



CHEMISTRY

BOOKS - CHHAYA CHEMISTRY (BENGALI ENGLISH)

ORGANIC CHEMISTRY : BASIC PRINCIPLES AND TECHNIQUES

Question Answer Zone For Board Examination

1. Which property of carbon is responsible for forming straight chains, branched chains or rings?

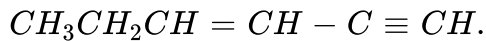


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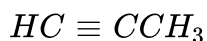
2. What are the reasons for the existence of a large number of organic compounds?

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3. Find the number of σ – and π – bond in the molecule:

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4. Predict the state of hybridisation of the carbon atoms: (1)

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5. What is the shape of the molecule: C_6H_5CN ?

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6. Give the shape of the molecule: $HC \equiv C - C \equiv CCI$

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7. What is the state of hybridisation of a carbon atom linked to two other by two double bonds?

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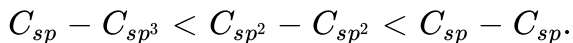
8. Arrange the following in order of increasing carbon-carbon bond length: ethane, entylene and acetylene.

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9. What will be the shape of a hydrocarbon molecule containing two sp^2 – & sp^2 one sp^3 -hybridised C-atom?

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10. Arrange in order of increasing bond dissociation enthalpy:



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11. Arrange the starred C-atoms in the following compound in order of increasing s-character of their hybridisation states:



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12. Which is the correct bond - line structural formula of $\text{CH}_2(2)=\text{CH}-\text{C}=\text{CCH}_2(3)$?

(i) 



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13. write the names of an alicyclic compound and a heterocyclic compound.



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14. Give one example of each benzenoid and nonbenzenoid aromatic compound.



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15. write down the IUPAC name of the compound represented by swastika sign.



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16. Which one is the correct name of an alkyne containing five carbon atoms?



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17. Mention the name of the alkyl group that may be obtained by removal of one 2° H-atom from propane.



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18. How many alkyl groups are expected to be obtained from $CH_3CH_2CH_2CH(CH_3)CH_2CH_3$ by the removal of different non-equivalent H - atoms?



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19. Which of the following has no existence? (1) 1° H-atom, (2) 3° C - atom, (3) 2° H - atom, (4) 4° H-atom



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20. How many 4° C atoms are there in 2,2,3,3 - tetramethylbutane?



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21. How many 3° H-atoms are there in 4 - ethyl-2-methylhexane?



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22. Write the band-line structural formula of an alkane with five carbon atoms which has only primary hydrogen atoms.



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23. Give examples of two terminal functional groups.



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24. How many univalent groups are expected to be obtained from toluene?

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25. What are the primary suffixes used to write IUPAC names of CH_3CH_3 , $CH_2 = CH_2$ and $HC \equiv CH$?

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26. Give an example of a saturated hydrocarbon which can be represented by the general formula, C_nH_{2n} .

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27. How many π - bonds are there in 3-methylidene-1,4 pentadine?

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28. Write names of the alkyl group(S) which may be obtained from $(CH_3)_4C$.



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29. Write the IUPAC name of a hydrocarbon containing one sp , two & two sp^2 - hybridised C - atoms.



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30. How many alkyl groups are possible having the molecular formula, C_4H_9 ?



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31. Which type of isomerism is exhibited by n- pentane and neopentane?





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32. Write down the structure and the IUPAC name of the tautomer of butanal.



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33. How many structural isomers will be obtained by the displacement of two H-atoms of propane by two Cl-atoms? Write their structures.



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34. Write structures and names of two compounds which are position isomers as well as metamers.



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35. How are the two compounds, $CH_2 = CHCH_2CH_3$ and \square related to each other?


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36. Which two of the following are geometrical isomers?  

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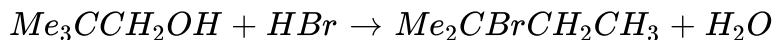
37. Which of the following compounds do not exhibit geometrical isomerism? (1) $phCH = CHPH$ (2) $Me_2C = NOH$ (3) $CH_2 = CH - CH = CH - CH = CH_2$

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38. Which of the given compounds are optically active? 

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39. Mention the type of the following reaction :



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40. How many types of non-equivalent H-atoms are present in the given compound? 

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41. In which of the given compounds, all the Hd-atoms are equivalent? 

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42. Calculate the double bond equivalent (DBE) of the compound having molecular formula, C_6H_8 . Is the compound aromatic?

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43. How many monobromo derivatives are possible for each of ortho, meta and para-xylene?




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44. Arrange the following groups in order of decreasing strength of -I effect: -



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45. Arrange the following free radicals in the decreasing order of their stability: 



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

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47. Arrange the following carbocations in increasing order of stability:



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48. Arrange the following compounds in increasing order of number of hyperconjugable hydrogen atoms:



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49. Arrange the following compounds in order of increasing bond dissociation enthalpy: (1) $CH_3 - H$, (2) $(CH_3)_2CH - H$, (3) $(CH_3)_3C - H$, (4) $CH_3CH_2 - H$

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50. Arrange the following in increasing order of stability:



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51. How can aniline be purified?

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52. How can glycerol be purified?

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53. Suggest a method to separate a mixture of o-hydroxy-benzaldehyde and p-hydroxybenzaldehyde.

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54. How will you separate a mixture of two solid compounds of different solubilities in the same solvent?

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55. An organic liquid decomposes below its boiling point. How can it be purified?

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56. Which technique can be used to purify iodine containing traces of common salt?

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57. Suggest a method for the purification of a liquid containing non-volatile impurities.

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58. How can aniline (*b. p.* 184°C) be separated from petroleum ether (*b. p.* $40 - 60^{\circ}\text{C}$)?

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59. Out of water and benzene, which can be used to purify benzoic acid containing naphthalene by fractional crystallisation?



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60. Give example of a chromatophic technique in which both the mobile and stationary phases are liquids.



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61. Mention two distillation processes in which organic liquids boil at temperatures below their respective boiling points.



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62. Explain why the Lassaigne's extract should not be prepared by using tap water.



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63. Give example of a compound which does not contain halogen but gives Beilstein's test.



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64. In Carius method for estimation of phosphorus, the precipitate of which compound is finally obtained?



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65. A compound (A) after fusion with metallic sodium gives a precipitate when silver nitrate solution is added to a portion of the filtrate acidified with nitric acid. Compound (A) is likely to be: (1) $CH_3CH_2CH_2Br$ (2) CH_3CH_2CHO (3) $CH_3CH_2CH_2OH$ (4) CH_3CH_2COOH



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66. Give example of a nitrogenous organic compound to which Kjeldahl's method for the estimation of nitrogen is not applicable.

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Short Answer Type

1. Which atoms in a toluene molecule always remain in the same plane and why? (2) Which atoms in a propyne molecule remain in a straight line and why?

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2. Write the state of hybridisation of C-atoms in the following compounds and predict the shape of each of the molecules : (1) H_2O (2) CH_3Cl (3) $HC \equiv N$ (4) $CH_2 = C = CH_2$ (5) $CH_2 = C = CCH_2$

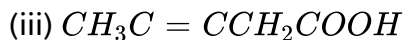
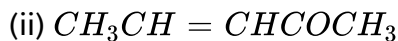
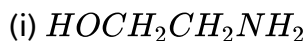
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3. Write IUPAC name of the compound,  mentioning secondary primary prefix, word root, primary suffix & secondary suffix respectively.

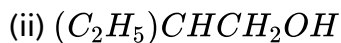


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4. Expand each of the following condensed formulas into their complete structural formulas:



(2) Write bond line formulas of the following two compounds:



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5. (1) How many σ and π bonds are present in (i)

$CH_2 = CH - CN$ and (ii) $CH_2 = CCHCH_3$?



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6. Which of the given compounds may exist as two or more isomeric forms?

Give the structures and names of the possible isomers.

(1) $CHBr_3$

(2) $C_2H_2Cl_4$

(3) C_3H_3

(4) C_2H_5F

(5) $C_2H_4Br_2$

(6) $C_6H_4Cl_2$



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7. Write the structures and IUPAC names of the compounds with molecular formula, $C_4H_8O_2$.



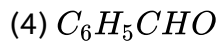
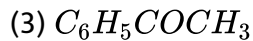
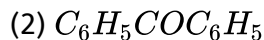
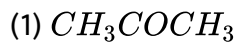
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8. Write the structures and IUPAC names of the compounds with molecular formula, $C_4H_{10}O$.



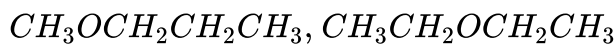
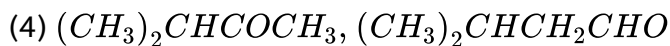
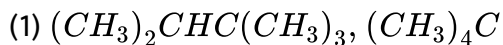
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9. Which of the following compounds will exhibit tautomerism and which do not? Give reasons.



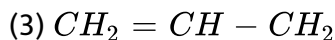
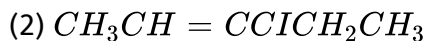
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10. Designate following pairs as metamers, chain isomers, position isomers, functional isomers, stereoisomers. Also, indicate which are not isomers at all.



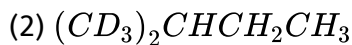
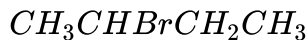
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11. Which of the following compounds will exhibit geometrical isomerism and why? (1) $CH_3CH = CCl_2$



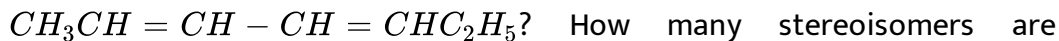
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12. Which of the following compounds are optically active and why? (1)



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13. Which type of stereoisomerism is exhibited by the compound,



How many stereoisomers are possible? Draw the structures and designate them as E/Z.



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14. Name a compound having two dissimilar asymmetric carbon atoms and

write its structure. What type of isomerism does it exhibit? Draw Fischer

projection formulas of the isomers and comment on their optical activity.

How are the isomers related to each other?



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15. Explain why the C-C bond length in benzene is in between the carbon-carbon bond lengths of ethylene ($CH_2 = CH_2$) and ethane ($CH_3 - CH_3$) respectively.

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16. Arrange cis - but - 2 ene, trans - but - 2 - ene and but - 1 ene in increasing order of their stability and give reason.

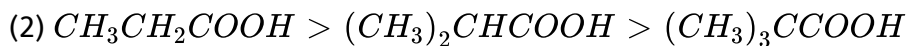
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17. CH_3Cl is unreactive towards S_N1 reaction - why?

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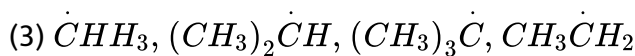
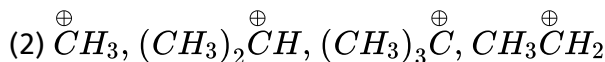
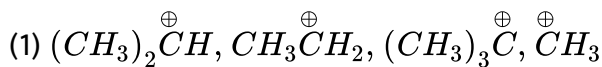
18. Explain the orders of acidity of carboxylic acids:





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19. Arrange in order of increasing stability :



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20. Explain why an organic liquid vaporises below its boiling point when it undergoes steam distillation.



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21. (1) Write the state of hybridisation of C - atoms mentioned in each of the following compounds:

(a) C - 4 of pent - 1 en - 4 - yne

(b) C - 1 of Propanoic acid

(d) C - 3 of Pentan - 3 - one and

(e) C - 3 of 3,3 diethylpentane

(2) Which atoms of each of the following molecules / ions always remain in the same plane?

(a) $CH_3CH = CHCH_3$

(b) $C_6H_5C \equiv C - CN$

(c) $C_6H_5CH_3$

(d) $CH_2 = C = CH_2$

(e) CH_3COCH_3

(f) $CH - (3)CONH_2$

(g) $Cl_3C - CH - \overset{\ominus}{C}H_2$

(h) $(CD_3)_3\overset{\oplus}{C}$

(i) 

(j) 

(k) $\overset{\ominus}{C}H_2COCH_2CH_3$

(i) 

(m) $(CH_3)_2\overset{\oplus}{C}H - NH_2$

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22. The boiling point of a pure organic liquid is 78°C . There are two samples of this liquid having boiling range: (1) $76 - 78^{\circ}\text{C}$ and $69 - 78^{\circ}\text{C}$ respectively. Which one of them is more pure and why?

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23. What is an azeotropic mixture? Give example.

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24. A mixture contains two organic solids, A and B. The solubilities of A and B in water are 12 g per 100 ml. and 3 g per 100 ml respectively. How will you separate A and B from this mixture?

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25. What is seeding?



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26. Suggest methods for the separation of the components in each of the following mixtures:

(1) A mixture of liquid A (b.p.366K) and liquid B (b.p.355.5 K).

(2) A mixture of liquid C (b.p.360 K) and liquid D (b.p.420 K).



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27. A mixture contains three amino acids. How can they be identified?



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28. The R_f values of X and Y in a mixture determined by TLC method in a solvent mixture are 0.75 and 0.25 respectively. If the mixture is separated

by column chromatography using the same solvent mixture as the mobile phase, which of the two components, will elute first and why?

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29. Why is an organic compound fused with sodium for testing nitrogen, halogens sulphur?

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30. (1) The electronic configuration of C - atoms is: $1s^2 2s^2 2p^2$, yet its valency is four - why?

(2) The four C - H bonds of methane molecule are equivalent - explain with reasons.

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31. (1) Arrange sp , sp^2 & sp^3 - orbitals in increasing order of :

(a) bond length

(b) bond angle

(c) bond energy

(d) size of orbitals and

(e) s - character.

(2) Organic compounds are usually water insoluble. Why?

(3) Write the structure of the smallest hydrocarbon having empirical formula C_2H . What is the shape of the molecule?

(4) Draw the p - orbitals involved in forming π - bonds in the molecule, $CH_2 = C = CH_2$ and predict whether the molecule is planar or not.



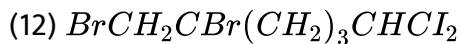
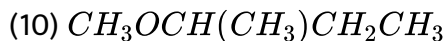
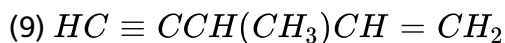
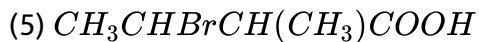
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32. Give the IUPAC names of the following compounds:

(1) $CH_3CHClCHBrCH_3$

(2) $CH_3CHFOCH_2CH_3$

(3) $(CH_3)_2CHCH_2OH$



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33. Write structures of the following:

(1) Hept - 5 ene - 1 - yne

(2) 1 - bromo - 2 ethoxyethane

(3) 3 - chloropropanoyl bromide

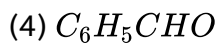
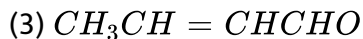
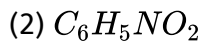
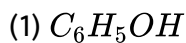
(4) 1 - chloropropan - 2 - amine

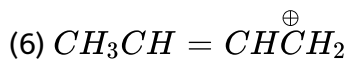
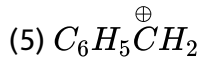
- (5) 4 - iodo - 3 - nitrobutanal
- (6) 3 - phenylprop - 2 enoic acid
- (7) Ethanoic methanoic anhydride
- (8) 2 - carbomyl - propanoic acid
- (9) Pentane - 2,4 - dione
- (10) 5 - formyl - 3 - oxopentanoic acid
- (11) tert - butyl alcohol
- (13) Trimethylacetic acid
- (14) Diethyl - butane - 1,4 diaote
- (15) 3 - (carboxymethyl) pentane - dioic acid
- (16) 1,3 - dimethylcyclohex - 1 - ene



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34. Draw resonance strutures of following compounds.





