is

A. Chromatography

B. Steam distillation

C. Crystallisation

D. Vaccum distillation.

Answer: A

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Section B Objective Type Question One Option Is Correct

1. Compound having molecular formula $C_5H_{12}O$ cannot show

A. Tautomerism

B. Position isomerism

C. Metamerism

D. Functional isomerism

Answer: A

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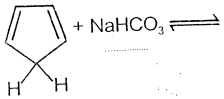
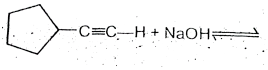
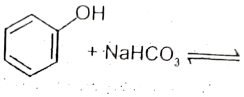
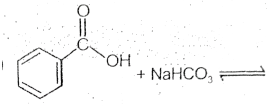
2. In which of the following reactions equilibrium will shift towards right?

A. 

B. 

C. 

D. 

Answer: D

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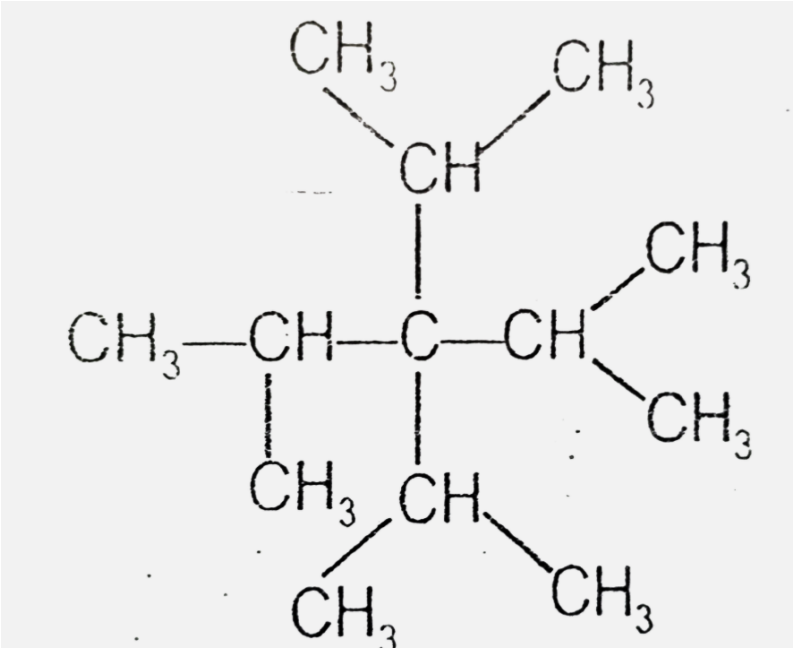
3. The IUPAC name of the compound



A. 3-disopropyl-2,4-dimethylpentane

B. 2,4-dimethyl-3-disopropylbutane

C. 2,4-dimethyl-3-3-bis(1-methylethyl) pentane

D. None of these

Answer: C

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4. At conjugated position -NO imparts

A. $+M$ and + I effect

B. $-M$ and -I effect

C. $+M$ and -I effect

D. $-M$ and +I effect

Answer: B

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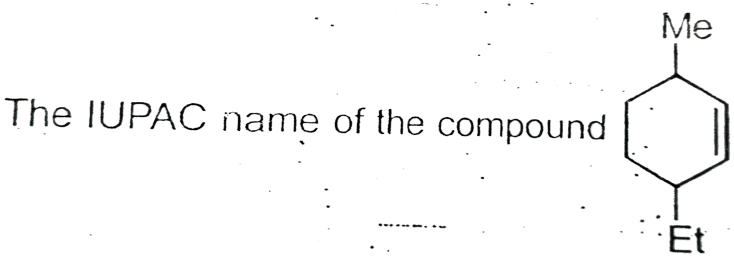
5. The IUPAC name of the compound



A. 3-methyl-56-ethylcyclohexene

B. 6-ethyl-3-methyl cyclohexene

C. 3-ethyl-6-methyl cyclohexene

D. 6-methyl-3-ethyl cyclohexene

Answer: C

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6. Strongest and weakest acid among the following is

$$CH_3 - NO_2CH_3 - CHOCH_3 - FCH_3 - CN$$

A. I and II

B. III and IV

C. III and II

D. I and III

Answer: D

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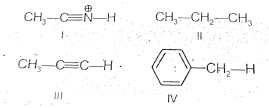
7. Correct order of acidic strength for the given species

A. $CH_3 - C \equiv \overset{\oplus}{N} - H$

B. $CH_3 - CH_2 - CH_3$

C. $CH_3 - C \equiv C - H$

D. 

Answer: D

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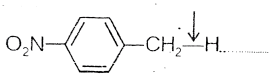
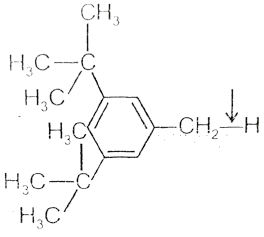
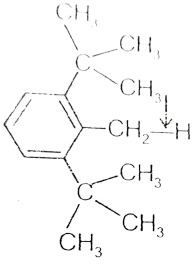
8. Which of the following will have weakest indicated C-H bond?

A. 

B. 

C. 

D. $CH_3 - H$

Answer: C

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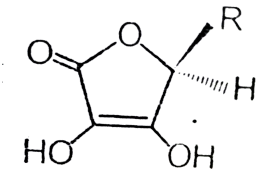
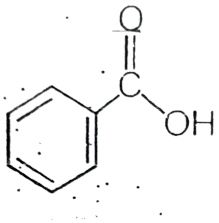
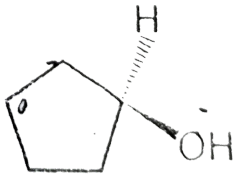
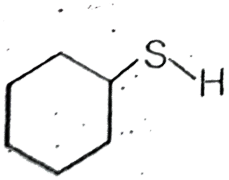
9. Which of the following compounds will not dissolve in aqueous NaOH?

A. 

B. 

C. 

D. 

Answer: C

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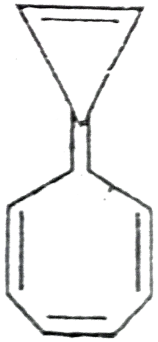
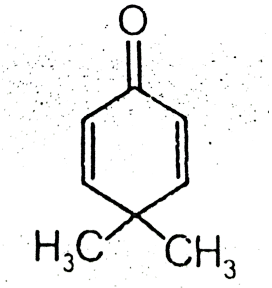
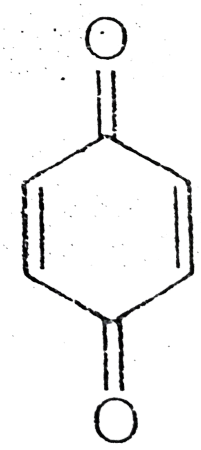
10. In which of the following all electronic effects namely inductive, mesomeric and hyperconjugative effects are present?

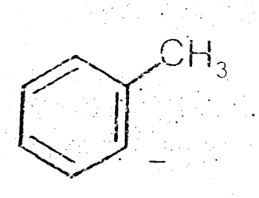
A.



B.



C. 

D. 

Answer: D

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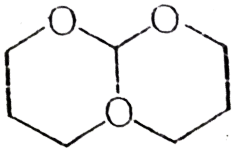
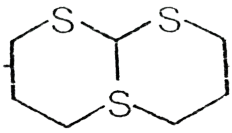
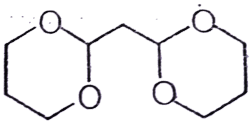
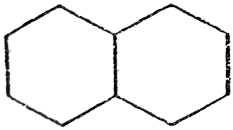
11. Most acidic species among the following is

A. 

B. 

C. 

D. 

Answer: B

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12. What is the index of hydrogen deficiencyd in the molecule $C_{12}H_{17}NO$?

A. 4

B. 5

C. 6

D. 7

Answer: B

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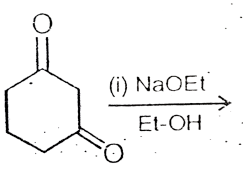
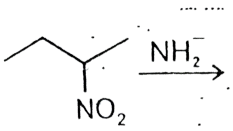
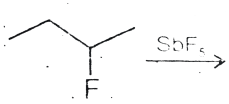
13. Which of the following reactions will not generate a carbonion?

A. 

B. 

C. 

D. $CH_3 - C \equiv C - H \xrightarrow{NaNH_2 / NH_3}$

Answer: C

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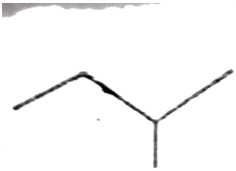
14. Which will have highest melting point?

