



CHEMISTRY

NCERT - NCERT CHEMISTRY(HINGLISH)

ORGANIC CHEMISTRY- SOME BASIC PRINCIPLES AND TECHNIQUES

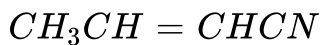
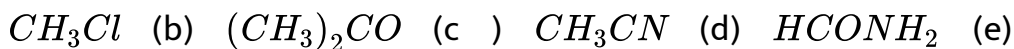
Solved Example

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

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

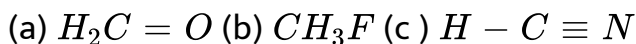
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2. What is the type of hybridization of each carbon in the following compounds?



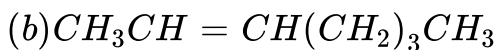
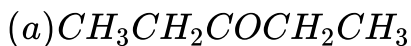
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3. Write the hybridised state of carbon in the following compounds and shapes of each of each of the molecules.



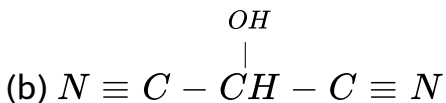
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4. Expand each of the following condensed formulas into their complete structural formulas.



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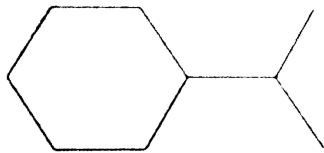
5. For each of the following compounds, write a condensed formula and also their bond-line formula.



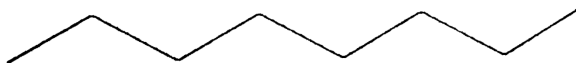
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6. Expand each of the following bond-line formulas to show all the atoms including carbon and hydrogen

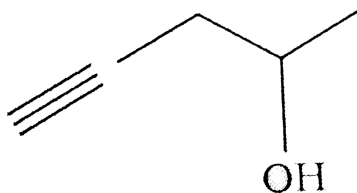
(a)



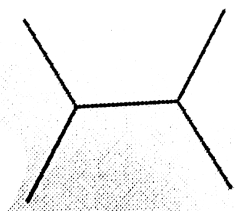
(b)



(c)

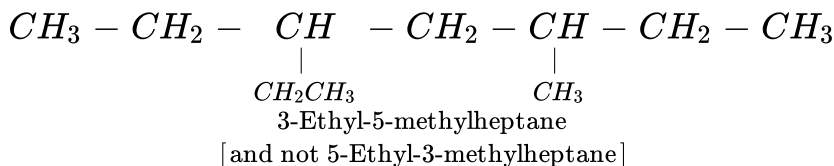


(d)



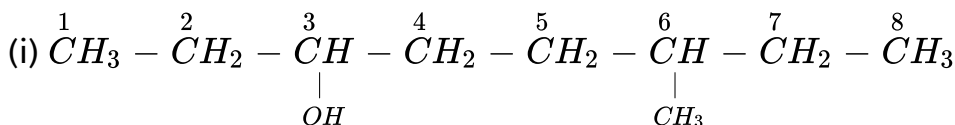
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7. Structures and IUPAC names of some hydrocarbons are given below. Explain why the names given in the parentheses are incorrect.



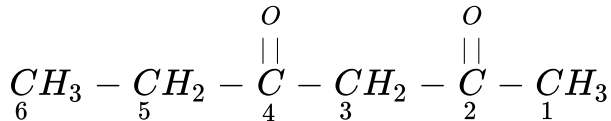
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8. Write the IUPAC names of the compounds i-iv from their given structures.



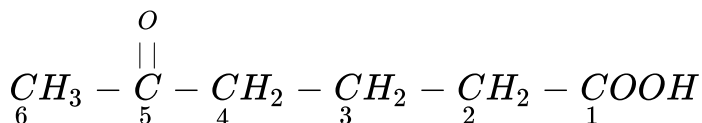
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9. Write the IUPAC names of the compounds i-iv from their given structures.



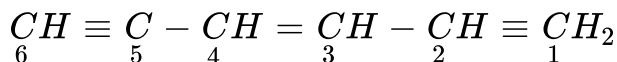
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10. Write the IUPAC names of the compounds i-iv from their given structures.



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11. Write the IUPAC names of the compounds i-iv from their given structures.



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



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13. Write the structural formula of:

(a) o-Ethylanisole, (b) p-Nitroaniline,

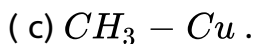
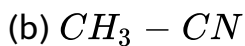
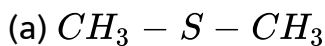
(c) 2,3 - Dibromo -1 - phenylpentane,

(d) 4-Ethyl-1-fluoro-2-nitrobenzene.