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35. Explain: (1) A mixture of ether and water can be separated by simple distillation.

(2) Water present in rectified spirit can be removed by azeotropic distillation.

(3) Benzoic acid can be extracted from its aqueous solution using benzene.

(4) Sugar containing NaCl as impurity can be purified by crystallisation using ethanol but not water. '



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1. Give IUPAC name: $CH_3CH = CHCOOH$, $CH_3COOC_2H_5$

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2. How will you detect presence of sulphur in an organic compound?

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3. Write the formula of the compound: $H_3C - O - \overset{\overset{{}^1CH_3}{|}}{\overset{\underset{{}^3CH_3}{|}}{C}} - CH_3$

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4. An organic compound containing C, H, N and Cl is fused with excess of metallic sodium and the fused mass is extracted with distilled water. Which radicals are expected to be present in the resulting aqueous solution?

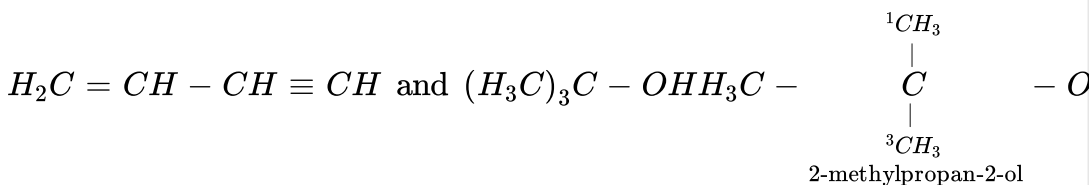
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5. How many σ & π bonds are present in buta - 1,3 diyne?



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6. Write the IUPAC names of the following compounds:



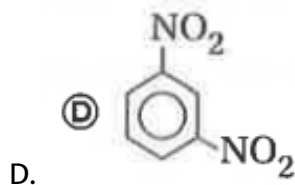
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7. In the Lassaigne's $NH_2O \cdot HCl$ reponds to the test for the element chlorine but not for the element nitrogen. Explain.



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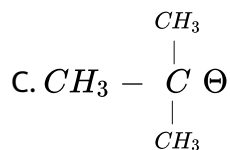
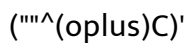
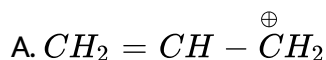
8. Which of the following compounds does not respond to Lassaigne test for nitrogen -

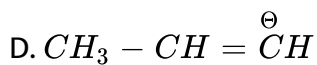


Answer: C

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9. Which species is stabilised by hyperconjugation -





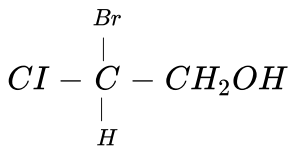
Answer: B

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10. What type of fission of a covalent bond produces free radicals? Give an example with proper sign.

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11. Write down the IPUAC name of the following compound:



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12. Draw the structure of the following compound: 3,4-dimethylpentanoic acid

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13. Draw the conanicals of CH_3COOH and $CH_3COO\ominus$. In which case resonance is more important?

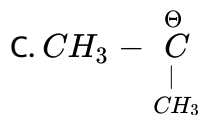
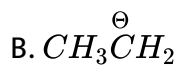
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14. Write the principal of estimation of carbon and hydrogen in an organic compound.

 Watch Video Solution

15. Which one of the carbanions is the most stable-

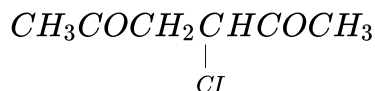




Answer: A

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16. Write down the IUPAC name of the following compound:



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17. Write down the structural formula of the following compound: Hex - 1 - en - 4 - yne

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18. Arrange the following radicals in increasing order of -I effect: I, Br, Cl, F

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19. Write the structural formula of the following compound: 5 - aminopent - 3 - enoic acid

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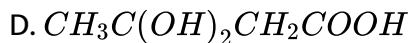
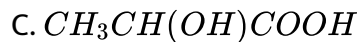
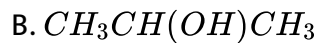
20. Why is $(CH_3)_3C^{\oplus}$ more stable than $CH_3CH_2^{\oplus}$?

 Watch Video Solution

21. Indicate the electrophilic centre of the following compounds:
 CH_3CHO , CH_3CN .

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22. In which of the following compound chiral C - atom is present-

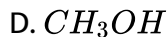


Answer: C



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23. Which one is most acidic among the given compounds-



Answer: D



Watch Video Solution

24. If in an organic compound both N and S elements are present, in Lassaigne's test which ion may be found-



Answer: D



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25. Between CH_3COOH and $HCOOH$ which one is most acidic and why?



Watch Video Solution

26. Name IUPAC name of the following:

$$\begin{array}{c} CH_2 - OH \\ | \\ CH_2 - OH \\ | \\ CH_2 - PH \end{array}$$

 Watch Video Solution

27. Name IUPAC name of the following: $CH_3CCl_2 - CH_2 - COOH$

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28. By which property the stability of $(CH_3)_3C^{\oplus}$ ion could be explained?

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29. Which of the following compounds is formed when a nitrogenous organic compound is heated with metallic sodium-

A. sodium nitrate

B. sodium nitrite

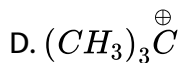
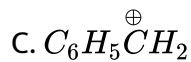
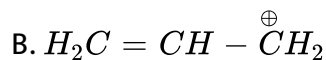
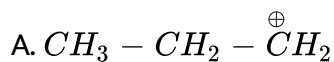
C. sodium amide

D. sodium cyanide

Answer: D

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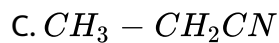
30. Which of the following is the stablest carbocation -



Answer: D

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31. Explain the order of basicity of the following compounds.



D.

Answer:



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32. A compound having molecular formula C_8H_{18} can form only one monobromo derivative. Draw the structure of the compound.



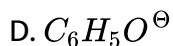
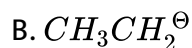
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33. Is 2 - hydroxypropanoic acid optically active? Explain.



Watch Video Solution

34. Which of the following is a carbanion -



Answer: B



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35. In the Lassaigne's test, for the detection of nitrogen in an organic compound, with which of the following metals the organic compound is fused -

A. Li

B. Mg

C. Na

D. Zn

Answer: C

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36. Between $(CH_3)_3C - CI$ and $CH_3 - CI$ which compound undergoes heterolytic fission readily in water? Why?

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37. Which reagent is called an electrophile in organic reaction? Write with an example.

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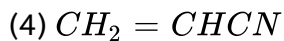
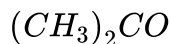
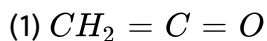
38. Write the IUPAC names of the compound



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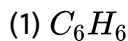
Solved Ncert Exercise

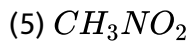
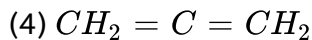
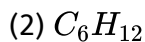
1. What are hybridisation states of each C - atom in the compounds:



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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 names of the following compounds:



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

- (1) 2,2 - dimethylpentane or 2 - demethylpentane
- (2) 2,4,7 - trimethyloctane or 2,5,7 - trimethyloctane
- (3) 2 - chloro - 4 - methylpentane or 4 - chloro - 2 - methyl - pentane
- (4) But - 3 - yne - 1 - ol - 1 - yne.



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6. Draw formulas for the first 5 members of each homologous series beginning with given compounds:

- (1) HCOOH
- (2) CH_3COCH_3
- (3) $\text{H} - \text{CH} = \text{CH}_2$



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

(1) 2,2,4 - trimethylpentane

(2) 2 - hydroxy - 1,2,3- propanetricarboxylic acid

(3) Hexanedial

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8. Identify the functional groups in given 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?

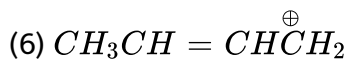
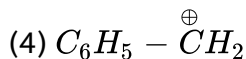
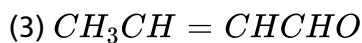
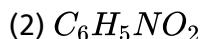
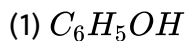
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10. Explain why alkyl groups act as electron donors when attached to a π system.



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11. Draw the resonant structures for the following compounds. Show the electron shift using curved arrow notation :



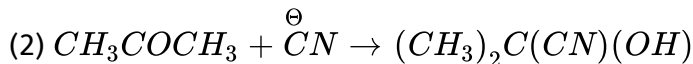
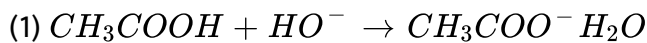
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12. What are electrophiles and nucleophiles ? Explain with examples.



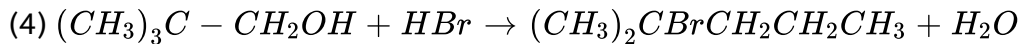
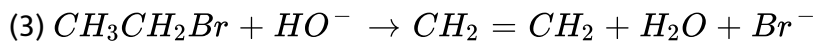
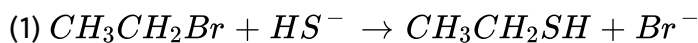
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13. Identify the reagents underlined in the following equations as nucleophiles or electrophiles:



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



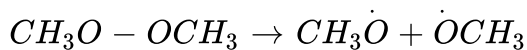
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15. What is the relationship between the members of following pairs of structures? Are they structural or geometrical isomers or resonance contributors?



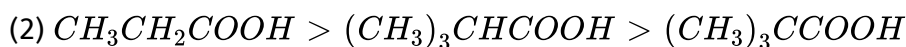
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16. For the given bond cleavages, use curved - arrows to show the electron flow and classify each as homolysis or heterolysis. Identify reactive intermediate produced as free radical, carbocation and carbanion.



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17. Explain the terms Inductive and Electromeric effects. Which electron displacement effect explains the given 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.

(1) Crystallisation

(2) Distillation

(3) Chromatography



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19. Describe the method, which can be used to separate 2 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. Explain the principal of paper chromatography.

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

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24. Explain the reason for the fusion of an organic compound with metallic sodium for testing nitrogen, sulphur and halogens.

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25. Name a suitable technique to separate the components from a mixture of calcium sulphate & camphor.



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



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27. Will CCl_4 give white precipitate of AgCl on heating it with silver nitrate? Give reason for your answer.



[Watch Video Solution](#)

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

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29. Why is it necessary to use acetic acid and not sulphuric acid for acidification of sodium extract for testing sulphur by lead acetate test?

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30. An organic compound contains 69 % carbon and 4.8 % hydrogen, the remainder being oxygen. Calculate the masses of CO_2 and water produced when 0.20g of this substance is subjected to complete combustion.

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31. 0.05g of an organic compound was treated according to Kjeldahl's method. Ammonia evolved was absorbed in 50ml of 0.05 (M) $H_2S)_4$. The residual acid required 60 ml 0.5 (M) solution of NaOH for neutralisation. Find the percentage composition of N in the compound.

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32. 0.3780 g of an organic chloro compound gave 0.5740 g of silver chloride in Carius estimation. Calculate the percentage of chlorine present in the compound.

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33. In the estimation of S by Carius method, 0.468 g of an organic sulphur compound afforded 0.68g barium sulphate. Find out the % of S in the given compound.

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34. In $CH_2 = CHCH_2CH_2C \equiv CH$, the pair of hybridised orbitals involved in the formation of $C_2 - C_3$ bond is:

- (1) $sp - sp^2$
- (2) $sp - sp^3$
- (3) $sp^2 - sp^3$
- (4) $sp^3 - sp^3$

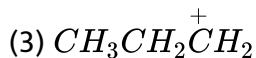
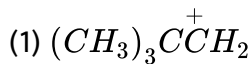
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35. In the Lassaigne's test, prussian blue colour is obtained due to formation of

- (1) $Na_4[Fe(CN)_6]$
- (2) $Fe_4[Fe(CN)_6]_3$
- (3) $Fe_2[Fe(CN)_6]$
- (4) $Fe_3[Fe(CN)_6]_4$

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36. Which is most stable:



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37. The best and latest technique for isolation, purification and separation and separation of organic compounds is :

(1) Crystallisation

(2) Distillation

(3) Sublimation

(4) Chromatography



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38. The reaction: $CH_3CH_2I + KOH(aq) \rightarrow CH_3CH_2OH + KI$ is a type of :

(1) electrophilic substitution

(2) nucleophilic substitution

(3) elimination

(4) addition.

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Higher Order Thinking Skill Hots Question

1. Depict the bonding in the following compounds in terms of atomic orbitals involved and predict all the bond angles:

(1) $CD_3CH = CH_2$

(2) CH_3OCH_3

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2. Mention the number of primary (1°), secondary (2°) and tertiary (3°) hydrogen atoms in the following molecules:



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3. How many alkyl groups can be derived from the alkane, $(CH_3)_2CHCH_2CH(CH_3)_2$ and why? Write their IUPAC names.

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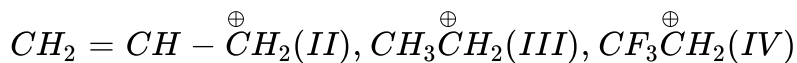
4. Write the IUPAC names of the following compounds:



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5. Arrange the given carbocations in order of increasing stability and explain the order:

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6. tert - Butyl chloride (Me_3CCI) does not participate in S_N^2 reaction - explain with reasons.

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7. Write the resonance structures of $CH_2 = CH - CHO$ and compare their stabilities.

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8. Which is more stable and why: $(CH_3)_3\overset{\oplus}{C}$, $(CD_3)_3\overset{\oplus}{C}$?

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9. (1) How many stereoisomers of formula, CH_3Y would be possible if methane was a pyramid with a rectangular base? Draw them.

(2) How many stereoisomers of formula, CH_2YZ would be possible if methane was a pyramid with a square base? Draw them.

(3) What is the relationship (diastereoisomers, enantiomers, conformational isomers, homomers i.e., identical structures or constitutional isomers) between the members of given pairs of structures?



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10. Although fluorine is more electronegative than chlorine, fluorobenzene has lower dipole moment ($\mu = 1.63D$) than chlorobenzene ($\mu = 1.75D$).



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11. The positively charged carbon atom in structure (I) is sp^2 - hybridised while the negatively charged carbon atom in (II) is sp^3 - hybridised - Explain.



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12. Can you separate two liquids A (b. p. 413K) and B (b. p. 403K) present in a mixture by simple distillation?



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13. Will CCl_4 give white precipitate of AgCl on heating it with silver nitrate solution? Give reason for your answer.



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14. Is it possible to distinguish between phenylhydrazine hydrochloride and hydrazine hydrochloride by Lassaigne's test? Give reason.



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15. Explain the principles of adsorption chromatography and partition chromatography. Define R_f value. What is called descending paper chromatography?

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16. Tendency of carbon to exhibit catenation is much higher than that of Si and S - why?

 [Watch Video Solution](#)

17. Melting and boiling points of organic compounds are usually very low - Why?

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18. Mention the number of primary (1°), secondary (2°) tertiary (3°) and quarternary (4°) C - atoms present in the given molecules:



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19. Write down the IUPAC name of a hydrocarbon having a 4° C - atom with molecular formula, C_6H_{14} . How many monobromo derivatives of this hydrocarbon is possible? Write their structures.

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20. Racemic tartaric acid and meso - tartaric acid are both optically inactive - why?

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21. How many isomers of butene are possible? What type of isomerism do they exhibit?

 **Watch Video Solution**

22. Give examples of :

- (1) an optically inactive compound containing asymmetric carbon atom,
- (2) an optically active compound containing no asymmetric carbon.

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23. Name a compound having two similar asymmetric carbon atoms and give its structure. What type of isomerism does it exhibit? Draw Fischer projection formulas of these isomers and comment on their optical activity. How are they related to each other?

