II. Short Answer Type Questions

Question 1. Define resonance energy. What is resonance energy of benzene?
Answer: Resonance .energy is the difference in energy between actual structure of compound . and most stable resonating structure. The resonance energy of benzene is 150.325 J mol^{-1} .

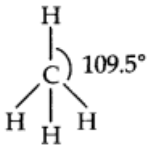
Question 2. Explain the following with examples:
(i) Wurtz reaction
(ii) Hydrogenation.
Answer: (i) Wurtz reaction: Alkanes are produced by heating an alkyl halide with sodium metal in dry ether solution.

$$CH_3Br + 2Na + BrCH_3 \xrightarrow{\text{dry ether}} \underset{\text{Ethane}}{CH_3CH_3} + 2NaBr$$

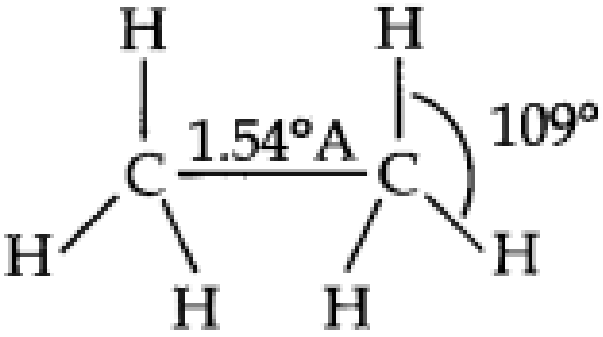
(ii) Hydrogenation: Alkenes react with hydrogen in presence of Ni or Pd catalyst to form saturated compounds.

$$CH_2{=}CH_2 + H_2 \xrightarrow[373K]{Ni} \underset{\text{Ethane}}{CH_3{-}CH_3}$$

Question 3. Discuss the shape of methane and ethane.
Answer: In methane, carbon forms have single bonds with four hydrogen atoms. Since the carbon atom is attached to four other atoms, it uses sp^3 hybrid orbitals to form these bonds. Hybridization of 'C' is sp^3



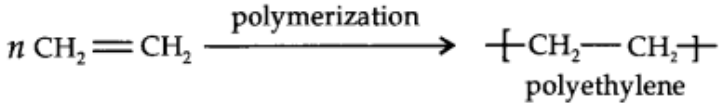
Shape—tetrahedral having bond angle = 109.5°
In ethane, there are six C—H covalent bonds and one C—C covalent bond.
The C—H bond is the result of overlap of an sp^3 hybrid orbital from carbon and s-orbital from hydrogen.
Orbital structure can be shown as



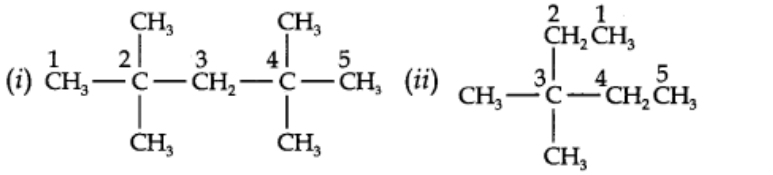
Orbital Structure of ethane

Question 4. Classify the following compounds into (i) alkanes (ii) alkenes (iii) alkynes (iv) arenes.
(a) C_6H_6 (b) C_4H_8 (c) C_8H_8
(d) C_5H_8 (e) C_6H_{14}
Answer: (i) Alkanes — C_6H_{14}, C_8H_{18}
(ii) Alkenes — C_4H_8
(iii) Alkynes — C_5H_8
(iv) Arenes — C_6H_6.

Question 5. What is polymerization? Give an example.
Answer: The process by which simple molecules join together to form large molecules is known as polymerization.
Simple alkenes polymerize to form long chain addition polymers. For example, ethylene gives polyethylene.