A. 

B. 

C. 

D. 

Answer: C

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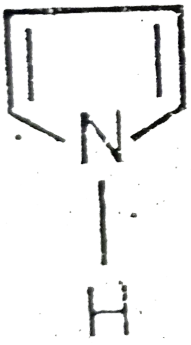
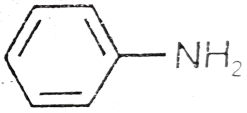
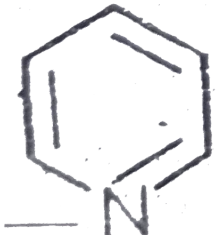
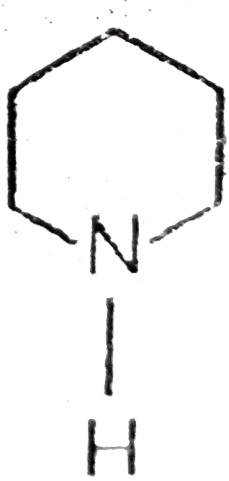
15. Which of the following is the strongest base in water?

A. 

B. 

C. 

D. 

Answer: D

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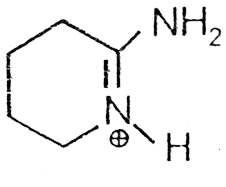
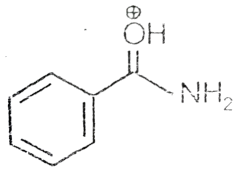
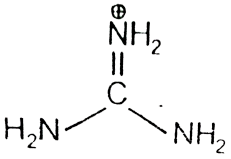
16. Which of the following is most acidic?

A. 

B. 

C. $CH_3 - O - H$

D. 

Answer: B

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17. Isomers which can be interconverted through rotation around a single bond are

A. Conformers

B. Diastereomers

C. Chain isomers

D. Positional isomers

Answer: A

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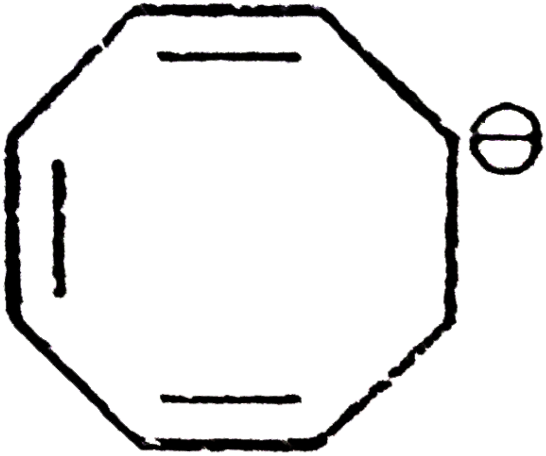
18. In the given anion,-ve charge is delocalized on



A. One atom

B. Three atom

C. Four atom

D. Five atom

Answer: C

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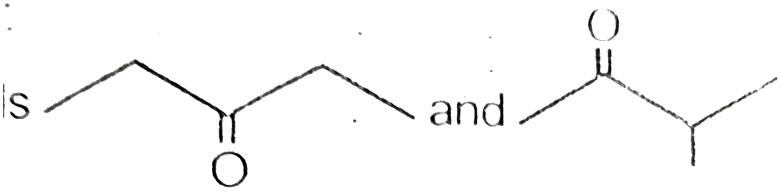
19. The compounds



are

A. Chain isomers

B. Metamers

C. Positions isomers

D. Both 1 and 2

Answer: D

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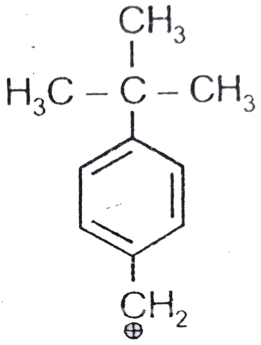
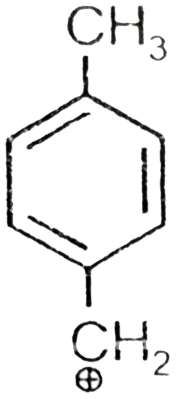
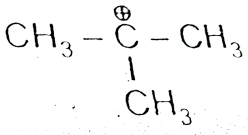
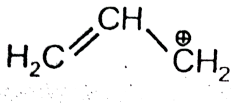
20. Least stable carbocation among the following is

A. 

B. 

C. 

D. 

Answer: D

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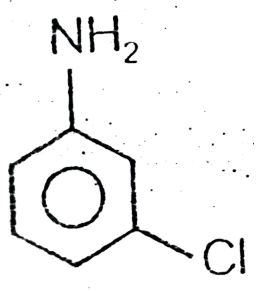
21. Which of the following compound will give blood red colour while doing the Lassaigne's test for N?

A. $(NH_2\_(2)C=O$

B. $H_2N(C_6H_4)SO_3H$

C. $C_6H_5SO_3H$



D.

Answer: B

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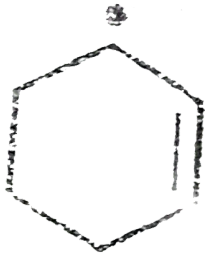
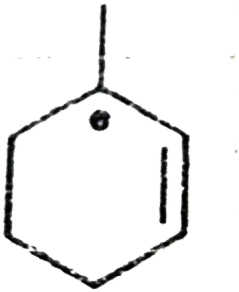
22. The most stable free radical is



A.

B.



C.

D.

Answer: B

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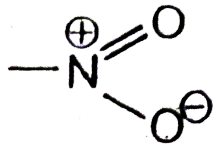
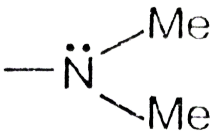
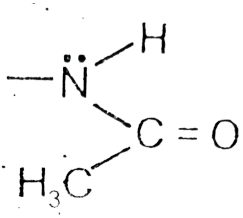
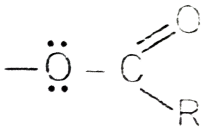
23. Which of the following group will have strongest electron donating mesomeric effect?

A. 

B. 

C. 

D. 

Answer: B

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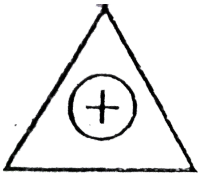
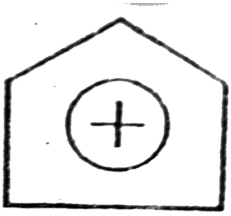
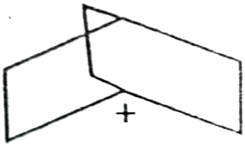
24. Among the following the most stable carbocation

A. $CH_3 - CH^+ - CH_3$

B. 

C. 

D. 

Answer: B

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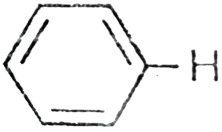
25. Most acidic species among the following is

A. $CH_3 - \overset{\overset{O}{||}}{C} - CH_3$

B. $CH_3 - O - H$

C. $CH_3 - C \equiv C - H$

D. 

Answer: B

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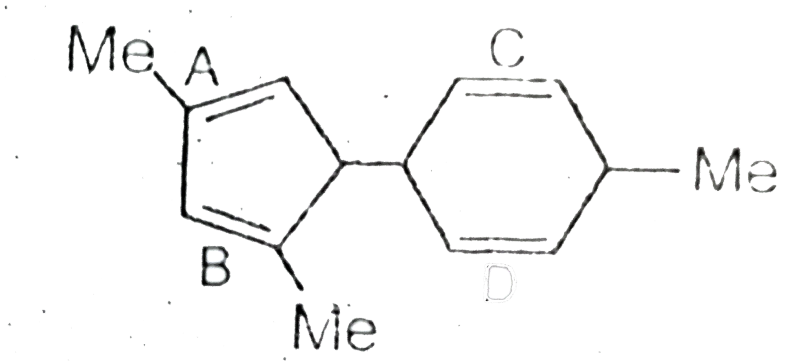
26. Which of the following double bond in the given molecule is most reactive towards a strong protic acid?



A. A

B. B

C. C

D. D

Answer: A

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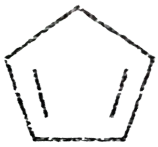
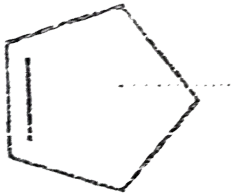
27. Which of the following hydrocarbon is most stable?

A. 

B. 

C. 

D. 