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24. (1) Give structure and IUPAC name of an optically active alkane having lowest molecular mass. Is there another alkane of the same molecular mass that is also optically active?

(2) Give example of a compound which exhibits both optical & geometrical isomerism.

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25. The following two isomers may be called diastereoisomers but not enantiomers - why? Explain why these are optically inactive.



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26. P - nitrophenol is more acidic than phenol. Explain.

 **Watch Video Solution**

27. P - nitroanilin is a weaker base than aniline. Explain.



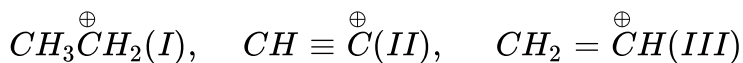
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28. Dipole moment of vinyl chloride ($CH_2 = CHCl$) is less than the dipole moment of ethyl chloride (CH_3CH_2Cl) - explain.



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29. Arrange the following ions in order of increasing basicity and explain the order:



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30. Give example:

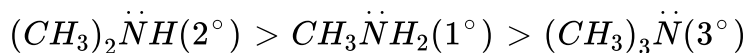
(1) a non - nucleophilic anion

- (2) a planar carbocation
- (3) an aromatic carbocation
- (4) an aromatic carbanion
- (5) a reagent which acts as source of carbanion
- (6) a reaction which does not proceed through intermediate
- (7) an aprotic polar solvent
- (8) an ambident nucleophile
- (9) a neutral electrophile
- (10) a group which stabilises a carbocation
- (11) a group which stabilises a carbanion
- (12) an alkyl group which does not supply electrons to a double bond by hyperconjugation
- (13) a carbocation which can be stored for years.



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31. Explain the given basicity order in aqueous medium:



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

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33. CH_3CI undergoes hydrolysis more easily than C_6H_5CI . Explain.

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34. Benzyl chloride participates in S_N1 reaction even though it is a primary (1°) substrate. Explain.

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35. Bond dissociation enthalpy of $C_6H_5CH_2$ - H bond is much less than CH_3 - H bond. Explain.



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36. N,N,2,6 - Tetramethylaniline is more basic than N,N - dimethylaniline. Explain.



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37. Chloroform is more acidic than fluoroform. Explain.



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38. How can you separate benzoic acid and nitro benzene from their mixture by the technique of extraction using an appropriate chemical reagent?



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39. How will you separate benzyl alcohol (neutral) and phenol (acidic) from their mixed solution in ether by extraction using an appropriate chemical reagent?

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40. Why is impure glycerol purified by distillation under reduced pressure?

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41. Why is it necessary to use acetic acid and not sulphuric acid for acidification of sodium extract for testing sulphur by lead acetate test?

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42. Presence of N in hydroxylamine hydrochloride cannot be detected by Lassaigne's test - why?

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43. How can it be possible to detect the presence of nitrogen in hydrazine hydrochloride?

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Entrance Question Bank Wbjee

1. The ease of dehydrohalogenation of alkyl halide with alcoholic KOH is

A. $3^\circ < 2^\circ < 1^\circ$

B. $3^\circ > 2^\circ > 1^\circ$

C. $3^\circ < 2^\circ > 1^\circ$

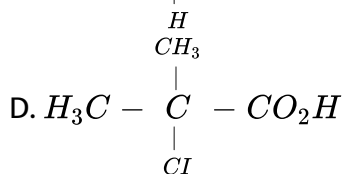
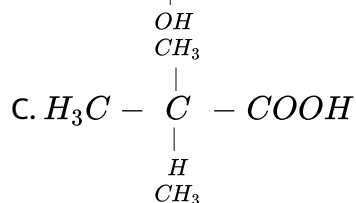
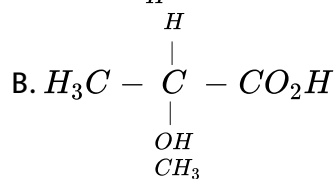
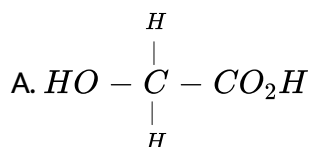
D. $3^\circ > 2^\circ < 1^\circ$

Answer: B

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Entrance Question Bank

1. Which will exhibit optical isomerism-



Answer: B



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2. Which of the following is sec - butyl phenyl vinyl methane-

3. The correct states of hybridisation of C_2 and C_3 in compound $H_3C - CH = CH - CH_3$ are-

A. sp, sp^3

B. sp^2, sp

C. sp^2, sp^2

D. sp, sp

Answer: B

4. Under identical conditions, the S_N1 reaction will occur most efficiently with -

A. tert - butyl chloride

B. 1 - chlorobutane

C. 2 - methyl - 1 - chloropropane

D. 2 - chlorobutane

Answer: A



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5. Which one of the following characteristics belongs to an electrophile-

A. it is any species having electron deficiency which reacts at an electron rich C - centre

B. it is any species having electron enrichment, that reacts at an electron deficient C - centre

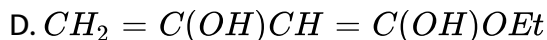
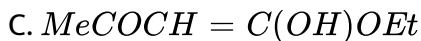
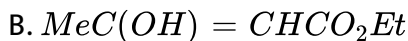
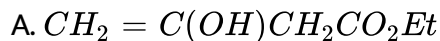
C. it is cationic in nature

D. it is anionic in nature

Answer: A

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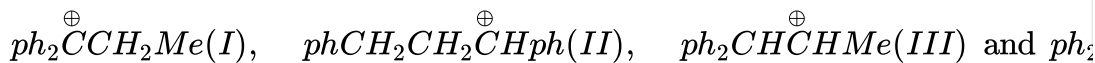
6. The most stable enol tautomer of $MeCOCH_2CO_2Et$ is-



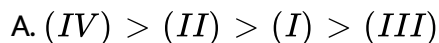
Answer: B

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7. Order of stability of the carbocations:



is-



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

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

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

Answer: B



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8. $MeCH_2CH = CH_2$ is stable than $Me_2C = CH_2$ because-

A. inductive effect of Me - group.

B. resonance effect of Me - group.

C. hyperconjugative effect of Me - group.

D. resonance and inductive effects of Me - group.

Answer: C



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9. (+) and (-) - Lactic acid have the same molecular formula, $C_3H_6O_3$. They are related as-

- A. structural isomers
- B. geometric isomers
- C. optical isomers
- D. homomers

Answer: C



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10. Which of the following statement is correct for 2 - butene-

- A. the $C_1 - C_2$ bond is an $sp^3 - sp^3\sigma$ - bond
- B. the $C_2 - C_3$ bond is an $sp^3 - sp^2\sigma$ - bond
- C. the $C_1 - C_2$ bond is an $sp^3 - sp^2\sigma$ - bond
- D. the $C_1 - C_2$ bond is an $sp^2 - sp^2\sigma$ - bond

Answer: C



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11. Basicity of aniline is less than methyl amine, because-

- A. hyperconjugative effect of Me - group in $MeNH_2$
- B. resonance effect of phenyl group in aniline
- C. molar mass of methylamine is less than that of aniline
- D. resonance effect of Me - group in $MeNH_2$

Answer: B



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12. Tautomerism is exhibited by-

- A. $(Me_3CCO)_3CH$

B. 

C. 

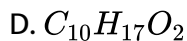
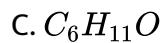
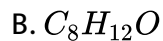
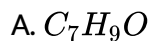
D. 

Answer: A,B,D



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13. Amongst the following, the one which can exist in free state as a stable compound is-



Answer: B



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

A. $NH_2NH_2 \cdot HCl$ and $ClCH_2COOH$

B. NH_2CSNH_2 and $phCH_2Cl$

C. NH_2CSNH_2 and $phCH_2Cl$

D. 

Answer: D



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15. The IUPAC name of the compound X is-



A. 4 - cyano - 4 - methyl - 2 - oxopentane

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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16. The optically active molecule is-

A. 

B. 

C. 

D. 

Answer: C



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17. (+) - 2 - chloro - 2 - phenylethane in toluene racemises slowly in the presence of small amount of $SbCl_5$, due of the formation of-

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

Answer: D



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



A. $H_a > H_b > H_c$

B. $H_a > H_c > H_b$

C. $H_b > H_a > H_c$

D. $H_c > H_b > H_a$

Answer: B



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19. The most likely protonation site in the given molecule is-



A. C - 1

B. C - 2

C. C - 3

D. C - 6

Answer: A



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20. The 4 - th higher homologue of ethane is-

- A. butane
- B. pentane
- C. hexane
- D. heptane

Answer: C



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21. Among the following structures the one which is not a resonating structure of other is-



A. I

B. II

C. III

D. IV

Answer: D



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22. The correct order of decreasing length of the bond as indicated by the arrow in the following structures is-



A. $I > II > III$

B. $II > III > III$

C. $III > II > I$

D. $I > III > II$

Answer: C



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23. IUPAC name of the molecule,



is-

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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24. The correct statement regarding the given compound is-



- A. all three compounds are chiral
- B. only I and II are chiral
- C. I and II are diastereomers
- D. only I and III are chiral

Answer: D



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25. In the Lassaigne's test for the detection of nitrogen in an 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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26. The reaction of methyl trichloroacetate (CI_3CCO_2Me) with sodium methoxide (NaOMe) generates-

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

Answer: B



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27. In a mixture, two enantiomers are found to be present in the amount of 85% and 15% respectively. The enantiomeric excess (e.e) is-

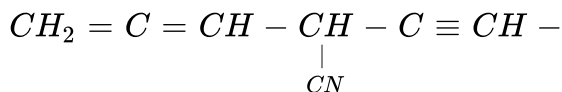
- A. 0.85
- B. 0.15
- C. 0.7
- D. 0.6

Answer: C



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28. 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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29. Which of the following statement is /are correct-



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30. The correct order of acid strenghts of benzoic acid (X), peroxybenzoic acid (Y) and p - nitrobenzoic acid (Z) is-

A. $Y > Z > X$

B. $Z > Y > X$

C. $Z > X > Y$

D. $Y > X > Z$

Answer: C



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

A. 3 - phenylpropanoic acid

B. benzylacetic acid

C. carboxyethylbenzene

D. 2 - phenylpropanoic acid

Answer: A



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32. The major product (s) obtained in the reaction is/are-



A. 

B. 

C. 

D. 

Answer: A,D

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33. The possible product (s) to be obtained from the reaction of cyclobuty amine with HNO_2 is/are-

A. 

B. 

C. 

D. 

Answer: A,C



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34. Identify the compound that exhibits tautomerism-

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

Answer: B



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35. How many chiral compounds are possible on monochlorination of 2 - methylbutane-

- A. 2
- B. 4

C. 6

D. 8

Answer: A



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36. Which branched chain isomer of the hydrocarbon with molar mass 72u gives only 1 monosubstituted alkyl halide-

A. neopentane

B. isohexane

C. neohexane

D. t - butyl chloride

Answer: A



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37. The order of stability of the following carbocation is-



A. $III > I > II$

B. $III > II > I$

C. $II > III > I$

D. $I > II > III$

Answer: A



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38. Arrange the compounds in order of decreasing acidity-



A. $IV > III > I > II$

B. $II > IV > I > III$

C. $I > II > III > IV$

D. $III > I > II > IV$

Answer: D



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39. A solution of (-) - 1 - chloro - 1 phenylethane in toluene racemizes slowly in the presence of a small amount of $SbCl_5$, due to the formation of-

A. free radical

B. carbanion

C. carbene

D. carbocation

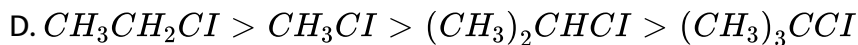
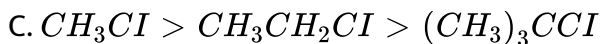
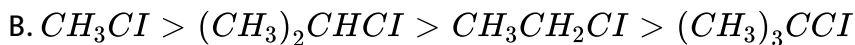
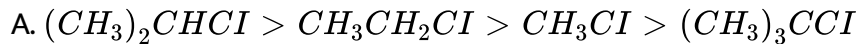
Answer: D



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40. In S_N2 reactions, the correct order of reactivity for the compounds:

CH_3Cl , CH_3CH_2Cl , $(CH_3)_2CHCl$ and $(CH_3)_3CCl$ -



Answer: C



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41. For the estimation of nitrogen, 1.4 g of an organic compound was digested by Kjeldahl method and the evolved ammonia was absorbed in 60 mL of M/10 sulphuric acid. The unreacted acid required 20 mL of M/10 sodium hydroxide for complete neutralisation. 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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42. In Carius method of estimation of halogens, 250 g of an organic compound gave 141 g AgBr. Percentage of Br in the compound ($Ag = 108, Br = 80$)-

A. 48

B. 60

C. 24

D. 36

Answer: C



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43. Which of the following compounds will exhibit geometrical isomersim-

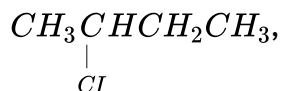
- A. 2 - phenyl - 1 - butene
- B. 1,1 - diphenyl - 1 - propene
- C. 1 - phenyl - 2 - butene
- D. 3 - phenyl - 1 - butene

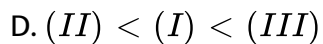
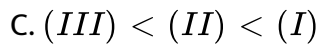
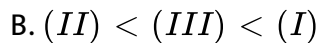
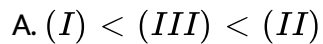
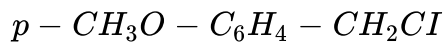
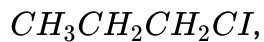
Answer: C



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44. The increasing order of S_N1 reactivity of the following compounds is-





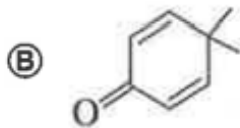
Answer: D

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45. The resonance stability is minimum for the compound-



A.



B.



C.

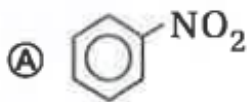


D.

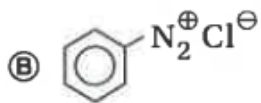
Answer: B

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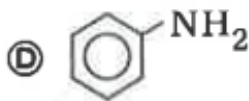
46. Which of the following compounds will be suitable for Kjeldahl's method of nitrogen estimation-



A.



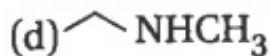
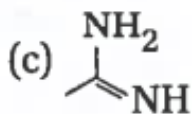
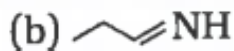
B.



Answer: D

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47. The increasing order of basicity of the following compounds is-



A. $(b) < (a) < (d) < (c)$

B. $(d) < (b) < (a) < (c)$

C. $(a) < (b) < (c) < (d)$

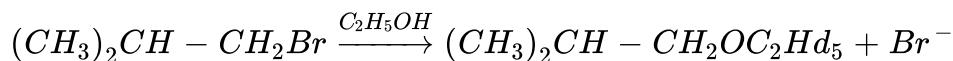
D. $(b) < (a) < (c) < (d)$

Answer: A

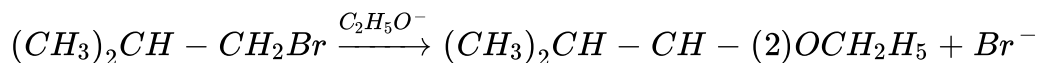


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48. Consider the reactions: (i)



(ii)



The mechanism of reactions (i) and (ii) are respectively-

A. S_N1 and S_N2

B. S_N1 and S_N1

C. S_N2 and S_N2

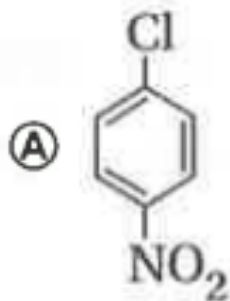
D. S_N2 and S_N1

Answer: C

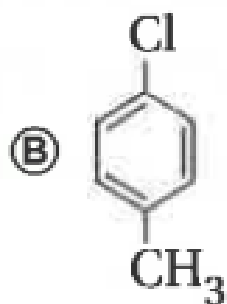


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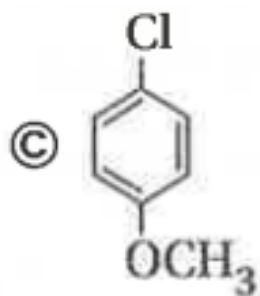
49. Which undergoes nucleophilic substitution most easily-



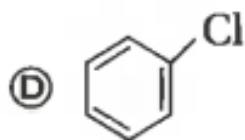
A.