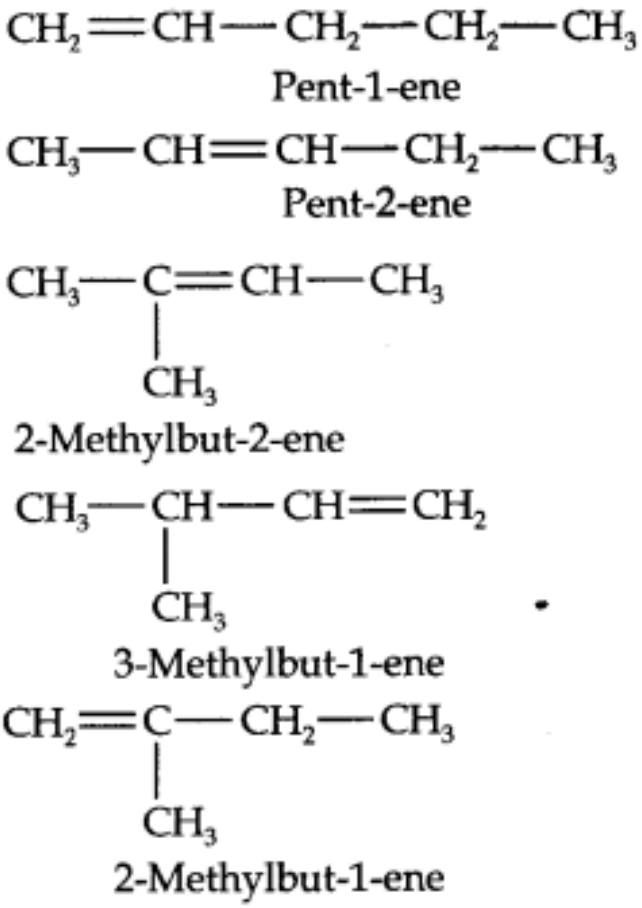
Question 6. Write the IUPAC names of the following compounds.
(i) $(CH_3)CCH_2C(CH_3)_3$
(ii) $(CH_3)_2C(C_2H_5)_2$
Answer:



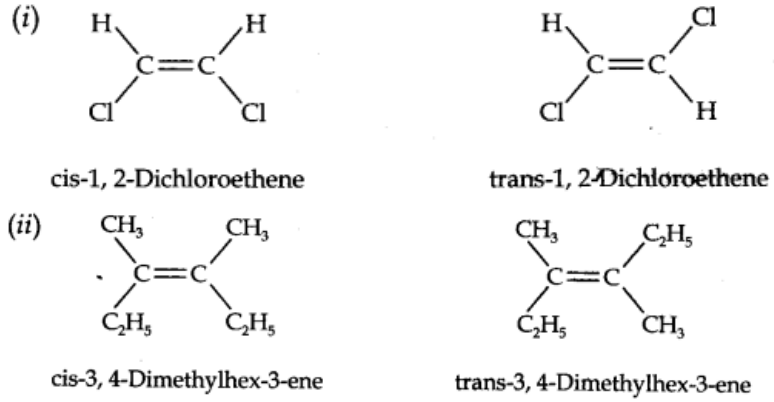
2,2,4,4 – Tetramethyl pentane

3 , 3 – Dimethyl pentane

Question 7. Write the structure and IUPAC names of different structural isomers of alkenes corresponding to C_5H_{10}.
Answer:

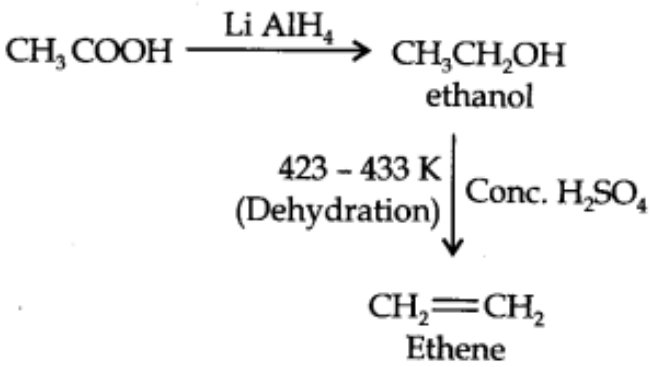


Question 8. Draw the structures of cis- and trans-isomers of the following compounds. Also write their IUPAC names.
(i) CHCl—CHCl
(ii) $C_2HC(CH_3)=C(CH_3)C_2H_5$
Answer:



Question 9. (a) What effect the branching of an alkane has on its melting point?
(b) Which of the following has highest boiling point?
(i) 2-methyl pentane
(ii) 2, 3-diethyl butane
(iii) 2, 2-dimethyl butane
Answer:
(a) In general conception, as the branching increases packing of the molecules in the crystal lattices becomes less close and hence melting point decreases accordingly.
(b) As the branching increases, surface area decrease and thus magnitude of van der Waals forces of attraction decreases and hence the boiling point decreases. 2,2-dimethyl butane has lower surface area due to more branching and hence has lower boiling point.

Question 10. How will you convert ethanoic acid into ethene?
Answer:



********** END **********