Answer: A

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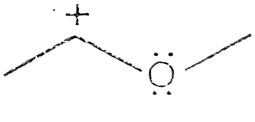
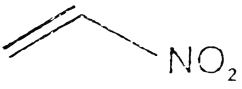
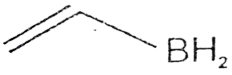
28. Resonance is not possible in

A. 

B. 

C. 

D. 

Answer: B

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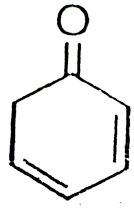
29. Which of the following compounds will have highest enolic content?

A. (1) 

B. CH_3COCH_2CHO

C. CH_3CHO

D. CH_3COCH_3

Answer: A

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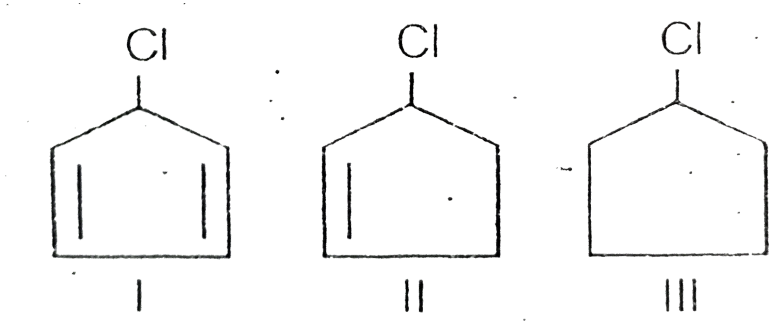
30. Among the following



The correct order of reactivity of chloride is

A. $I > II > III$

B. $III > II > I$

C. $II > I > III$

D. $II > III > I$

Answer: D

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31. Which of the following organic molecule can not form hydrogen bond in pure state but can form the same in water?

A. $(CH_3CH_2)_2NH$

B. CH_3CHO

C. CH_3CH_2COOH

D. $CH_2\overset{O}{\overset{||}{C}} - NH_2$

Answer: B

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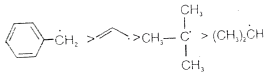
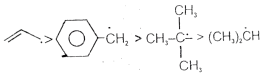
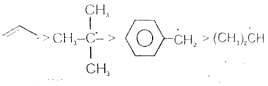
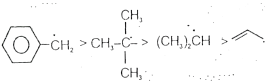
32. Correct stability order of the given free radicals is

A. 

B. 

C. 

D. 

Answer: B

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33. In which of the following, homolytic bond fission takes place :

A. Alkaline hydrolysis of ethylchloride

B. Addition of HBr to double bond.

C. Photochlorination of methane

D. Nitration of benzene

Answer: C

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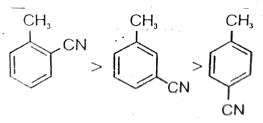
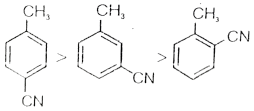
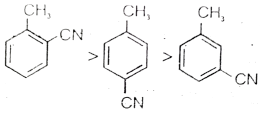
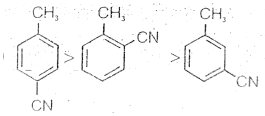
34. Which of the following is correct order of dipole moment of 0, m and p-methyl benzonitrile?

A. 

B. 

C. 

D. 

Answer: B

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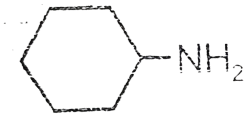
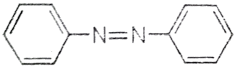
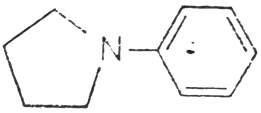
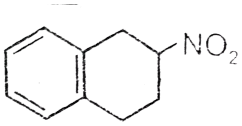
35. Which of the following compounds will give negative Lassaigne is test for Nitrogen?

A. 

B. 

C. 

D. 

Answer: B

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36. A mixture contains four solid organic compounds containing A, B, C and D. On heating only C changes from solid to vapour state .C can be separated from the rest in the mixture by

A. Distitation

B. Kinetic resolution

C. Crystalization

D. Sublimation.

Answer: D

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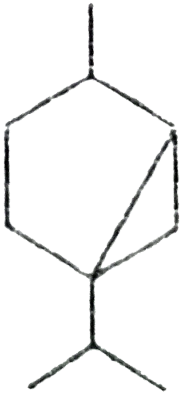
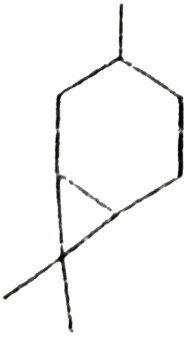
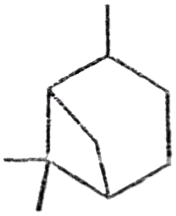
Section C Objective Type Question More Than One Options Are Correct

1. Which of the following bicyclic compounds are isomers?

A. 

B. 

C. 

D.

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

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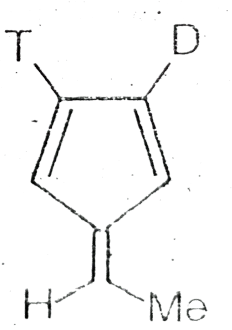
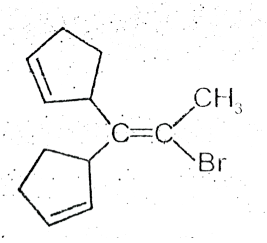
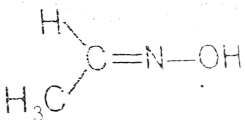
2. Species which will exhibit geometrical isomerism among the following is/are?

A. 

B. 

C. 

D. N_2H_2

Answer: A::C::D

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3. Which of the following molecular formula will exhibit functional isomerism as well as metamerism?

A. $C_4H_{10}O$

B. $C_4H_{11}N$

C. C_4H_8O

D. C_4H_9Cl

Answer: A::B::C

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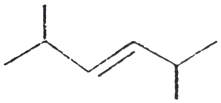
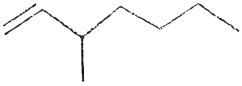
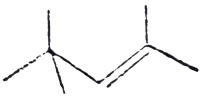
4. Out of the given isomeric hydrocarbons which will undergoes rearrangement reaction in acidic medium?

A. 

B. 

C. 

D. 

Answer: B::C

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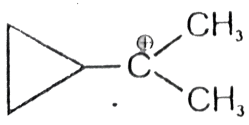
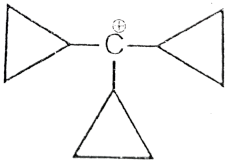
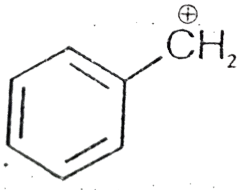
5. Which of the following is stablised by overlapping of p-orbitals?

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

B. 

C. 

D. 

Answer: B::C

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6. Formic acid is more acidic than

A. Benzoic acid

B. Acetic acid

C. Phenol

D. Benzene sulphoric acid

Answer: A::B::C

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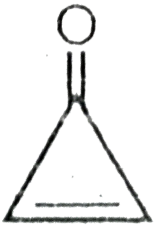
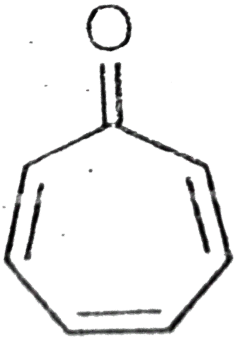
7. Which of the following will have C=O bond length almost similar to C-O bond length?

A. 

B. 

C. 

D. $O = C = O$

Answer: A::B

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8. Dichloro ethene shows

A. Geometrical isomerism

B. Position isomerism

C. Metamerism

D. Chain isomerism

Answer: A::B

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9. A compound having molecular formula $C_4H_{10}O$ can show

A. Metamerism

B. Functional isomerism

C. Chain isomerism

D. Position isomerism

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

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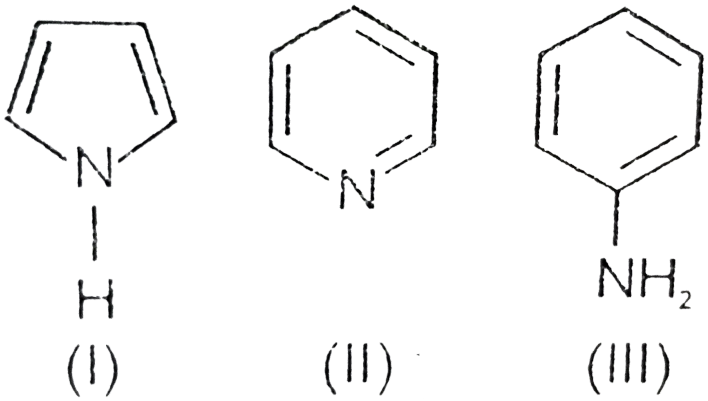
10. Consider the following compounds Which of the following statements are correct?