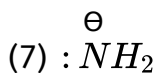
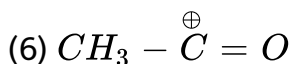
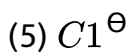
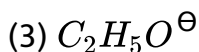
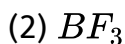
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14. Using the curved-arrow notation, show the formation of reactive intermediates when the following covalent bonds undergo heterolytic cleavage :



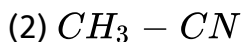
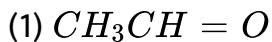
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15. Categorise the following molecules/ions as nucleophile or electrophile.



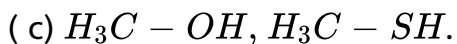
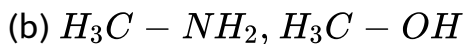
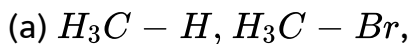
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16. Identify electrophilic centre in the following :



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17. Which bond is more polar in the following pairs of molecules ?



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18. In which ($C - C$) bond of $\left(H_3\overset{3}{C} - \overset{2}{C}H_2 - \overset{1}{C}H_2 - Br\right)$, the inductive effect is expected to be the least ?



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



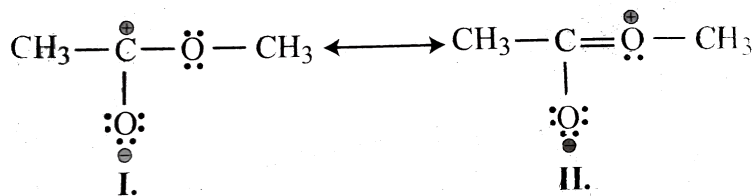
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20. Write the resonance structures of (1) CH_3COO^\ominus and (2) $CH_2 = CH - CHO$. Indicate the relative stability of the contributing structures.



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21. Explain why the following two structures (I) and (II) cannot be the major contributors to the real structures of CH_3COOCH_3 .



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22. Explain why $(CH_3)_3\overset{+}{C}$ is more stable than $CH_3\overset{+}{CH_2}$ and CH_3 is the least stable cation

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23. On complete combustion, 0.246 g of an organic compound gave 0.198g of carbon dioxide and 0.1014g of water. Determine the

percentage composition of carbon and hydrogen in the compound



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24. In Dumas' method for estimation of nitrogen, 0.3g of an organic compound gave 50mL of nitrogen collected at 300K temperature and 715mm pressure. Calculate the percentage composition of nitrogen in the compound. (Aqueous tension at 300K=15 mm)



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25. During estimation of nitrogen present in an organic compound by Kjeldahl's method, the ammonia evolved from 0.5 g of the compound in Kjeldahl's estimation of nitrogen, neutralized

10 mL of 1 M H_2SO_4 . Find out the percentage of nitrogen in the compound.



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26. 0.15 gm of an organic compound gave 0.12 gm of silver bromide by the carius method. Find the percentage of bromine in the compound.



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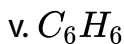
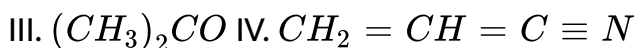
27. In sulphur estimation, 0.157 g of an organic compound gave 0.4813 g of barium sulphate. What is the percentage of sulphur in the compound?



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Exercise

1. Given the hybridization state of each carbon in the following compounds :



A. `

B.

C.

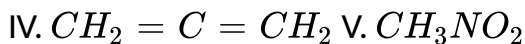
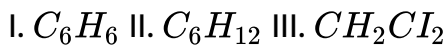
D.

Answer:



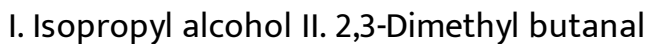
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2. Indicate the σ – and π – bonds in the following molecules:



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3. Write the bond line formula for the following compounds:



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4. Give the IUPAC names of the following compounds :

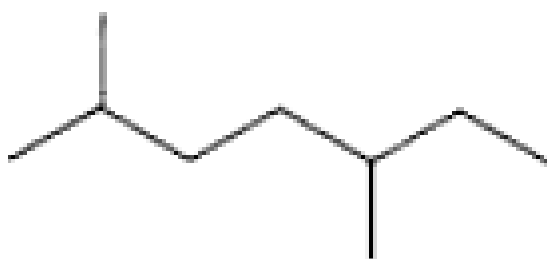
(a)



