



CHEMISTRY

BOOKS - PRADEEP CHEMISTRY (HINGLISH)

ORGANIC CHEMISTRY-SOME BASIC PRINCIPLES TECHNIQUES

Solved Problem

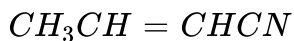
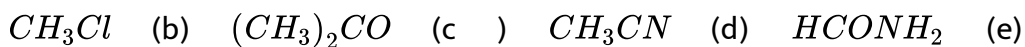
1. How many σ and π bonds are present in each of the following molecules?

(a) $HC \equiv CCH = CHCH_3$ (b) $CH_2 = C = CHCH_3$



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



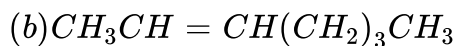
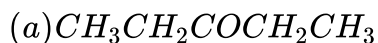
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3. What is the shape of following compounds ?



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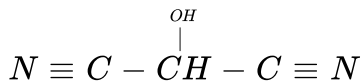
4. Expand each of the following condensed formulas into their complete structural formulas.



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5. For each of the following compounds, write a condensed formula and also their bond-line formula.

(a) $HOCH_2CH_2CH_2CH(CH_3)CH(CH_3)CH_3$, (b)



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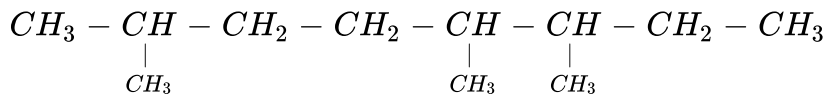
6. Expand each of the following bond-line formulae to show all the atoms including carbon and hydrogen.



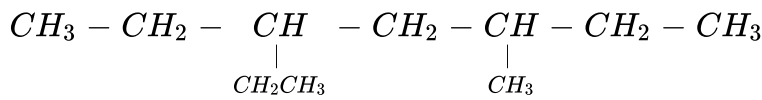
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7. Structures and IUPAC names of some hydrocarbons are given below.

Explain why the names given in the parentheses are incorrect.



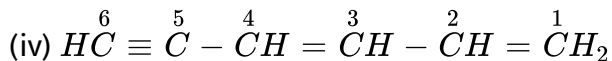
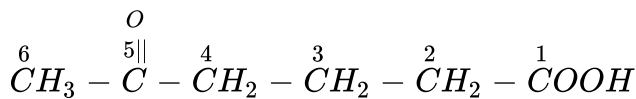
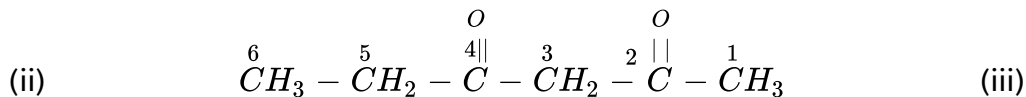
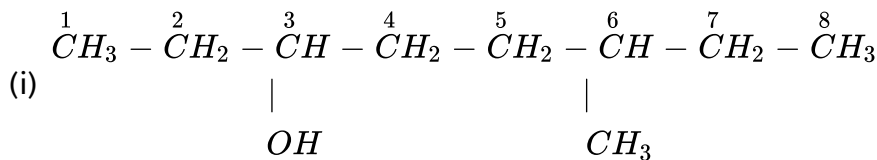
2,5,6-Trimethyloctane
[and not 3,4,7-Trimethyloctane]



3-Ethyl-5-methylheptane
[and not 5-Ethyl-3-methylheptane]

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8. Write the IUPAC names of the compounds (i-iv) from their given structures



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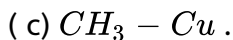
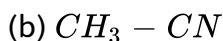
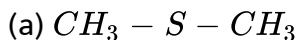
9. Derive the structure of (i) 2-Chlorohexane, (ii) Pent-4-en-2-ol, (iii) 3-Nitrocyclohexene, (iv) Cyclohex-2-en-1-ol, (v) 6-Hydroxy-heptanal.

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10. Write the structures of the following compounds : (a) o-Ethylanisole
(b) p-Nitroaniline (c) 4-Ethyl-1-fluoro-2-nitrobenzene.

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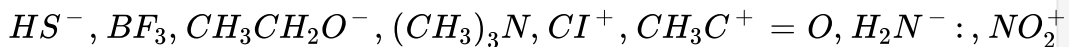
11. Using the curved-arrow notation, show the formation of reactive intermediates when the following covalent bonds undergo heterolytic cleavage :



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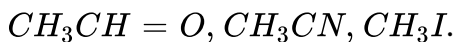
12. Classify the following molecules I ions as nucleophiles or electrophiles

:



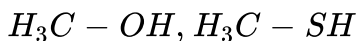
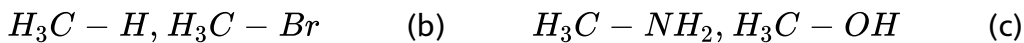
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13. Identify the electrophilic centres in the following:



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14. Which bond is more polar in the following pairs of molecules: (a)



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15. In which C-C bond of $CH_3CH_2CH_2Br$, the inductive effect is expected to be the least ?

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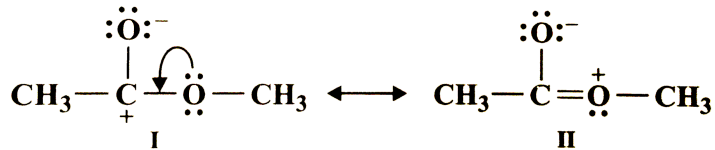
16. Write resonance structures of CH_3COO^- and show the movement of electrons by curved arrows.

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17. Write resonating structures for $CH_2 = CHCHO$. Indicate relative stability of the contributing structures :

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18. Explain why the following two structures, I and II cannot be the major contributors to the real structure of CH_3COOCH_3 .



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19. Explain why $(\text{CH}_3)_3\text{C}^+$ is more stable than CH_3CH_2^+ and CH_3^+ is the least stable cation

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20. 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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21. In Dumas' method for estimation of nitrogen, 0.3g of an organic compound gave 50mL of nitrogen collected at 300K temperature and

715mm pressure. Calculate the percentage composition of nitrogen in the compound. (Aqueous tension at 300K=15 mm)

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22. 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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23. In the Carius method of estimation of halogen. 0.25 g of an organic compound gave 0.188 g of AgBr. The percentage of bromine in the compound is

(Molar mass of AgBr = 188 g mol^{-1})

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24. 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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25. 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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Curiosity Questions

1. Why is methane tetrahedral ?

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2. How many tetrahedral angles does a molecule of methane have?

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3. Isobutyl and sec-butyl represent different alkyl groups. Do Isopropyl and sec-propyl also represent different alkyl groups ? Comment.

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4. CN group is attached to cyclohexane ring. Should it be called as cyclohexanenitrile or cyclohexanecarbonitrile ? Explain.

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5. Can Li or K metal be used in place of Na during detection of elements by Lassaigne's test ?

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6. Can $AgNO_3$ test be used for the detection of fluoride ion in Lassaigne's extract ?

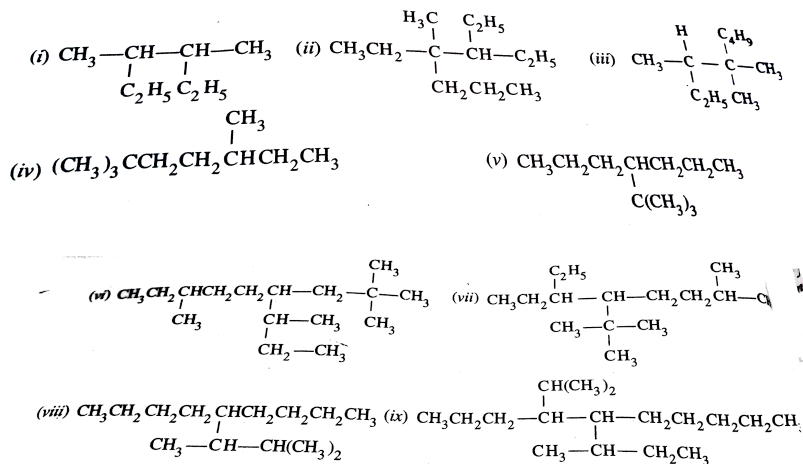
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7. For testing the presence of sulphur by lead acetate test, the Lassaigne's extract is acidified with dilute acetic acid. Can we use dilute hydrochloric or sulphuric acid instead of acetic acid ?

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Problem For Practice

1. Give the IUPAC name of the following alkanes:



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2. What is wrong with the following names ? Draw the structures they represent and give their correct name

(i) 1, 1-Dimethylpentane (ii) 2-Methyl-2-propylhexane (iii) 3,4-

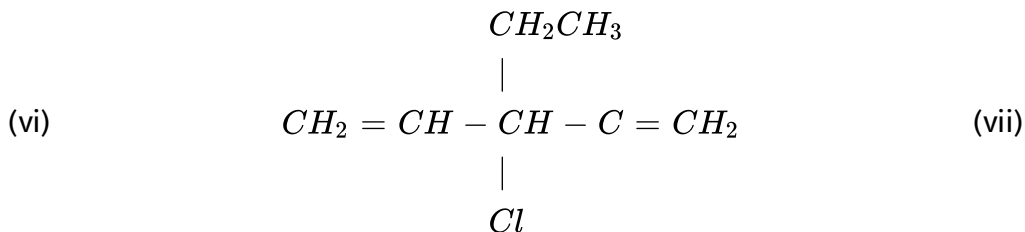
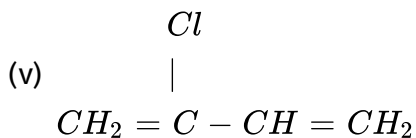
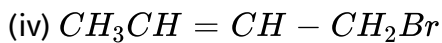
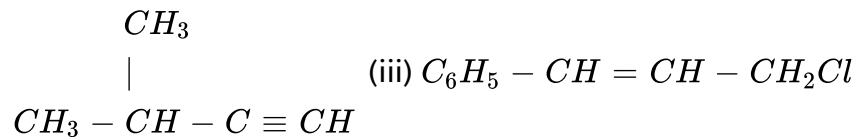
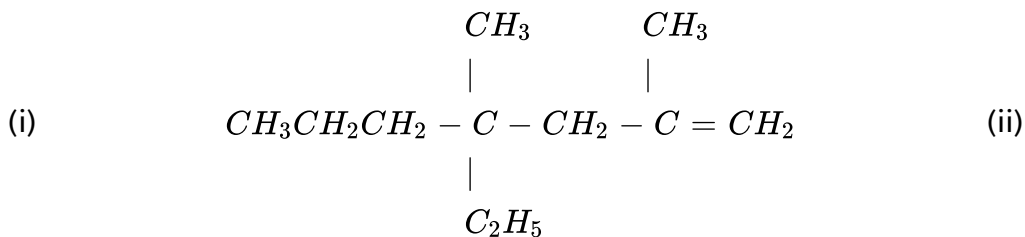
Dimethylpentane

(iv) 4, 4-Dimethyl-3-ethylpentane (v) 4-(2-Methylethyl)heptane

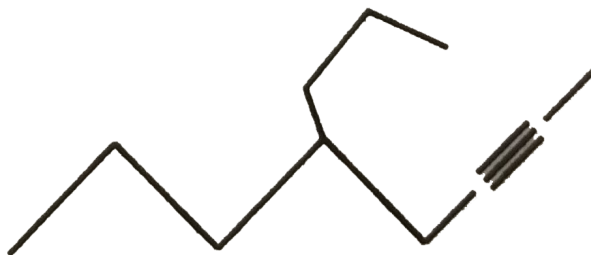


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3. Give the IUPAC names of the following compounds :



(vii)



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4. Give the condensed and bond-line structural formulae for the following :

(a) 2-Methylbuta-1, 3-diene

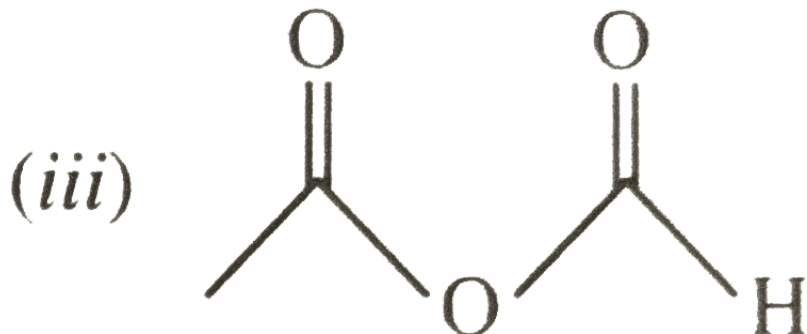
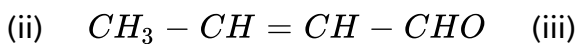
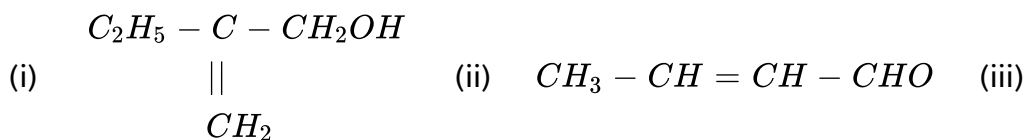
(b) Penta-1, 4-diene

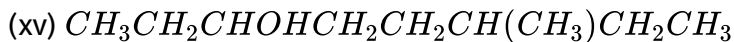
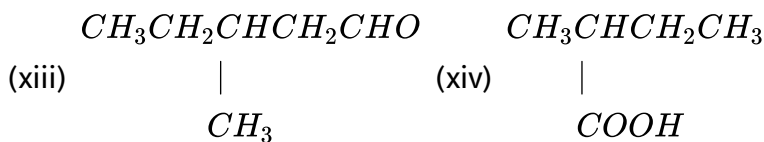
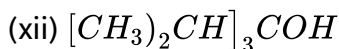
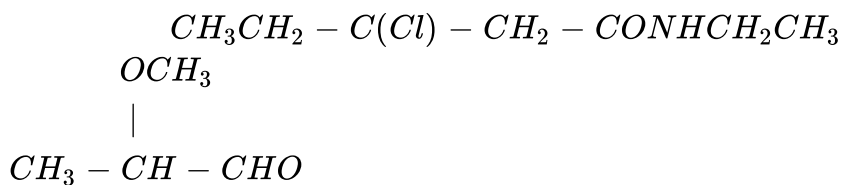
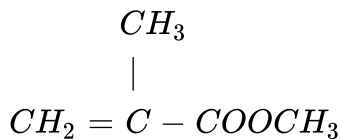
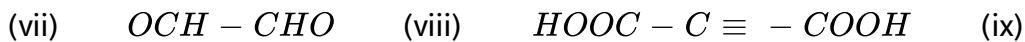
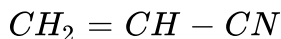
(c) Hexa-1, 3, 5-triene

(d) 3-Ethylpenta-1, 3-diene

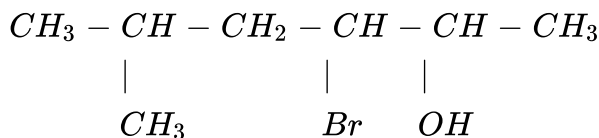
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5. Give the IUPAC name of the following compounds :



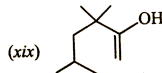
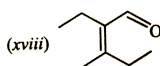
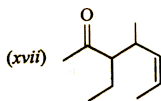
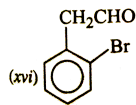
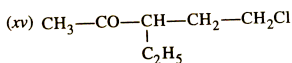
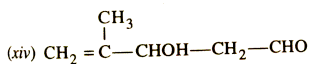
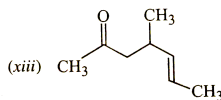
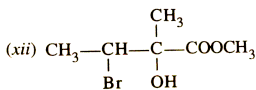
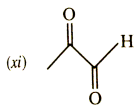
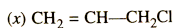
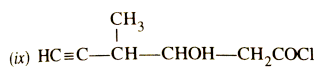
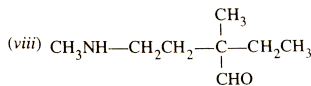
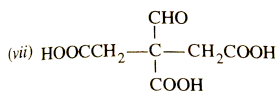
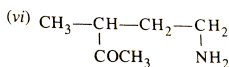
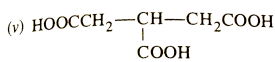
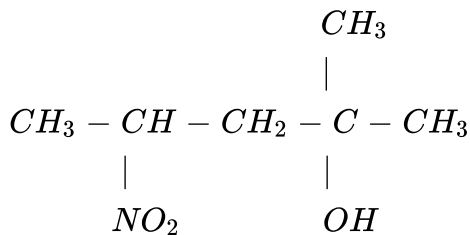
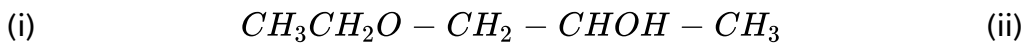


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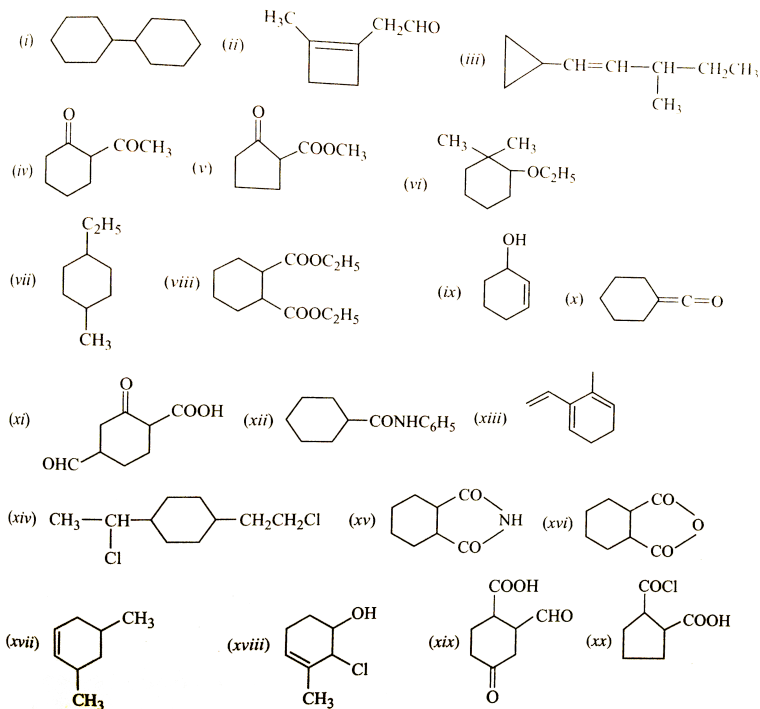
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6. Give the IUPAC names for the following polyfunctional compounds.



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7. Give the IUPAC name the following compounds :



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8. Draw the structures of the following compounds :

- (i) Hex-3-en-1-oic acid (ii) 2-Chloro-2-methylbutane-1-ol (iii) 5, 5-Diethylnonan-3-ol
- (iv) 1-Bromo-3-chlorocyclohex-1-ene (v) 1, 3-Dimethylcyclohex-1-ene

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9. Write the condensed formulae for each of the following compounds :

(i) Isopropyl alcohol

(ii) Methyl t-butyl ether

(iii) 2-Chloro-1, 1, 1-trifluoroethane

(iv) 2-Methylbuta-1, 3-diene

(v) But-2-en-1-ol



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10. Draw structures of all isomeric ethers corresponding to molecular formula $C_5H_{12}O$.



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11. Write condensed and bond line structural formulae for all the possible isomers of molecular formula C_4H_6 .

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

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13. 0.6723 g of an organic compound gave on combustion 1.530 g of carbon dioxide and 0.625g of water. Find the percentage of carbon and hydrogen in the compound.

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14. 0.465 g of an organic substance gave on combustion 1.32 g of CO_2 and 0.315g of H_2O . Calculate the percentage of carbon and hydrogen in the compound.

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15. 0.2475 gm of an organic substance gave on combustion 0.495 gm of CO_2 and 0.2025gm of H_2O . Calculate the percentage of carbon and hydrogen in it.

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16. 0.2046 g of an organic compound gave 30.4 mL of moist nitrogen measured at 288 K and 732.7 mm pressure. Calculate the percentage of nitrogen in the substance (Aqueous tension at 288 K is 12.7 mm).

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17. 0.27g of an organic compound gave on combustion 0.396 of CO_2 and 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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18. 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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19. 0.4422g of an organic compound was Kjeldahlised and ammonia evolved was absorbed in 50 mL of semi-molar (0.5 M) H_2SO_4 . The residual acid required 131 mL of 0.25 M NaOH. Determine the percentage of nitrogen in the compound.