(I) (II) (III)

A. I is more basic than II

B. II is more basic than I and III

C. III is more basic than II

D. I is weakly acidic

Answer: B::D

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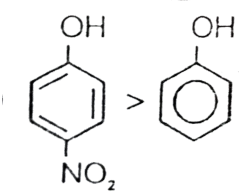
11. Which of the following correctly represent the acidic strenth of given acids?

A. $Cl_3CH > F_3CH$

B. $CH_3COOH > CH_3CH_2OH$

C. $H_2O > CH_3CH_2OH$

D. 

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

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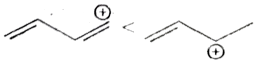
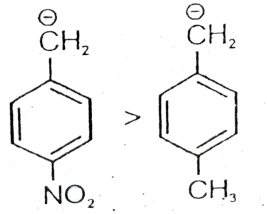
12. Which of the following correctly represents the stability of reactive intermediate?

A. $CH_3 - CH_2 < CH_3O\overset{\oplus}{C}H_2$

B. 

C. 

D. 

Answer: A::B::C

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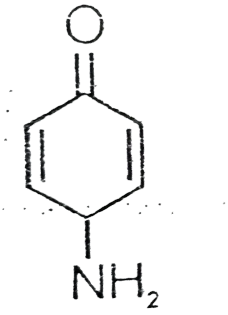
13. Keto-enol Tautomerism is observed in

A. $C_6H_5 - CHO$

B. $C_6H_5 - CO - CH_3$

C. 

D. $C_6H_5 - CO - CH_2 - CO - CH_3$

Answer: B::C::D

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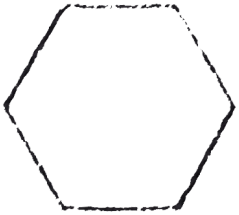
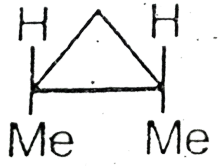
14. Which of the following can exhibit geometrical isomerism?

A. $C_6H_4CH2 = N - OH$

B. 

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

D. 

Answer: A::D

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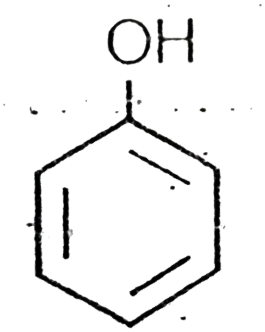
15. The compounds which cannot react with NaOH is/are

A. $CH_3 - C \equiv CH$

B. NH_3

C. C_2H_5OH

D. 

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

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16. The hybridisation of N is correctly given in

A. sp^3 in acetamide

B. sp^2 in pyridine

C. sp^2 in pyrrole

D. sp in methyl cyanide

Answer: B::C::D

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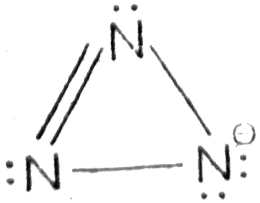
17. Which of the following Lewis structures are valid resonating structuresfor the azide ion?

A. $: \overset{\cdot\cdot}{N} - \overset{\oplus}{\underset{\cdot\cdot}{(N)}} - \overset{\cdot\cdot}{N} :$

B. $: N \equiv N = \overset{\cdot\cdot\ \oplus}{N} :$

C. $: \overset{\oplus\ \cdot\cdot}{N} = \overset{+}{N} = \overset{\cdot\cdot\ \oplus}{N} :$

D. 

Answer: A::C

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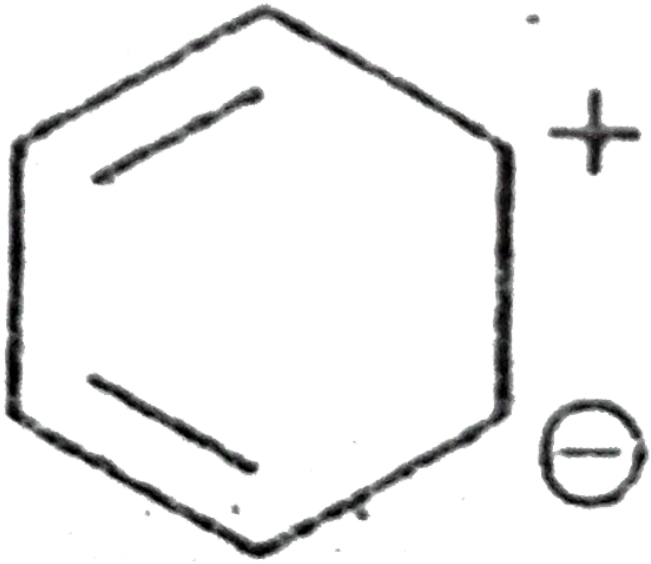
18. In the given compound



A. sp^2 and sp^2

B. sp^3

C. sp

D. dsp^2

Answer: B::C::D

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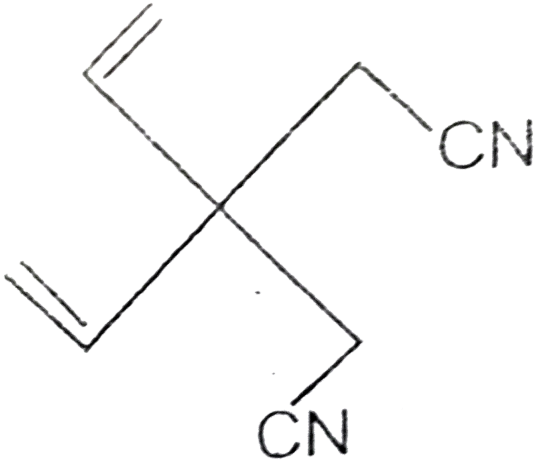
Section D Linked Comprehension Type Questions

1. Names of organic compounds are under the latest guide line of IUPAC IUPAC means international union of pure and applied chemistry. The main rules are longest chain rule, lowest number rule etc. We have to include the rules for naming the substituetns, multiple bonds and even functional groups.

Write the IUPAC name of the following compound



A. 3,3-Diethenyl pentane 1,5-dinitrile

B. 3, ethyenyl,3-ethyl pentane 1,5-dinirile

C. 3,3-diethenyl pentane 1,5-dicyanide

D. None of these

Answer: A

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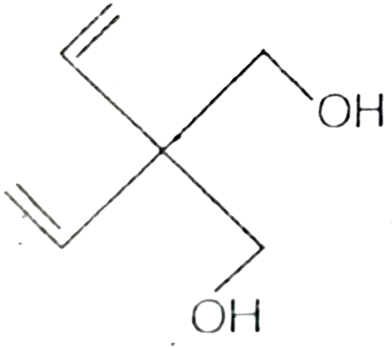
2. Names of organic compounds are under the latest guide line of IUPAC IUPAC means international union of pure and applied chemistry. The main rules are longest chain rule, lowest number rule etc. We have to include the rules for naming the substituetns, multiple bonds and even functional groups.



, IUPAC name is

A. 3,3-diethenyl pentane 1,5-diol

B. 2,2-diethenyl propane 1,3-diol

C. 2,3-diethenyl propane 1,3-diol

D. 3,3-diethenyl propane 1,3j-dialcohol

Answer: B

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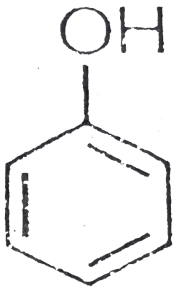
3. Weak Acid does not dissociate completely into its ions. It is in equilibrium with its conugate base. Greater is the stability of conjugate base, greater is value of k for that equilibrium making the equilibrium move in $\left(Ha \overset{K}{\Longleftrightarrow} H + A^{-}\right)$ forward direction i.e. more is the degree of dissociation of that acid. Same is the case for weak bases. Factors affecting the stability of conjugate acid or base are electronic effect like resonance effect

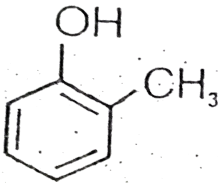
and inductive effect acting upon the species.

Which of the following is strongest acid?

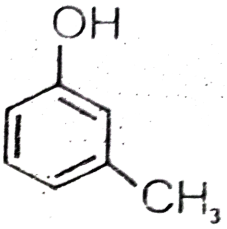
A.



