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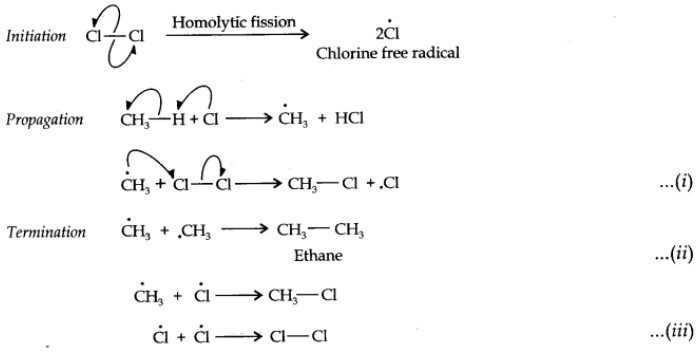
TEXTBOOK QUESTIONS SOLVED

Question 1. How do you account for the formation of ethane during chlorination of methane?
Answer: Chlorination of methane is a free radical reaction which occurs by the following mechanism:

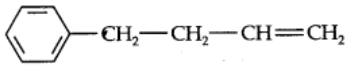


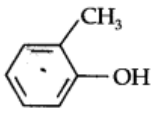
From the above mechanism, it is evident that during propagation step, CH_3 free radicals are produced which may undergo three reactions, i.e., (i) — (iii). In the chain termination step, the two CH_3 free radicals combine together to form ethane (CH_3—CH_3) molecule.

Question 2. Write IUPAC names of the following compounds:

(a) $CH_3CH{=}C(CH_3)_2$ (b) $CH_2{=}CH{-}C{\equiv}C{-}CH_3$

(c) 

(d) 

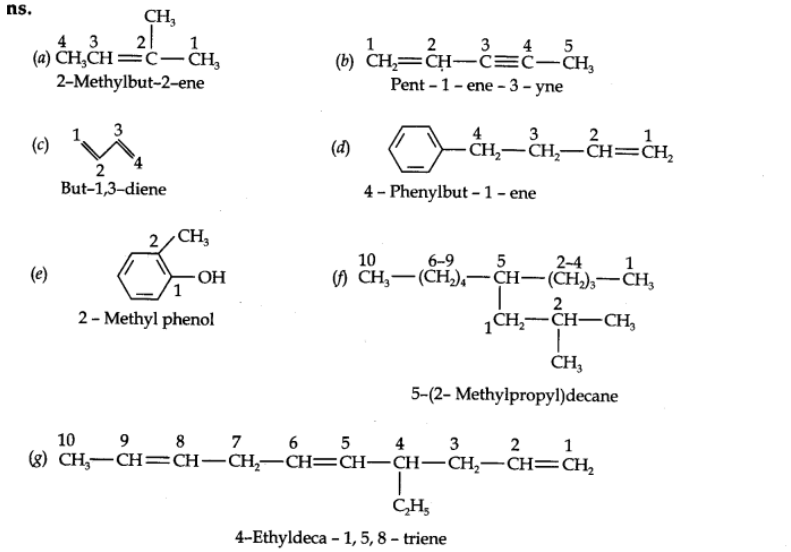
(e) 

(f) $CH_3(CH_2)_4CH(CH_2)_3CH_3$
$CH_2{-}CH(CH_3)_2$

(g) $CH_3{-}CH{=}CH{-}CH_2{-}CH{=}CH{-}CH(C_2H_5){-}CH_2{-}CH{=}CH_2$

Answer:

ns.

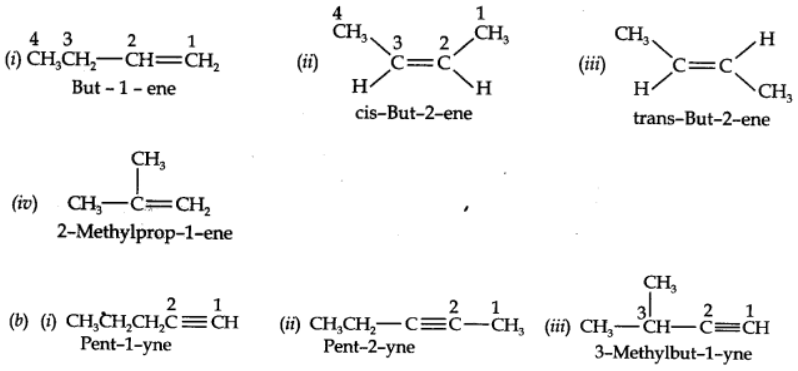


Question 3. For the following compounds, write structural formulas and IUPAC names for all possible isomers having the number of double or triple bond as indicated:

(a) C_4H_8 (one double bond)

(b) C_5H_8 (one triple bond)

Answer: (a) Isomers of C_4H_8 having one double bond are:



Question 4. Write IUPAC names of the products obtained by the ozonolysis of the following compounds:

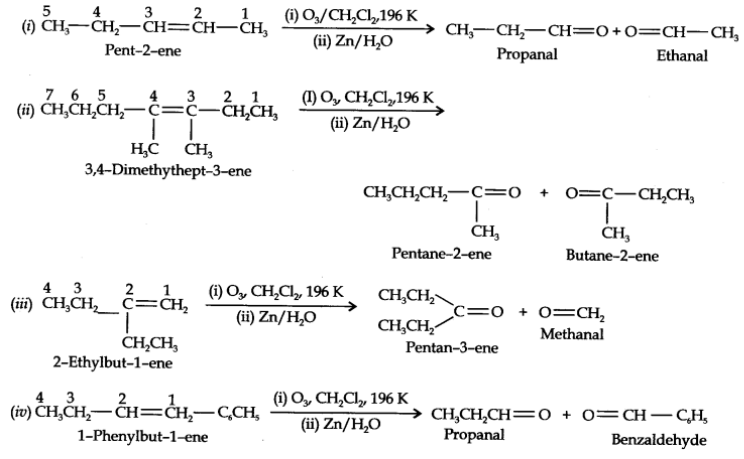
(i) Pent-2-ene

(ii) 3, 4-Dimethylhept-3-ene

(iii) 2-Ethylbut-l-ene

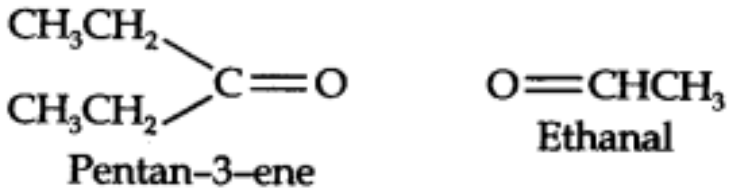
(iv) 1-Phenylbut-l-ene.

Answer:

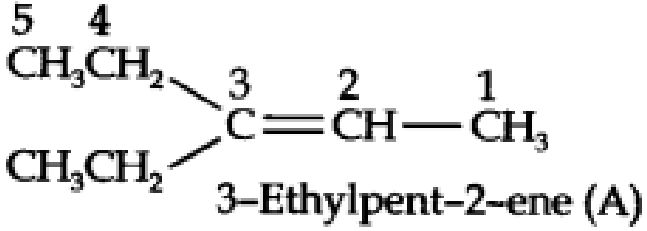


Question 5. An alkene 'A' on ozonolysis gives a mixture of ethanal and pentan-3-one. Write the structure and IUPAC name of 'A'.

Answer: Step 1. Write the structure of the products side by side with their oxygen atoms pointing towards each other.

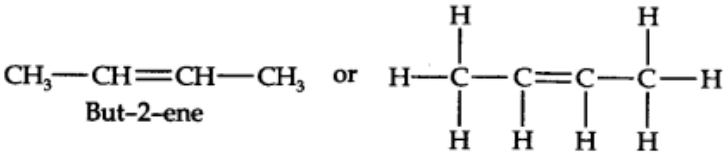


Step 2. Remove the oxygen atoms and join the two ends by a double bond, the structure of the alkene 'A' is



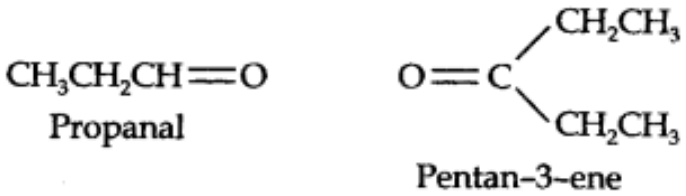
Question 6. An alkene 'A' contains three C—C, eight C—H, a-bonds, and one C—C n-bond. 'A' on ozonolysis gives two moles of an aldehyde of molar mass 44 u. Write the IUPAC name of'A'.
Answer:
(i) An aldehyde with molar mass of 44 u is ethanal, $CH_3CH{=}0$
(ii) Write two moles of ethanal side by side with their oxygen atoms pointing towards each other.