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20. Ammonia obtained from 0.4 g of organic substance by Kjeldahl's method was absorbed in 30 mL of 0.25M H_2SO_4 . The excess of the acid was neutralized by the addition of 30 mL of 0.2 M NaOH. Calculate the percentage of nitrogen in the substance.

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

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22. 0.301 g of an organic compound gave 0.282 g of silver bromide by a halogen estimation method. Find the percentage of bromine in the compound.

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23. 0.2174 g of the substance gave 0.5825 g of $BaSO_4$ by Carius method.

Calculate the percentage of sulphur.

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24. 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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25. 0.2595 gm of an organic substance when treated by carius method gave 0.35 gm of $BaSO_4$. Calculate the percentage of sulphur in the compound?

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26. 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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27. 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

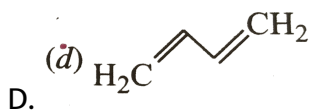
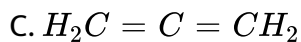
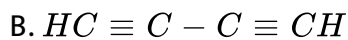


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Test Your Grip (Multiple Choice Questions)

1. Which of the following represents the given mole of hybridization $sp^2 - sp^2 - sp - sp$ from left to right?





Answer: A

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2. Which of the following forms a homologous series ?

A. ethane, ethylene, ethyne

B. methane, methanol, methanal

C. methane, ethane, propane

D. 1-hexene, 2-hexene, 3-hexene

Answer: C

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3. Members of a homologous series have

- A. Different general formulae
- B. Different molecular weights
- C. Different methods of preparation
- D. Different chemical properties.

Answer: B



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4. The number of primary, secondary, tertiary and quaternary carbons in neo-pentane are respectively,

- A. 4,3,2 and 1
- B. 5, 0,0 and 1
- C. 4,0,0 and 1

D. 4,0,1 and 1

Answer: C

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5. The compound which has one isopropyl group is –

A. 2,2,3,3-Tetramethylpentane

B. 2,2-Dimethylpentane

C. 2,2,3, Trimethylpentane

D. 2-Methylpentane

Answer: D

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6. The general formula $C_nH_{2n}O_2$ could be for open chain

A. dialdehyde

B. diketones

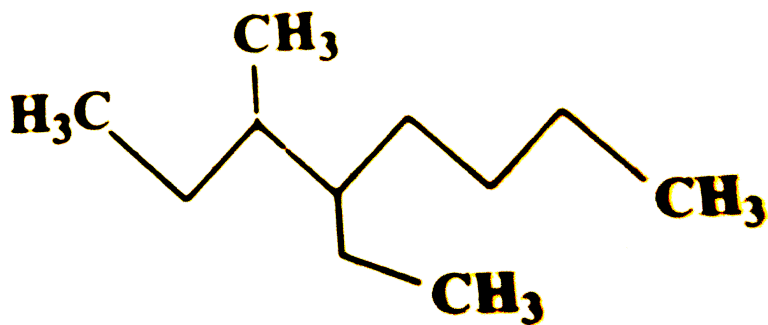
C. carboxylic acids

D. diols

Answer: C

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7. Name of the compound given below is



A. 4-ethyl-3-methyloctane

B. 3-methyl-4-ethyloctane

C. 2, 3-diethylheptane

D. 5-ethyl-6-methyloctane

Answer: A

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8. The systematic name of $PhCH_2COOH$ is

A. benzeneacetic acid

B. phenylmethyl carboxylic acid

C. 2-phenylmethanoic acid

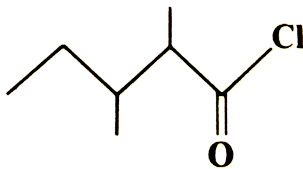
D. 2-phenylethanoic acid

Answer: D

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9. The IUPAC name of

The IUPAC name of



is

is

A.

B.

C.

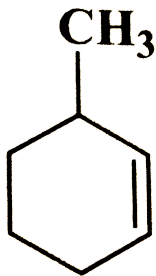
D.

Answer: A



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10. The IUPAC name of



The IUPAC name of is

is

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11. Among the following pairs, the pair that illustrates functional isomerism is

- A. 1-butanol and 2-butanol
- B. dimethyl ether and ethanol
- C. cis-2-butene and trans-2-butene
- D. ethanol and ethanal

Answer: B

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12. The temporary effect in which there is complete transfer of a shared pair of pi-electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent is called

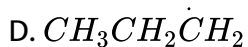
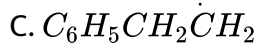
- A. inductive effect
- B. hyperconjugation effect
- C. positive resonance effect
- D. electromeric effect

Answer: D

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13. The stablest radical among the following is

- A. $C_6H_5 - \dot{C}H - CH_3$
- B. $CH_3 - \dot{C}H - CH_3$



Answer: A

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14. The reaction, $(CH_3)_3C - I \xrightarrow{H_2O} (CH_3)_3C - OH$ is

- A. elimination reaction
- B. substitution reaction
- C. free radical reaction
- D. addition reaction.

Answer: B

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15. A mixture of o-nitrophenol and p- nitrophenol can be separated by

- A. sublimation
- B. steam distillation
- C. fractional crystallization
- D. simple distillation

Answer: B

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16. Two volatile liquids A and B differ in their boiling points by 15K. The process which can be used to separate them is

- A. fractional distillation
- B. steam distillation
- C. distillation under reduced pressure

D. simple distillation

Answer: A

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17. Glycerol which decomposes at its boiling point can be purified by

A. steam distillation

B. simple distillation

C. distillation under reduced pressure

D. fractional distillation

Answer: C

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18. An organic substance from its aqueous solution can be separated by

- A. distillation
- B. steam distillation
- C. solvent distillation
- D. fractional distillation

Answer: C

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19. In Kjeldahl's method, the nitrogen present in the organics compound is converted into

- A. gaseous ammonia
- B. ammonium sulphate
- C. ammonium phosphate
- D. ammonium nitrate.

Answer: B



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Test Your Grip (I. Multiple Choice Questions)

1. 1.2 g of an organic compound on Kjeldahlization liberates ammonia which consumes 30 cm^3 of 1 N HCl. The percentage of nitrogen in the organic compound is

- A. 30
- B. 35
- C. 46.67
- D. 20.8

Answer: B



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Test Your Grip (II. Fill in the Blanks)

1. Wohler prepared urea by heating a mixture of.....and.....or simply by heating..... .

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2. Cyclohexane is an.....compound while benzene is an.....compound.

A. aromatic , aromatic

B. alicyclic, aromatic

C. Both are aromatic

D. None of the above

Answer: B

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3. The correct IUPAC name for pent-4-en-1-yne is..... .



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4. The prefix and the suffix for CHO group are.....and.....respectively when the carbon atom of the CHO group is not included in the parent chain.

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5. The aryl group left after the removal of a hydrogen atom from benzene is called.....group while that obtained from methyl group of toluene is called.....group.

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6. Aldehydes and ketones are isomers.

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7. But-1-ene and cyclobutane are.....isomers.

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8. What will be total number of isomers of compound with molecular formula C_7H_8O

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9. In ethyl acetoacetate, it is the.....form which is more stable while in acetylacetone, it is the.....form which is more stable.

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10. Amongst OH^- , CH_3COO^- and CH_3O^- ions, nucleophilicity decreases in the order.....

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11. The kind of delocalization involving sigma bond orbitals is called:

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12. Among isomeric butenes, is the most stable.

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13. Methyl carbanion is.....and.....with ammonia.

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14. The shape of CH_3^- is.....while that of CH_3^+ is..... .

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15. The bond dissociation energy needed to form the benzyl radical from toluence is..... Than the formation of the methyl radical from methane.

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16. Liquids which decompose at or below their boiling points are purified by..... .

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17. Steam distillation is used for separation and purification of those compounds which are.....with water but..... .

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18. Paper chromatography is also called.....chromatography in which.....constitutes the stationary phase while a.....constitutes

the mobile phase.

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19. In Lassaigne test for nitrogen, conc HNO_3 is used to destroy.....and

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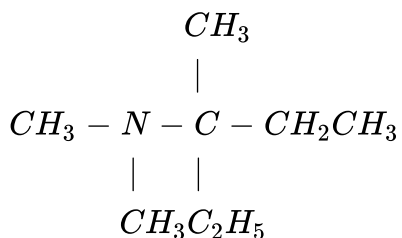
20. In Duma's method, the nitrogen present in the organic compound is converted into.....

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Conceptual Questions (I. Hybridization Classification and Nomenclature)

1. Write the state of hybridization of all the atoms in $CH_2 = C = CH_2$ and draw its orbital structure. Do the two atoms on C_1 lie in the same

4. Give the IUPAC name for the amine.



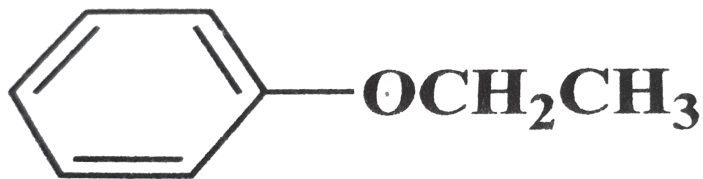
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Conceptual Questions (II. Isomerism)

1. How many isomers are possible for a disubstituted benzene ? What is the relationship between them ?

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2. Write metamers of



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3. Write the structures and IUPAC names of the functional isomers having the molecular formula $C_2H_5O_2N$.

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4. Differentiate between chiral and achiral molecules.

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5. Identify and indicate the presence of centre of chirality, if any, in the following molecules? How many stereoisomers are possible for each ?

(i) 2-Aminobutane (ii) 3-Bromopent-1-ene (iii) 1, 2-Dichloropropane, (iv) 3-Methyl-1-pentene

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6. What is meant by chirality of a compound ? Give an example.

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7. What are enantiomers ? Draw the structures of the possible enantiomers of 3-methylpent-1-ene.

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8. Distinguish between enantiomers and diastereomers.

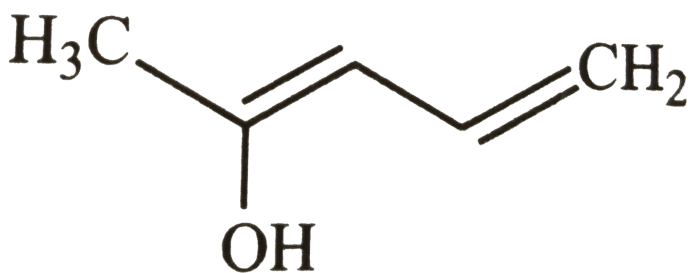
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9. (±)-2-Butanol is optically inactive. Give reasons.

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Conceptual Questions (III. Fundamental Concepts of Organic Reaction Mechanism)

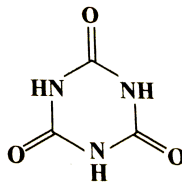
1. Write resonance structures of the given compound.



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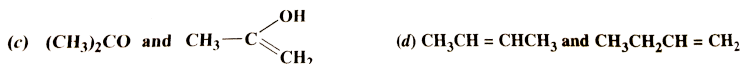
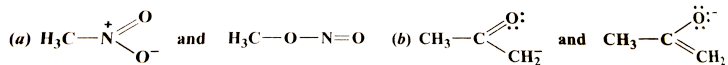
2. Write down resonating structure and tautomers of

Write down resonating structures and tautomers of

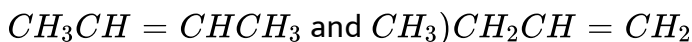


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3. Which of the following pairs do not constitute resonance structures ?

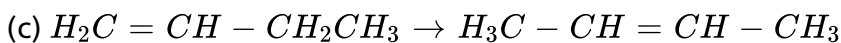
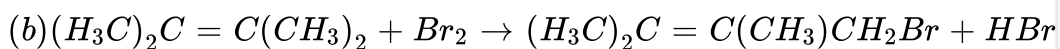
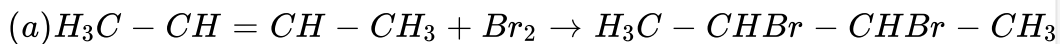


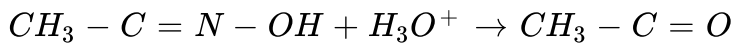
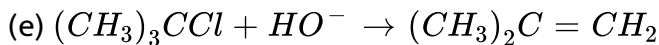
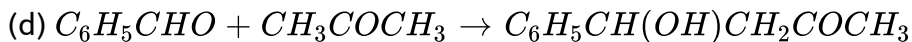
(d)



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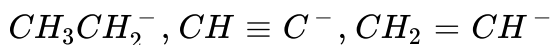
4. Classify the following transformation according to the reaction type.





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5. Arrange the following in order of increasing stability :



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6. Carbenes are regarded as neutral bivalent carbon species. Explain why?

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Conceptual Questions (IV. Purification and Separation of Organic Compounds)

1. Suggest a method to purify : (i) Camphor containing traces of common salt.

(ii) Kerosene oil containing water.

(iii) A liquid which decomposes at its boiling point.



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2. A mixture contains two components A and B. The solubilities of A and B in water near their boiling point are 10 grams per 100 mL and 2 g per 100 mL respectively. How will you separate A and B from this mixture ?



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3. Suggest methods for the separation of the following mixtures :

(a) a mixture of liquid A (b.p. 365 K) and liquid B (b.p. 355 K)

(b) a mixture of liquid C (b.p. 348 K) and liquid D (b.p. 478 K).



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4. A mixture of X and Y was loaded in the column of silica. It was eluted by alcohol-water mixture. Compound Y eluted in preference to compound X. Compare the extent of adsorption of X and Y on column.

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5. The R_f value of A and B in a mixture determined by TLC in a solvent mixture are 0.65 and 0.42 respectively. If the mixture is separated by column chromatography using the same solvent mixture on a mobile phase, which of the two components A or B will elute first?

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6. A mixture contains benzoic acid and nitrobenzene. How can this mixture be separated into its constituents by the technique of extraction using an appropriate chemical reagent ?

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7. Without using column chromatography, how will you separate a mixture of camphor and benzoic acid?

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8. A reaction is carried out aniline as a reactant as well as a solvent. How will you remove unreacted aniline ?

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9. Commercial benzene obtained from coal-tar distillation contains 3-5% thiophene as impurity. Suggest a simple method to purify it.

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10. During hearing a court case, the judge suspected that some changes in the original documents has been deliberately made. He asked the

forensic department to check the ink used at two different places. After reading the above passage, answer the following questions :

(i) What technique do you think can be used to ascertain whether the ink used at two places was the same or different ?

(ii) What is the principle of this technique applied ?

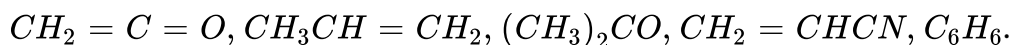
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11. Sometimes a red colour is not produced in the Lassaigne's test even if both nitrogen and sulphur are present in the organic compound. Explain.

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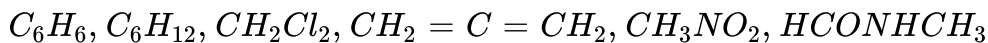
NCERT Questions and Exercises With Answers

1. What are hybridisation states of each carbon atom in the following compounds ?



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2. Indicate the σ - and π -bonds in the following molecules :



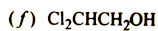
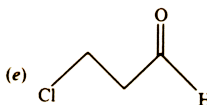
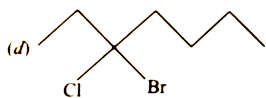
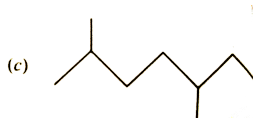
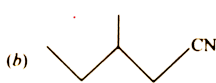
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3. Write bond line formulas for :

(i) Isopropyl alcohol (ii) 2, 3-Dimethylbutanal (iii) Heptan-4-one

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4. Give the IUPAC name of the following compounds :



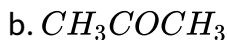
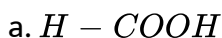
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5. Which of the following represents the correct *IUPAC* name for the compounds concerned?

- a. 2,2-Dimethyl pentane or 2-Dimethyl pentane
- b. 2,4,7-Trimethyloctane or 2,5,7-Trimethyloctane
- c. 2-Chloro-4-methylpentane or 4-Chloro-2-methylpentane
- d. But-3-yn-1-ol or But-4-ol-1-yne

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6. Draw the formulae for the first five numbers of each homologous series beginning with the following compounds:



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7. Give condensed and bond line structural formulas and identify the functional group(s) present, if any, for :

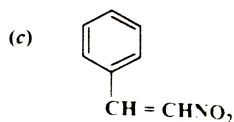
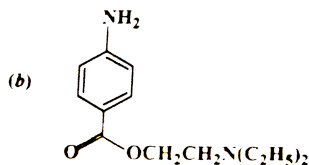
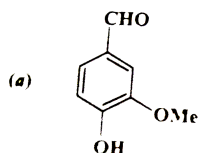
(a) 2,2,4-Trimethylpentane

(b) 2-Hydroxy-1,2,3-propanetricarboxylic acid

(c) Hexanedial

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8. Identify the functional groups in the following compounds :



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9. Which of the two: $O_2NCH_2CH_2O^-$ or $CH_3CH_2O^-$ is expected to be more stable and why ?

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10. Explain why alkyl groups act as electron donors when attached to a π - system.

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11. Draw the resonance structures for the following compounds. Show the electron shift using curved-arrow notation.

(a) C_6H_5OH (b) $C_6H_5NO_2$ (c) $CH_3CH = CHCHO$ (d) C_6H_5-CHO

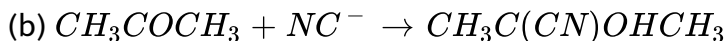
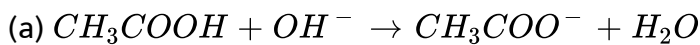
(e) $C_6H_5 - \overset{+}{C}H_2$ (f) $CH_3CH = \overset{+}{C}HCH_2$

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12. What are electrophiles and nucleophiles ? Explain with examples.

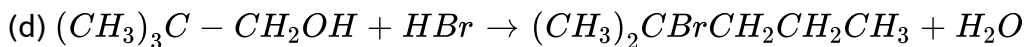
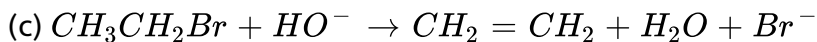
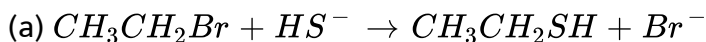
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13. Identify the reagents shown in bold in the following equations as nucleophiles or electrophiles.



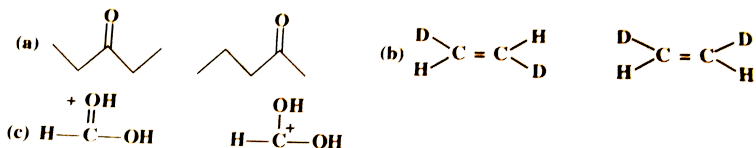
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14. Classify the following reactions in one of the reaction type studied in this unit.



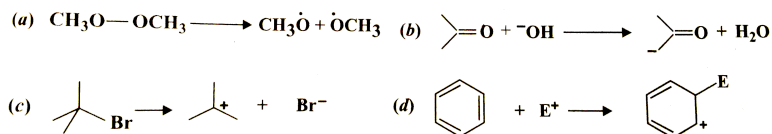
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15. What is the relationship between the members of following pairs of structures ? Are they structural or geometrical isomers or resonance contributors ?



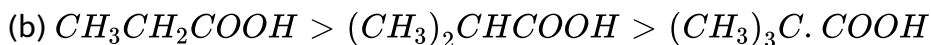
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16. For the following bond cleavages, use curved-arrows to show the electrons flow and classify each as homolysis or heterolysis. Identify reactive intermediate produced as free radical, carbocation and carbanion.



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17. Explain the terms Inductive and Electromeric effects. Which electron displacement effect explains the following correct orders of acidity of the carboxylic acids?



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18. Give a brief description of the principles of the following techniques taking an example in each case.

(a) Crystallisation (b) Distillation (c) Chromatography

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19. Describe the method, which can be used to separate two compounds with different solubilities in a solvent S.

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20. What is the difference between distillation, distillation under reduced pressure and steam distillation ?

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21. Discuss the chemistry of Lassaigne's test.

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22. Differentiate between the principle of estimation of nitrogen in an organic compound by (i) Dumas method and (ii) Kjeldahl's method.

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23. Discuss the principle of estimation of halogens, sulphur and phosphorus present in an organic compound.