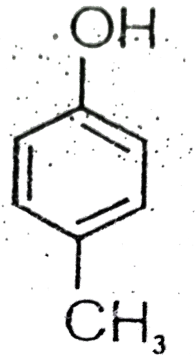
B.



C.



D.



Answer: A

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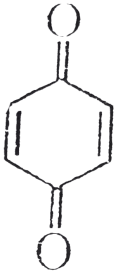
4. Weak Acid does not dissociate completely into its ions. It is in equilibrium with its conugate base. Greater is the stability of conjugate base, greater is value of k for that equilibrium making the equilibrium move in $\left(Ha \overset{K}{\Longleftrightarrow} H + A^-\right)$ forward direction i.e. more is the degree of dissociation of that acid. Same is the case for weak bases. Factors affecting the stability of conjugate acid or base are electronic effect like resonance effect and inductive effect acting upon the species.

Which of the following is having most acidic α-Hydrogen?

A. $CH_3 - NO_2$

B. $\underset{\underset{NO_2}{|}}{CH_2} - NO_2$

C. $NO_2 - \underset{\underset{NO_2}{|}}{CH} - NO_2$



D.

Answer: C

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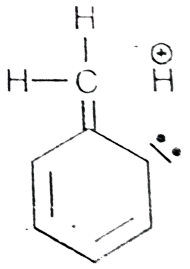
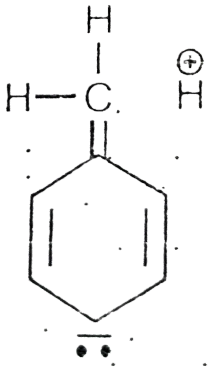
5. Hyperconjugation is defined as No bond resonance. The concept of hyperconjugation arose from the discovery of electron releasing pattern for alkyl groups. It involves σ electrons of C-H bond. Greater the number of C-H bond (α-hydrogen atom w.r.t. double bond) more will be hyperconjugative structures, more will be stability Heat of hydrogenation of alkene are affected by hyperconjugative effects.

Which of the following is incorrect hyperconjugative structure?

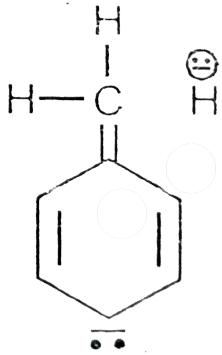
A.



B.



C.



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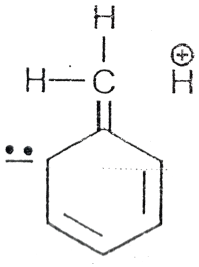

Answer: C

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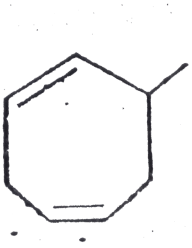
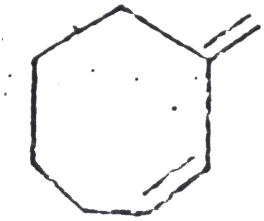
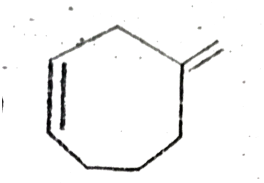
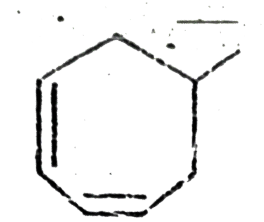
6. Hyperconjugation is defined as No bond resonance. The concept of hyperconjugation arose from the discovery of electron releasing pattern for alkyl groups. It involves σ electrons of C-H bond. Greater the number of C-H bond (α-hydrogen atom w.r.t. double bond) more will be hyperconjugative structures, more will be stability Heat of hydrogenation of alkene are affected by hyperconjugative effects.

Which of the following has highest heat of hydrogenation?

A. 

B. 

C. 

D. 

Answer: C

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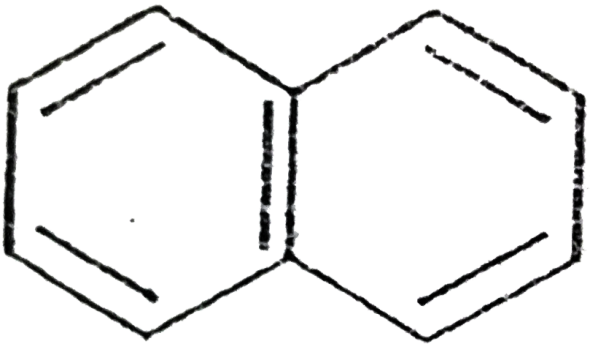
Section E Assertion Reason Type Questions

1. Statement-1: In naphthalene all C-C bonds are equal



Naphthalene

and

Statement-2: Like benzene naphthalene is also aromatic.

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2. Statement-1: p-Nitroaniline is more polar than nitrobenzene

and

Statement-2: Nitro group has -M effect.

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3. Statement-1: All C-C bonds are equal in [10]-Annulene.

and

Statement-2: [10]-Annulene is a non aromatic compound

A. Statement - I is True; Statement -II is true; Statement-II is not a correct explanation for Statement-I

B. Statement - I is True; Statement -II is true; Statement-II is a correct explanation for Statement-I

C. Statement -I is True; Statement -II is False.

D. Statement -I is False; Statement -II is True

Answer: D

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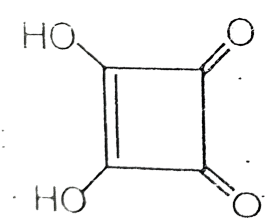
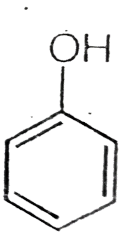
4. Statement-1:



Squaric acid

is less acidic than



Phenol

and

Statement-2: Conjugate base of phenol is resonance stabilized

Statement-2: Conjugate base of phenol is resonance stabilized.

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5. Statement-1: A compound with odd number of nitroen always contains odd molecular weight.

and

Statement-2: Nitrogen has odd molecular mass.

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6. Statement-1: Aldehydes and ketones having same molecular formulae are structural isomers

and Statement-2: Aldehyde and ketones are metamers.

A. Statement -I is True; Statement -II is True; Statement-II is a correct explanation for Statement-I

B. Statement - I is True; Statement -II is true; Statement-II is not a correct explanation for Statement-I

C. Statement -I is false; Statement -II is False.

D. Statement -I is False; Statement -II is True

Answer: C

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7. Statement-1: Carbocationic rearrangement is known as electrophilic rearrangement

and

Statement-2: Carbocations are stabilized by both hyperconjugation and +I effect.

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8. Statement-1: Cyclopentanone exhibits keto enol tautomerism.

and

Statement-2: Cyclopentanone has two hydrogen atoms attached to the carbon atom adjacent to carbonyl.

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9. Statement-1: $CH_3CH_2\overset{\oplus}{C}H_2$ is less stable than $CH_3-\underset{\underset{H}{|}}{N}-\overset{\oplus}{C}H_2$

and

Statement-2: Carbocation with adjacent hetero-atom like N O are less stable .

A. Statement -1 is True, Statement -2 is True, Statement -2 is a correct explanation for Statmenet -1.

B. Statement -1 is True, Statement -2 is True, Statement-2 is NOT a correct explanation for Statement -1

C. Statement -1 is True, Statement -2 is False

D. Statement -1 is False, Statmenet -2 is True

Answer: C

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10. Statement-1: Cyclopentanone exhibits keto enol tautomerism.

and

Statement-2: Cyclopentanone has two hydrogen atoms attached to the carbon atom adjacent to carbonyl.