B.



C.




D.

Answer: A



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50. IUPAC name of the compound, 

A. trans - 2 - chloro - 3 - iodo - 2 - pentene

B. cis - 3 - indo - 4 - chloro - 3 - pentene

C. trans - 3 - iodo - 4 - chloro - 3 - pentene

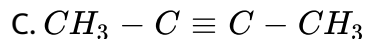
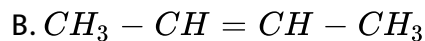
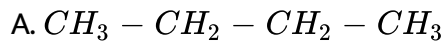
D. cis - 2 - chloro - 3 - iodo - 2 - pentene

Answer: A



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51. Considering the state of hybridisation of C - atoms, which one among the following is linear-

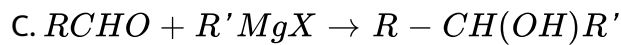
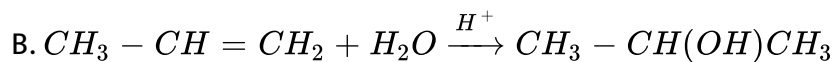
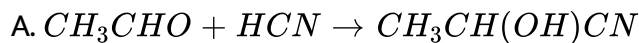


Answer: C



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52. Which is a nucleophilic substitution reaction-



D.



Answer: D



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53. Which is most reactive towards an electrophilic reagent-

A. 

B. 

C. 

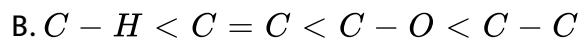
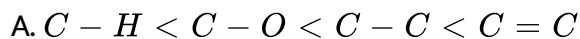
D. 

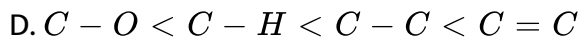
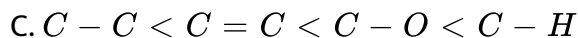
Answer: C



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54. The correct order of increasing bond length C - H , C - O , C - C and C = C is-

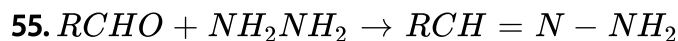




Answer: B



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What sort of reaction is it-

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

Answer: D



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56. Which of the following acids do not exhibit optical isomerism-

- A. malic acid
- B. α - amino acids
- C. lactic acid
- D. tartaric acid

Answer: A



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57. The correct order of decreasing acid strength of trichloroacetic acid (I), trifluoroacetic acid (II), acetic acid (III) and formic acid (IV) is-

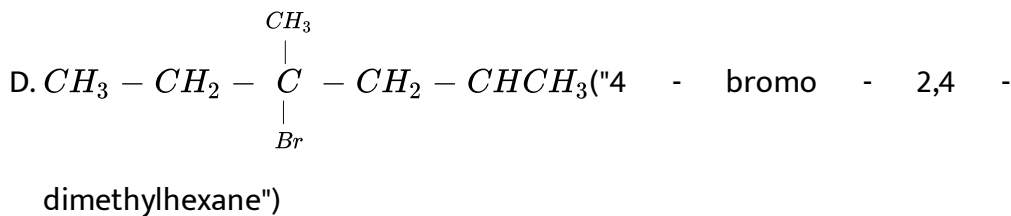
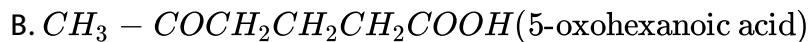
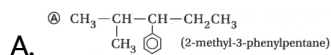
- A. $II > I > IV > III$
- B. $II > IV > III > I$
- C. $I > II > III > IV$
- D. $I > III > II > IV$

Answer: A



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58. Which nomenclature is not according to IUPAC system-



Answer: C



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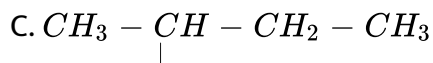
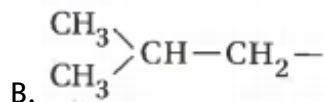
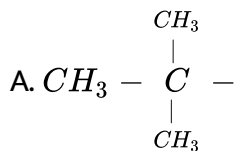
59. Structure of the compound whose IUPAC name is 3 - ethyl - 2 - hydroxy - 4 - methylhex - 3 - ene - 5 - ynoic acid is-

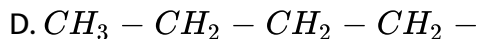


Answer: D

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60. Structure of isobutyl group in an organic compound is-

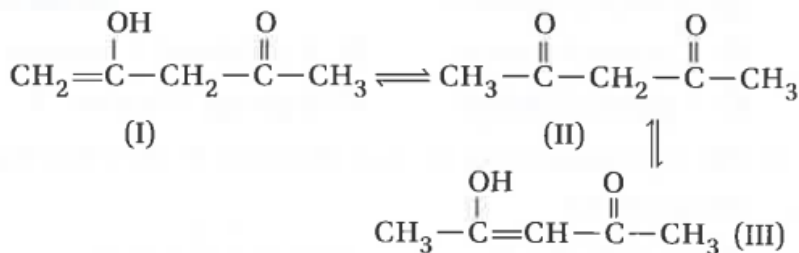




Answer: B

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61. The order of stability of the following tautomeric forms is-



A. $II > III > I$

B. $I > II > III$

C. $III > II > I$

D. $II > I > III$

Answer: C

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62. Which of the following compounds will undergo racemisation when solution of KHO hydrolyses-

(I) 

(II) $CH_3CH_2CH_2CI$

(III) $H_3C - \overset{\overset{CH_3}{|}}{C}H - CH_2CI$



A. I and II

B. II and IV

C. III and IV

D. I and IV

Answer:



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63. Most reactive towards nucleophilic addition reaction is-

A. 

B. 

C. 

D. 

Answer: D



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64. In the Kjeldahl's method for estimation of nitrogen present in a soil sample, ammonia evolved from 0.75 g of sample neutralised 10 mL of $1M H_2SO_4$. 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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65. The number of structural isomers possible from the molecular formula C_3H_9N is-

A. 4

B. 5

C. 2

D. 3

Answer: A



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66. In an $\text{S}_{\text{N}}1$ reaction on centres there is

- A. 100% racemisation
- B. inversion more than retention leading to partial racemisation
- C. 100% retention
- D. 100% inversion

Answer: B



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67. Which of the following statements is not correct for a nucleophile-

- A. nucleophile is a Lewis acid
- B. ammonia is a nucleophile
- C. nucleophile attack low electrons density sites
- D. nucleophilic are not electron seeking

Answer: A,B,C



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68. Two possible stereo - structures of $CH_3CHOH \cdot COOH$, which are optically active, are called-

- A. diastereomers
- B. atropisomers
- C. enantiomers
- D. mesomers

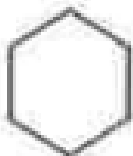
Answer: C



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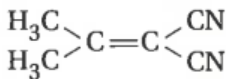
69. In which of the following molecules, all the atoms are coplanar-

Ⓐ



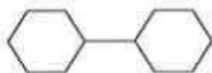
A.

Ⓑ



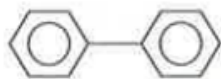
B.

Ⓒ



C.

Ⓓ



D.

Answer: D



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70. The correct order of acid strenghts of the given carboxylic acid is- 

A. $II > I > III$

B. $I > II > III$

C. $II > III > I$

D. $III > II > I$

Answer: C



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71. Which among the given molecules can exhibit tautomerism-



- A. both I and III
- B. both I and II
- C. both II and III
- D. III only

Answer: D



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72. Which of the following biphenyl is optically active-

A. 

B. 

C. 

D. 

Answer: B

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73. The pair of electrons in the given carbanion is present in which of the following orbitals- $CH_3 - \overset{\ominus}{\underset{\cdot\cdot}{C}}$

A. sp

B. $2p$

C. sp^3

D. sp^2

Answer: A



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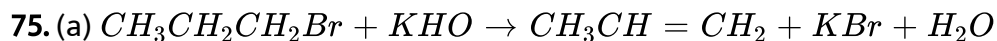
74. The correct statement about the basicity of aryl amines is-

- A. aryl amines are in genral more basic than alkyl amines because the N - atom in aryl amines is sp - hybridised
- B. aryl amines are in genral less basic than alkl amines because the unshared pair of electrons on nitrogen in aryl amines undergoes effective delocalisation with the ring π - electrons
- C. aryl amines are in genral more basic than alkyl amines because the unshared pair of electrons on nitrogen in aryl amines does not undergo delocalisation with the ring π - electrons
- D. aryl amines are more basic than alkyl amines due to the pressure of aryl groups


Answer: B



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(b) 

(c) 

Which one of the following statements for the given reactions is correct -

A. (a) is a substitution reaction but (b) and (c) are addition reactions.

B. (a) and (b) are elimination reactions, but (c) is an addition reaction.


C. (a) is an elimination reaction, (b) is a substitution reaction and (c) is an addition reaction.

D. (a) is an elimination reaction, but (b) and (c) are substitution reactions

Answer: C



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76. The IUPAC name of the compound 

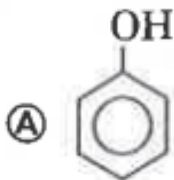
- A. 5 - formylhex - 2 - ene - 3 - one
- B. 5 - methyl - 4 oxohex - 2 - en - 5 - al
- C. 3 - keto - 2 - methylhex - 5 - enal
- D. 3 - keto - 2 - methylhex - 4 - enal

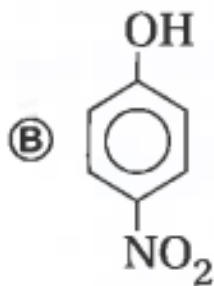
Answer: D



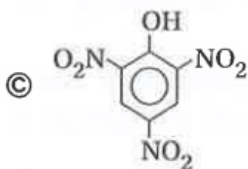
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77. Which one is the most acidic compound-

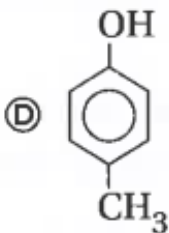




B.



C.



D.

Answer: C



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78. The most suitable method of separation of 1 : 1 mixture of ortho and para - nitrophenols is-

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

Answer: C

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79. 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. electrophiles can be either neutral or positively charged species and can form a bond by accepting a pair of electrons from a nucleophile

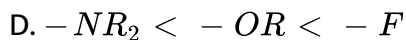
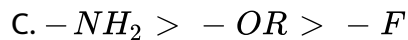
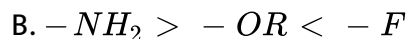
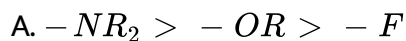
D. electrophile is a negatively charged species and can form a bond accepting a pair of electrons from a nucleophile

Answer: C



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80. Which of the following is correct with respect to -I effect of the substituents (R = alkyl) -

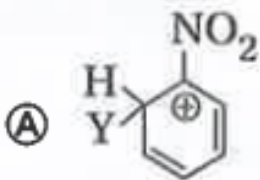


Answer: D

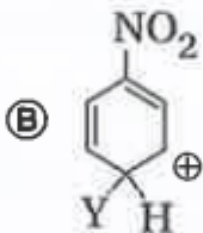


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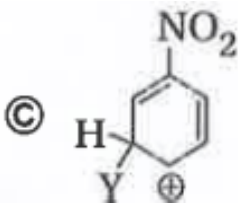
81. Which of the following carbocations is expected to be most stable-



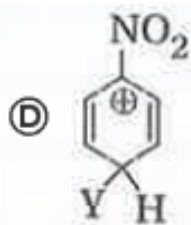
A.



B.



C.



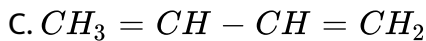
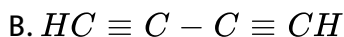
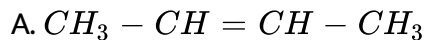
D.

Answer: C



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

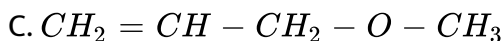
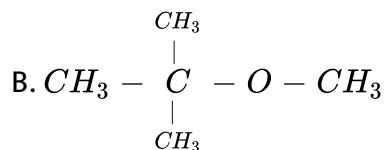
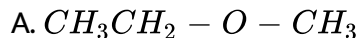


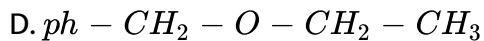
Answer: D



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83. S_N2 reaction readily occurs in-

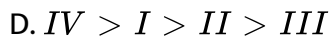




Answer: A

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84. The correct decreasing order of pK_a is-



Answer: A

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85. 

The correct decreasing order of pK_b is-

A. $I > II > III > IV$

B. $III > IV > II > I$

C. $II > III > IV > I$

D. $IV > II > I > III$

Answer: D



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86. Find the number of stereoisomers of 1,2 - dihydroxycyclopentane-

A. 1

B. 2

C. 3

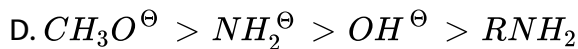
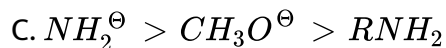
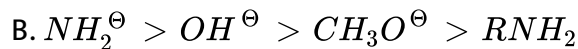
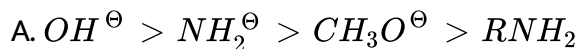
D. 4

Answer: C



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87. Decreasing order of nucleophilicity is-



Answer: C



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88. pK_a increases in benzoic acid when substituent "x" is bonded at para - position, then "x" is-

A. $-COOH$

B. $-NO_2$

C. $^{\cdot}CN$

D. $-OCH_3$

Answer: D

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89. The IUPAC name of the given compound is $(CH_3)_3CCH_2C(CH_3)_3 -$

A. 2,3,4,4 - tetramethylpentane

B. 1,2,2,4 - tetramethylpentene

C. 2,2,4,4 - tetramethylpentane

D. 3,3 - dimethylpentane

Answer: C

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90. The purity of an organic compound is determined by -

- A. chromatography
- B. crystallisation
- C. melting or boiling point
- D. both (a) and (c)

Answer: D



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

- A. $H_2N - CO - NHNH_2 \cdot HCl$
- B. $NH_2 - NH_2 \cdot HCl$
- C. $C_6H_5 - NH - NH_2 \cdot HCl$

D. $C_6H_5CONH_2$

Answer: B

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92. Arrange the following nucleophiles in the decreasing order of nucleophilicity-

A. 2 - ethylalanine

B. 2 - methylglycine

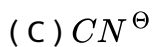
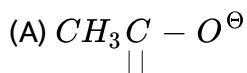
C. 2 - hydroxymethylserine

D. tryptophan

Answer: C

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93. Arrange the following nucleophiles in the decreasing order of nucleophilicity-



A. C,B,A,D

B. A,B,C,D

C. D,C,B,A

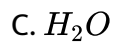
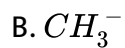
D. B,C,A,D

Answer: D



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94. Which of the following is an electrophile-



Answer: A

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95. Give IUPAC name of the following compound-