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24. Explain the principle of paper chromatography.

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25. Why is nitric acid added to sodium extract before adding silver nitrate for testing halogens ?

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26. Explain the reason for the fusion of an organic compound with metallic sodium for testing nitrogen sulphur and halogen.

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27. Name a suitable technique of the components from a mixture of calcium sulphate and camphor.



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28. Explain why an organic liquid vaporises at a temperature below its boiling point in steam distillation?



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29. Will CCl_4 give white precipitate of $AgCl$ on heating with nitrate?

Give reason for your answer



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30. Why is solution of potassium hydroxide used to absorb carbon dioxide evolved during the estimation of carbon present in an organic compound?



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31. Acetic acid and not sulphuric acid is essential for acidification of sodium extract for testing sulphur by lead acetate test because

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32. 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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33. A sample of 0.50 gm of an organic compound was treated according to Kjeldahl's method the ammonia evolved was absorbed in 50 ml of 0.5M H_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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34. 0.3780 g of an organic chloro compound gave 0.5740 g silver chloride in Carius estimation. Calculate the percentage of chlorine present in the compound.

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35. In the estimation of sulphur by carius method, 0.468 gm of an organic sulphur compound afforded 0.668 gm of barium sulphate. Find out the percentage of sulphur in the given compound.

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36. In the organic compound $CH_2 = CH - CH_2 - CH_2 - C \equiv CH$, the pair of hybridised orbitals involved in the formation of: $C_2 - C_3$ bond is:

(a) $sp - sp_2$ (b) $sp - sp_3$ (c) $sp_2 - sp_3$ (d) $sp_3 - sp_3$

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37. In the Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of:

- (a) $Na_4[Fe(CN)_6]$ (b) $Fe_4[Fe(CN)_6]_3$ (c) $Fe_2[Fe(CN)_6]$ (d) $Fe_3[Fe(CN)_6]_4$

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38. Which of the following carbocation is most stable ?

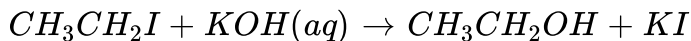
- (a) $(CH_3)_3C \cdot \overset{+}{C}H_2$ (b) $(CH_3)_3\overset{+}{C}$ (c) $CH_3CH_2\overset{+}{C}H_2$ (d) $CH_3\overset{+}{C}HCH_2CH_3$

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

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40. The reaction:



is classified as :

- (a) electrophilic substitution (b) nucleophilic substitution
(c) elimination (d) addition



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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS
(Multiple Choice Questions - I)

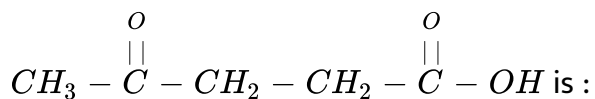
1. Which of the following is the correct IUPAC name ?

- A. 3-Ethyl-4, 4-dimethylheptane
B. 4, 4-Dimethyl-3-ethylheptane
C. 5-Ethyl-4, 4-dimethylheptane
D. 4, 4-Bis(methyl)-3-ethylheptane

Answer: A

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2. The IUPAC name for



A. 1-hydroxypentane-1, 4-dione

B. 1, 4-dioxopentanol

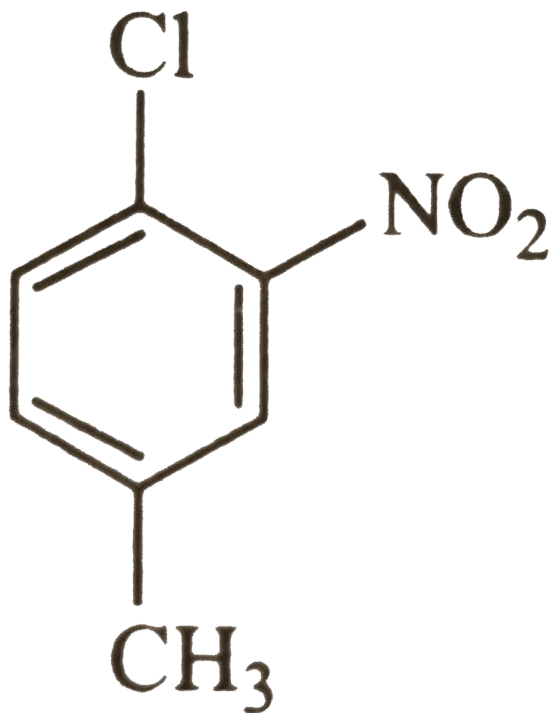
C. 1-carboxybutan-3-one

D. 4-oxopentanoic acid

Answer: D

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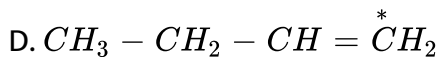
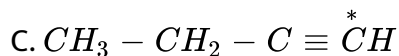
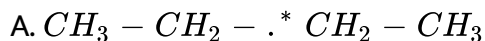
3. The IUPAC name for



- A. 1-Chloro-2-nitro-4-methylbenzene
- B. 1-chloro-4-methyl-2-nitrobenzene
- C. 2-Chloro-1-nitro-5-methylbenzene
- D. m-Nitro-p-chlorotoluene

Answer: B

4. Electronegativity of carbon atoms depends upon their state of hybridisation. In which of the following compounds, the carbon marked with asterisk is most electronegative ?



Answer: C



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5. In which of the following, functional group isomerism is not possible ?

A. Alcohols

B. Aldehydes

C. Alkyl halides

D. Cyanides

Answer: C



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6. The fragrance of flower is due to the presence of some steam volatile organic compounds called essential oils. These are generally insoluble in water at room temperature but are miscible with water vapour in vapour phase. A suitable method for the extraction of these oils from the flower is

A. Distillation

B. Crystallisation

C. Distillation under reduced pressure

D. Steam distillation

Answer: D

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7. During hearing of a court case, the judge suspected that some changes in the documents had been carried out. He asked the forensic department to check the ink used at two different places. According to you which technique can give the best results ?

- A. Column chromatography
- B. Solvent extraction
- C. Distillation
- D. Thin layer chromatography

Answer: D

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8. The principle involved in paper chromatography is

A. Adsorption

B. Partition

C. Solubility

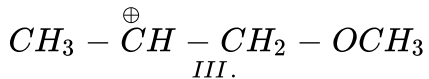
D. Volatility

Answer: B



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9. What is the correct order of decreasing stability of the following carbocations.



A. $II > I > III$

B. $II > III > I$

C. $III > I > II$

D. $I > II > III$

Answer: A

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10. Correct IUPAC name for $H_3C - \underset{\substack{| \\ C_2H_5}}{CH} - \underset{\substack{| \\ C_2H_5}}{CH} - CH_3$ is.....

A. 2-ethyl-3-methylpentane

B. 3, 4-dimethylhexane

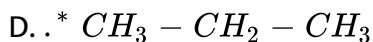
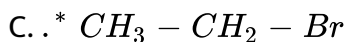
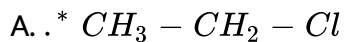
C. 2-sec-butylbutane

D. 2, 3-dimethylbutane

Answer: B

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11. In which of the following compounds the carbon marked with asterisk is expected to have greatest positive charge ?

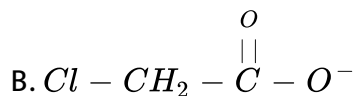
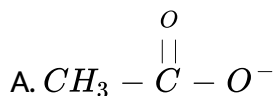


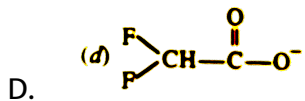
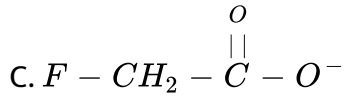
Answer: A



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12. Ionic species are stabilised by the dispersal of charge. Which of the following carboxylate ion is the most stable ?

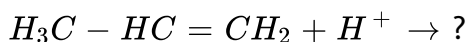




Answer: D

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13. Electrophilic additions reactions proceed in two steps. The first step involves the additions of an electrophile. Name the type of intermediate formed in the first step of the following addition reaction

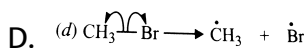
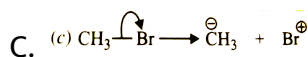
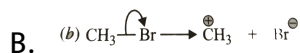
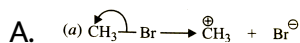


- A. 2° Carbanion
- B. 1° Carbocation
- C. 2° Carbocation
- D. 1° Carbanion

Answer: C

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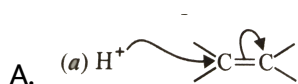
14. Covalent bond can undergo fission in two different ways. The correct representation involving a heterolytic fission of $CH_3 - Br$ is

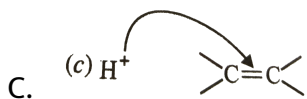


Answer: B

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15. The addition of HCl to an alkene proceeds in two steps. The first step is the attack of H^+ ion to $>C=C<$ portion which can be shown as





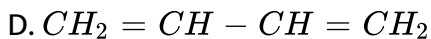
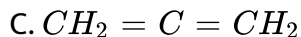
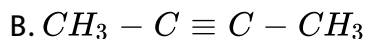
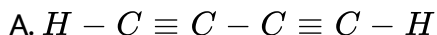
D. All of these are possible

Answer: B

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**NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS
(Multiple Choice Questions - II)**

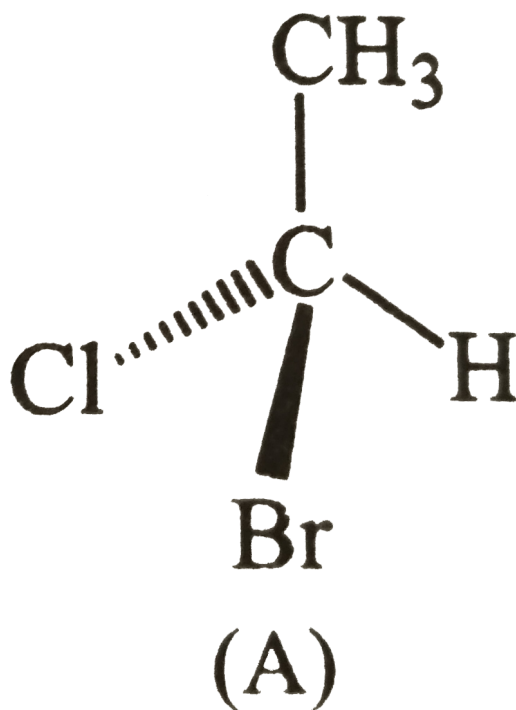
1. Which of the following compounds contain all the carbon atoms in the same hybridisation state ?

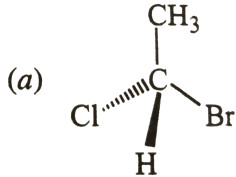


Answer: A:D

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2. In which of the following representations given below, spatial arrangement of group/atom is different from that given in structure 'A'?





A.

B. 

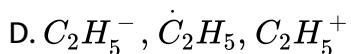
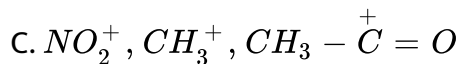
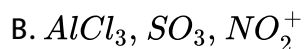
C. 

D. 

Answer: A::C::D

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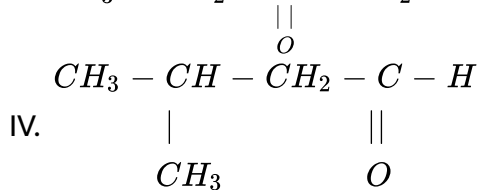
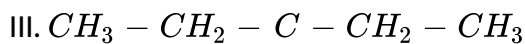
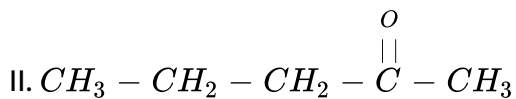
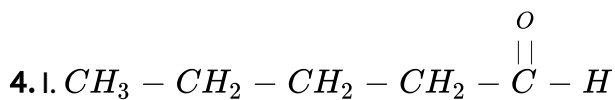
3. Electrophiles are electron seeking species. Which of the following groups contain only electrophiles ?



Answer: B::C



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Which of the following pairs are position isomers ?

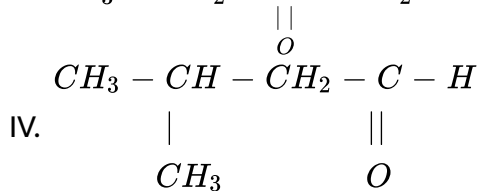
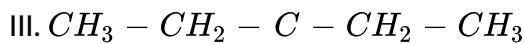
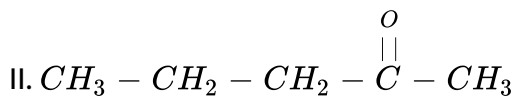
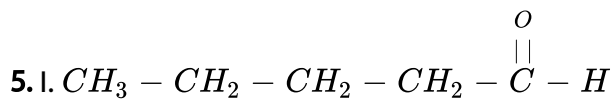
A. I and II

B. II and III

C. II and IV

D. III and IV

Answer: B

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Which of the following are not functional group isomers ?

A. II and III

B. II and IV

C. I and IV

D. I and II

Answer: A::C

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6. Nucleophile is a species that should have

- A. a pair of electrons to donate
- B. positive charge
- C. negative charge
- D. electron deficient species

Answer: A::B



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7. Hyperconjugation involves delocalization of

- A. electrons of carbons-hydrogen σ bond of an alkyl group directly attached to an atom of unsaturated system
- B. electrons of carbon-hydrogen σ bond of alkyl group directly attached to the positively charged carbon atom

C. π -electrons of carbon-carbon bond

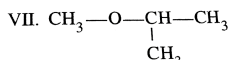
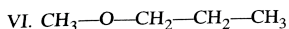
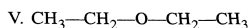
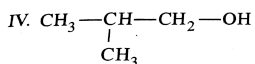
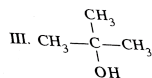
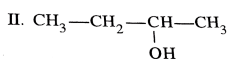
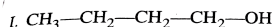
D. lone pair of electrons

Answer: A::B



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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (Short Answer Questions)

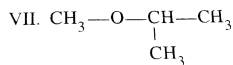
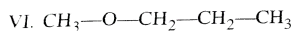
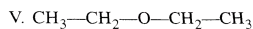
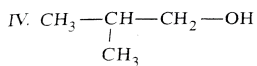
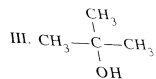
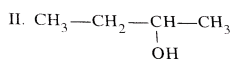
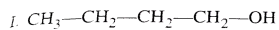


1.

Which of the above compounds form pairs of metamers ?



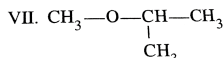
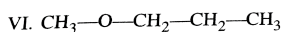
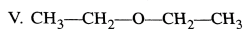
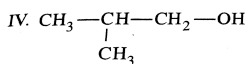
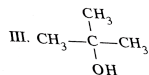
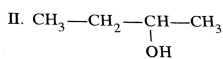
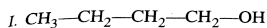
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2.

Identify the pairs of compounds which are functional group isomers.

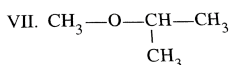
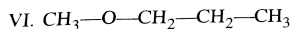
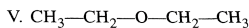
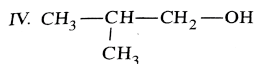
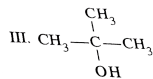
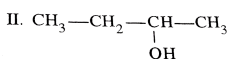
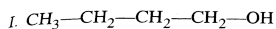
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3.

Identify the pairs of compounds that represent position isomerism.

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4.

Identify the pairs of compounds that represents chain isomerism.

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5. For testing halogens in an organic compound with AgNO_3 solution, sodium extract (Lassaigne's test) is acidified with dilute HNO_3 . What will happen if a student acidifies the extract with dilute H_2SO_4 in place of dilute HNO_3 ?

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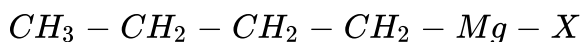
6. What is the hybridisation of each carbon in $\text{H}_2\text{C} = \text{C} = \text{CH}_2$?

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7. Explain, how is the electronegativity of carbon atoms related to the state of hybridisation in an organic compound ?

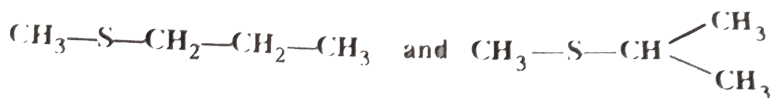
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8. Show the polarisation of carbon-magnesium bond in the following structure.



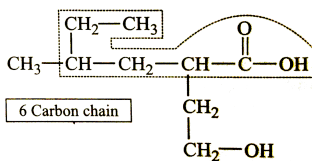
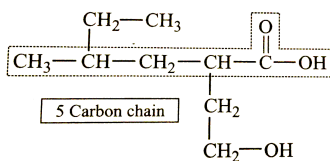
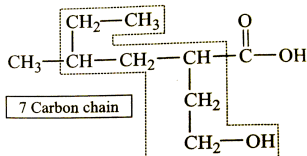
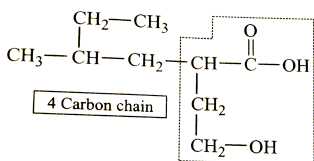
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9. Compounds with same molecular formula but differing in their structures are said to be structural isomers. What type of structural isomerism is shown by



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10. Which of the following selected chains is correct to name the given compound according to IUPAC system.



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11. In DNA and RNA, nitrogen atom is present in the ring system. Can Kjeldahl method be used for the estimation of nitrogen present in these ? Give reasons.

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12. If a liquid compound decomposes at its boiling point, which method (s) can you choose for its purification. It is known that the compound is stable at low pressure, steam volatile and insoluble in water.

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13. "Stability of carbocations depends upon the electron releasing inductive effect of groups adjacent to positively charged atom involvement of neighbouring groups in hyperconjugation and resonance".

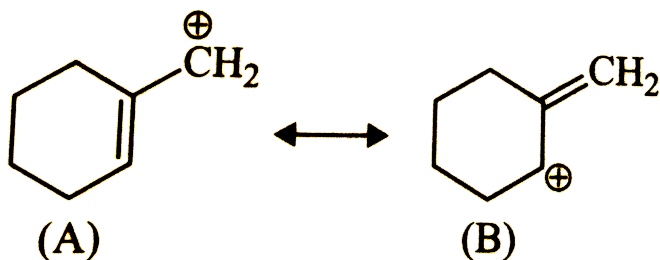
Draw the possible resonance structures for $CH_3 - \overset{\cdot\cdot}{\underset{\cdot\cdot}{O}} - \overset{+}{CH_2}$ and predict which of the structures is more stable. Give reason for your answer.

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14. "Stability of carbocation depends upon the electron releasing inductive effect of groups adjacent to positively charged carbon atom, involvement of neighbouring groups in hyperconjugation and

resonance".

Which of the following ions is more stable ? Use resonance to explain your answer.

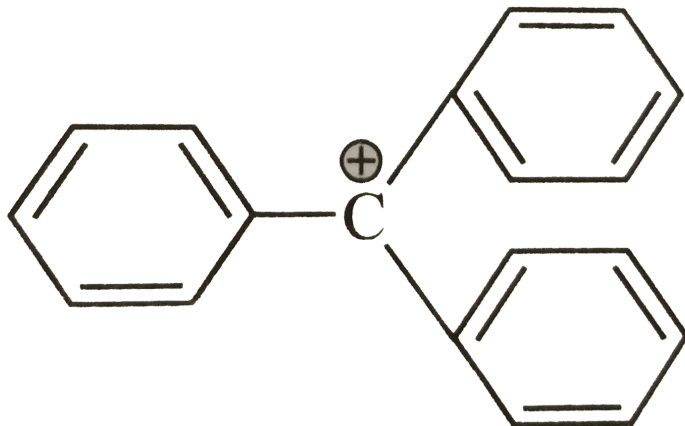


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15. "Stability of carbocation depends upon the electron releasing inductive effect of groups adjacent to positively charged carbon atom, involvement of neighbouring groups in hyperconjugation and resonance".

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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16. 'Stability of carbocations depends upon the electron releasing inductive effect of groups adjacent to positively charged atom involvement of neighbouring groups in hyperconjugation and resonance'.