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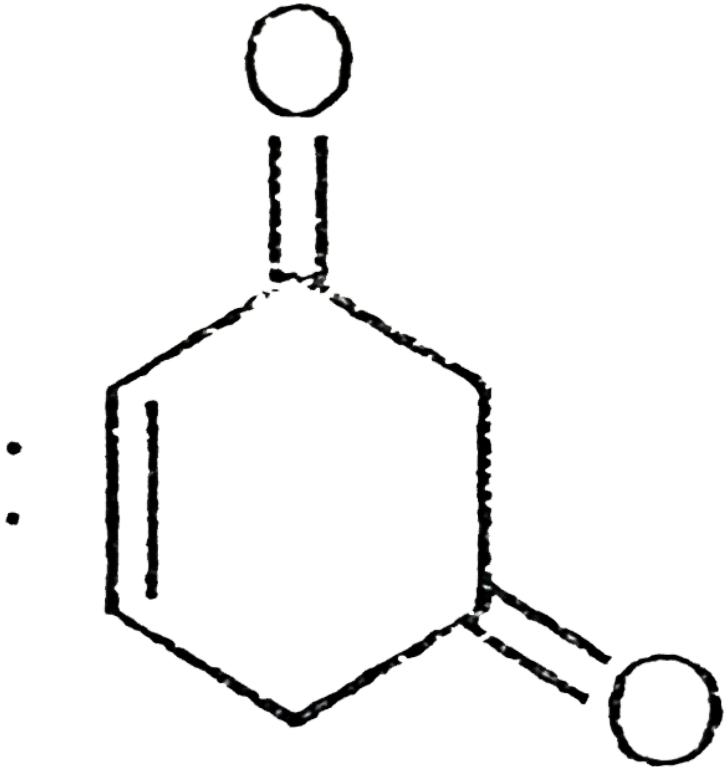
11. Statement-1:



Keto form

is less stable than enol form

and

Statement-2: Enol form is stabilized by aromaticity.

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12. Statement-1: Aniline undergoes-Friedel craft alkylation more readily than Toluene

and

Statement-2: Aniline undergoes fast electrophilic substituion than Toluene.

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13. Statement-1: Bridge head carbocation is less stable than Bridge head carbanion.

and

Statement-2: C atom in carbocation is sp^2 generally hybridized.

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Section G Integer Answer Type Questions

1. One mole of a compound with molecular formula $C_{30}H_{43}N$ absorbs 8 moles of H_2 gas under catalytic hydrogenation. Then what is the ratio of number of π bonds to the number of rings in the compound

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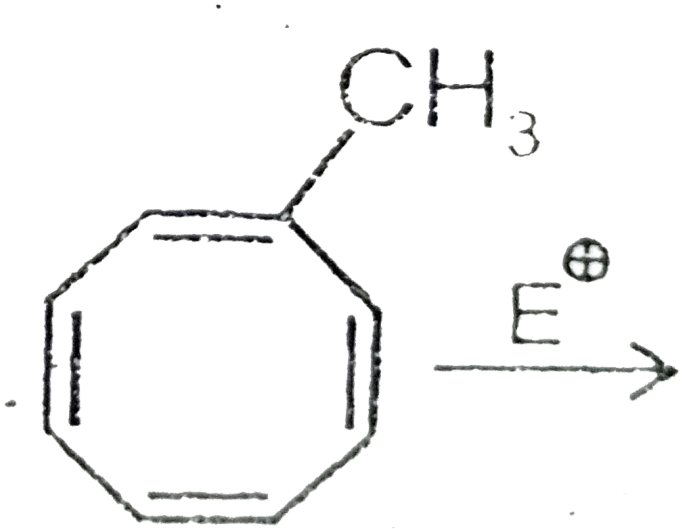

2.

How many intermediates are obtained when reactant is treated with an electrophile E^+?

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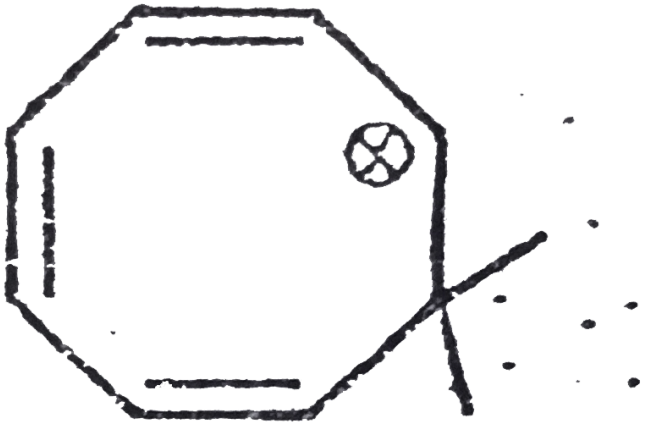
3. On how many atoms positive charge is deloclized in the given ion ?



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4. How many of the given species will behave as an electrophile?

$: CCl_2, NH_3, \overset{\oplus}{C}H_3, \overset{\oplus}{N}H_4, \overset{-}{C}H_3, \overset{\oplus}{O}H, BF_3, AlCl_3, \overset{\oplus}{B}r$

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5. How many bicyclic isomers are possible for the molecular formula $C_6H_{12}O$?

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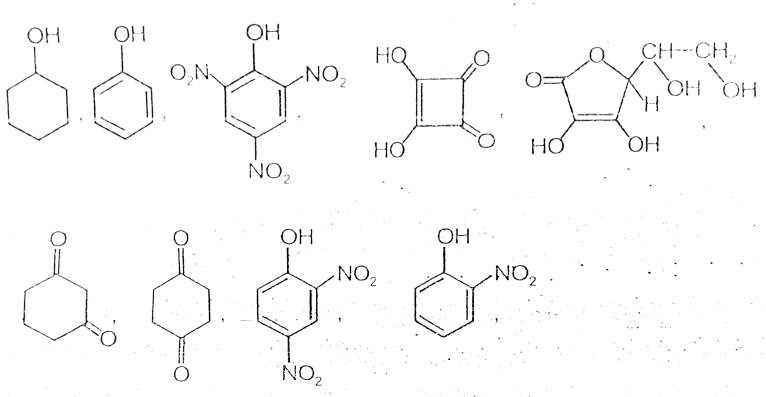
6. How many of the given species will evolve CO_2 with $NqaHCO_3$?



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7. How many total types of products are formed by dehydrohalogenation of 2 chlorobutane?

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8. The toal number of structural dihaloderivative possible in n-pentane are ____.

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Section H Multiple True False Type Question

1. Statement-1: Phenol is more acidic than benzoic acid

Statement-2: Fluorbenzene is les reactive than chlorobenzene towards electrophilic substitiution

Statement-3: Friedel Craft alkylation is not possible in tertiary butyl benzene

A. TFT

B. F F F

C. F T F

D. T T F

Answer: B

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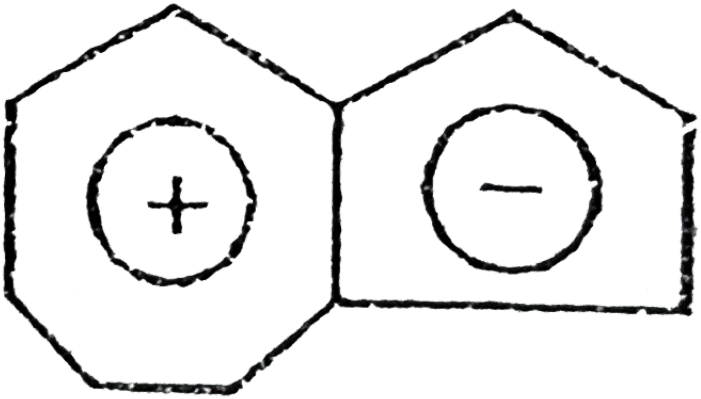
2. Statement-1: $CH_3 - O - CH_2$ is more stable than

$$O = \overset{\overset{O}{|}}{N} - CH_2$$

Statement-2:



is

antiaromatic molecule

Statement-3: Phenoxide is more stable than ethoxide

A. F F T

B. T T F

C. F T F

D. T F T

Answer: D

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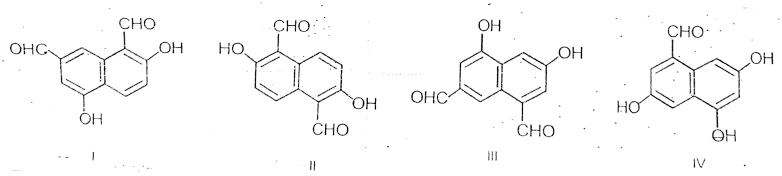
Section I Subjective Type Questions

1. Rank the given species in the increasing order of water solubility



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2. The given six compounds are similarly sized, very similar molecular weight and number of electrons, but the boiling point of these compounds are quite different $(30^{\circ}C - 141^{\circ}C)$ rank these compounds in the increasing order of boiling point (lowest boiling first)

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3. For the given pair of compounds, identify the compound you expect to have the higher boiling point

and explain your reasoning.

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4. Which of the following reactive intermediate is more stable and why?