A. 5 - hydroxycyclohex - 3 - ene - 1 - one

B. 3 - hydroxycyclohex - 5 - en - 1 - one

C. 8 - hydroxycyclohex - 3 - en - 1 - one

D. 7 - hydroxycyclohex - 5 - en - 1 - one

Answer: A

96. Which of the following is the correct order of acidic strenght of the following compounds-



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

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

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

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

Answer: D

97. IUPAC name of the given compounds is-



- A. 2 - methoxy - 4 - bromonitrobenzene
- B. 3 - bromo - 6 - nitro - 1 - methoxybenzene
- C. 3 - methoxy - 4 - nitrobromobenzene
- D. 5 - bromo - 2 - nitro - 1 - methoxybenzene

Answer: D

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Mcq Single Correct Type

1. The number of σ — and π - bonds in pent - 1 - en - 4 - yne molecule is respectively-

- A. 8 and 2
- B. 10 and 3
- C. 6 and 4
- D. 7 and 2

Answer: B



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2. The hybrid orbitals involved in the formation of the $C_2 - C_3$ bond in the following compound, $CH_2 = CH - CH_2 - CH_2 - C \equiv CH$ are-

A. $sp - sp^2$

B. $sp - sp^3$

C. $sp^2 - sp^3$

D. $sp^3 - sp^3$

Answer: C



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3. The increasing order of electronegativity of the carbon atoms C - 2, C - 3 and C - 4 in the compound $CH_3 - C \equiv C - CH_2 - CH = CH_2$ is-

A. $C - 3 < C - 2 < C - 4$

B. $C - 4 < C - 3 < C - 2$

C. $C - 2 < C - 4 < C - 3$

D. $C - 3 < C - 4 < C - 2$

Answer: A



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4. $CH_3CONH_2 \rightarrow CH_3CN$, In this conversion, the change in hybridisation state of the carbon atom of the functional group is-

A. $sp^3 - sp$

B. $sp^2 - sp$

C. $sp - sp^3$

D. $sp^2 - sp^3$

Answer: B



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5. The correct shapes of CCl_4 and $CCl_2 = C = C = CI_2$ molecules are respectively-

- A. linear and tetrahedral
- B. planar and pyramidal
- C. tetrahedral and planar
- D. tetrahedral and linear

Answer: C



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6. The number of C and H - atoms that in the same plane in a toluene ($C_6H_5CH_3$) molecule is respectively-

- A. 7 and 5

B. 6 and 5

C. 7 and 3

D. 6 and 3

Answer: A



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7. The number primary, secondary, tertiary and quaternary carbon atoms in 2,2,4 - trimethylpentane is respectively-

A. 5,1,1 and 1

B. 1,1,1 and 5

C. 4,1,1 and 2

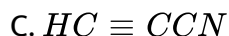
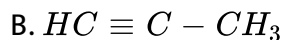
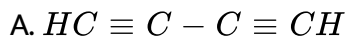
D. 1,5,1 and 1

Answer: A



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8. In which of the following molecules does all the atoms lie on the same straight line-

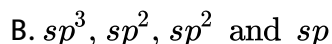
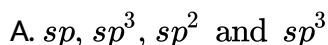
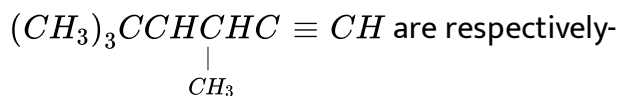


Answer: B



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9. Hybridisation states of C - 2 , C - 3 , C - 5 and C - 6 in the compound,



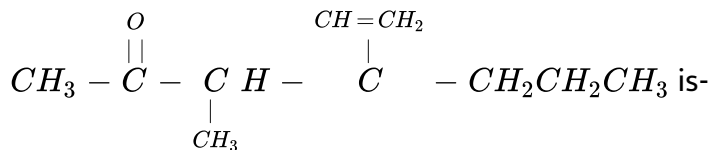
C. sp , sp^2 , sp^2 and sp^3

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

Answer: A

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10. IUPAC name of the compound,



A. 4 - propyl - 3 - methylhex - 5 - en - 2 - one

B. 3 - propyl - 5 methylhex - 1 - en - 5 - one

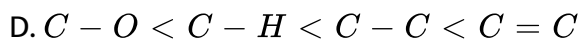
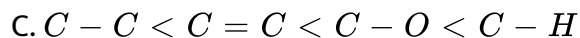
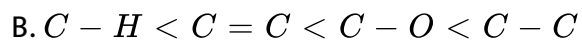
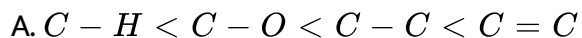
C. 3 - methyl - 4 - propylhex - 5 - en - 2 - one

D. 3 - methyl - 4 - vinylheptan - 2 - one

Answer: C

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11. Bond lengths of C - H, C - O, C - C and C = C follow the sequence-

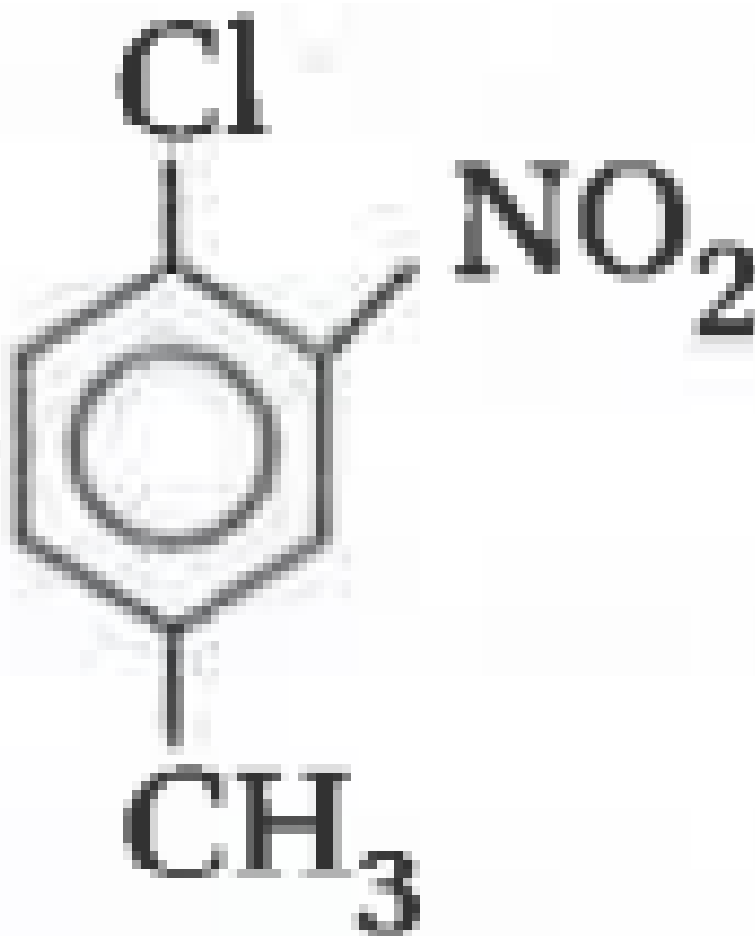


Answer: B



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12. IUPAC name of the compound



A. 1 - chloro - 2 - nitro - 4 - methylbenzene

B. 1 - chloro - 4 - methyl - 2 - nitrobenzene

C. m - nitro - p - chlorotoluene

D. 2-chloro-1-nitro-5-methylbenzene

Answer: B

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13. The hybridisation states of the carbon atom of amido and cyano group are respectively-

A. sp^3 and sp^2

B. sp^2 and sp

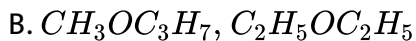
C. sp and sp^2

D. sp^3 and sp

Answer: B

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14. Which of the following pair of compounds are isomers-



Answer: D



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15. Two aliphatic compounds will not be considered isomers if they are-

A. aldehyde and ketone

B. ether and alcohol

C. ether and aldehyde

D. carboxylic acid and ester

Answer: C



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16. The number of organic compounds with molecular formula C_4H_{10} are-

A. 7

B. 5

C. 6

D. 8

Answer: A



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17. What happens when $CHCl_3$ reacts with oxygen in presence of sunlight?

A. propane

- B. pentane
- C. butane
- D. cyclohexane

Answer: D

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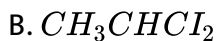
18. Two enantiomers rotate the plane of polarisation of plane polarised light-

- A. in different directions but keeping the angle same
- B. in the same direction but with different angles
- C. in the same direction and in the same angle
- D. in different directions with different angles

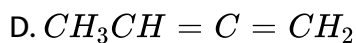
Answer: A

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19. Which of the following is an optically compound-



C. meso - tartaric acid

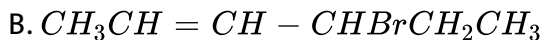


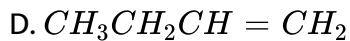
Answer: A



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20. Which of the following compounds exhibit both geometrical and optical isomerism-



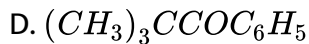
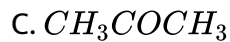
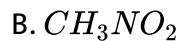


Answer: B



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21. Which of the following compounds does not exhibit tautomerism-

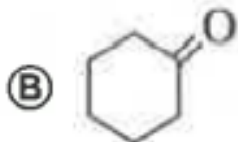


Answer: D

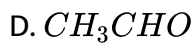
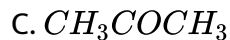


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22. The enol content in which of the following compounds is maximum-



B.



Answer: A

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23. The optically active alkane of lowest molecular mass which is also chiral is-

A. 3 - methylhexane

B. 2,3 - dimethylpentane

C. 2 - methylhexane

D. 2,5 - dimethylhexane

Answer: A



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24. Which of the following compounds possesses a centre of symmetry-

- A. trans - 1,3 - dimethylcyclobutane
- B. cis - 1,3 - dimethylcyclobutane
- C. trans - 1 - ethyl - 3 - methylcyclobutane
- D. cis - 1 - ethyl - 3 - methylcyclobutane

Answer: A



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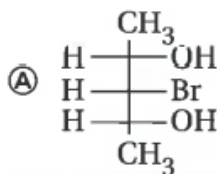
25. The compounds cis - 2 - butene and trans - 2 - butene can be differentiated by -

- A. the number of products obtained due to their chlorination
- B. the number of products obtained due to their bromination
- C. their reaction with H_2 in presence of nickel catalyst
- D. their respectively boiling points

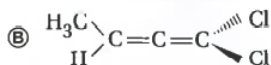
Answer: D

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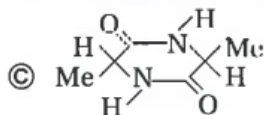
26. Which of the following is optically active -



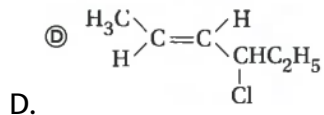
A.



B.



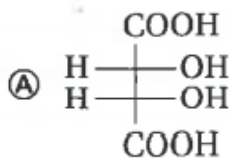
C.



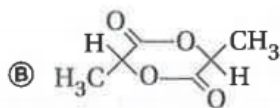
Answer: D

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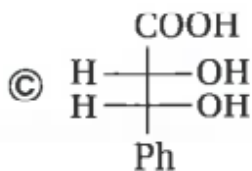
27. Which of the following is non - superimposable on its mirror image-



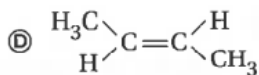
A.



B.



C.



D.

Answer: C



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28. The number of isomers formed by a compound whose molecular formula is $C_2BrClFI$ is

A. 3

B. 4

C. 5

D. 6

Answer: D



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29. $CH_3CH(OH)CH \xrightarrow{H_3O^+} CH_3CH(OH)COOH$, In this reaction, the hydroxyacid obtained is-

- A. (+) - enantiomer
- B. (-) - enantiomer
- C. 50% (+) and 80% (-) - enantiomer
- D. 20% (+) and 80% (-) - enantiomer

Answer: C



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30. Which of the following compounds will produce the most stable carbocation in presence of an acid-

- A. $(CH_3)_2CHCH_2OH$
- B. $CH_2 = CH - CH_2OH$
- C. $(CH_3)_2CHOH$
- D. $(CH_3)_3COH$

Answer: B

31. The correct order of stability of the given carbonions: para -

$O_2NC_6H_4\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2(I)$, $C_6H_5\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2(II)$ and para - $CH_3OC_6H_4\overset{\ominus}{\underset{\cdot\cdot}{C}}H_2(III)$ is-

A. $I > II > III$

B. $II > I > III$

C. $III > II > I$

D. $II > III > I$

Answer: A

32. The most stable carbocation is-

A. 

B. 

C. 

D. 

Answer: D

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33. The most stable carbanion is-



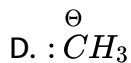
A.



B.



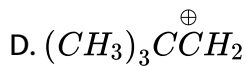
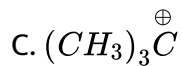
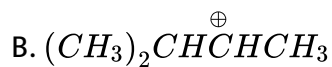
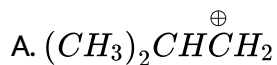
C.



Answer: B

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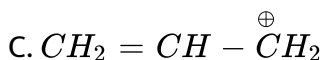
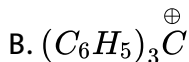
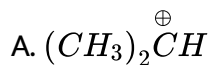
34. Carbocation which does not undergo rearrangement is-



Answer: C

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35. Which of the following carbocations is quite stable and can even be stored in the laboratory as a salt-

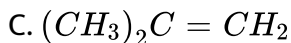
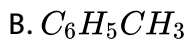
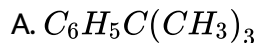


Answer: B



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36. Compound in which hyperconjugation does not occur-

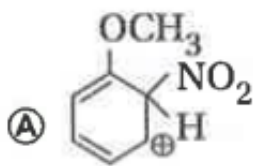


Answer: A

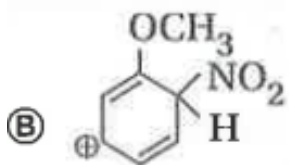


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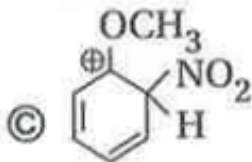
37. Which of the given resonance structures is most stable-



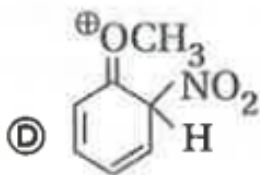
A.



B.



C.



D.

Answer: D



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38. Which of the given alicyclic compounds is most active-

(A)



A.

(B)



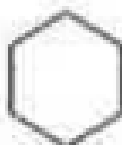
B.

(C)



C.

(D)



D.