Write structure of various carbocations that can be obtained from 2-methylbutane. Arrange these carbocations in order of increasing stability

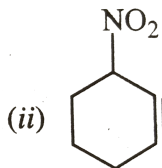
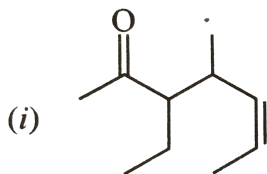
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17. Three students, Manish Ramesh and Rajni were determining the extra elements present in an organic compound given by their teacher. They prepared the Lassaigne's extract (L.E.) independently by the fusion of the compound with sodium metal. Then they added solid $FeSO_4$ and dilute sulphuric acid to a part of Lassaigne's extract. Manish and Rajni obtained prussian blue colour but Ramesh got red colour. Ramesh repeated the test with the same Lassaigne's extract, but again got red colour only. They were surprised and went to their teacher and told him about their observation. Teacher asked them to think over the reason for this. Can you help them by giving the reason for this. observation. Also, write the chemical equations to explain the formation of compounds of different colours.



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18. Name the compounds whose line formulae are given below :



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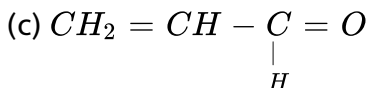
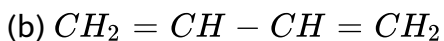
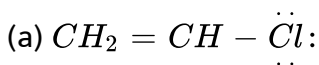
19. Write structural formulae for compounds named as

(a) 1-Bromoheptane

(b) 5-Bromoheptanoic acid

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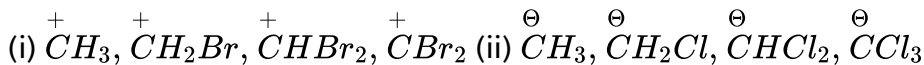
20. Draw the resonance structures of the following compounds.



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21. Identify the most stable species in the following set of ions giving reasons :



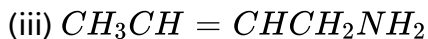
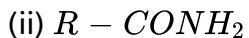
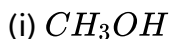
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22. Give three points of difference between inductive effect and resonance effect.

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23. Which of the following compounds will not exist as resonance hybrid.

Give reason for your answer :





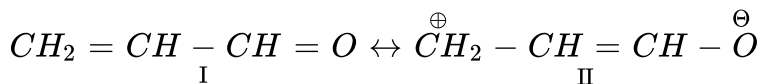
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24. Why does SO_3 act as an electrophile ?



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25. Resonance structures of propenal are given below. Which of these resonating structures is more stable ? Give reason for your answer.



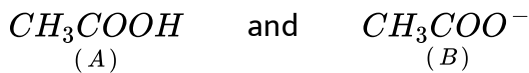
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26. By mistake, an alcohol (boiling point $97^\circ C$) was mixed a ketone (boiling point $68^\circ C$). Suggest a suitable method to separate the two compounds. Explain the reason for your choice.



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27. Which of the two structures (A) and (B) given below is more stabilised by resonance ? Explain



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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (Matching Type Questions)

1. Match the terms mentioned in Column I with the terms in Column II.

Column I

- (i) Carbocation
- (ii) Nucleophile
- (iii) Hyperconjugation
- (iv) Isomers
- (v) sp Hybridisation
- (vi) Electrophile

Column II

- (a) Cyclohexane and 1-hexene
- (b) Conjugation of electrons of C—H σ bond with empty p -orbital present at adjacent positively charged carbon.
- (c) sp^2 Hybridised carbon with empty p -orbital
- (d) Ethyne
- (e) Species that can receive a pair of electrons
- (f) Species that can supply a pair of electrons

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2. Match the intermediates given in Column I with their probable structure in Column II.

Column I

- (i) Free radical
- (ii) Carbocation
- (iii) Carbanion

Column II

- (a) Trigonal planar
- (b) Pyramidal
- (c) Linear

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3. Match the ions given Column I with their nature in Column II.

Column I

- (i) $\text{CH}_3-\ddot{\text{O}}-\overset{\oplus}{\text{C}}\text{H}-\text{CH}_3$
- (ii) $\text{F}_3-\text{C}\oplus$
- (iii) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3-\text{C}\ominus \\ | \\ \text{CH}_3 \end{array}$
- (iv) $\text{CH}_3-\overset{\oplus}{\text{C}}\text{H}-\text{CH}_3$

Column II

- (a) Stable due to resonance
- (b) Destabilised due to inductive effect
- (c) Stabilised by hyperconjugation
- (d) A secondary carbocation

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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS
(Assertion and Reason Type Questions)

1. Assertion (A). Simple distillation can help in separating a mixture of propan-1-ol (boiling point $97^{\circ}C$) and propanone (boiling point $56^{\circ}C$)

Reason (R). Liquids with a difference of more than $20^{\circ}C$ in their boiling points can be separated by simple distillation.

- A. Both A and R are correct and R is the correct explanation of A.
- B. Both A and R are correct but R is not the correct explanation of A.
- C. Both A and R are not correct.
- D. A is not correct but R is correct.

Answer: A

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2. Assertion (A) . Energy of resonance hybrid is equal to the average of energies of all canonical forms.

Reason (R). Resonance hybrid cannot be presented by a single structure.

- A. Both A and R are correct and R is the correct explanation of A.
- B. Both A and R are correct but R is not the correct explanation of A.
- C. Both A and R are not correct.
- D. A is not correct but R is correct.

Answer: D

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3. Assertion (A) : Pent-1-ene and pent-2-ene are position isomers.

Reason (R) : Position isomers differ in the position of functional group or a substituent.

- A. Both A and R are correct and R is the correct explanation of A.
- B. Both A and R are correct but R is not the correct explanation of A.
- C. Both A and R are not correct.
- D. A is not correct but R is correct.

Answer: A

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4. Assertion (A) . All the carbon atom in $H_2C = C = CH_2$ are sp^2 -hybridised.

Reason (R). In this molecule all the carbon atoms are attached to each other by double bonds

- A. Both A and R are correct and R is the correct explanation of A.
- B. Both A and R are correct but R is not the correct explanation of A.
- C. Both A and R are not correct.
- D. A is not correct but R is correct.

Answer: D

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5. Assertion (A) : Sulphur present in an organic compound can be estimated quantitatively by Carius method.

Reason (R) : Sulphur is separated easily from other atoms in the molecule and gets precipitated as light yellow solid.

- A. Both A and R are correct and R is the correct explanation of A.
- B. Both A and R are correct but R is not the correct explanation of A.
- C. Both A and R are not correct.
- D. A is not correct but R is correct.

Answer: D



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6. Assertion (A) . Components of a mixture of red and blue inks can be separated by distributing the components between stationary and mobile phases in paper chromatography

Reason (R). The coloured components of inks migrate at different rates

because paper selectively retains different components according to the difference in their partition between the two phases.

- A. Both A and R are correct and R is the correct explanation of A.
- B. Both A and R are correct but R is not the correct explanation of A.
- C. Both A and R are not correct.
- D. A is not correct but R is correct.

Answer: A



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NCERT EXEMPLAR PROBLEMS WITH ANSWERS, HINTS AND SOLUTIONS (Long Answer Type Questions)

1. What is meant by hybridisation ? Compound $CH_2 = C = CH_2$ contains sp or sp^2 hybridised carbon atoms. Will it be a planar molecule ?



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2. Benzoic acid is an organic compound. Its crude sample can be purified by crystallisation from hot water. What characteristic differences in the properties of benzoic acid and the impurity make this process of purification suitable ?

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3. Two liquids (A) and (B) can be separated by the method of fractional distillation. The boiling point of liquid (A) is less than boiling point of liquid (B). Which of the liquids do you expect to come out first in the distillate ? Explain.

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4. You have a mixture of three liquids A, B and C. There is a large difference in the boiling points of A and rest of the two liquids i.e., B and C. Boiling point of liquids B and C are quite close. Liquid A boils at a higher temperature than B and C and boiling point of B is lower than C.

How will you separate the components of the mixture. Draw a diagram showing set up the apparatus for the process.

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5. Draw a diagram of bubble plate type fractionating column. When do we require such type of a column for separating two liquids. Explain the principle involved in the separation of components of a mixture of liquids by using fractionating column. What industrial applications does this process have ?

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6. A liquid with high boiling point decomposes on simple distillation but it can be steam distilled for its purification. Explain how is it possible ?

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Additional Questions (Very short Answer Questions)

1. Give the IUPAC name of the alkane having the lowest molecular mass that contain a quaternary carbon.

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2. Arrange the following in increasing order of C-C bond length :

C_2H_6 , C_2H_4 , C_2H_2 .

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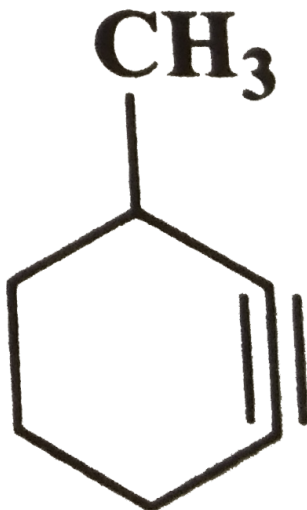
3. Name a functional group whose IUPAC name has only a prefix but no suffix. Give one example.

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4. Write the IUPAC names of (i) $CH_3 - C = CHCOOCH_3$, (ii)

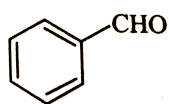
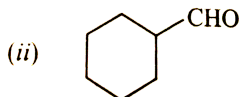
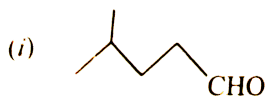


(ii)



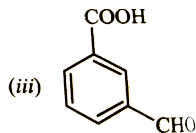
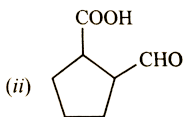
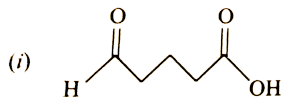
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5. Give the IUPAC names of the following compounds :



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6. Give the IUPAC names of the following bifunctional compounds.



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7. Name the alkyl groups derives from isobutane.

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8. A compound is formed by the substitution of two chlorine atoms for two hydrogen atoms in propane. What is the number of structural isomers possible ?

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9. How many metamers of 3-pentanone are possible ? Write their structures and IUPAC names. Can these be regarded as position isomers as well ?

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10. Write the position isomers of diethyl ether. Write their structures and IUPAC names. Can these be also regarded as metamers ?

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11. Write the tautomer of acetaldehyde and give its IUPAC name. Which of the two is more stable and why ?

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12. Write the structure of the tautomer of phenol and give its IUPAC name. which of the tautomers is more stable and why?

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13. Nitromethane exists in the aci-form but nitrobenzene does not. Explain why ?

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14. Select electrophiles out of the following :

H^+ , Na^+ , Cl^- , C_2H_5OH , $AlCl_3$, SO_3 , CN^- , $CH_3CH_2^+$, $:CCl_2$, $R-X$

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15. $H_2C=O$ or CH_3CN acts as a nucleophile as well as an electrophile.

Explain

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16. $CH_2 = CH^-$ is a better nucleophile than $HC \equiv C^-$. Explain.

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17. $CH_2 = CH^-$ is more basic than $HC \equiv C^-$. Explain why?

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18. Write the resonance structures of aniline and explain which one is the most stable?

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19. Arrange the following :

(i) $-NO_2$, $-COOH$, $-F$, $-CN$, $-I$, in decreasing order of $-I$

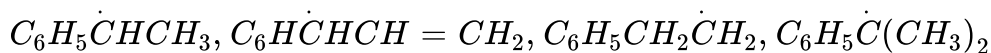
effect.

(ii) CH_3^- , D^- , $(CH_3)_3C^-$, $(CH_3)_2CH^-$, $CH_3CH_2^-$, in increasing order of +I effect.

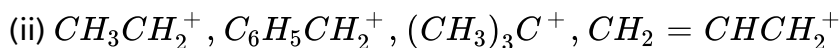
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20. Arrange the following :

(i)

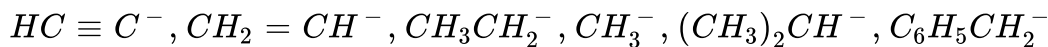


in order of increasing stability.



in order of decreasing stability.

(iii)



in order of increasing stability.

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21. When do we use a fine paper or hot water funnel for filtration ?

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22. How will you purify a liquid having non-volatile impurities ?

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23. How will you separate a mixture of urea and sodium chloride ?

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24. How will you purify essential oils ?

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25. How will you separate a mixture of o-nitrophenol and p-nitrophenol ?

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26. Name two methods which can be safely used to purify aniline.

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27. What type of compounds are purified by sublimation ?

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28. How will you separate iodine from sodium chloride ?

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29. How will you separate a mixture of two organic compounds which have different solubilities in the same solvent ?

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30. An organic liquid decomposes below its boiling point. How will you purify ?

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31. Define the term 'elution' as applied to column chromatography.

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32. Will you get any precipitate if you add silver nitrate solution to chloromethane ? If not, why ?

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33. Name two compounds which do not contain halogens but give positive Beilstein test.

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34. Why is freshly prepared saturated solution of ferrous sulphate used in the Lassaigne's test for nitrogen.

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35. Lassaigne's test is not shown by diazonium salts. Why ?

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36. Write the molecular formula of iron (III) hexacyanoferrate (II).

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37. What conclusion would you draw if during Lassaigne's test, a blood red colouration is obtained ?

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38. What type of organic compounds cannot be Kjeldahlised ?

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39. The oxygen is estimated in the organic compound by

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40. Find out percentage of carbon in acetic acid.

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41. Nitrogen is estimated in organic compounds by

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Additional Questions (Short Answer Questions)

1. Explain tetravalency of carbon.

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2. Why does carbon undergo hybridization prior to bond formation ?

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3. Draw the orbital diagram for methane and ethane molecules indicating the hybridization involved.

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4. Discuss the orbital diagram of ethene indicating the hybridization involved and the nature of the bonds formed.

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5. Describe the orbital diagram of acetylate indicating the hybridization involved and the nature of bonds formed.

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6. What is the effect of type of hybridization on (i) bond length (ii) bond strength.

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7. What are alicyclic compounds. Give two examples with their names.

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8. What are homocyclic and heterocyclic compounds? Give one example of each type along with its name.

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9. What is a functional group ? Write the functional groups of the following :

(i) Thioalcohol (ii) Isothiocyanate (iii) Thiocyanate and (iv) Sulphonic acid
(v) Sulphones (vi) Sulphoxides.

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10. What is homologous series ? Give its important characteristics. Write the first four homologues of alcohols and give their IUPAC names.

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11. Explain the following terms with one example in each case, (i) word root (ii) primary and secondary suffixes and prefixes.

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12. Pick up the error and write the correct IUPAC names for the following.

(i) 3-Pentyne (ii) 1, 6-Hexadiene (iii) 2-Ethyl-2-pentene (iv) 1, 2-Dihydroxyethane (v) Pent-4-en-1-yne.

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13. Explain: (i) position isomerism (ii) functional isomerism giving one example in each case.

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14. Write the tautomers of (i) ethyl acetoacetate and (ii) acetylacetone.

Explain why the latter has higher percentage of enol than the former.

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15. Explain the following with one example in each case.

(i) Homolytic fission (ii) Heterolytic fission of covalent bonds.

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16. What are electrophiles and nucleophiles ? Explain with examples.

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17. Explain inductive and electromeric effect with examples.

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18. What is resonance? How does resonance explain that all the carbon-carbon bond lengths in benzene are equal (139 pm)?

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19. Spectroscopic measurements indicate that the two oxygen atoms of sodium acetate are equivalent. Both the C-O bonds have the same lengths (126 pm). Explain.

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20. What is resonance effect ? What are its various types ? In what respects, does the resonance effect differ from inductive effect ?

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21. Comment upon the statement : 'Usual order of inductive effects of the alkyl groups is often reversed when attached to a double bond or a benzene ring'. Name the electronic effect and illustrate your answer with suitable examples.

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22. Explain hyperconjugation effect.

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23. How does hyperconjugation effect explain the stability of alkenes ?

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24. What are carbocations ? Discuss their various types.

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25. Give two methods of preparation of carbocations.

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26. Discuss the configuration of carbocations.

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27. What are reactive intermediates ? How are they generated by bond fission ?

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28. How an inductive and hyperconjugation effects the stability of primary, secondary and tertiary carbocations ?

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29. What are carbanions ? Discuss their configuration.

 [Watch Video Solution](#)

30. Give two methods of preparation of carbanions.

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31. Discuss the stability of carbanions on the basis of inductive effects.

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32. What are free radicals ? Discuss their configuration.

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33. How can hyperconjugation effect and inductive effect explain the stability of primary, secondary and tertiary free radicals ?

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34. Explain the following with examples :

(i) Tetravalency

(ii) Substitution reaction

(iii) Addition reaction

(iv) Combustion

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35. List the different method used for the purification of organic compounds.

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36. How will you separate a mixture of benzoic acid and naphthalene ?

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37. How will you purify sugar which has impurities of sodium chloride ?

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38. When is the process of fractional crystallisation employed ?

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39. Describe the method, which can be used to separate two compounds with different solubilities in a solvent S.

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40. Which of the following mixture does not use fractional crystallisation method for their separation?

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41. SEPARATION OF MISCIBLE LIQUID

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42. Glycerol which decomposes at its boiling point can be purified by

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43. Assertion (A) Aniline is purified by steam distillation.

Steam distillation is used for purification of substances which are insoluble in water but volatile in steam.

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44. Two volatile liquids A and B differ in their boiling points by 15K. The process which can be used to separate them is

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45. What is the basic principle of chromatography ?

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46. What is the basic principle of chromatography ?

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47. How will you detect the presence of carboxyl group in a compound ?

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48. Discuss the chemistry of Lassaigne's test.

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49. How will you detect the presence of carboxyl group in a compound ?

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50. Lassaigne's test for the detection of nitrogen fails in

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51. Discuss the principle of estimation of halogens, sulphur and phosphorus present in an organic compound.

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52. the percentage of carbon and hydrogen are estimated simultaneously in an organic compound by Liebig's method. State true or false.

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53. In Dumas' method for nitrogen estimation, the element nitrogen is estimated as

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Additional Questions (Long Answer Type Questions)

1. Discuss classification of hydrocarbons into various types and illustrate each class by taking two examples.

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2. Explain the following giving examples :

(i) Functional group (ii) Homologous series and its characteristics.

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3. What is mean by isomerism ? Discuss its various types giving at least one example in each case.

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4. Keto-enol tautomerism is shown by

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5. Give a brief account of opiates.

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6. Least contributing resonating structure of nitroethene is:

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7. Which of the following group has the maximum hyperconjugation effect ?

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8. How are free radicals, carbocations and carbanions produced ? Discuss their relative stabilities.

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9. Give an account of a common types of organic reactions with suitable examples.

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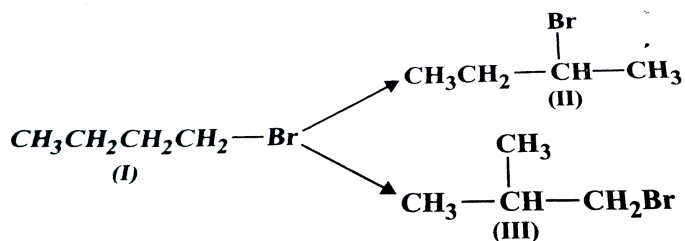
10. Give a brief description of the principles of the following techniques taking an example in each case.

(a) Crystallisation (b) Distillation (c) Chromatography

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Analytical Questions and Problems with Answers/Solutions (Questions)

1. Conversion of 1-bromobutane (I) to 2-bromobutane (II) is called isomerisation reaction. Will conversion (I) to 1-bromo-2-methylpropane (III) be also called an isomerization reaction? Justify your answer ?