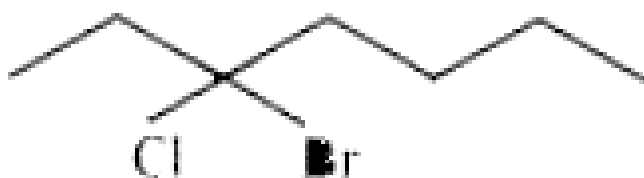
(b)



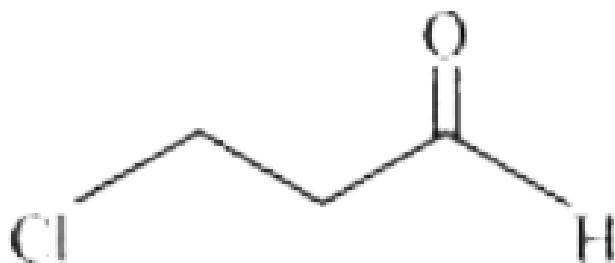
(c)



(d)



(e)



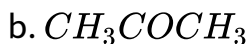
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5. Which of the following represents the correct *IUPAC* name for the compounds concerned?

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

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



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

(a) 2,2,4-Trimethylpentane

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

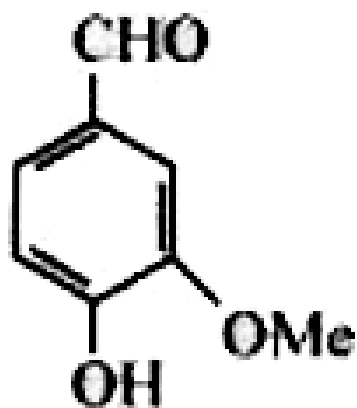
(c) Hexanedial



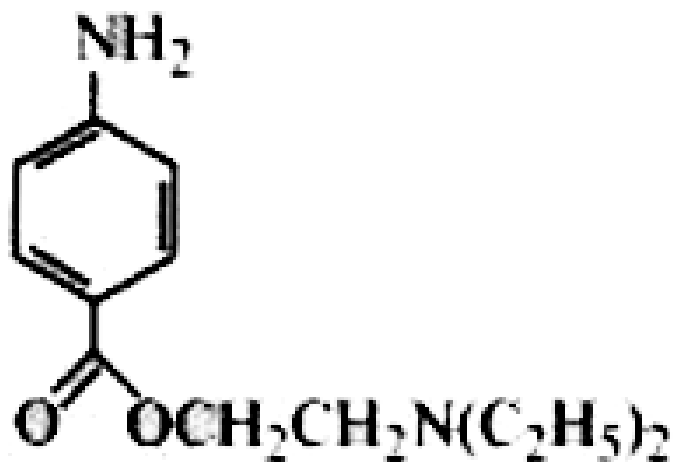
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8. Identify the functional groups in the following compounds

(a)

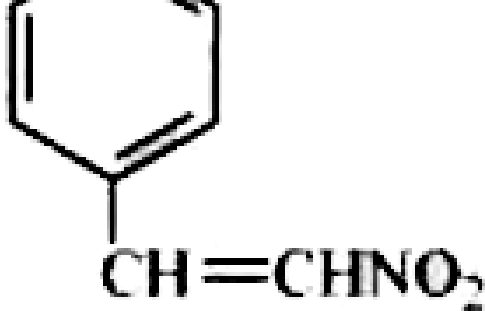


(b)



(c)





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

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

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11. Draw the resonance structures for the following compounds.

Show the electron shift using curved-arrow notation.

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

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



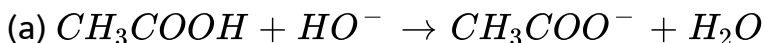
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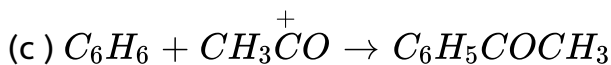
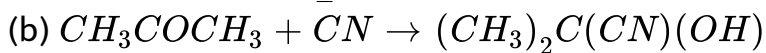
12. What are electrophiles and nucleophiles ? Explain with examples.



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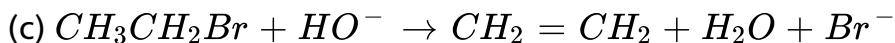
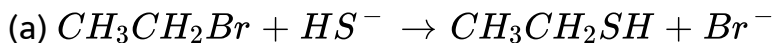
13. Identify the reagents shown in bold in the following equations as nucleophiles or electrophiles:



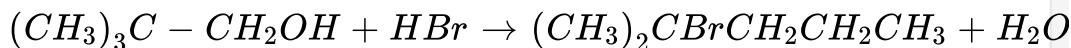


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14. Classify the following reactions in one of the reaction type studied in this unit.