Answer: B



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39. $\dot{C}H_3(I)$, $CH_3\dot{C}H_2(II)$, $CH_2 = CH\dot{C}H_2(III)$, $C_6H_5\dot{C}H_2(IV)$,

The correct order of stability of these free radicals is-

A. $I > II > III > IV$

B. $III > II > I > IV$

C. $IV > III > II > I$

D. $IV > I > II > III$

Answer: C



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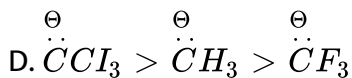
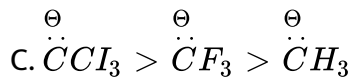
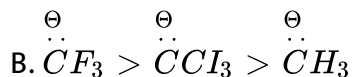
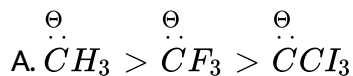
40. The structures of carbocation and carbanion are respectively-

- A. linear and planar
- B. trigonal planar and trigonal pyramidal
- C. tetrahedral and trigonal planar
- D. trigonal pyramidal and tetrahedral

Answer: B

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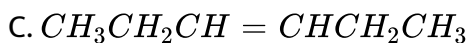
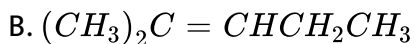
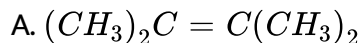
41. Correct order of stability of the given three carbonions is-



Answer: C

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42. Which of the following alkenes is most stable-



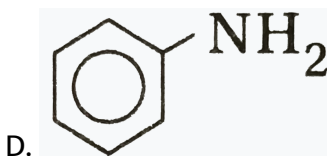
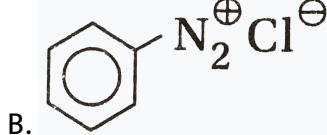
Answer: A



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43. In which of the following compounds, extent of resonance between the benzene ring and halogen atom is maximum-

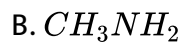


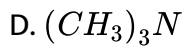
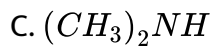


Answer: A

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44. The compound whose basicity is maximum in gaseous and aqueous medium is-





Answer: C



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45. (+) - 1 - Chloro - 1 - pheylethane undergoes racemisation in presence of small amount of $SbCl_5$. The intemediate formed in this process is-

A. a carbene

B. a carbocation

C. a carbanion

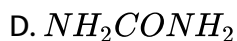
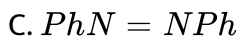
D. a free radical

Answer: B



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46. In which of the following compounds, presence of nitrogen cannot be detected by Lassaigne's test-

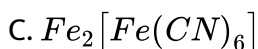
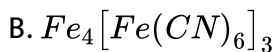
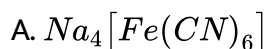


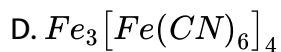
Answer: A



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47. Which of the following compounds is responsible for the formation of Prussian blue during detection of nitrogen by Lassaigne's test-





Answer: B



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48. The process by which essential oils can be extracted from flowers is-

A. distillation

B. crystallisation

C. vacuum distillation

D. steam distillation

Answer: D



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49. The process which is suitable for detecting two different types of ink in any handwritten ancient document is-

- A. column chromatography
- B. solvent extraction
- C. distillation
- D. thin layer chromatography

Answer: D



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50. Detection of which of the following functional groups is required to confirm the presence of nitrogen in the corresponding compound-

- A. amido
- B. carboxyl
- C. carbonyl

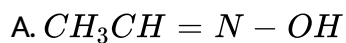
D. alkoxy carbonyl

Answer: A



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51. Which of the following compounds does not exhibit geometrical isomerism-



Answer: C



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52. The number of geometrical isomers of the compound,

$CH_3CH = CH - CH = CHCH_3$ is-

A. 3

B. 2

C. 4

D. 5

Answer: A



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53. The number of optically active isomers of the compounds,

$CH_3CH(OH)CH(OH)CH_3$ is

A. 4

B. 2

C. 3

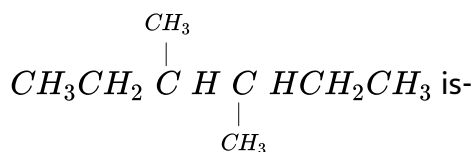
D. none of these

Answer: B



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54. The number of compounds formed on monobromination of



A. 3

B. 2

C. 5

D. 4

Answer: D



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55. Double bond equivalent of C_8H_9ClO is

A. 4

B. 6

C. 3

D. 2

Answer: A



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56. The correct order of basicity of

$CH_3NH_2(I)$, $(CH_3)_2NH(III)$ and $(CH_3)_3N$ in chlorobenzene is-

A. $I < III < II$

B. $II < III < I$

C. $II < I < III$

D. $II < I < III$

Answer: C



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57. The correct order of stability of

$(CH_3)_2\overset{\oplus}{C}H(I)$, $CH_3\overset{\oplus}{C}HOCH_3(II)$ and $ClCH_2\overset{\oplus}{C}HCH_3$ is-

A. $I > II > III$

B. $II > III > I$

C. $II > I > III$

D. $III > II > I$

Answer: C



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58.

$CH_3\overset{\ominus}{C}H - CO - CH_3(I)$, $CH_3CH_2 - CO - \overset{\ominus}{C}H_2(II)$ and $\overset{\ominus}{C}H_2CH_2 - CO - CH_3(III)$

, The correct order of stability of these carbanious is-

A. $III < I < II$

B. $I < III < II$

C. $II < III < I$

D. $III < II < I$

Answer: A



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59. In kjedahl's method, $CuSO_4$ is used to-

A. catalyse the reaction

B. oxidise the reaction

C. reduce the reacation

D. increases boiling point

Answer: A



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60. The number of optically active isomers among five probable alcohols of molecular formula $C_4H_{10}O$ is-

A. 1

B. 2

C. 3

D. 4

Answer: B



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61. Which compound gives most unstable enol-

A. 

B. 

C. 

D. 

Answer: A



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62. If 3.4% sulphur is present in insulin, then the minimum molecular mass of insulin will be-

A. 350

B. 470

C. 560

D. 940

Answer: D



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63. The number three different asymmetric carbon atoms in a compound.

The number of possible stereoisomers of this compound is-

A. 8

B. 3

C. 9

D. 6

Answer: A



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64. There are three different asymmetric carbon atoms in a compound. The number of possible stereoisomers of this compound is-

A. 8

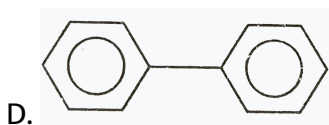
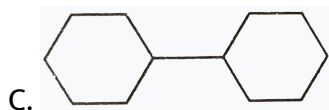
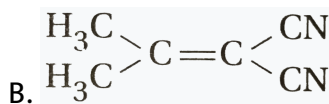
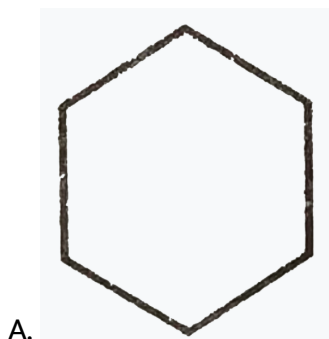
B. 3

C. 9

Answer: A

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65. In which of the following compounds, the nucleophilic character of N - atom is maximum-



Answer: A



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66. Which of the following resonance structures is incorrect

A. 

B. 

C. 

D. 

Answer: C



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67. Number of electrons in the p - orbital of methyl cation is-

A. 2

B. 3

C. 4

D. none of these

Answer: D



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68. Which compound can exhibit geometrical isomerism-

A. acetone - oxime

B. isobutene

C. acetophnone - oxime

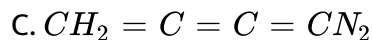
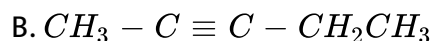
D. benzophenone - oxime

Answer: C



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69. In which of the following molecules, all the constituent carbon atoms have the same state of hybridisation-

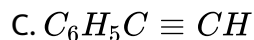
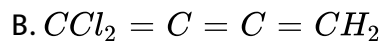
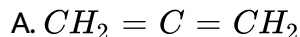


Answer: A::D



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70. In which of the following molecules, all the atoms lie in the same plane-



Answer: B::C::D



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71. Which of the following express a homologous series-

- A. methanol, ethanol, 1 - propanol
- B. 1 - hexene, 2 - hexene, 3-hexene
- C. formic acid, acetic acid, propionic acid
- D. methane, methanol, methanal

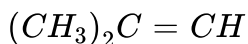
Answer: A::C



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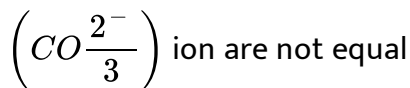
72. Which of the following statements are incorrect-

A. heat of hydrogenation of $CH_3CH_2CH=CH_2$ is less than that of



B. $\overset{\ominus}{C}CI_3$ is more stable than $\overset{\ominus}{C}F_3$

C. bond lengths of three carbon - oxygen bonds in carbonate



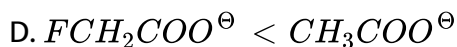
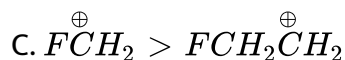
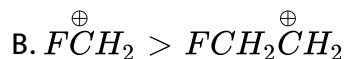
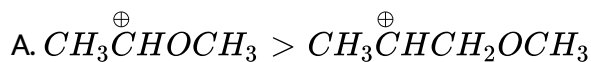
D. free radicals are paramagnetic

Answer: A::C



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73. Which of the following orders of stability are correct -



Answer: A::B



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74. Which process is not represented correctly-

A. 

B. 

C. 

D. 

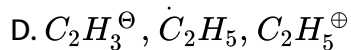
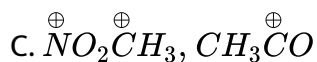
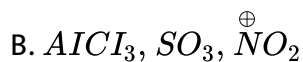
Answer: A::C



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75. Which of the following sets represent only electrophiles-

A. BF_3 , NH_3 , H_2O



Answer: B::C



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76. Delocalisation in hyperconjugation occurs-

- A. in case of σ - bond electrons of C - H bond of any alkyl group directly linked to a double bond
- B. in case of σ - bond electrons of C - H bond of any alkyl group directly linked to a positive carbon atom
- C. in case of π - electrons of C = C
- D. in case of lone pair of electrons

Answer: A::B



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77. Which of the following statements are incorrect-

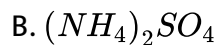
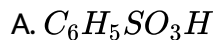
- A. sodium extract is first boiled with dilute HCl during detection of halogens by Lassaigne's test
- B. if in an organic compound, both nitrogen and sulphur are present, then blood - red colouration is observed during detection of nitrogen by Lassaigne's test
- C. organic compounds which dissociate at their melting points are purified by vacuum distillation
- D. in paper chromatography, the stationary phase is solid while the mobile phase is liquid

Answer: A::D



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78. Which of the following compounds give a red colouration in Lassaigne's test during detection of nitrogen-

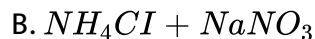
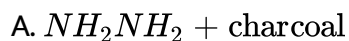


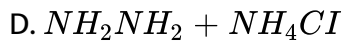
Answer: C::D



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79. Which of the following compounds give a red colouration in Lassaigne's test during detection of N-





Answer: A::C

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80. Which of the following are optically active compounds -

A. 

B. 

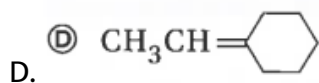
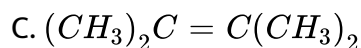
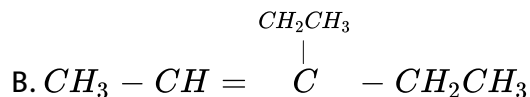
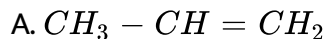
C. 

D. 

Answer: B::C

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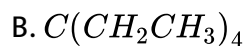
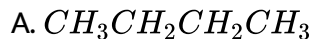
81. In which of the following compounds the number of hyperconjugable hydrogen atoms same



Answer: B::D

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82. For which of the following compounds the number of compounds formed on monbromination are same-

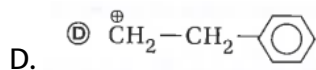
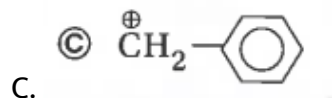
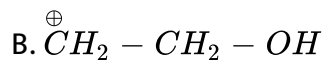
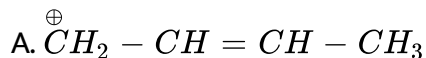




Answer: A::B

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83. The carbocations which attain stability by resonance are-



Answer: A::C

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84. Mixtures that can be separated by simple distillation are-

- A. a mixture of ether and toluene
- B. a mixture of hexane and toluene
- C. a mixture of benzene and chloroform
- D. a mixture of 95% ethanol and 5% water

Answer: A::C



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85. Compound that can be purified by steam distillation are -

- A. acetic acid
- B. o - nitrophenol
- C. ethanol
- D. nitrobenzene

Answer:



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86. Which of the following statements are incorrect ?

- A. quantitative estimation of nitrogen in any compound can be done by kjedahl's method
- B. quantitative estimation of sulphur in organic compounds can be done by Dumas method
- C. quantitative estimation of halogens in organic compounds can be done by Carius method
- D. in Liebig's method of detecting carbon and hydrogen in organic compounds carbon is converted into carbon dioxide while hydrogen is converted into water

Answer: B::D



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87. In which of the following processes, any organic liquid vapourises below its boiling point-

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

Answer: A::C



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88. Which exhibit optical and geometrical isomerism-

- A. $CH_3CHClCH = CH_2$
- B. $CH_3 - CHCl - CH = CH_2$
- C. $CH_3CH = CH - CH(CH_3)_3$
- D. $CH_3CH = CH - CH = C = CHCH_3$

Answer: A::C



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89. Which of the following are correct statements-

A. $(CF_3)_3C^+$ is more stable than $(CH_3)_3C^+$

B. Na^+ does not act as an electrophile

C. Ph_3C^+ can be stored in the form of $Ph_3C^+BF_4^-$

D. $CH_3CH_2O^-$ is less stable than $O_2NCH_2CHf_2O^-$

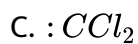
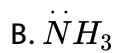
Answer: B::D



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90. The nucleophilic reagents are-

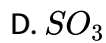
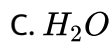
A. BF_3



Answer: B::C::D

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91. The electrophile reagents are-



Answer: A::B::D

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92. Which of the following statements regarding Lassaigne's test are correct-

- A. N,S and halogens are detected by converting them into their corresponding inorganic salts
- B. this test is done to detect N, S and hydrogen
- C. organic compounds are fused with sodium metal
- D. different halogens can be distinguished

Answer: A::C::D



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93. Which of the following exhibit keto - enol tautomerism-

- A. $C_6H_5COC_6H_5$
- B. $C_6H_5COCH = CH_2$
- C. $C_{(6)}H_{(5)}COCH_{(2)}COCH_{(3)}$



Answer: B::C::D



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94. Which of the following do not exhibit optical activity-

A. 3 - methyl - 1 - pentene

B. 2 - methyl - 2 - pentene

C. 4 - methyl - 1 - pentene

D. 3 - methyl - 2 - pentene

Answer: B::C::D



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95. The correct statements are-

- A. racemic mixture is an equimolecular mixture of a pair of enantiomers
- B. configuration of a molecule means stable three - dimensional arrangement of the groups attached to a specific atom of the molecule
- C. melting & boiling points of 2 enantiomers are different
- D. a molecule may be optically active or inactive if more than one asymmetric carbon is present in the molecule

Answer: A::B::D



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96. Which of the following are planar-

- A. tert - butyl radical
- B. tert - butyl carbocation
- C. tert - butyl carbonion

D. allyl carbanion

Answer: A::B::D



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97. Which can act as both electrophile and nucleophile-

A. CH_3OH

B. CH_3Cl

C. CH_3CN

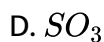
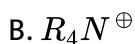
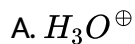
D. $HCHO$

Answer: C::D



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98. Which of the following can act neither as an electrophile nor as a nucleophile-



Answer: A::B



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99. Which of the following conditions favour E2 reaction

A. a strong base of high concentration

B. a solvent of low polarity

C. 3° alkyl halide as the substrate

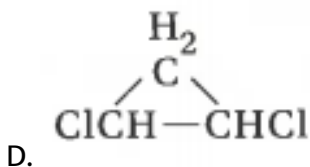
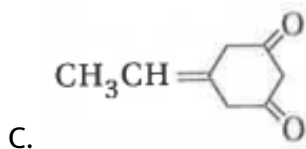
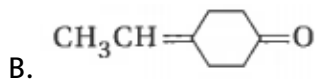
D. alkyl iodide

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



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100. Compounds that will not exhibit geometrical isomerism-

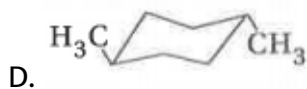
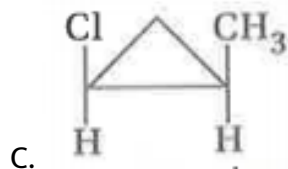
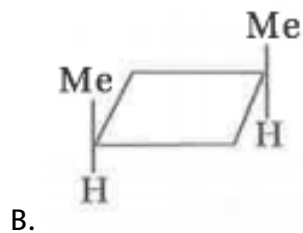
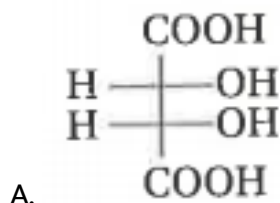


Answer: A::B::C



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101. In which of the following a plane of symmetry is present-



Answer: A::B::D



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102. Three stereoisomers of CH_2YZ are possible if the structure of methane be-

- A. rectangular planar
- B. square planar
- C. square pyramidal
- D. octahedral

Answer: A::B



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Very Short Type Question

1. What is the value of C - C = C bond angle in benzene (C_6H_6) molecule?



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2. What is the value of $H - C \equiv C$ bond angle in acetylene (C_2H_2) molecule?