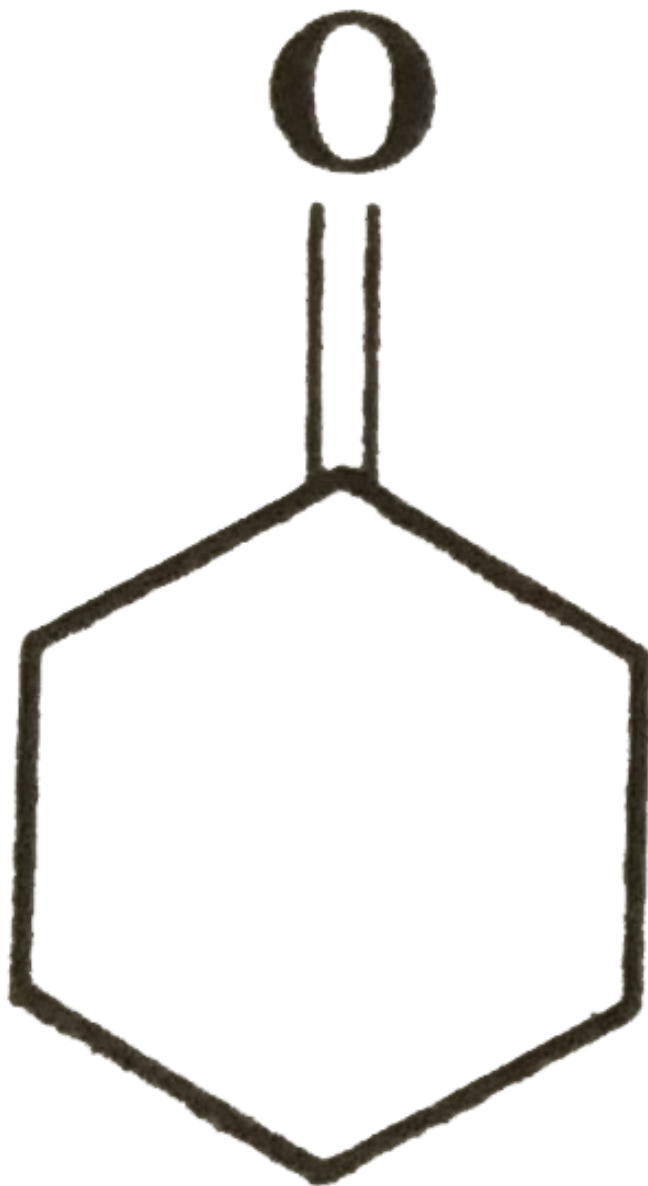
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2. The four hydrogens atoms of ethane lie in a plane. Do you think, four hydrogen atoms of allene (i.e., $H_2C = C = CH_2$) also lie in a plane?

Comment.



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3. Explain why

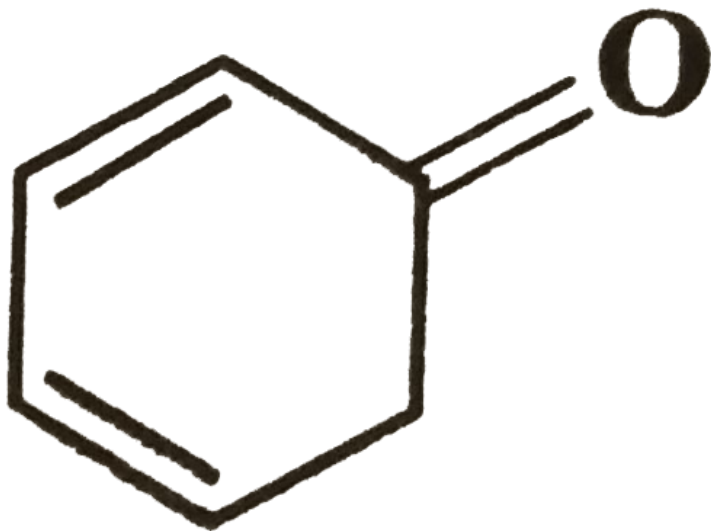
exists

in

keto

form

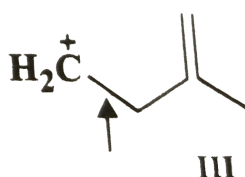
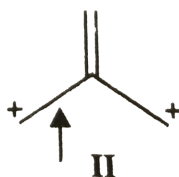
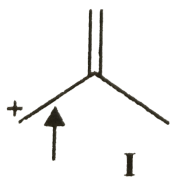
but



exists in the enol form?

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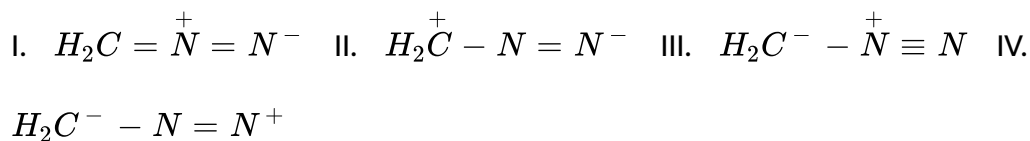
4. Consider the following carbocations?



Arrange them in decreasing order of the length of the bond as indicated by the arrows.

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5. With proper reasoning, arrange the following resonance structures in order of decreasing stability.



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6. Iodide is a better nucleophile than bromide. Explain

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7. H_3O^+ or RN_4^+ neither acts as an electrophile nor as a nucleophile.

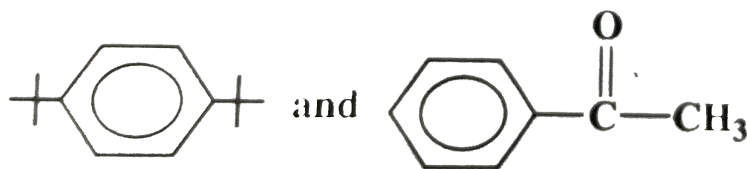
Explain why?

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8. $H_2C = O$ or CH_3CN acts as a nucleophile as well as an electrophile.

Explain

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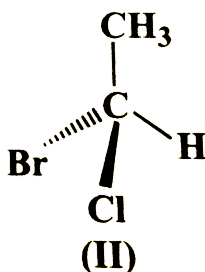
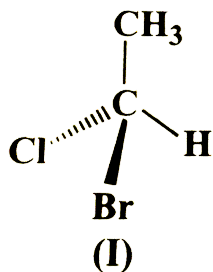
which will be eluted first in moderately polar solvent and why?

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10. A compound which does not give a positive test in Lassaigne's test for nitrogen is:

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11. The 3D structure of a compound is given below :



Write the 3D structure of its stereoisomer.

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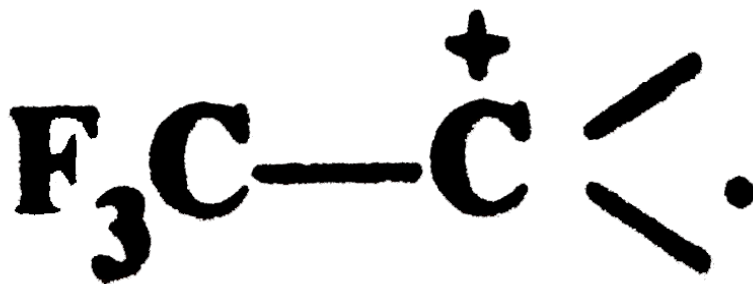
12. A compound which does not give a positive test in Lassaigne's test for nitrogen is:

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13. Although C-D bond is stronger than C-H bond, yet $(CH_3)_3C^+$ (i) is more stable than $(CD_3)_3C^+$ (ii) Why so ?

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14. Although F has high -I effect, yet F_3C^+ is more stable



. Explain why

is it so ?

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15. Why less stable carbocations tend to rearrange to more stable carbocations but carbanions and free radicals do not ? Why so ? Explain.

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16. Although carbocations are always planar but carbanions and free radicals can assume either planar or pyramidal geometry. Why is it so ?

Explain.

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Analytical Questions and Problems with Answers/Solutions (Problems)

1. 1.216 gm of an organic compound was reacted under Kjeldahl's method and the ammonia evolved was absorbed in 100 ml NH_2SO_4 . The remaining acid solution was made up to 500 ml by the addition of water. Twenty millilitres of the dilute solution required 32 ml $\frac{N}{10}$ caustic soda solution for complete neutralisation. Calculate the percentage of nitrogen in the compound.

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2. 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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3. Complete combustion of a sample of hydrocarbon Q gives 0.66 g of CO_2 and 0.36 g of H_2O . The empirical formula of the compound is

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4. An oxygen containing organic compound was found to contain 52% carbon and 13% of hydrogen. Its vapour density is 23. The compound reacts with sodium metal to liberate hydrogen. A functional isomer of this compound is

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Competition Focus (Jee (Main and Advanced)/Medical Entrance) I. Multiple choice Questions (With One Correct Answer)

1. In allene (C_3H_4), the type (s) of the carbon atom (s) is (are) :

A. sp and sp^3

B. sp and sp^2

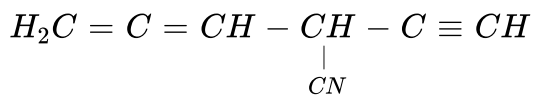
C. only sp^2

D. sp^2 and sp^3

Answer: B

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2. In the following compound, the number of 'sp' hybridised carbon is:



A. 2

B. 3

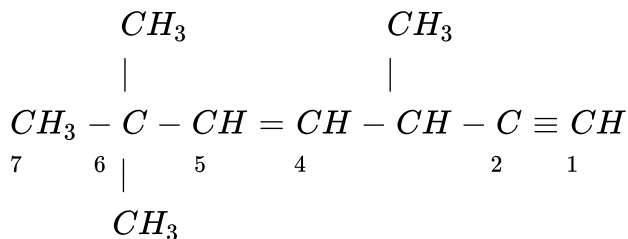
C. 4

D. 5

Answer: C

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3. The state of hybridisation of C_2 , C_3 , C_5 and C_6 of the hydrocarbon -



is in the following sequence :

A. sp^3 , sp^2 , sp^2 and sp

B. sp , sp^2 , sp^2 and sp^3

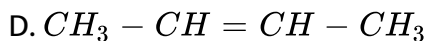
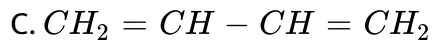
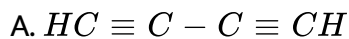
C. sp , sp^2 , sp^3 and sp^2

D. sp , sp^3 , sp^2 and sp^3

Answer: D

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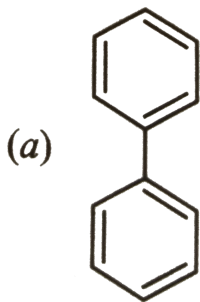
4. Which of the following molecules represents the order of hybridisation sp^2 , sp^2 , sp , sp from left to right atoms ?



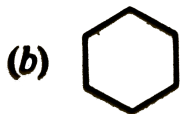
Answer: B

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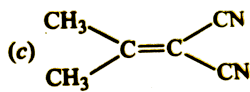
5. In which of the following molecules, all atoms are coplanar?



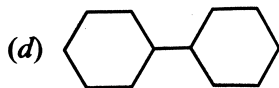
A.



B.



C.

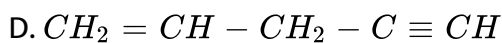
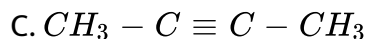
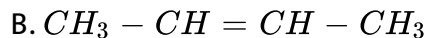
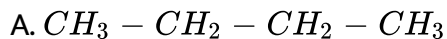


D.

Answer: A

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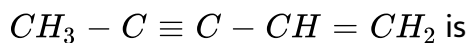
6. Considering the state of hybridization of carbon atoms, find out the molecule among the following which is linear?



Answer: C

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7. The maximum number of carbon atoms arranged linearly in the molecule,



A. 5

B. 4

C. 3

D. 2

Answer: B

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8. The number of sigma and pi-bonds present in 1, 3-butadiene are respectively

(a) 9 and 2

(b) 8 and 2

(c) 9 and 3

(d) 9 and 1

(e) 8 and 1

A. 9 and 2

B. 8 and 2

C. 9 and 3

D. 9 and 1

Answer: A



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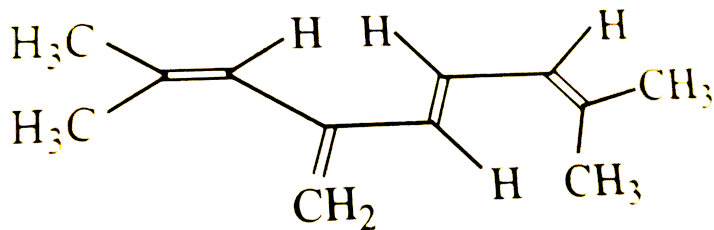
9. In hexa-1,3-diene-5-yne, the number of $C - C\sigma$, $C - C\pi$ and $C - H\sigma$ bonds respectively are:

- A. 5, 4 and 6
- B. 6, 3 and 5
- C. 5, 3 and 6
- D. 6, 4 and 5

Answer: A

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10. The total number of π -bond electrons in the following structure is



- A. 12

B. 16

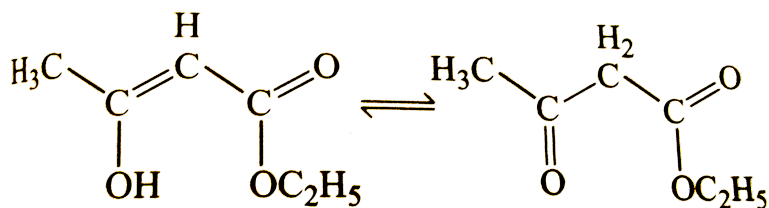
C. 4

D. 8

Answer: D

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11. The enolic form of ethyl acetoacetate as shown below has



A. 9 sigma bonds and 2pi- bonds

B. 9 sigma bonds and 1 pi-bond

C. 18 sigma bonds and 2 pi-bonds

D. 16 sigma bonds and 1 pi-bonds

Answer: C



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12. Which one of the following is a benzenoid aromatic compound ?

A. Furan

B. Thiophene

C. Pyridine

D. Aniline

Answer: D



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13. Tropolone is an example of

A. benzenoid aromatic compound

B. non-benzenoid aromatic compound

C. alicyclic compound

D. acyclic compound

Answer: B

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14. The structure of isobutyl group in an organic compound is :

A. $CH_3 - CH_2 - CH_2 - CH_2 -$

B.
$$\begin{array}{c} CH_3 \\ | \\ CH_3 - C - \\ | \\ CH_3 \end{array}$$

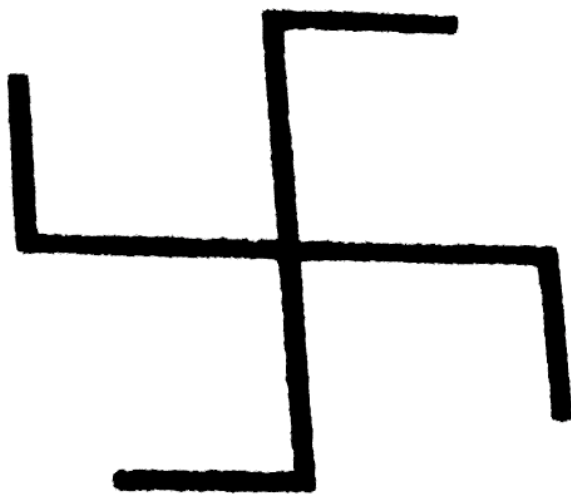
C.
$$\begin{array}{c} CH_3 \\ \diagdown \\ (c) \quad CH - CH_2 - \\ \diagup \\ CH_3 \end{array}$$

D. $CH_3 - CH - CH_2CH_3$

Answer: C



15. The IUPAC name for the hydrocarbons represented by the Swastik sign



is

- A. neononance
- B. tetraethylcarbon
- C. 2-ethylpentane
- D. 3,3-diethylpentane

Answer: D



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16. Which isomer of hexane has only two different sets of structurally equivalent hydrogen atoms?

A. 2,2-dimethylbutane

B. 2-methylpentane

C. 3-methylpentane

D. 2,3-dimethylbutane

Answer: D



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17. A compound with molecular formula C_6H_{14} has two tertiary carbons.

Its IUPAC name is

A. n-hexane

B. 2-methylpentane

C. 2, 3-dimethylbutane

D. 2, 3-dimethylpentane

Answer: C



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18. The IUPAC name of



is

A. 3-ethyl-4, 4-dimethylheptane

B. 1, 1-dimethyl-2, 2-dimethylpentane

C. 4, 4-dimethyl-5, 5-diethylpentane

D. 5, 5-diethyl-4, 4-dimethylpentane

Answer: A



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19. The IUPAC name of the following molecule



- A. 5, 6-dimethylhept-2-ene
- B. 2, 3-dimethylhept-5-ene
- C. 5, 6-dimethylhept-3-ene
- D. 5-isopropylhex-2-ene

Answer: A



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20. The correct IUPAC name for the compound



- A. 4-ethyl-3-propylhex-1-ene
- B. 3-ethyl-4-ethenylheptane

C. 3-ethyl-4-propylhex-5-ene

D. 3-(1-ethylpropyl) hex-1-ene

Answer: A



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21. The IUPAC name of the following compound is



A. 4-methyl-3-ethylhex-4-ene

B. 4, 4-diethyl-3-methylbut-2-ene

C. 3-ethyl-4-methylhex-4-ene

D. 4-ethyl-3-methylhex-2-ene

Answer: D



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22. What is the IUPAC nomenclature of the given compound ?

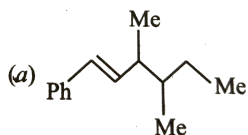


- A. 5-Ethynyl-1,6-heptadiene
- B. 3-Ethynyl-1, 6-heptadiene
- C. 3-Vinyl-hept-6-en-1-yne
- D. 5-Vinyl-hept-1-en-6-yne

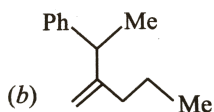
Answer: B

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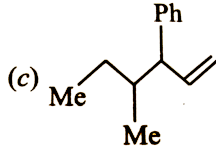
23. Which one of the following is s-butylphenylvinyl methane ?



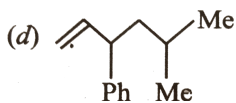
A.



B.



C.



D.

Answer: C

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24. Consider the following compound,



IUPAC name of this compound is

- A. 5, 6-diethyl-3-methyldecane
- B. 5, 6-diethyl-3-methyldec-4-ene
- C. 3, 5, 6-triethyldec-6-ene
- D. 3, 5, 6-trimethyldec-4-ene

Answer: B

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25. The *IUPAC* name of the compound having the formula $CH \equiv C - CH = CH_2$ is

- A. 1-butyne-3-ene
- B. but-1-yne-3-ene
- C. 1-butene-3-yne
- D. 3-butene-1-yne

Answer: C

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26. The *IUPAC* name of the compound $CH_3CH = CHC \equiv CH$ is

A. pent-4-yn-2-ene

B. pent-3-en-1-yne

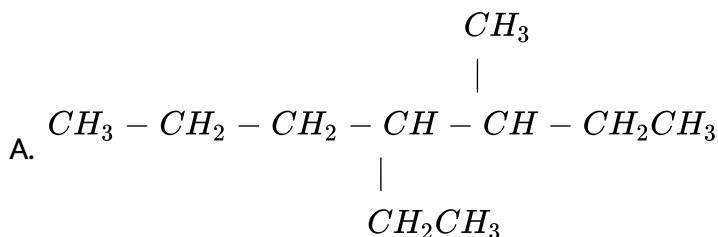
C. pent-2-en-4-yne

D. pent-1-yn-3-ene

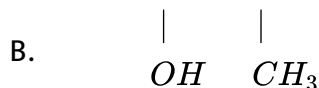
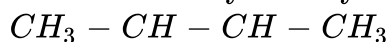
Answer: B

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27. The names of some compounds are given. Which one not in the *IUPAC* system?