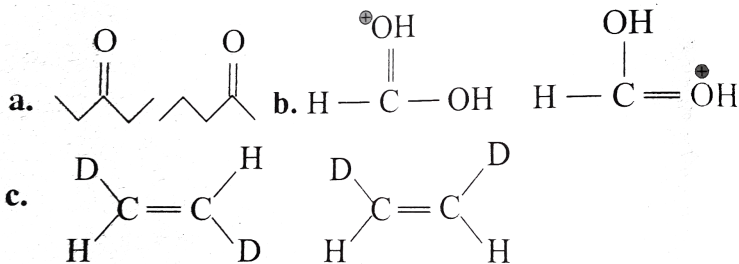
(d)



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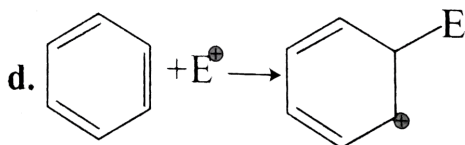
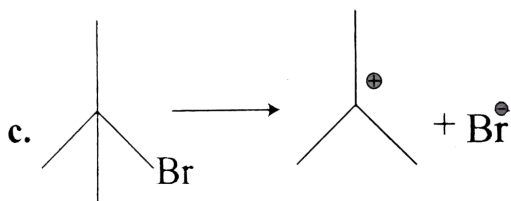
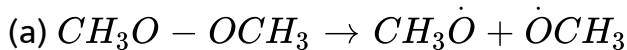
15. What is the relationship between the members of the following pairs of structures describing them as identical ,

structural, or geometrical isomers, or resonance contributors ?



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16. For the following bond cleavages, use curved-arrow to show the electron flow and classify each as homolysis or heterolysis. Identify intermediate products as free radical, carbocation, and carbanion.



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



(b)



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

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

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

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

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21. Discuss the chemistry of Lassaigne's test.



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



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



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24. Explain the principle of paper chromatography.



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



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



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



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



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29. Will CCl_4 give white precipitate of $AgCl$ on heating with nitrate? Give reason for your answer



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



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



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

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33. 0.50 gm of an organic compound was treated according to Kjeldahl's method. The ammonia evolved was absorbed in 50 ml of 0.5 MH_2SO_4 . The residual acid required 60 ml of $\frac{M}{2}NaOH$ solution. Find the percentage of nitrogen in the compound.

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34. 0.3080 gm of an organic chloro compound gave 0.5740 gm of silver chloride in Carius estimation. Calculate the percentage of chloride present in the compound

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



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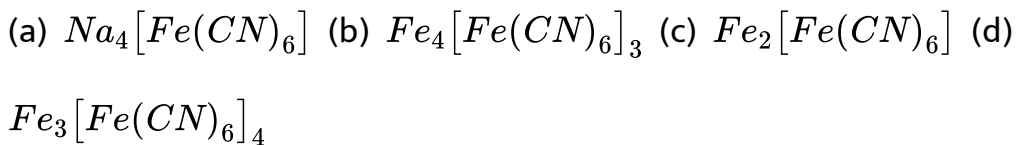
36. In the organic compound $CH_2 = CH-CH_2-CH_2-C \equiv CH$, the pair of hybridised orbitals involved in the formation of: C_2-C_3 bond is:

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



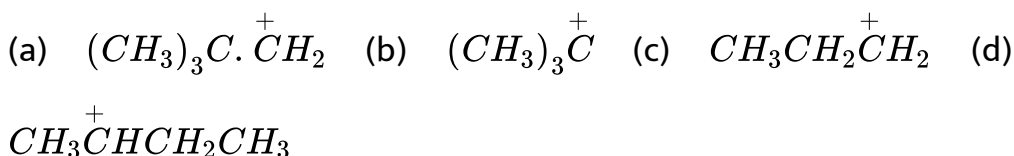
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37. In the Lassaigne's test for nitrogen in an organic compound, the Prussian blue colour is obtained due to the formation of:



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38. Which of the following carbocation is most stable ?



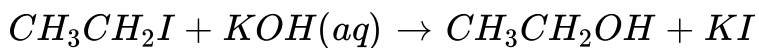
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39. For the purification of organic compounds, the latest technique followed is



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40. The reaction:



is classified as :

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



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