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3. Mention the state of hybridisation of C and N - atoms in CH_3NH_2 .

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4. Mention the state of hybridisation of the carbon atoms present in the molecule, $CH_3CH = C = CHCH_2CH_3$.

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5. Give the name of a simple organic molecule which has a cylindrical π - electron cloud?

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6. Give example of a molecule in which all atoms lie in same plane.

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7. Give example of a molecule in which all the aoms lie in a straight line.

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8. Calculate the number of σ and π - bonds in the molecule,
 $CH_3CH = CH - C \equiv C - CHO$.

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9. What are the possible values of n if $CH_2 = (C)_n = CH_2$ is a non - planar molecule?

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10. What are the possible values of n if $CH_2 = (C)_n = CH_2$ is a non-planar molecule?

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11. Write the structure of a hydrocarbon molecule which contains one 4° carbon atom.

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12. Give example of a compound which contains primary (1°), secondary (2°) and tertiary (3°) H-atoms.

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13. How many alkyl groups can be derived from the alkane, $CH_3(CH_2)_3CH_3$?

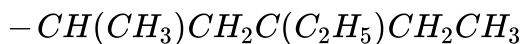
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14. Write the group prefix used for the - COOH group.

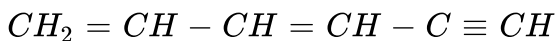
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15. Write the IUPAC name.



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16. Write the IUPAC name:



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17. Write the structure and name of an alkane having five C - atoms which on bromination gives only one monobromo derivative.



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18. Write structures of two compounds which are metamers as well as position isomers.



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19. Give example of a carbonyl compound in which tautomerism does not take place.



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20. Give example of a 3° free radical containing six hyperconjugable hydrogens.



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21. Which is the most stable carbocation having formula, $C_4H_9^+$?

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22. Which has greater resonance stabilisation – $Ph\ddot{N}H_2$ or $Ph\overset{+}{N}H_3$?

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23. Write the name of a cyclic compound which is isomeric with but - 1 - ene.

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24. Write names of two non - polar solvents which are commonly employed for crystallisation.

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25. What type of furnace is used in the Carius method for the estimation of halogens?

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26. Mention the type of chromatography in which both the mobile and stationary phases are liquid.

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27. With the help of which type of distillation process glycerol can be purified?

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Fill In The Blanks

1. When four alkyl groups are attached to a carbon atom, that particular C - atom is called _____ carbon atom.



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2. The shape of the molecule containing only sp^2 - hybridised carbon atoms is _____



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3. The C - 2 atom of propa - 1,2 diene is _____ hybridised.



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4. The shape of the molecule containing only sp - hybridised carbon atoms is _____



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5. The successive members of a homologous series differ by _____ mass units.

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6. The molecule, $HC \equiv C - CH = CH - CH_3$ contains _____ σ - bonds

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7. The general formula of dihydric alcohol is _____

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8. The compound 5 - (1,2 - dimethylpropyl) - 6 - ethyldecane contains _____ 3° carbon atoms.

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9. Stereoisomers have _____ atoms - to - atom bonding sequence or connectivity.



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10. The number of isomers of a benzenoid aromatic compound having molecular formula, C_7H_8O is _____



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11. Ethoxyethane and 2 - methoxypropane are related as _____



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12. The amount of negative charge present on each O - atom of carbonate ion is _____



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13. The homolytic fission of a covalent bond requires _____ energy than that required by its heterolytic fission.



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14. _____ involves delocalisation of σ - electrons of C - H bond of an alkyl group directly attached to an unsaturated system or to an atom with a vacant or singly p - orbital.



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15. In paper chromatography, both the stationary and mobile phases are _____



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16. An impure sample of benzoic acid containing a little sodium chloride can be purified by _____

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17. In steam distillation, the organic liquid boils at a temperature _____ than its normal boiling point.

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18. In Carius method of estimation, chlorine present in an organic compound is converted into _____

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19. _____ distillation is used to remove water from rectified spirit.

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Short Type Questions

1. The bond dissociation energy of $C_{sp^3} - H$ is smaller than that of $C_{sp} - H$ bond - why?



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2. Write structures and names of a cycloalkane and an alkene which are isomeric with each other.



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3. How many organic groups can be derived from propene? Write their structures and names.



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4. Write the structure of the compound 1,1,4 - trimethylcyclohexane.

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5. How many structural isomers having molecular formula $C_3H_5Br_3$ is possible?

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6. Predict whether the ketone, PhCOPh will exhibit tautomerism or not.

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7. Write structure of that geometric isomer of 2,3 - dichlorobut - 2 - ene which has lower boiling point and explain this observation.

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8. Which out of $CH_2 = CH - CH = CHCH_3$ and $CH_2 = CHCH_2CH = CH_2$ has higher heat of hydrogenation and why?

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9. Explain why all C - O bonds in $CO\frac{2-}{3}$ ion are equal in length.

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10. Explain why 2 - fluorobutanoic acid is more acidic than 2 - chlorobutanoic acid.

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11. Write structures of the ions expected to be formed by the heterolytic cleavage of a C - C bond of 2,2 - dimethylpropane and explain their formation.



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12. Which out of $CH_3CH_2\ddot{N}H_2$ and $CH_3CO\ddot{N}H_2$ is more basic and why?



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13. How will you separate benzene from nitrobenzene mixed with their mixture and why?



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14. Explain, why an organic liquid vaporise at a temprature below its boiling point in its steam distillation?



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15. The presence of nitrogen in hydrocyclamine hydrochloride cannot be detected by Lassaighe's test - why?

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16. Before the tests for halogens the Lassaighe's extract is to be boiled with dil. HNO_3 - why?

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17. R_f values are usually expressed as decimal fraction - why?

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Warm Up Exericse

1. The valency of carbon is four even though its electronic configuration is $1s^2 2s^2 2p^2$ - explain.

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2. No organic compound is known in which C^{4+} or C^{4-} ion exists - explain.

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3. What is the angle between any two adjacent valencies (bonds) in the tetrahedral model of carbon?

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4. Why are the four C - Cl bonds in CCl_4 equivalent?

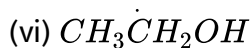
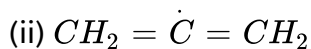
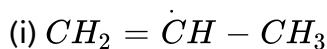
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5. Mention the angles between two sp^3 , sp^2 and sp orbitals.



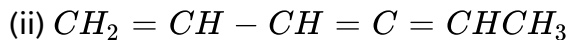
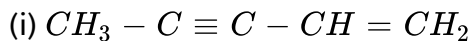
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6. Mention the state of hybridisation of the starred (*) carbon atoms in each of the following compounds.



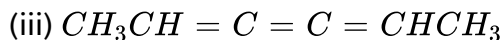
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7. How many σ and π - bonds are present in each of the following molecules?



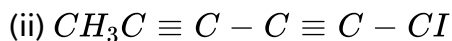
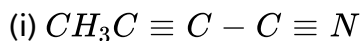
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8. Which atoms in each of the following molecules remain in the same plane and why?



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9. Which atoms in each of the following molecules lie in the same line and why?





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10. For what type of hybridisation of carbon atom an organic molecule possess three - dimensional shape?



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11. A π - bond is weaker and more reactive than a σ - bond. Why?



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12. Arrange sp , sp^2 , sp^3 hybrid orbitals in order of their increasing size.



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13. What is the shape of each of the given compounds?

(i) $H_2C = O$

(ii) CH_3CI

(iii) HCN

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14. Arrange $C_{sp} - H$, $C_{sp^3} - H$ and $C_{sp^3} - H$ σ - bonds in order of increasing bond length and explain the order.

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15. Arrange $C_{sp} - C_{sp}$, C_{sp^2} and $C_{sp^3} - C_{sp^3}$ σ - and explain the order.

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16. Write down the bond - line structural formula of

(i) 2 - methylbutane,

(ii) 3,3 - dimethylhexane,

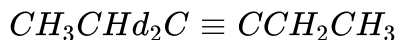
(iii) 2 - bromo - octane and

(iv) chlorocyclopentane.



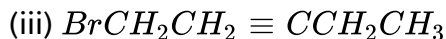
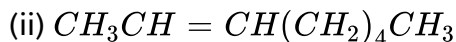
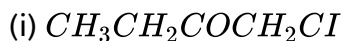
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17. Which is the correct bond - line structural formula into



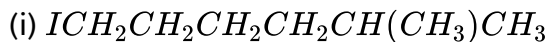
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18. Expand each of the following condensed formula into their complete structural formulas:



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19. Write down the condensed structural formula and bond - line structural formula for each of the following molecules:



(ii) 



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20. Expand each of the following bond - line formulas to show all the atoms including carbon and hydrogen:



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21. Give examples of

(i) Alicyclic compound

(ii) Benzenoid aromatic compound

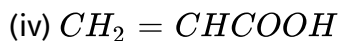
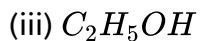
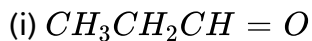
(iii) Non - benzenoid aromatic compound

(iv) Heterocyclic aromatic compound.



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22. Identify the saturated compounds :



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23. Give examples of two terminal functional groups.



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24. Give the structural difference of aldehydic & ketonic groups.



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25. Both formic acid (HCOOH) and acetic acid (CH_3COOH) contain the same functional group, yet there are some difference in their chemical properties - explain.

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26. Members of the same homologous series have similar chemical properties - explain.

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27. Label the primary (1°), secondary (2°), tertiary (3°) and quaternary (4°) carbon atoms in the following compounds:



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28. Write down the structure of an alkane which contains only primary (1°) carbon atoms and primary (1°) hydrogen atoms.

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29. Give examples of the following :

- (i) a mixed ether ,
- (ii) a tertiary alcohol,
- (iii) an aromatic aldehyde,
- (iv) a mixed anhydride and
- (v) a secondary amine.

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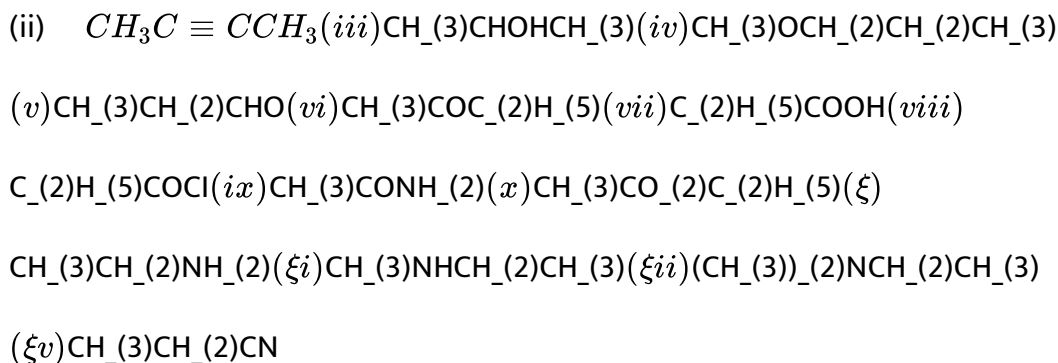
30. What is called alkyl group of alkyl radical? Give example.

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31. Write down the IUPAC names of the alkyl groups having the molecular formula, C_4H_9 .

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32. Write down the IUPAC and common names of each of the given compounds:



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33. Write down the structures of the following compounds:

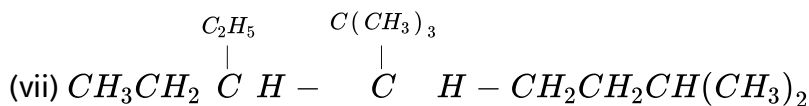
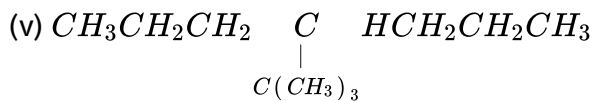
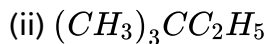
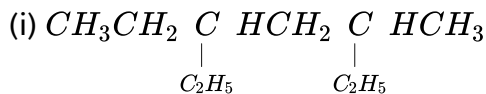


- (ii) Hex - 3 - yne
- (iii) pent - 1 - ene
- (iv) 2,2 - Dichloropropane
- (v) 1,1,1,2 - Tetrachloroethane
- (vi) propan - 2 - ol
- (vii) propane - 1,3 - diol
- (viii) Butane - 1,2,3, - triol.
- (ix) 2 - Methoxypropane
- (x) 2 - Methylpentanoic acid
- (xi) 2,2 - Dimethylbutanal
- (xii) Pentan - 3 - one
- (xiii) Butanoyl chloride
- (xiv) Acetic formic anhydride
- (xv) Ethyl methanoate
- (xvi) N - Methylmethanamine
- (xvii) N - Ethyl - N - methyl - ethanamine
- (xviii) Butanenitrile.



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34. Write down the IUPAC names of the following compounds:



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35. What is wrong with the following names? Draw the structures they represent and write their correct names.