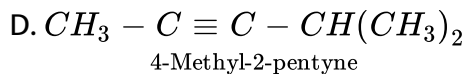
3-Methyl-4-ethylheptane



3-Methyl-2-butanol



2-Ethyl-3-methylbut-1-ene



Answer: A

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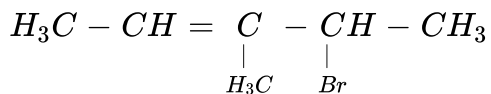
28. The IUPAC name of C_6H_5COCl is

- A. chlorobenzyl ketone
- B. benzene chloroketone
- C. benzenecarbonyl chloride
- D. chlorophenyl ketone

Answer: C

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29. The correct IUPAC name of the following compound is :



- A. 4-bromo-3-methylpent-2-ene
- B. 2-bromo-3-methylpent-4-ene
- C. 3-methyl-4-bromopent-4-ene
- D. 2-bromo-4-methylpent-2-ene

Answer: A



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30. IUPAC name of the compound



- A. 1-bromobut-2-ene
- B. 2-bromo-2-butene
- C. bromobutane

D. 1-bromobut-3-ene

Answer: A

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31. In the IUPAC system, $PhCH_2CH_2CO_2H$ is named

A. 3-phenylpropanoic acid

B. benzylacetic acid

C. carboxyethyl benzene

D. 2-phenylpropanoic acid

Answer: A

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32. The IUPAC name of the compound X is



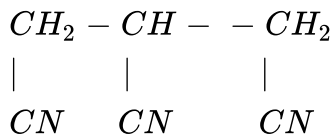
- A. 4-cyano-4-methyloxopentane
- B. 2-cyano-2-methyl-4-oxopentane
- C. 2, 2-dimethyl-4-oxopentanenitrile
- D. 4-cyano-4-methyl-2-pentanone

Answer: C



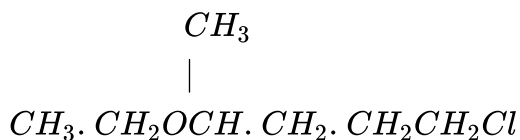
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33. The IUPAC name of the following compound is



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34. Give the correct IUPAC name of

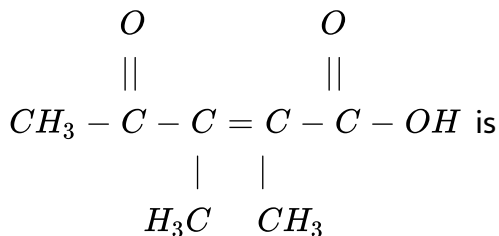


- A. 2-ethoxy-5-chloropentane
- B. 1-chloro-4-ethyl-4-methylpentane
- C. 1-chloro-4-ethoxypentane
- D. ethyl-1-chloropentyl ether

Answer: C

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35. IUPAC name of the molecule



A. 4-oxo-2, 3-dimethylpent-2-en-1-oic acid

B. 3-carboxy-3-methylpent-2-en-3-one

C. 4-carboxy-3-methylpent-3-en-2-one

D. 2, 3-dimethyl-4-oxopent-2-en-1-oic acid

Answer: D

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36. The IUPAC name of  is

A. but-3-enoic acid

B. but-1-enoic acid

C. pent-4-enoic acid

D. prop-2-enoic acid

Answer: A

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37. The IUPAC name of the compound

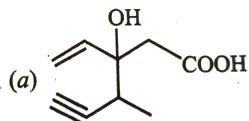
 is

- A. 5-formylhex-2-en-3-one
- B. 5-methyl-4-oxohex-2-en-5-al
- C. 3-keto-2-methylhex-5-enal
- D. 3-keto-2-methylhex-4-enal

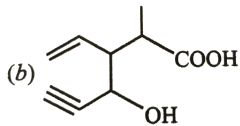
Answer: D

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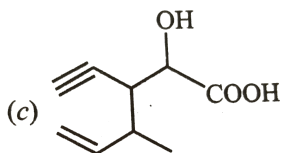
38. Structure of the compound whose *IUPAC* name is 3-ethyl-2-hydroxy-4-methylhex-3-en-5-ynoic acid is



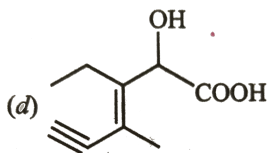
A.



B.



C.



D.

Answer: D



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39. Give the IUPAC name of the compound



A. 1, 1, 3-Trimethylcyclohex-2-ene

B. 1, 3, 3-Trimethylcyclohex-1-ene

C. 1, 1, 5-Trimethylcyclohex-5-ene

D. 2, 6, 6-Trimethylcyclohex-1-ene

Answer: B

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40. The IUPAC name of the compound shown below is



A. 2-bromo-6-chlorocyclohexene-1-ene

B. 6-bromo-2-chlorocyclohexene

C. 3-bromo-1-chlorocyclohexene

D. 1-bromo-3-chlorocyclohexene

Answer: C

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41. The IUPAC name of

 is

- A. acetylcyclohexadiene
- B. 1-cyclohexa-2, 4-dienylethanone
- C. 6-cyclohexa-1, 3-dienylethanone
- D. none of these

Answer: B



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42. The IUPAC name of

 is

- A. N-cyclohexylbenzamide
- B. N-phenyl-N-cyclohexylmethanamide
- C. N-phenylcyclohexancarboxamide

D. N-cyclohexyl-N-phenylmethanamide.

Answer: C

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43. The IUPAC name of

 is

- A. cyclohexanone
- B. cyclohexylmethanone
- C. oxycyclohexene
- D. cyclohexylidenemethanone

Answer: D

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44. The correct decreasing order of priority for the functional groups of organic compounds in the IUPAC system of nomenclature is

A. $-CONH_2$, $-CHO$, $-SO_3H$, $-COOH$

B. $-COOH$, $-SO_3H$, $-CONH_2$, $-CHO$

C. $-SO_3H$, $-COOH$, $-CONH_2$, $-CHO$

D. CHO , $-COOH$, $-SO_3H$, $-CONH_2$

Answer: B



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45. The IUPAC name of the following compound



is

A. 4-bromo-3-cyanophenol

B. 2-bromo-5-hydroxybenzonitrile

C. 2-cyano-4-hydroxybromobenzene

D. 6-bromo-3-hydroxybenzonitrile

Answer: B



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46. The IUPAC name of the compound



is

A. 4-methoxy-2-nitrobenzaldehyde

B. 4-formyl-3-nitroanisole

C. 4-methoxy-5-nitrobenzaldehyde

D. 2-formyl-6-nitrobenzene

Answer: A



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47. The IUPAC name for the compound

 is

- A. 1-fluoro-4-methyl-2-nitrobenzene
- B. 4-fluoro-1-methyl-3-nitrobenzene
- C. 4-methyl-1-fluoro-2-nitrobenzene
- D. 2-fluoro-5-methyl-1-nitrobenzene

Answer: A



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48. The *IUPAC* name of 4-isopropyl-m-xylene is

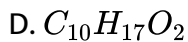
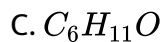
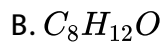
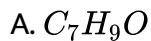
- A. 1-Isopropyl-2, 4-dimethylbenzene
- B. 4-Isopropyl-m-xylene
- C. 1-Isopropyl-3, 5-dimethylbenzene

D. 4-Isopropyl-3, 5-dimethylbenzene

Answer: A

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49. Among the following the one which can exist in free state as a stable compound is:



Answer: B

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50. Which one of the following is not an isomer of 3-methylbut-1-yne?

A. Pent-1-yne

B. Buta-1, 3-diene

C. Pent-2-yne

D. Penta-1, 3-diene

Answer: B



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51. Which of the following pairs of compound are not position isomers ?

A. 

B. 

C. 

D. 

Answer: A

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52. Acetone (CH_3COCH_3) and propanal (CH_3CH_2CHO) are

- A. functional isomers
- B. position isomers
- C. geometrical isomers
- D. optical isomers

Answer: A

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53. Identify the correct statement in the following:

- A. Dimethyl ether and ethanol are chain isomers

- B. Ethanoic acid and methyl methanoate are position isomers
- C. n-Butane and isobutane are functional isomers.
- D. Propan-1-ol and propan-2-ol are position isomers.

Answer: D

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54. The correct statement regarding a carbonyl compound with a hydrogen atom on its alphacarbon, is

- A. a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as carbonylation
- B. the carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as keto-enol tautomerism

C. a carbonyl compound with hydrogen atom on its alpha-carbon never equilibrates with its corresponding enol

D. a carbonyl compound with a hydrogen atom on its alpha-carbon rapidly equilibrates with its corresponding enol and this process is known as aldehyde-ketone equilibrium

Answer: B

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55. The type of isomerism found in urea molecule is

A. chain

B. position

C. geometrical

D. tautomerism

Answer: D



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56. Identify the compound that exhibits tautomerism

- A. lactic acid
- B. 2-pentanone
- C. phenol
- D. 2-butene

Answer: B



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57. The enolic form of acetone contains

- A. 9 sigma bonds, 1 pi bonds and two lone pairs
- B. 8 sigma bonds, 2 pi bonds and two lone pairs

C. 10 sigma bonds, 1 pi bonds and one lone pairs

D. 9 sigma bonds, 2 pi bonds and one lone pairs

Answer: A



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58. Given :



Which of the following compounds can exhibit tautomerism ?

A. II and III

B. I, II and III

C. I and II

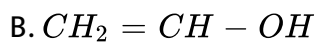
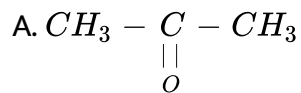
D. I and II

Answer: B



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59. Which one of the following compounds cannot show tautomerism?



Answer: D

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60. Which of the following does not exhibit tautomerism?



D. 

Answer: A

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61. Maximum enol content is in :

A. 

B. 

C. 

D. 

Answer: B

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62. The order of stability of the following tautomerism compound is



A. $II > I > III$

B. $II > III > I$

C. $I > II > III$

D. $III > II > I$

Answer: D



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63. The total number of acyclic structural isomers possible for compound with molecular formula $C_4H_{10}O$ is

A. 9

B. 7

C. 5

D. 6

Answer: B

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64. How many cyclic and acyclic isomers (including tautomers) can be made by the formula C_3H_6O ?

A. 4

B. 5

C. 9

D. 10

Answer: C

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65. $:CCl_2$ is

- A. an electrophile
- B. a free radical
- C. a nucleophile
- D. none of these

Answer: A



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66. Which of the following statement is not correct for a nucleophile ?

- A. Ammonia is a nucleophile
- B. Nucleophiles attack low e^- density sites
- C. Nucleophiles are not electron seeking
- D. Nucleophile is a Lewis acid

Answer: D

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67. Which of the following is the most correct electron displacement for a nucleophilic reaction to take place ?

A. 

B. 

C. 

D. 

Answer: A

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68. Which of the following is correct regarding the -I-effect of the substituents ?

A. $-NR_2 < -OR < -F$

B. $-NR_2 > -OR < -F$

C. $-NR_2 < -OR > -F$

D. $-NR_2 > -OR > -F$

Answer: A

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69. The correct statement regarding electrophile is

A. electrophile is a negatively charged species and can form a bond by

accepting a pair of electrons from another electrophile

B. electrophiles are generally neutral species and can form a bond by

accepting a pair of electrons from a nucleophile

C. electrophile can be either neutral or positively charged species and

can form a bond by accepting a pair of electrons from a

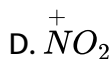
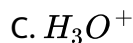
nucleophile

D. electrophile is a negatively charged species and can form a bond by accepting a pair of electrons from a nucleophile.

Answer: C

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70. Which of the following species is not electrophilic in nature



Answer: C

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71. Consider thiol anion (RS^{\ominus}) and alkoxy anion (RO^{\ominus}). Which of the following statements is correct?

- A. RS^{\ominus} is less basic and less nucleophilic than RO^{\ominus}
- B. RS^{\ominus} is less basic but more nucleophilic than RO^{\ominus}
- C. RS^{\ominus} is more basic and more nucleophilic than RO^{\ominus}
- D. RS^{\ominus} is more basic but less nucleophilic than RO^{\ominus}

Answer: B

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72. In which of the following, resonance of $-NH_2$ group is possible ?

- A. 1-Aminobutane
- B. Ethylamine
- C. Benzylamine

D. p-Toluidine

Answer: D

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73. Which of the following molecules is least resonance stabilised?

A. 

B. 

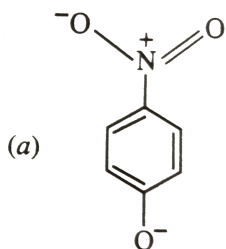
C. 

D. 

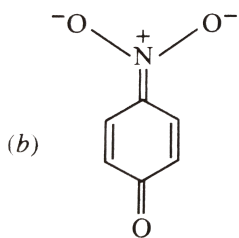
Answer: B

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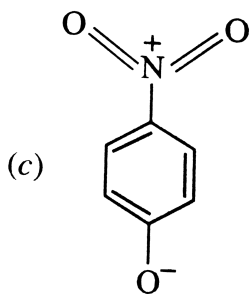
74. The most unlikely representation of resonance structure of p-nitrophenoxide is :



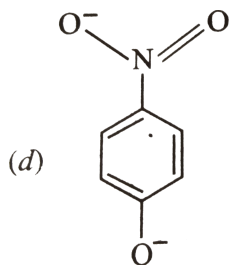
A.



B.



C.

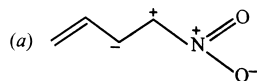


D.

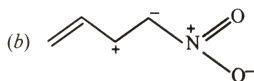
Answer: C

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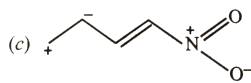
75. Among the following, the least stable resonance structure is :



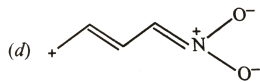
A.



B.



C.

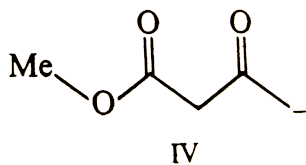
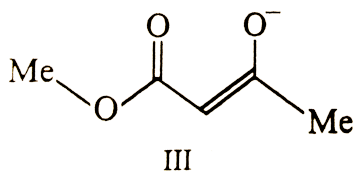
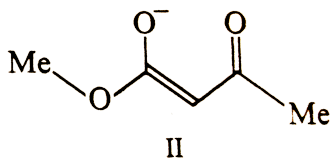
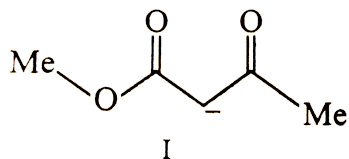


D.

Answer: A

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76. Among the following structures, the one which is not resonating structure of others is



A. I

B. II

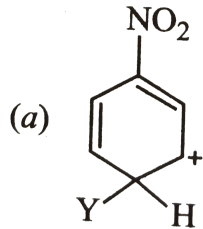
C. III

D. IV

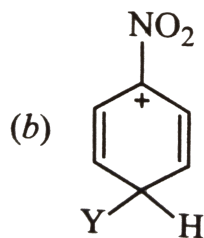
Answer: D

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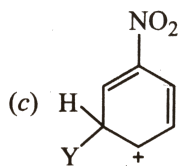
77. Which of the following carbocations is expected to be most stable ?



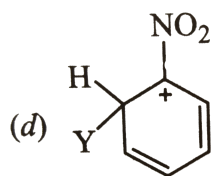
A.



B.



C.



D.

Answer: C

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78. Hyperconjugation involves overlap of the following orbitals :

A. $\sigma - \sigma$

B. $\sigma - p$

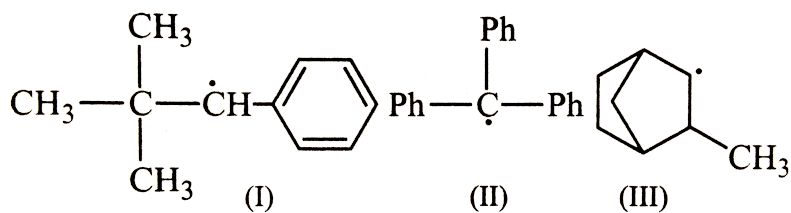
C. p-p

D. $\pi - \pi$

Answer: B

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79. Consider the following compounds:



Hyperconjugation occurs in

A. II only

B. I and II

C. I only

D. II only

Answer: A

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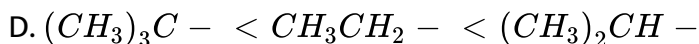
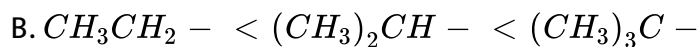
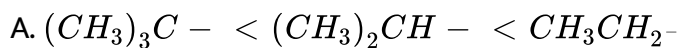
80. The hyperconjugative stabilities of tert-butyl cation and 2-butene, respectively, are due to

- A. $\sigma - p$ (empty) and $\sigma - \pi^*$ electron delocalisations
- B. $\sigma - \sigma^*$ and $\sigma - \pi^*$ electron delocalisations
- C. $\sigma - p$ (filled) and $\sigma - \pi$ electron delocalisations
- D. p (filled) $\rightarrow \sigma^*$ and $\sigma - \pi^*$ electron delocalisations

Answer: A

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81. Arrangements of $(CH_3)_3C -$, $(CH_3)_2CH -$, $CH_3CH_2 -$ when attached to benzyl or n unsaturated group in increasing order of inductive effects is:

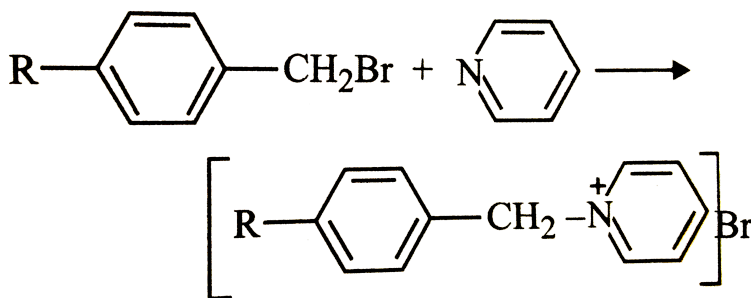


Answer: A



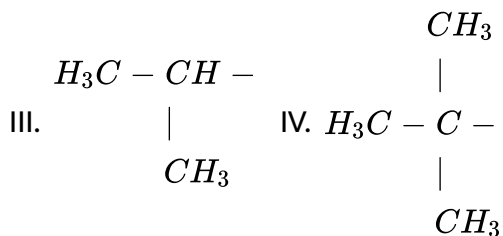
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82. The rate of the reaction



is influenced by the hyperconjugation effect of group R. If R sequentially is

I. CH_3- II. CH_3CH_2-



the increasing order of speed of the above reaction is

A. IV, III, II, I

B. I, II, III, IV

C. I, IV, III, I

D. III, II, I, IV

Answer: B



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83. The effect that makes 2,3-dimethyl-2-butene more stable than 2-butene is :

- A. resonance
- B. hyperconjugation
- C. electromeric effect
- D. inductive effect

Answer: B



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

A. neopentyl

B. tert-Butyl

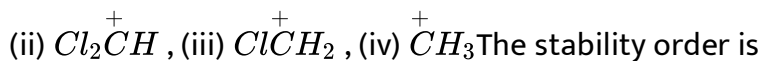
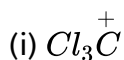
C. isopropyl

D. ethyl

Answer: B

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85. Consider the following carbocation:



A. $(iv) < (i) < (ii) < (iii)$

B. $(i) < (ii) < (iii) < (iv)$

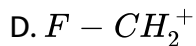
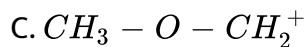
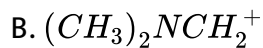
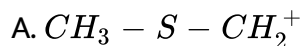
C. $(iv) < (i) < (iii) < (ii)$

D. $(iv) < (ii) < (i) < (iii)$

Answer: B

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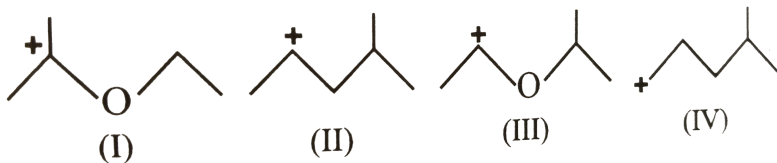
86. Which of the following cation would have greatest stability?