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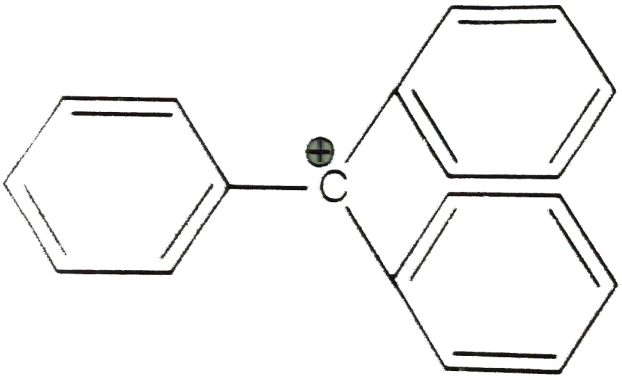
5. The structure of triphenylmethyl cation is given below. This is very stable and some of its salts can be stored for months. Explain the cause of high stability of

this cation.



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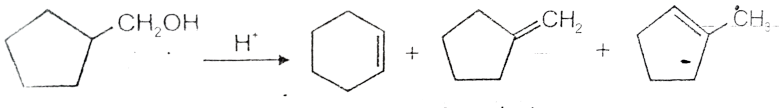
6. For the dehydration reaction.



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7. Which of the following carbanion is less stable and why?

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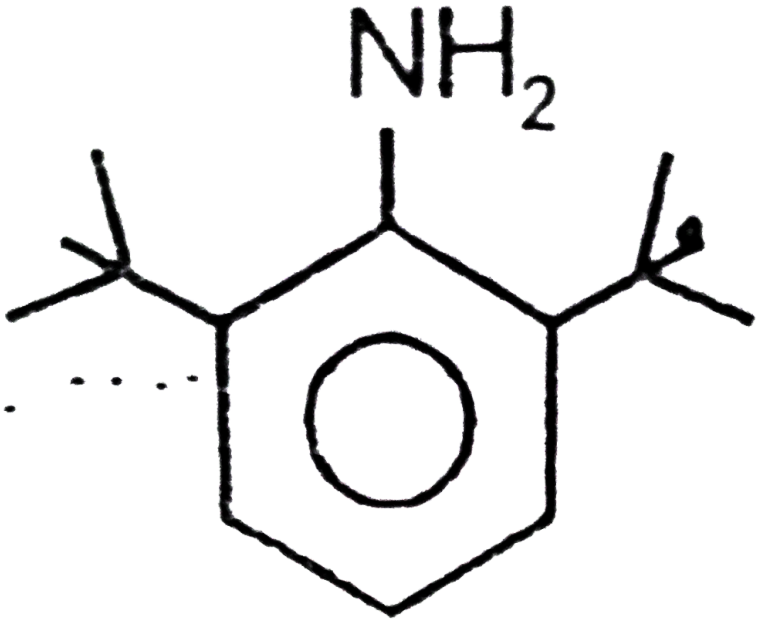
8. Aromatic amines are weakly basic, whereas



is strongly basic, explain this unusual behaviour.

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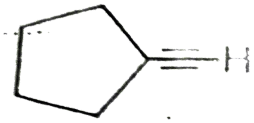
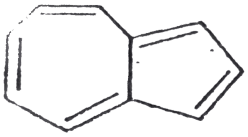
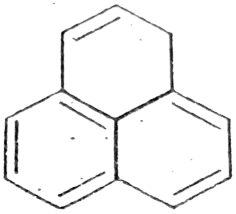
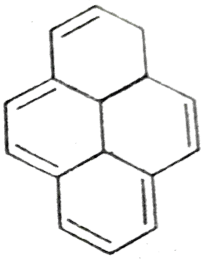
Section J Aakash Challengers Questions

1. Which of the following hydocarbon can be readily deprotonated by NaOEt? Explain.

A. 

B. 

C. 

D. 

Answer:

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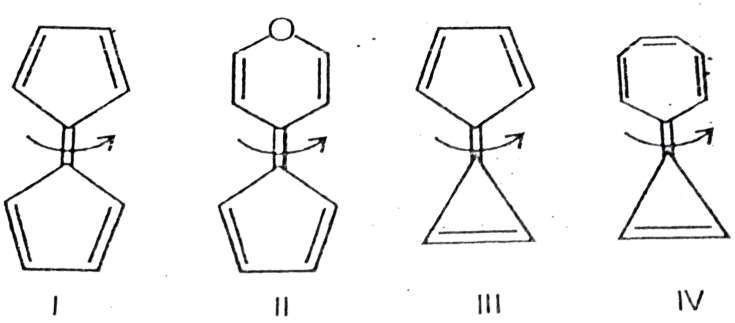
2. Pick out the correct statements about the barrier of rotation about the indicated bond in the given compounds



A. I and IV will have nearly same barrier of rotation

B. II and III will have same barrier of rotation

C. At room temperature I will have frozen rotation.

D. III will relatively lower barrier of rotation as compared to IV.

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

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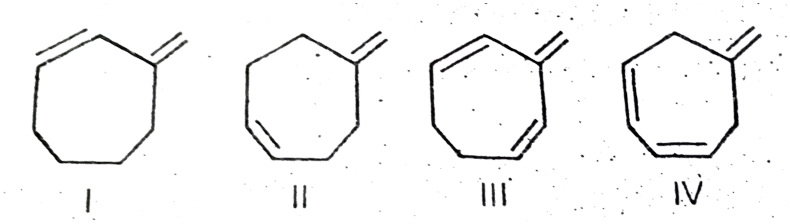
3. Arrange the given species in the increasing acidic strength:



A. $II < I < IV < III$

B. $IV < III < I < II$

C. $II < I < III < IV$

D. $III < IV < II < I$

Answer: C

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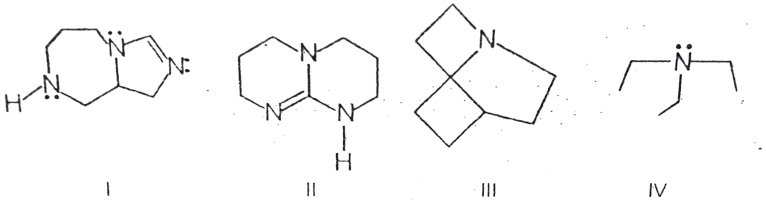
4. Order of basicity of the following species is



A. $I > II > IV > III$

B. $III > IV > II > I$

C. $IV > III > I > II$

D. $II > I > III > IV$

Answer: D

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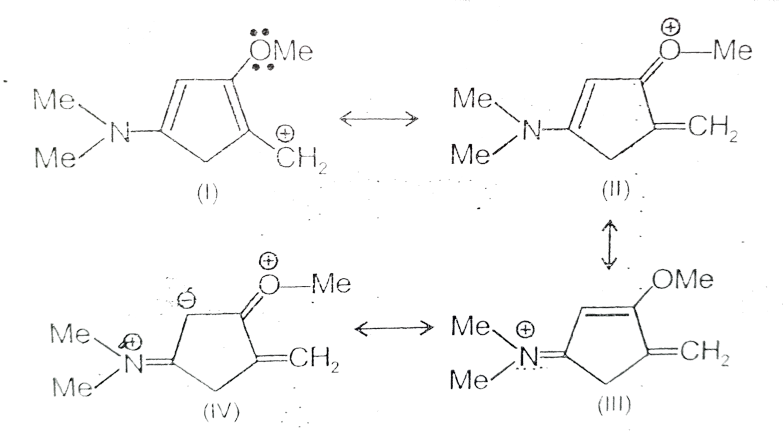
5. The correct statbility order of the following resonance structure is



A. $I < III < IV < II$

B. $I < IV < III < II$

C. $I < IV < II < III$

D. $IV < I < II < III$

Answer: C

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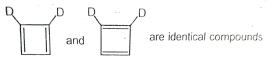
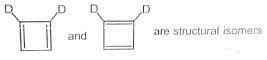
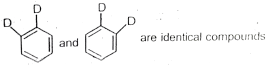
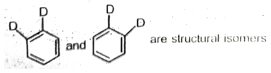
6. Correct statements among the following is/are

A. 

B. 

C. 

D. 

Answer: B::C

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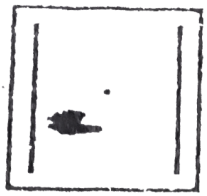
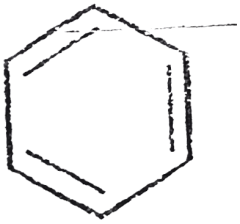
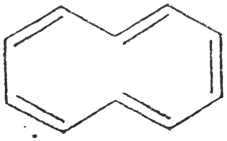
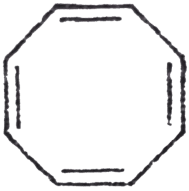
7. Species in which all C-C bonds are not equal is/are

A. 

B. 

C. 

D. 