(i) 1,1 - dimethylhexane

(ii) 2 - methyl - 2 - propylhexane

(iii) 3 - methyl - 5 - ethylheptane

(iv) 4,4 - dimethyl - 3 - ethyl - pentane

(v) 3,4,7 - trimethyloctane

(vi) 3,3 - diethyl - 2,4,4 trimethylpentane



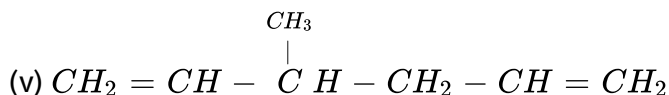
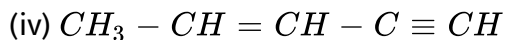
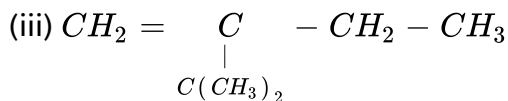
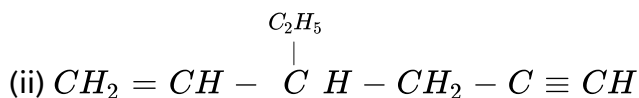
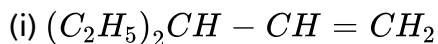
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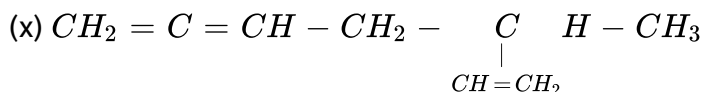
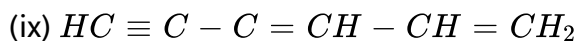
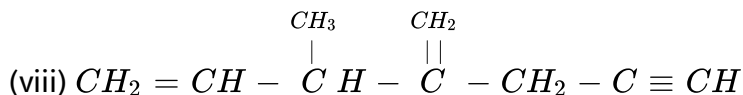
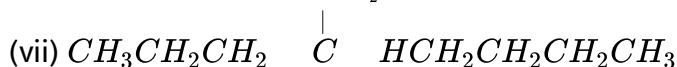
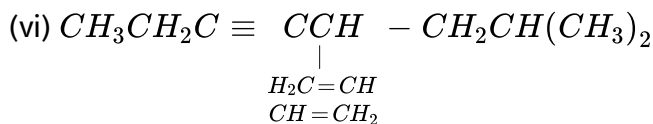
36. Give the IUPAC name of the following alkane containing complex substituents:



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37. Write the IUPAC names of the following compounds:





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38. Write down the structure of the following compounds:

(i) Pent - 3 - en - 1 - yne

(ii) 3 - methylpenta - 1 - 4 - diyne

(iii) 3 - (2 - methyl propyl)hept - 1 - en - 4 - yne

(iv) 3 - ethylpenta - 1,3 diene

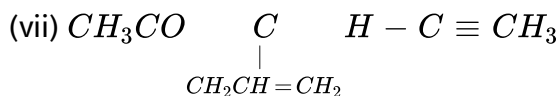
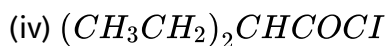
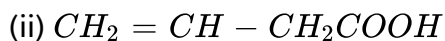
(v) 5 - ethynylhepta - 1,3,6 - triene

(vi) 4 - ethyl - 4 - methylhex - 1 - yne



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39. Write down the IUPAC names of the following compounds:



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40. Write down the structures of the following

(i) 2 - methyl - butanoyl chloride

(ii) 5 - chloro - 3 - ethylpentan - 2 - one

(iii) Diethyl butane - 1,4 dioate

(iv) Methyl - 2 - methylprop - 2 - en - 1 - oate

(v) 3 - phenylprop - 2 - enoic acid

(vi) Propane - 1,2,3 - tricarboxamide.



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41. Arrange the following functional groups in order of preference as the principal functional groups:

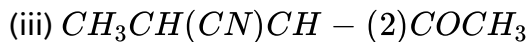
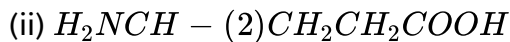
$-CONH_2$, $-NH_2$, $-CHO$, $-CN$, $-COOH$, $-OH$



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42. Give the IUPAC names of the following compounds:

(i) $CH_3COCH_2COOC_2H_5$



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43. Write down the structures of the following compounds:

(i) 3 - formylpentanoic acid

(ii) 3 - hydroxy - 4 - oxopentanal

(iii) 2,3 - dihydroxybutanedioic acid

(iv) 3 - hydroxycyclo - hexanone

(v) 3 - hydroxy - 3 - methylbutan - 2 - one



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44. Write the structure of the following compounds:

(i) 2 - chloro - 2 - methylbutan - 1 - ol

(ii) 4 - amino - 2 - ethylpent - 2 - enal

(iii) Hex - 4 - yn - 2 - one

(iv) 1 - bromo - 3 - chlorocyclohex - 1 - ene

(v) But - 2 - ene 1, 4 - dioic acid

(vi) 4 - nitropent - 1 - yne

(vii) Ethyl 3 - methoxy - 4 - nitrobutanoate



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45. What type of structural isomerism is exhibited by the following pairs of isomers?

(i) CH_3CH_2COOH and CH_3COOCH_3

(ii) $CH_3 - C \equiv C - CH_3$ and $CH_3CH_2C \equiv CH$

(iii) $CH_2 = CHOH$ and CH_3CHO

(iv) $CH_2 = CH(CH_2)_3CH_3$ and



(vi) $CH_3CH_2CH_2OH$ and $(CH_3)_2CHOH$



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46. Write the structures and IUPAC names of two metemers having molecular formula, $C_5H_{10}O$.



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47. Give example of a ketone that does not exhibit tautomerism.



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48. Arrange in the order in increasing enol content and give reasons:



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49. Which two of the following compounds are:

(i) position isomers

(ii) tautomers

(iii) ring - chain isomers

(iv) metamers

(v) chain isomers and

(vi) functional isomers?

(a) C_2H_5NO

(b) 

(c) 

(d) $CH_3OCH - (3)$

(e) $CH_2 = CHCH_2OH$


(f) $CH_3CH = NOH$



(g) 

(h) 

(i) 

(j) ( width="80%")>

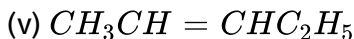
(k) 

(l) C_2H_5OH



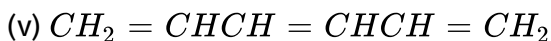
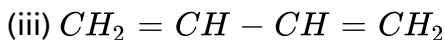
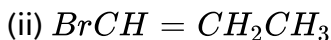
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50. Identify the optically active and optically inactive compounds :




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51. Which of the following will geometrical or cis - trans isomerism and which of them will not? Give reasons.



(vii) 

(viii) 



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52. Draw the Fischer projection formulas of all stereoisomers of $CH_3CHBrCHClCOOH$. Mention how they are related to each other.



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53. Write down the structure and IUPAC name of two isomeric optically active alkanes having lowest molecular mass.



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54. Which of the following compounds are meso - compounds and which are not? Give reasons.



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55. Write the structure and the IUPAC name of the alkane having lowest molecular mass and which on bromination produces three monobromo derivatives.

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56. How many types of non - equivalent H - atoms are there in each of the following compounds:

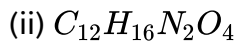
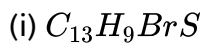


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57. Write the structure and the IUPAC name of alkane ($C_{18}H_{36}$) which on bromination produces only 1 monobromo derivative.

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58. Calculate the double bond equivalent (DEB) of each of the given compounds:



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59. Calculate the double bond equivalent (DEB) of a compound having molecular formula, C_5H_8 . On catalytic hydrogenation. Write the structures of all the possible isomers of the compound.

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60. Arrange the following atoms or groups in increasing order of - I effect: - I, - Br, - Cl, - F

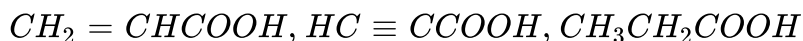
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61. Arrange in decreasing order of their strength and give reasons:



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62. Arrange in increasing order of strength and give reasons:

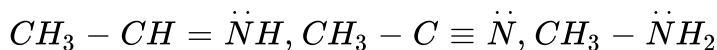


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63. Why is Bu_3N more basic than $BuNH_2$ in C_6H_5Cl medium?

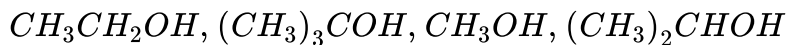
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64. Arrange in order of decreasing basic strength and show reasons



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65. Arrange in order of increasing acidity and give reasons:



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66. Arrange the following anions in increasing order of stability and give



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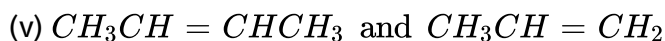
67. Which of the following pairs do not represent two resonance structures and why?

(i) 

(ii) 



(iv) 



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68. In between CH_3COOH and CH_3COO^\ominus , which one is more resonance stabilised and why?

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69. Which N - atom of guanidine $\left(\begin{array}{c} \ddot{N}H_2 \\ | \\ H_2\ddot{N} - C = \ddot{N}H \end{array} \right)$ is more basic and why?

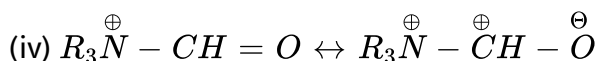
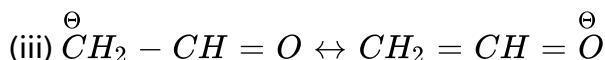
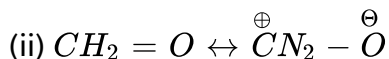
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70. Which of the two N - atom of the following compound undergoes protonation and why?



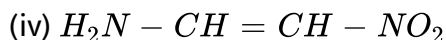
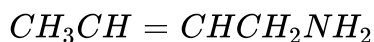
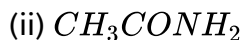
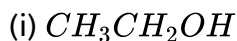
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71. Which resonance structure in each of the following cases contributes more towards the hybrid and why?



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72. Which of the following compounds can be represented as a resonance hybrid and which of them cannot be? Give reasons.



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73. Why are the three carbon - oxygen bonds in carbonate $\left(\text{CO}_3^{2-}\right)$ ion equal in length?

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74. Which one between phenol and cyclohexanol is more acidic and why?

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75. Arrange the following ions in order of increasing stability and give your reasons:



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76. Which one between 2 - methylbut - 2 - ene and 2 - methylbut - 1 - ene has higher heat of hydrogenation and why?

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77. The C - C bond in acetaldehyde (CH_3CHO) is shorter than that in ethane while the C - C bond in trifluoroacetaldehyde (CF_3CHO) is essentially the same as that in ethane. Explain.

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78. Arrange the following isomeric alkenes in order of increasing stability and give your reasons:



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79. Which one of the following two conformations of butane is more stable and why?



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80. Which of the 2 geometric isomers of $Me_3CCH = CHCMe_3$ has higher heat of combustion and why?

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81. Explain the following observation



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82. Label the following carbocations as 1° , 2° or 3° :



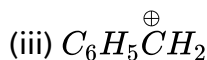
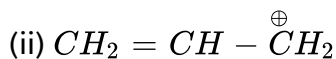
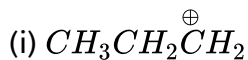
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83. Arrange the following carbocations in order of increasing stability and explain the order:



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84. Which of the carbocations is the most stable?



(iv) All are equally stable.

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85. Which one of the two carbanions $\overset{\ominus}{\Delta}$, $\overset{\ominus}{\Delta}$ is less stable and why?

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86. Which one between the two $CH_3CO\overset{\ominus}{C}H_2$ and $CH_3CO\overset{\ominus}{C}HOCH_3$ is more stable and why?

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87. Arrange the following free radicals in order of increasing stability and explain the order:



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88. What are the shapes of the free radicals $\dot{C}H_3$, $\dot{C}F_3$ and why?

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89. What is homolytic bond fission?



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90. Which one between $C_6H_5CH_3$ and CH_4 has lower $C_{sp^3} - H$ bond dissociation enthalpy and why?



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91. Arrange the following carbocation in order of increasing stability and explain the order:



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92. Arrange the following carbonions in order of increasing stability and explain the order:



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93. Designate the species as electrophile or nucleophile obtained on heterolytic cleavage of C - C bond in ethane.

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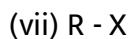
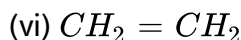
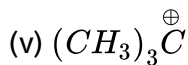
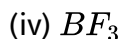
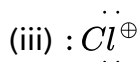
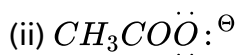
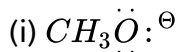
94. Although BF_4^\ominus is an anion, it is not a nucleophile - why?

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95. Why does : CCl_2 act as an eletrophile?

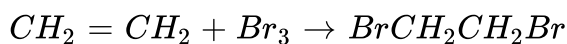
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96. Classify the following species as electrophile or nucleophile and explain your choice:



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97. Formulate the following as a two - step reaction and designate the nucleophile and electrophile in each step:

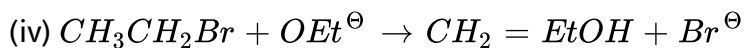
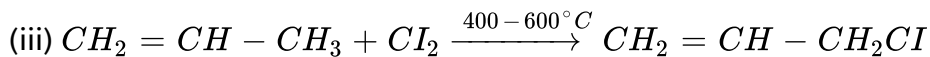
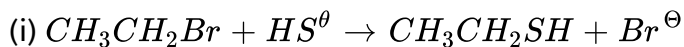


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98. CN^- and NO_2^- are called ambident nucleophiles. Explain

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99. Mention the type of each of the following reactions:



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100. Which one out of S_N1 and S_N2 reactions is more susceptible to steric effect and why?

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101. Which of the following reactions do not involve an intermediate and why? S_N1 , S_N2 , $E1$, $E2$

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102. Mention the type of substitution reactions in which the attacking reagents are NO_2^+ , OH^- or Cl^- .

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103. How will you purify a sample of benzoic acid that contains traces of common salt?

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104. It is possible to get pure benzoic acid from a sample containing impurities of naphthalene through the process of recrystallisation using benzene as a solvent? Give reason-



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105. Explain why glycerol cannot be purified by simple distillation. Mention a method which can be useful.



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106. How do you separate a mixture of o - nitrophenol and p - nitrophenol?



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107. Suggest a method to purify: (i) iodine containing traces of common salt:

(ii) Kerosene containing a little of water and

(iii) camphor containing a little benzoic acid.



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108. Suggest a method for the separation of each of the following mixtures:

(i) A mixture of liquid A (b.p.365K) and liquid B (b.p.356K)

(ii) A mixture of liquid C (b.p.395K) and liquid D (b.p.360K)



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109. Which technique is the most suitable one to separate the three components A,B and C from 10mL of their mixture?



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110. The R_f values of two compounds, X and Y in a mixture determined by TLC are 0.66 and 0.41 respectively. If the mixture is separated by column chromatography using the same solvent mixture as the mobile phase, which one of the two compounds will be eluted first and why?



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111. Which physical properties are generally used to determine purity of organic compounds?

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

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113. Give an example of each of:

- (i) adsorption chromatography and
- (ii) partition chromatography.

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114. Which reagent is used to detect the presence of hydrogen in an organic compound?

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115. Explain the reason for the fusion of an organic compound with metallic sodium in Lassaigne's test.

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116. In the fusion test of organic compounds, the nitrogen of an organic compound is converted to - sodium nitrate, sodium nitrite, sodium amide, sodium cyanide.

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117. Why is Lassaigne's extract not prepared with tap water?



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118. Write down the formula of Prussian blue.



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119. Why do diazonium salts not respond to Lassaigne's test ?



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120. Explain why chlorine but not nitrogen in hydroxylamine hydrochloride ($NH_2OH \cdot HCl$) can be detected by Lassaigne's test.



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121. Is it possible to distinguish between hydrazine and phenyl-hydrazine by the Lassaigne's test? Give your reason.



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122. Explain why the sodium extract is boiled with nitric acid before adding silver nitrate solution for detecting halogens.



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123. Beilstein test cannot be considered as a confirmatory test for the presence of halogen in a compound - why?



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124. Differentiate between the principles of Dumas method & Kjeldahl's method.



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125. What is the role of $CuSO_4$ and K_2SO_4 used in Kjeldahl's method for the estimation of nitrogen?

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126. Which method is used to estimate N in food stuffs?

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127. For which compounds, Kjeldahl's method is not applicable for the estimation of nitrogen?

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128. What is the principle of Carius method for estimation of S?

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129. The weight of which compound is finally taken in Carius method for estimation of phosphorus?



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130. 0.495 g of an organic compound on combustion gave 0.99 g of CO_2 and 0.405 g of water. Calculate the percentages of carbon and hydrogen in the compound.



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131. 0.05 g of an organic compound when analysed by Dumas method produced 62.0 mL of nitrogen at STP. Determine the percentages of nitrogen in the compound.



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132. 0.4 g of an organic compound containing N was Kjeldahlised and NH_3 obtained was passed into 50 mL (N/2) H_2SO_4 solution. Volume of the acid solution was increased to 150 mL by adding distilled water. 20 mL of this acid solution required 31 mL (N/20) NaOH for complete neutralisation. Calculate the percentage of N.



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