Answer: B

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87. The correct stability order for the following species is



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

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

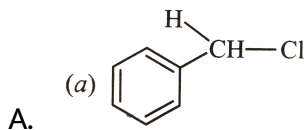
C. $(II) > (I) > (IV) > (III)$

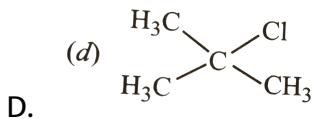
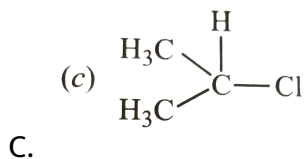
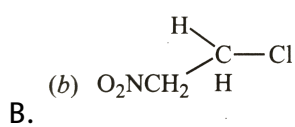
D. $(I) > (III) > (II) > (IV)$

Answer: D

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88. In which of the following compounds, the C-Cl bond ionisation shall give most stable carbonium ion

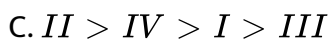
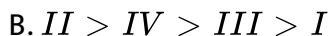
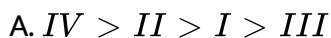
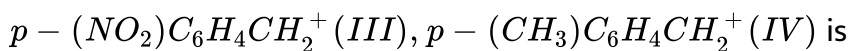
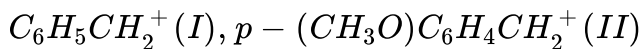




Answer: D

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89. The decreasing order of stability of the carbonium ions

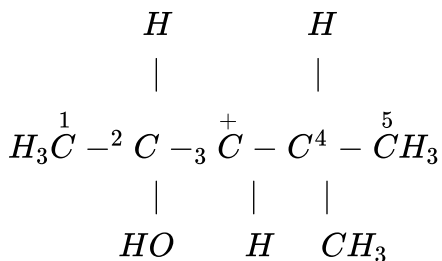


D. $IV > II > III > I$

Answer: C

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90. In the following carbocation, H/CH_3 that is most likely to migrate to the positively charged carbon is



A. CH_3 at C-4

B. H at C-4

C. CH_3 at C-2

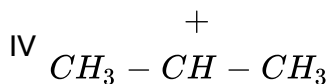
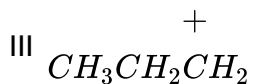
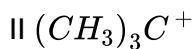
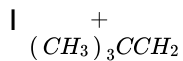
D. H at C-2

Answer: D

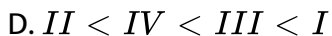
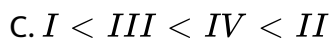




91. Consider the following carbocations



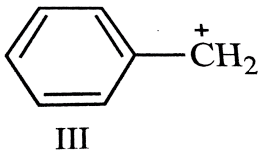
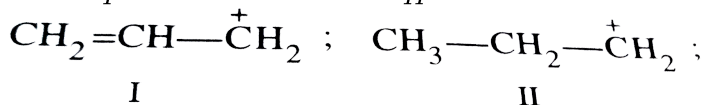
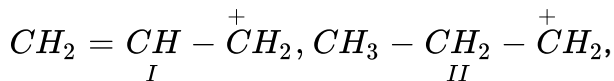
The correct order for the stability of the above carbocations is



Answer: C



92. The order of stability of the following carbocations is



A. $III > I > II$

B. $III > II > I$

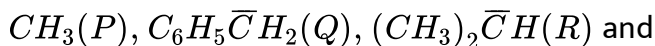
C. $II > III > I$

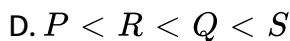
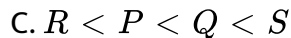
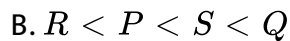
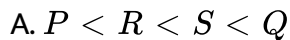
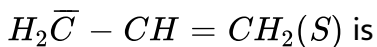
D. $I > II > III$

Answer: A

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93. the ascending order of stability of the carbanion

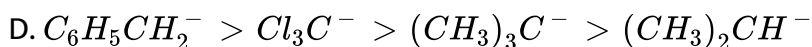
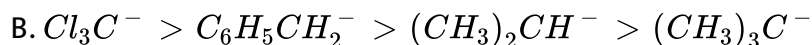
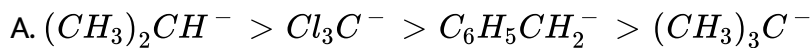




Answer: B

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94. Arrange the carbanions, $(CH_3)_3\bar{C}$, $\bar{C}Cl_3$, $(CH_3)_2\bar{C}H$, $C_6H_5\bar{C}H_2$, in order of their decreasing stability

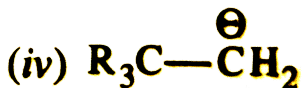
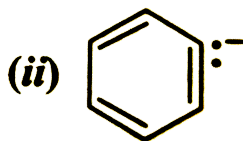


Answer: B

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95. The stability of carbanions in the following.

(i) $RC \equiv C^{\ominus}$ (ii)



(iii) $R_2C = \overset{\ominus}{C}H$ (iv) $R_3C - \overset{\ominus}{C}H_2$

A. (iv) > (ii) > (iii) > (i)

B. (i) > (iii) > (ii) > (iv)

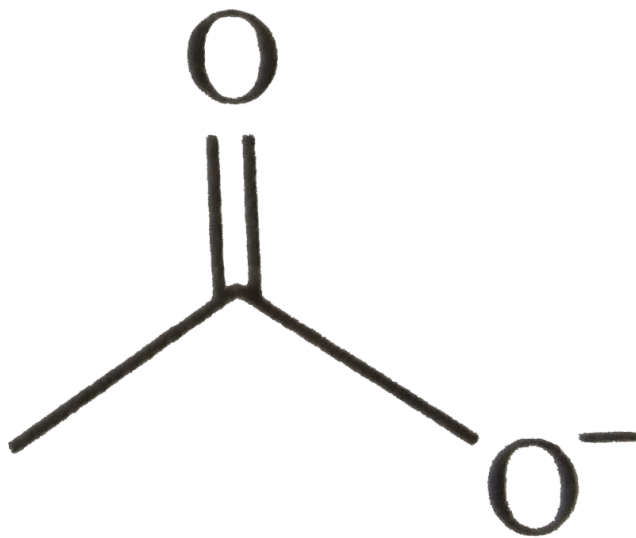
C. (i) > (ii) > (iii) > (iv)

D. (ii) > (iii) > (iv) > (i)

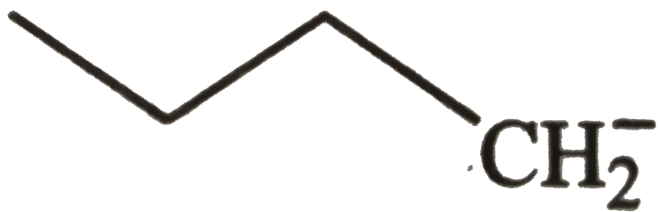
Answer: C

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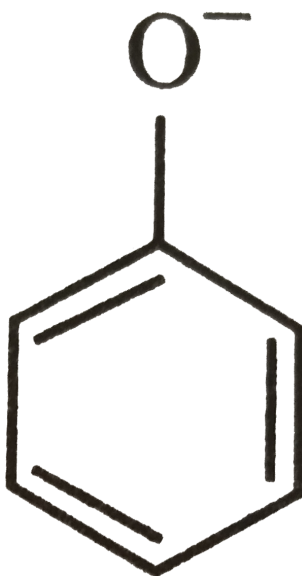
96. The order of the base strength of the compounds



(i)



(ii)



(iv)

is

(iii) NH_2^-

A. (iv) > (ii) > (i) > (iii)

B. (iii) > (ii) > (iv) > (i)

C. $(ii) > (iii) > (iv) > (i)$

D. $(ii) > (iii) > (i) > (iv)$

Answer: C



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97. Which of the following compounds possesses the $C - H$ bonds with the lowest bond dissociation energy?

A. Toluene

B. Benzene

C. n-Pentane

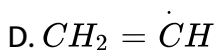
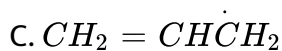
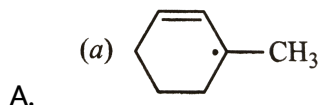
D. 2, 2-Dimethylpropane

Answer: A



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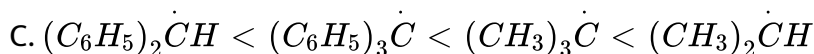
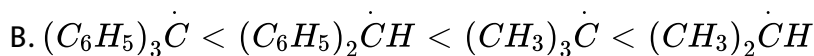
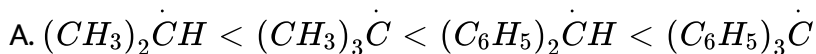
98. Most stable radical is

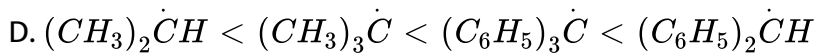


Answer: A

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99. The increasing order of stability of the following free radicals is :



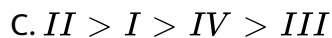
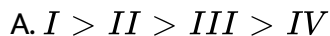


Answer: A

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100. Arrange the following free radicals in order of decreasing stability.

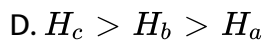
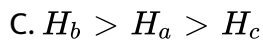
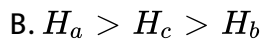
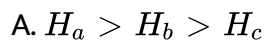
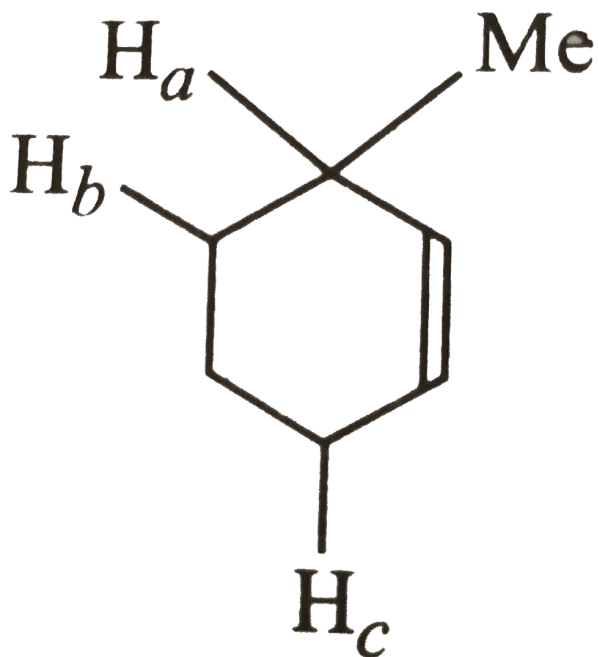
Methyl (I), Vinyl(II), Allyl(III), Benzyl(IV)



Answer: D

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101. The order of decreasing ease of abstraction of hydrogen atoms in the following molecule is



Answer: B

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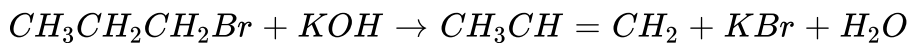
102. The reaction of methyl trichloroacetate (Cl_3CCO_2Me) with sodium methoxide (NaOMe) generates :

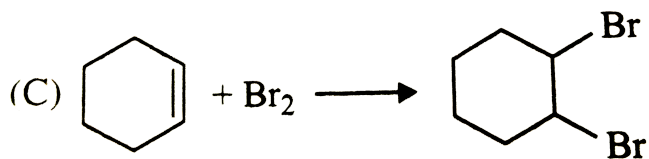
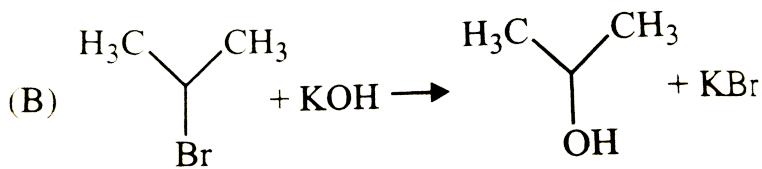
- A. carbocation
- B. carbene
- C. carbanion
- D. carbon radical

Answer: B

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103. For the following reactions:





Which of the following statement is correct ?

- A. (A) is elimination, (B) and (C) are substitution reactions
- B. A is substitution, (B) and (C) are addition reactions
- C. (A) and (B) are elimination reaction reactions and (C) is an addition reaction
- D. (A) is elimination, (B) is substitution and (C) is addition reaction

Answer: D

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104. An alkyne combines with a conjugated diene to give an unconjugated cycloalkadiene. The most likely title of this reaction is

- A. Schotten Baumann reaction
- B. Hofmann bromamide reaction
- C. Pinacol-pinacolone rearrangement
- D. Diels-Alder reaction

Answer: D



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105. How will you purify an impure sample of (i) Camphor (ii) aniline ?

- A. distillation
- B. vacuum distillation
- C. sublimation

D. steam distillation

Answer: C

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106. The best method for the separation of naphthalene and benzoic acid from their mixture is

A. sublimation

B. chromatography

C. crystallisation

D. distillation

Answer: C

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107. A miscible mixture of $C_6H_6 + CHCl_3$ can be separated by

- A. sublimation
- B. distillation
- C. filtration
- D. crystallization

Answer: B



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108. If the boiling point difference between the two liquids is not much then they can be separated by:

- A. Simple distillation
- B. Distillation under reduced pressure
- C. steam distillation

D. fractional distillation

Answer: D



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109. The distillation technique most suited for separating glycerol from spent lye in the soap industry is

- A. simple distillation
- B. fractional distillation
- C. steam distillation
- D. distillation under reduced pressure

Answer: D



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110. In steam distillation of toluene , the pressure of toluene in vapour is

- A. equal to pressure of barometer
- B. less than pressure of barometer
- C. equal to vapour pressure of toluene in simple distillation
- D. more than the vapour pressure of toluene in simple distillation

Answer: B



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111. The most suitable method of separation of a 1:1 mixture of o- and p-nitrophenol is-

- A. chromatography
- B. crystallisation
- C. steam distillation

D. sublimation

Answer: C

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112. The separation of the constituents of a mixture by column chromatography depends upon their

- A. different solubilities
- B. different boiling points
- C. different refractive indices
- D. differential adsorption

Answer: D

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113. Paper chromatography has following mobile and stationary phases respectively

- A. liquid, solid
- B. solid, solid
- C. gas, liquid
- D. liquid, liquid

Answer: D



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114. The elution sequence of a mixture of compounds containing chlorobenzene, anthracene and p-cresol developed on an alumina column using a solvent system of progressively increasing polarity is

- A. anthracene → chlorobenzene → p-cresol
- B. anthracene → p-cresol → chlorobenzene

C. chlorobenzene → anthracene → p-cresol

D. p-cresol → anthracene → chlorobenzene

Answer: A



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115. An organic compound which produces a bluish green colored flame on heating in the presence of copper is

A. chlorobenzene

B. benzaldehyde

C. aniline

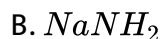
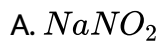
D. benzoic acid

Answer: A



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116. During the fusion of an organic compound with sodium metal, nitrogen of the organic compound is converted into



Answer: C

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117. In the Lassaigne's test for the detection of nitrogen in an organic compound, the appearance of blue coloured compound is due to

A. ferric ferricyanide

B. ferrous ferricyanide

C. ferric ferrocyanide

D. ferrous ferrocyanide

Answer: C

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118. The LaSSaigen's extract is boiled with conc. HNO_3 while testing for halogens. By doing so it :

- A. decomposes Na_2S and NaCN, if formed
- B. helps in the precipitation of AgCl
- C. increases the solubility product of AgCl
- D. increases the concentration of NO_3^- ions

Answer: A

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119. Lassaigne's test (with silver nitrate) is commonly used to detect halogens such as chlorine, bromine and iodine but not useful to detect fluorine because the product AgF formed as

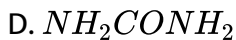
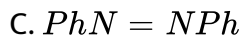
- A. volatile
- B. reactive
- C. explosive
- D. soluble in water

Answer: D

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120. Which of the following compounds will not give Lassaigne's test for nitrogen ?

- A. NH_2NH_2
- B. $C_6H_5NHNH_2$



Answer: A

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121. Which of the following compounds gives blood red colouration when its Lassaigne's extract is treated with alkali and ferric chloride .

A. thiourea

B. diphenyl sulphide

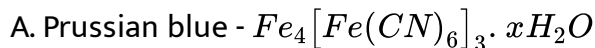
C. phenylhydrazine

D. benzamide

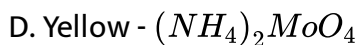
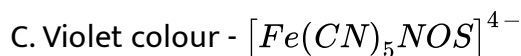
Answer: A

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122. The colour of the solution/precipitate obtained in the elemental analysis of an organic compound and the molecule/ion responsible for the colour are given below. Choose the incorrectly matched pair:



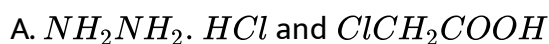
B. Black - PbS



Answer: D

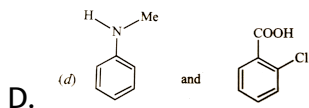
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123. Correct pair of compounds which gives blue colouration/precipitate and white precipitate, respectively, when their Lassaigne's test separately



B. NH_2CSNH_2 and $PhCH_2Cl$

C. NH_2CH_2COOH and NH_2CONH_2



Answer: D

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124. 0.30g of an organic compound containing C , H , and O on combustion yields 0.44g of CO_2 and 0.18g of H_2O . If its molecular mass is 60μ the molecular mass is formula will be

A. C_3H_8O

B. $C_2H_4O_2$

C. CH_2O

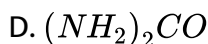
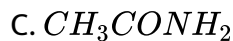
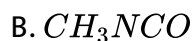
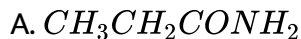
D. C_4H_6O

Answer: B



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125. An organic compound having molecular mass 60 is found to contain $C = 20\%$, $H = 6.67\%$, and $N = 46.67\%$, while rest is oxygen. On heating, it gives NH_3 along with a solid residue. The solid residue gives violet color with alkaline copper sulphate solution. The compound is



Answer: D



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126. In Duma's method for estimation of nitrogen. 0.25g of an organic compound gave 40mL of nitrogen collected at 300K temperature of

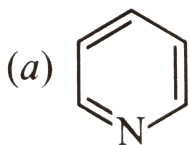
725mm pressure. If the aqueous tension at 300K is 25mm, the percentage of nitrogen in the compound is

- A. 16.76
- B. 15.76
- C. 17.36
- D. 18.20

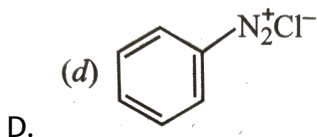
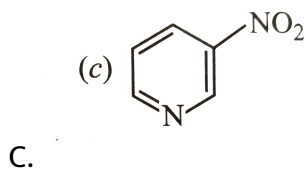
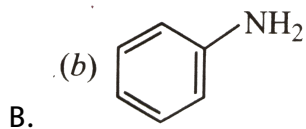
Answer: A

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127. Nitrogen can be estimated by Kjeldahl's method for which of the following compound ?



A.



Answer: B

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128. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralized 10 mL of 1 M H_2SO_4 . The percentage of nitrogen in the soil is

A. 37.33

B. 45.33

C. 35.33

D. 43.33

Answer: A

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129. The ammonia evolved from the treatment of 0.03 g of an organic compound for the estimation of nitrogen was passed in 100 mL of 0.1 M sulphuric acid. The excess of the acid required 20 mL of 0.5 M solution hydroxide solution for complete neutralisation. the organic compound is

:

A. acetamide

B. benzamide

C. urea

D. thiourea

Answer: C

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130. 29.5 mg of an organic compound containing nitrogen was digested according to Kjeldahl's method and the evolved ammonia was absorbed in 20 mL of 0.1 M HCL solution. The excess of the acid required 15 mL of 0.1 M NaOH solution for complete neutralization. The percentage of nitrogen in the compound is:

- A. 29.5
- B. 59.0
- C. 47.4
- D. 23.7

Answer: D

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131. A sample of 0.5 g of an organic compound was analysed using Kjeldahl's method. The ammonia evolved was absorbed in 50 ml of 0.5 M H_2SO_4 . The unused acid after neutralisation by ammonia consumed 80 ml of 0.5N NaOH. Then calculate percentage of nitrogen in organic compound

A. 14

B. 28

C. 42

D. 56

Answer: B



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132. For the estimation of nitrogen, 1.4 g of an organic compound was digested by Kjeldahl method and the evolved ammonia acid absorbed in 60 mL of $\frac{M}{10}$ sulphuric acid. The unreacted acid required 20 mL of $\frac{M}{10}$

sodium hydroxide for complete neutralization. the percentage of nitrogen in the compound is

A. 0.05

B. 0.06

C. 0.1

D. 0.03

Answer: C

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133. In Carius method of estimation of halogens 250mg of an organic compound gave 141mg of AgBr . The percentage of bromine in the compound is (atomic mass $\text{Ag} = 108$, $\text{Br} = 80$)

A. 48

B. 60

C. 24

D. 36

Answer: C



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134. In the estimation of sulphur by Carius method, 0.480 g of an organic compound gives 0.699 g of barium sulphate. The percentage of sulphur in this compound is (atomic masses : Ba = 137, S = 32 and O = 16)

A. 0.2

B. 0.15

C. 0.35

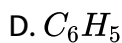
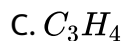
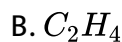
D. 0.3

Answer: A



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135. A gaseous hydrocarbon gives upon combustion, 0.72 g of water and 3.08 g of CO_2 . The empirical formula of the hydrocarbon is



Answer: A



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Competition Focus (Jee (Main and Advanced)/Medical Entrance) II. Multiple Choice Questions (with one or more than one correct answers)

1. Which of the following compounds contain only sp^3 hybridized carbon ?

A. Cycloalkanes

B. Straight chain alkanes

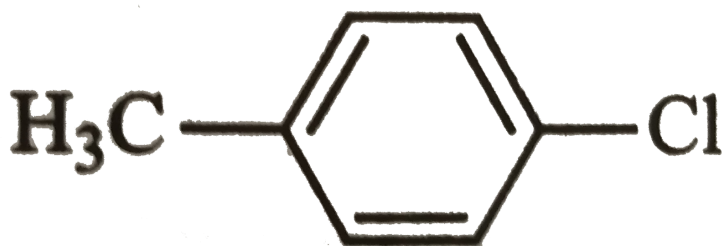
C. Branched chain alkanes

D. Benzene

Answer: A::B::C

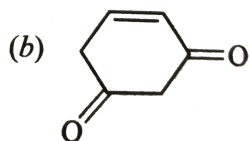
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2. The IUPAC name (s) of the following compound is(are)

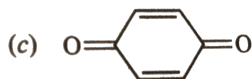


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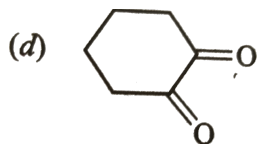
3. Tautomerism is exhibited by



B.