Answer: A::C::D

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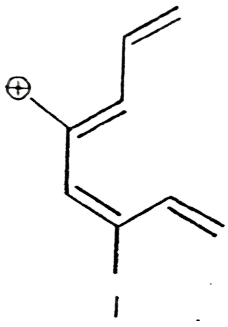
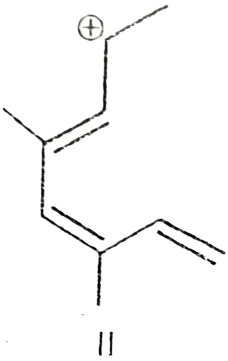
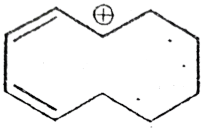
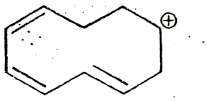
8. Most stable carbocation among the following is

A. 

B. 

C. 

D. 

Answer: B

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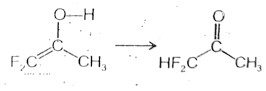
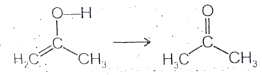
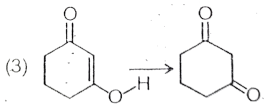
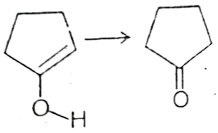
9. For which of the following compound tautomerization reaction is very slow?

A. 

B. 

C. 

D. 

Answer: A

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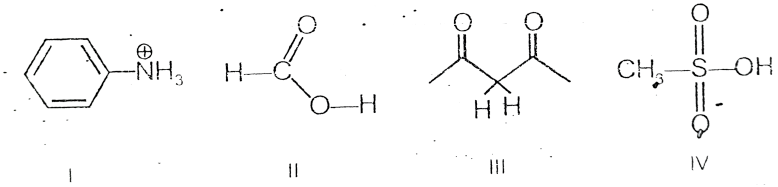
10. Compare acidic strength of



A. $II > I > III > IV$

B. $IV > II > I > III$

C. $III > IV > II > I$

D. $II > IV > I > III$

Answer: B

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Try Yourself

1. Indicate the $\sigma \& \pi$ bonds in

(i) CH_2Cl_2

(ii) $CH_3 - C \equiv C - CH_3$

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2. On the basis of hydribidsation predict the shape of the following molecules

(i) CH_3F

(ii) $CH_2 = O$

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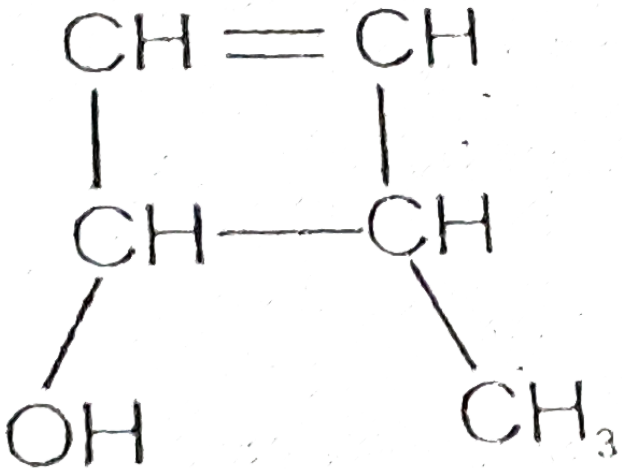
3. Write its bond line formula

(i) $CH_3CH(OH)CH_2CH_2OH$

(ii) 

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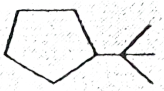
4. Expand each of the structure

(i) 

(ii) 

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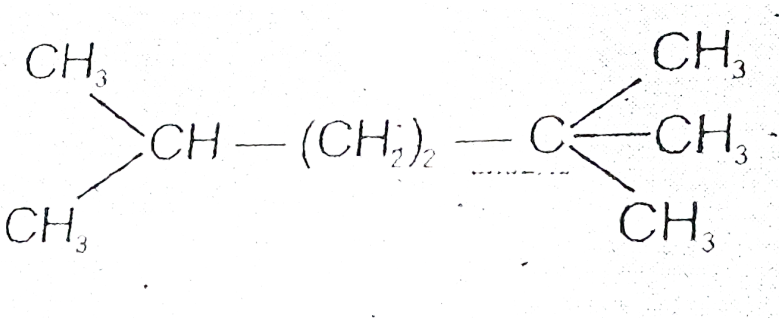
5. Draw the bond line structure for



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6. Write three-dimensional representation for CH_3CH_2OH compound.

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7. Give the IUPAC name

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8. Give its IUPAC name.

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9. Write the IUPAC names of the following compounds

(i) $CH_3 - CH_2 - \overset{\overset{O}{||}}{C} - CH_2 - \overset{\overset{O}{||}}{C} - CH_3$

(ii)

$$CH_3 - \overset{\overset{O}{||}}{C} - CH_2 - CH_2 - CH_2 - CH_2 - COOH$$

(iii) $CH_3 - \underset{\underset{C_2H_5}{|}}{CH} - \underset{\underset{C_2H_5}{|}}{CH} - CH_3$

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10. Derive the structure of (i) 2-Chlorohexane, (ii) Pent-4-en-2-ol, (iii) 3- Nitrocyclohexene, (iv) Cyclohex-2-en-1-ol, (v) 6-Hydroxy- heptanal.

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11. Draw all the possible isomers of C_4H_8O (containing carbony group)

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12. What is the relation between 2-methyl propanaol-1 and 2-methoxy propane?

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13. Using the curved-arrow notation, show the formation of reactive intermediates when the following convalent bonds undergo heterolytic cleavage :

(a) $CH_3 - S - CH_3$

(b) $CH_3 - CN$

(c) $CH_3 - Cu$.

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14. Classify the following molecules/ions as nucleophiles or electrophiles

$HS^-, BF_3, CH_3CH_2O^-, NO_2^+, NH_3, NH_2^-, Cl^+$

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15. Draw the resonating strcuture for C_6H_5CHO compound.

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16. Arrange the following carbocations in increasing order of stability and mention basis of the order suggested

(i) $\overset{\oplus}{C}H_3$ (ii) $CH_3\overset{\oplus}{C}H_2$ (iii) $CH_3\overset{\oplus}{C}HCH_3$ (iv)

$$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle \oplus}{C}} - CH_3$$

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17. On complete combustion, 0.246 g of an organic compound gave 0.198g of carbon dioxide and 0.1014g of

water. Determine the percentage composition of carbon and hydrogen in the compound

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18. 0.2613g of an organic compound on combustion in oxygen gave 0.8844 g of carbon dioxide and 0.1809 of water Find the % oc arbon and hydrogen in the substance.

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19. 0.2313 g of an organic substance gave 40 ml of moist nitrogen measured at $15^{\circ}C$ and 745 mm pressure.

Calcualte the % of nitrogen (Aq tension at $15^{\circ}C$ is 12.7mm)

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20. 0.27g of an organic compound gave on combustion 0.396 of CO_2 0.216g of H_2O 0.36g of the same substance gave 48.88 ml of N_2 at 290K and 740mm pressure Calculate the percentage composition of the compound.

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21. 0.2g of an organic compound of kjedahl's analysis gave enough ammonia to just neutralise 20ml of 0.1 NH_2SO_4 Calculate the % of nitrogen in the compound.

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22. A sample of 0.50 gm of an organic compound was treated according to Kjeldahl's method the smmonia evolved was absorbed in 50 ml of $0.5MH_2SO_4$. The residual acid required 60 cm of 0.5M solution of $NaOH$ for neutralisation. Find the percentage composition of nitrogen in the compound.

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23. 0.15 gm of an organic compound gave 0.12 gm of silver bromide by the carius method. Find the percentage of bromine in the compound.

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24. 0.525g of an organic compound gave 0.356g of silver chloride by a halogen estimation method. Find the % of Cl in the compound.

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25. 0.2595 g of an organic substance, when treated by carius method gave 0.25g of $BaSO_4$ calculates the % of S in the compound.

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26. In sulphur estimation, 0.157 g of an organic compound gave 0.4813 g of barium sulphate. What is the percentage of sulphur in the compound?

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27. 0.092 g of an organic compound containing phosphorus gave 0.111 g $Mg_2P_2O_7$ usual analysis Calculate the % of phosphorus in the organic compound.

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28. 0.12 gm of an organic compound containing phosphorus gave 0.22 gm of $Mg_2P_2O_7$ by the usual analysis. Calculate the percentage of phosphorus in the compound.

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