(iii) Remove the oxygen atoms and join them by a double bond, the structure of alkene 'A' is

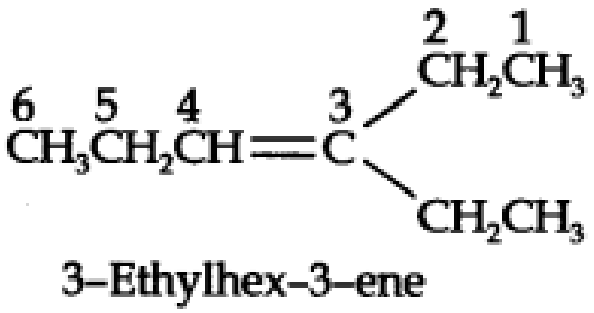


As required, but-2-ene has three C—C, eight C—H a-bonds and one C—C π-bond.

Question 7. Propanal and pentan-3-ene are the ozonolysis products of an alkene. What is the structural formula of the alkene?
Answer:
(i) Write the structures of propanal and pentan-3-ene with their oxygen atoms facing each other, we have,



(ii) Remove oxygen atoms and join the two fragments by a double bond, the structure of the alkene is



Question 8. Write chemical equations for the combustion reaction of the following hydrocarbons,
(i) Butane
(ii) Pentene
(iii) Hexyne
(iv) Toluene
Answer:

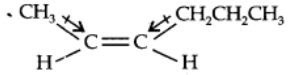
(i) $\underset{\text{Butane}}{C_4H_{10}(g)} + 13/2\ (g) \xrightarrow{\Delta} 4CO_2(g) + 5H_2O(g)$

(ii) $\underset{\text{Pentene}}{C_5H_{10}(g)} + 15/2O_2(g) \xrightarrow{\Delta} 5CO_2(g) + 5H_2O(g)$

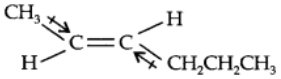
(iii) $\underset{\text{Hexyne}}{C_6H_{10}(g)} + 17/2O_2(g) \xrightarrow{\Delta} 6CO_2(g) + 5H_2O(g)$

(iv) $\underset{\text{Toluene}}{\text{C}_6\text{H}_5\text{CH}_3(g)}$ or $C_7H_8(g) + 9O_2(g) \xrightarrow{\Delta} 7CO_2(g) + 4H_2O(g)$

Question 9. Draw the cis- and trans-structures for hex-2-ene. Which iosmer will have higher b.p. and why?
Answer: The structures of cis- and trans-isomer of hex-2-ene are:



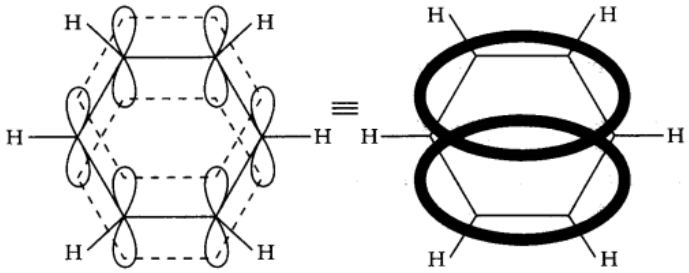
cis–Hex–2–ene
(Higher dipole moment, higher b.p.)



trans–Hex–2–ene
(Lower dipole moment, lower b.p.)

The boiling point of a molecule depends upon dipole-dipole interactions. Since cis-isomer has higher dipole moment, therefore, it has higher boiling point.

Question 10. Why is benzene extra-ordinarily stable though it contains three double bonds?
Answer:



The six electrons of the p-orbitals cover all the six carbon atoms, and are said to be delocalized. As a result of delocalization there formed a stronger n-bond and a more stable molecule.

Question 11. What are the necessary conditions for any system to be aromatic?
Answer: The necessary conditions for a molecule to be aromatic are:

- It should have a single cyclic cloud of delocalised n-electrons above and below the plane of the molecule.
- It should be planar. This is because complete delocalization of n-electrons is possible only if the ring is planar to allow cyclic overlap of p-orbitals.
- It should contain Huckel number of electrons, i.e., (4n + 2) n-electrons where n = 0, 1, 2, 3 etc.
  A molecule which does not satisfy any one or more of the above conditions is said to be non-aromatic.

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