C.

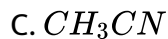
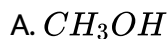


D.

Answer: A::B::D

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4. Which of the following behave both as nucleophile as well as an electrophile ?



D. HCHO

Answer: C::D

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5. Resonating structures of a molecule have:

- A. identical arrangement of atoms
- B. nearly the same energy content
- C. same number of paired electrons
- D. identical bonding

Answer: A::B::C

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6. Which of the following statements are correct ?

A. $R - \overset{+}{C} = \ddot{O}:$ and $R - C \equiv \overset{+}{O}:$ are resonance structures

B. Methyl carbanion is both isostructural and isoelectronic with ammonia

C. In $\overset{4}{C}H_2 = \overset{3}{C}H - \overset{2}{C}H = \overset{1}{O}$, nucleophilic centre is position 4 while electrophilic centre position 1.

D. $SnCl_4$ acts as an electrophile

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

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7. Which of the following species is/are planar ?

A. tert-Butyl free radical

B. tert-Butyl carbocation

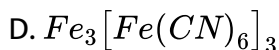
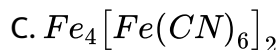
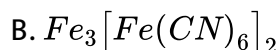
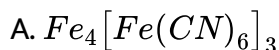
C. tert-Butyl carbanion

D. Allyl carbanion

Answer: A::B::D

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8. Sodium fusion extract, obtained from aniline, on treatment with iron (II) sulphate and H_2SO_4 in the presence of air gives a Prussian blue precipitate. The blue colour is due to the formation of



Answer: A

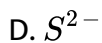
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1. Here paragraphs are given. Based upon the paragraphs some multiple choice questions are given. Each question has 4 choices A, B, C and D. Out of which one is correct. Choose the correct option

Paragraph/comprehension

In the detection of elements by Lassaigne's test, the covalent compounds are converted into ionic compounds on fusion with sodium metal. The nitrogen, sulphur and halides present in the organic compounds are test with their usual tests. In this test blue or green colour is obtained when only nitrogen is present whereas red colour is obtained when both nitrogen and sulphur are present. The Lassaigne's extract is boiled with HNO_3 so as to decompose Na_2S and NaCN if present. Phosphorus is detected in the organic compound by fusing it with sodium peroxide. When sodium phosphate formed is detected with cone. HNO_3 and ammonium molybdate.

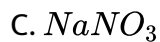
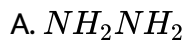
An organic compound containing N, S and O as extra elements is fused with sodium metal and then extracted with water. The species which is not present in the solution of the extract is



Answer: C

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2. Which of the following compounds will answer Lassaigne's test for nitrogen.

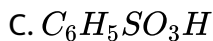
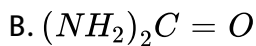
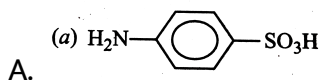


Answer: B

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3. Qualitative analysis of organic compounds is performed by Lassaigne's test by fusion with metallic sodium, by which the covalent compounds are converted into ionic compounds. Extra elements like N , S , P and halogens are detected by their usual tests.

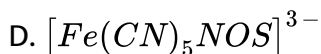
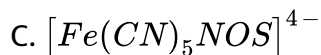
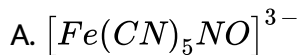
Q. Which of the following will give blood-red colour in lassaigne's test for nitrogen



Answer: A

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4. Sodium nitroprusside reacts with sulphide ion to give a purple colour due to the formation of



Answer: C



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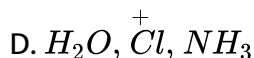
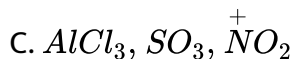
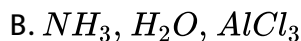
5. An organic reaction occurs through making and breaking of bonds. The breaking of bonds may occur either homolytically leading to the formation of radicals or heterolytically generating positively and negatively charged species. The neutral species (free radicals, carbenes, nitrenes, etc.) and positively charged species being electron deficient are collectively called electrophiles while neutral and negatively charged

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The stability of a molecule can be judged on the basis of contribution of its resonance structures. Resonance structures have same position of nuclei and have same number of unpaired electrons. Among resonance structures, the one which has greater number of covalent bonds, has less separation of opposite Charges, a negative charge on more

electronegative and a positive charge on a more electropositive atom are more stable than others.

Which of the following series contains only electrophiles ?



Answer: C



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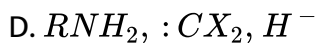
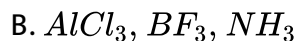
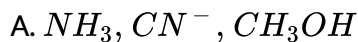
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Out of the following, the one containing only nucleophiles is



Answer: A



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The C-C bond length in propene is little shorter (1.49 Å) than the C-C bond length (1.54 Å) in ethane. This is due to

A. +I effect of CH_3 group

B. mesomeric effect

C. electromeric effect

D. hyperconjugation effect

Answer: D



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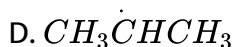
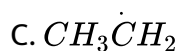
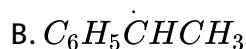
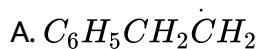
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separation of opposite charges, a negative charge on more electronegative and a positive charge on a more electropositive atom are more stable than others.

The most stable free radical among the following is



Answer: B



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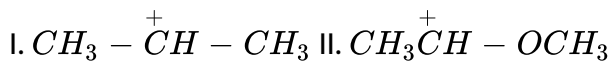
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What is the decreasing order of stability of the ions ?



A. $I > II > III$

B. $II > III > I$

C. $III > I > II$

D. $II > I > III$

Answer: D



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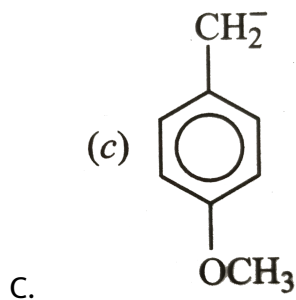
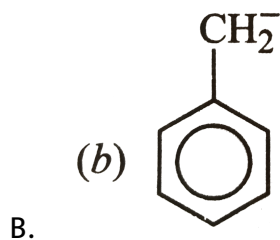
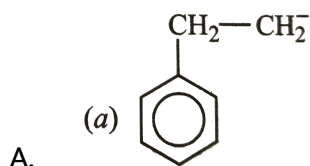
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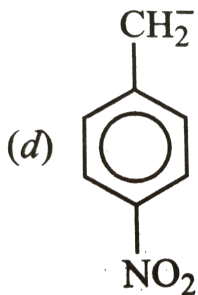
negatively charged species. The neutral species (free radicals, carbenes, nitrenes, etc.) and positively charged species being electron deficient are collectively called electrophiles while neutral and negatively charged species which are electron rich are called nucleophiles. An organic reaction usually involves the attack of a reagent (radicals, positively and negatively charged species) on the substrate molecule. The substrate molecule, although as a whole electrically neutral, has centres of low and high electron density due to displacement of bonding electrons. These electrons displacements occur through inductive, electromeric occur through inductive, electromeric, resonance and hyperconjugation effects. Whereas inductive effects involve displacement transfer of n - and π -electrons along a conjugated system. Hyperconjugation effects, on the other hand, involve $\sigma - \pi$ -conjugation. Both inductive and hyperconjugation effects can be used to explain the stability of carbocations and free radicals which follow the stability order: $3^\circ > 2^\circ > 1^\circ$. The stability of carbanions, however, follows opposite order.

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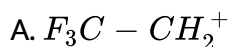
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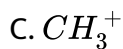
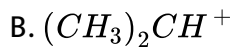
11. The electronic displacements in covalent bonds may occur either in the ground state under the influence of an atom or a substituent group or in presence of an appropriate attacking reagent. As a result of these electron displacements, centres of different electron densities are created and these centres are susceptible to attack by the reagents. These electron displacements occur through inductive electromeric, resonance and hyperconjugation effects. Whereas inductive effect involves displacement of σ -electrons towards the substituent, resonance effect involves delocalization of π – electrons transmitted through the chain and both are permanent effect. Electromeric effect is the complete

transfer of a shared pair of π - electrons to one of the atoms joined by a multiple bond on the demand of an attacking reagent. Hyperconjugation effects on the other hand involve delocalization of σ -electrons of $C - H$ bond of an alkyl group directly attached to an atom of unsaturated system (i.e., $\sigma - \pi$ -conjugation). Both inductive and hyperconjugation effects can be used to explain the stability of carbocations and free radicals which follow the stability order : $3^\circ > 2^\circ > 1^\circ$. The stability of carbanions, however, follows the reverse order.

An organic reaction occurs through making and breaking of bonds. The breaking of a covalent bond may occur either homolytic leading to the formation of free radicals or heterolytic forming positively (carbocations) or negatively (carbanions) charged species. Most of the attacking reagents carry either a positive or a negative charge. The positively charged species with electron deficient centre or neutral species (free radicals, carbenes, nitrene) are collectively called electrophiles, while negatively charged species with electron rich centre or neutral species (like water, alcohol, ammonia, etc.) are called nucleophiles.

Which of the following is most stable cation?





Answer: B

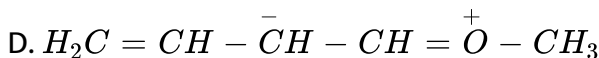
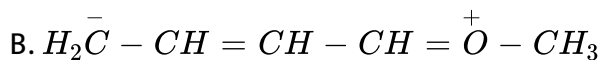
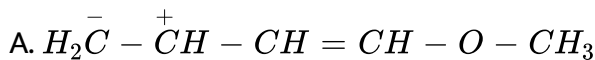
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For 1-methoxy-1, 3-butadiene, which of the following resonating structure is the least stable ?



Answer: C



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Competition Focus (Jee (Main and Advanced)/Medical Entrance) IV. Matching Type Questions

List-I

- (A) Coloured impurity
 (B) Mixture of *o*-nitrophenol and *p*-nitrophenol
 (C) Crude Naphtha
 (D) Mixture of glycerol and sugars

List-II

- (p) Steam distillation
 (q) Fractional distillation
 (r) Charcoal treatment
 (s) Distillation under reduced pressure

1.

A. (A) - r, (B)-s, (C)-p, (D)-q

B. (A)-r, (B)-p, (C)-q, (D)-s

C. (A)-p, (B)-s, (C)-r, (D)-q

D. (A)-r, (B)-p, (C)-s, (D)-q

Answer: B

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Competition Focus (Jee (Main and Advanced)/Medical Entrance) V. Matrix-Match Type Questions

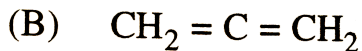
1. Match the following columns

• **Column I**

Column II



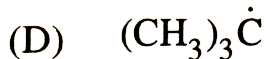
(p) Resonance



(q) Planar



(r) Inductive effect



(s) Non-planar

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Competition Focus (Jee (Main and Advanced)/Medical Entrance) VI. Integer Type Questions

1. How many of the following are heterocyclic aromatic compounds ?

benzene, cyclopentadiene, oxirane, tetrahydrofuran, naphthalene, cyclopentane, tropolone, azulene, diphenyl.

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2. How many alkyl groups having the molecular formula C_4H_9 - are possible?

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3. How many of following cannot show tautomerism acetophenone, acetaldehyde, cyclohexanone, acetylacetone, benzoquinone, acetone, benzaldehyde, butanone, ethyl acetoacetate

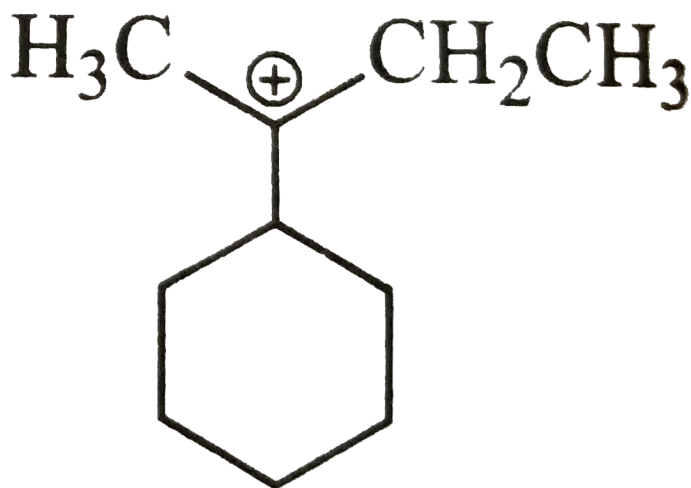
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4. The total number of cyclic isomers possible for a hydrocarbon with the molecular formula C_4H_6 is

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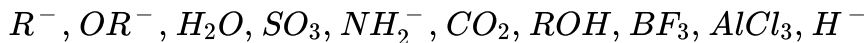
5. Amongst the following the total number of electrophiles is

CN^- , H^+ , NO_2^+ , Cl^+ , OH^- , H_3O^+ , $:CH_2$, $:NH_3$, Na^+



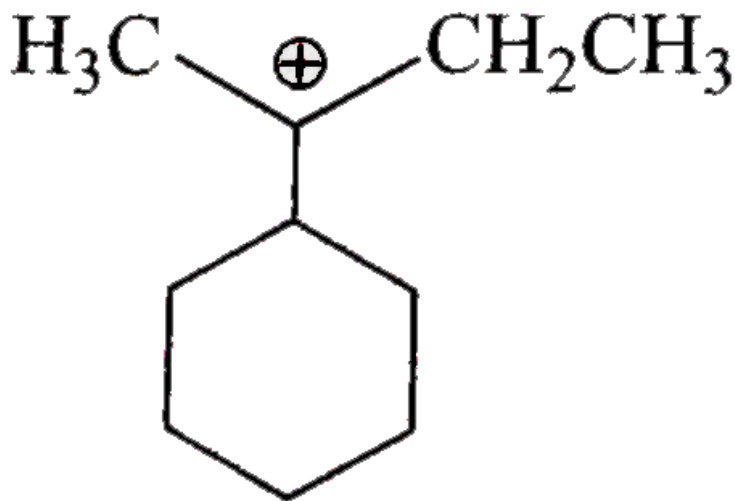
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6. Amongst following the total number of nucleophiles is:



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7. The total number of contributing structures showing hyperconjugation (involving $C - H$ bonds) for the following carbocation is



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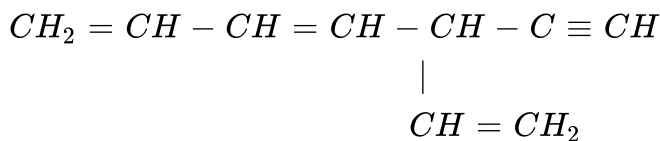
Competition Focus (Jee (Main and Advanced)/Medical Entrance) VII.
Numerical Values Type Questions

1. A mixture of 2.3 g formic acid and 4.5 g oxalic acid is treated with conc. H_2SO_4 . The evolved gaseous mixture is passed through KOH pellets. Weight (in g) of the remaining product at STP will be

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Competition Focus (Jee (Main and Advanced)/Medical Entrance) VIII.
Assertion-Reason Type Questions

1. Statement-1 . The IUPAC name of the compound



5-ethynylhepta-1,3,6-triene

Statement-2. While numbering the carbon chain triple bond is given preference over the double bond.

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

Answer: C

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2. Assertion: CH_3CHO and $CH_2 = CHOH$ are resonance structures.

Reason: Tautomers differ both in the position of atoms as well as electrons.

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

Answer: D

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3. Statement-1. Simple carbanions are usually pyramidal but allyl carbanion is a planar species.

Statement-2. All the carbon atoms in allyl carbanion are sp^2 -hybridized.

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

Answer: B

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4. Assertion: tert-Butyl carbanion is less stable than methyl carbanion.

Reason: The +I-effect of the CH_3 groups tends to stabilize the tert-butyl carbanion.

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

Answer: C

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5. Assertion: Free radicals are always planer.

Reason: They can achieve sp^2 as well as sp^3 -hybridisation

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

Answer: D

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6. Assertion: Nitrenes cannot be isolated.

Reason: Nitrenes are the nitrogen analogues of carbenes

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

Answer: B



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7. Statement-1. Beilstein test can be used to detect fluorine in the organic compound.

Statement-2. CuF is not volatile and hence does not impart any colour to the flame.

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

Answer: D

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8. Statement-1. Lassaigne's extract is boiled with dil. HNO_3 before testing for halogens by $AgNO_3$.

Statement-2. CN^- and S^{2-} ions present in the extract interfere with the test of halide ions by $AgNO_3$.

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

Answer: A

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9. Assertion : Butane and 2 – methyl butane are chain isomers.

Reason : Butane is a straight chain alkane while 2 – methyl butane is a branched chain alkane.

A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: B



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10. Assertion : But-1-ene and 2-Methylprop-1-ene are position isomers. Reason
Position isomers have same molecular formula but different arrangement
of carbon atoms

A. If both assertion and Reason are true, and reason is the true
explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true
explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: D

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11. Assertion : All the carbon atoms of but-2-ene lie in one plane.

Reason : All the carbon atoms in but-2-ene are sp^2 -hybridized.

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12. Assertion : In $CH_2 = C = CH_2$, all the carbon atoms are sp^2 -hybridized.

Reason : All the hydrogen atoms lie in one plane.

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13. Assertion : A free radical is paramagnetic species.

Reason : A free radical is formed in homolytic fission of covalent bond.

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14. (A) Tertiary carbocations are generally formed more easily than primary carbocations.

(R) Hyperconjugation as well as inductive effect due to additional alkyl groups stabilize tertiary carbocations.

A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: A



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15. Assertion: Alkyl carbonaions like ammonia have pyramidal shape.

Reason: The carbon carrying negative charge has an octet of electrons.

- A. If both assertion and Reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false
- D. If both assertion and reason are false

Answer: B



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16. (A) Tertiary butyl carbonion is less stable than methyl carbanion.

(R) +*I* effect of the three methyl groups in tertiary butyl carbanion tends to make it more stable than methyl carbanion.

- A. If both assertion and Reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false
- D. If both assertion and reason are false

Answer: D



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17. (A) Allyl free radical is more stable than simple alkyl free radical.

(R) The allyl free radical is stabilized by resonance.

- A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: A

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18. Assertion (A) o-and p-nitrophenol can be separated by steam distillation.

Reason (R) o-Nitrophenol is steam volatile whereas p-nitrophenol is not steam volatile.

A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: C

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19. Assertion : Essential oils are purified by steam distillation.

Reason : Essential oils are volatile and are insoluble in water.

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20. (A) Oils are purified by steam distillation.

(R) The compounds which decompose at their boiling points can be purified by steam distillation.

A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: D

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21. Assertion : During test for nitrogen with Lassaigne extract on adding $FeCl_3$ solution sometimes a red precipitate is obtained.

Reason : Sulphur is also present.

A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: A

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22. Assertion : $NH_2 = \overset{S}{\underset{||}{C}} - NH_2$ gives red colour in Lassaigne's test.

Reason : Compounds having N along with C give red colour in Lassaigne's test for nitrogen.

A. If both assertion and Reason are true, and reason is the true explanation of the assertion.

B. If both assertion and reason are true, but reason is not the true explanation of the assertion.

C. If assertion is true, but reason is false

D. If both assertion and reason are false

Answer: C

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23. Assertion (A) Hydrazine contains nitrogen but does not give Lassaigne's test for nitrogen.

Reason (R) Hydrazine reacts with acetone to form corresponding aldimine.

- A. If both assertion and Reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false
- D. If both assertion and reason are false

Answer: B

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24. Note: In the following questions a statement of assertion followed by a statement of reason is given. Choose the correct answer out of the following choices.

Assertion : Lassaigne's test is not shown by diazonium salts.

Reason : Diazonium salts lose N_2 on heating much before than they have a chance to react with fused sodium.

- A. If both assertion and Reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false
- D. If both assertion and reason are false

Answer: A



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25. Assertion : Vapour density is the same thing as density.

Reason : Molecular weight is twice density.

- A. If both assertion and Reason are true, and reason is the true explanation of the assertion.
- B. If both assertion and reason are true, but reason is not the true explanation of the assertion.
- C. If assertion is true, but reason is false
- D. If both assertion and reason are false

Answer: D



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