

---

---

## Important Questions for Class 11

### Chemistry

#### Chapter 13 – Hydrocarbons

##### Very Short Answer Questions

1 Mark

##### 1. Classify the hydrocarbons according to the carbon – carbon bond

**Ans:** According to the carbon–carbon bond that occurs between them, hydrocarbons are divided into three categories:

- (a) saturated hydrocarbon
- (b) unsaturated hydrocarbon
- (c) aromatic hydrocarbon.

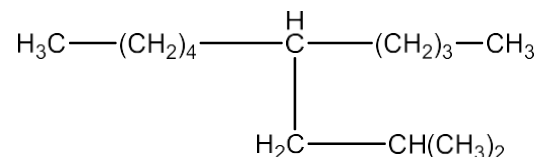
##### 2. What are cycloalkanes?

**Ans:** Cycloalkanes are formed when carbon atoms form a closed chain or ring.

##### 3. Why carbon does have a larger tendency of catenation than silicon although they have same number of electrons?

**Ans:** It's because the C-C bond is smaller but stronger ( $335 \text{ KJ mol}^{-1}$ ) than the Si bond ( $225.7 \text{ KJ mol}^{-1}$ ).

##### 4. Write IUPAC name of the following



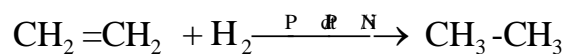
**Ans:** The IUPAC name of the compound is 5-(2-Methylpropyl)-decane.

##### 5. What is hydrogenation?

**Ans:** To produce alkanes, dihydrogen gas is added to alkenes and alkynes in the presence of finely split catalysts such as Pt, Pd, or Ni. This is referred to as hydrogenation.

##### 6. How would you convert ethene to ethane molecule?

**Ans:** The reaction is given below:



**7. Give the IUPAC name of the lowest molecular weight alkane that contains a quaternary carbon.**

**Ans:** 2, 2-dimethyl propane.

**8. Methane does not react with chlorine in dark. Why?**

**Ans:** Chlorination of methane is a substitution process involving free radicals. Chlorine cannot be transformed into free radicals in the dark, therefore the reaction does not take place.

**9. Which conformation of ethane is more stable?**

**Ans:** Staggered conformation.

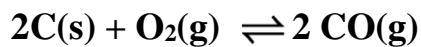
**10. State Le chatelier's principle.**

**Ans:** It asserts that a change in any of the elements that define a system's equilibrium conditions will cause the system to alter in such a way that the effect of the change is reduced or counteracted.

**11. Can a catalyst change the position of equilibrium in a reaction?**

**Ans:** No, a catalyst cannot alter the equilibrium position of a chemical process. A catalyst, on the other hand, has an effect on the reaction rate.

**12. What is the effect of reducing the volume on the system described below?**



**Ans:** A rise in volume occurs in tandem with the forward response. As a result, according to Chatelier's principle, lowering the volume will cause the equilibrium to shift forward.

**13. What happens when temperature increases for a reaction?**

**Ans:** As the temperature rises, the equilibrium constant for an exothermic process ( $\Delta H = -ve$ ) drops.

**14. Can a catalyst change the position of equilibrium in a reaction?**

**Ans:** No, a catalyst cannot alter the equilibrium position of a chemical process. A catalyst, on the other hand, has an effect on the reaction rate.

---

**15. If  $Q_c < K_c$ , when we continuously remove the product, what would be the direction of the reaction?**

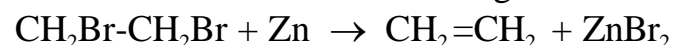
**Ans:** When a product is continuously removed,  $Q_c$  remains smaller than  $K_c$ , and the reaction continues to go ahead.

**16. What is a Lindlar's catalyst?**

**Ans:** The Lindlar catalyst is characterised as partly deactivated palletized charcoal.

**17. How is alkene produced by vicinal dihalide?**

**Ans:** Vicinal dihalide loses a  $ZnX_2$  molecule from the alkene upon treatment with Zn metal. This is called a dehalogenation reaction. The reaction is given below:



**18. Arrange the following halogen atom to determine rate of the reaction. Iodine, Chlorine, Bromine.**

**Ans:** The order will be Iodine > Bromine > Chlorine

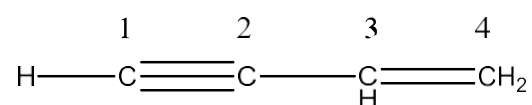
**19. What is  $\beta$ -elimination reaction?**

**Ans:** When the atom of hydrogen is removed from  $\beta$ -carbon (carbon atom next to the carbon to which halogen is attached).

**20. What is the number of  $\sigma$  and  $\pi$  bond in  $N \equiv C-CH-C \equiv N$ ?**

**Ans:** The numbers of  $\sigma$  bonds are 7 and the numbers of  $\pi$  bonds are 5.

**21. Name the type of hybridization in C (2) and C (3) in the following molecule:**



**Ans:** The hybridization of C(2) is  $sp$  and the hybridization of C(3) is  $sp^2$ .

**22. Why do alkynes not show geometrical isomerism?**

**Ans:** Alkynes' structure is linear. They cannot therefore demonstrate geometric isomerism.

**23. Write the general formula of alkynes.**

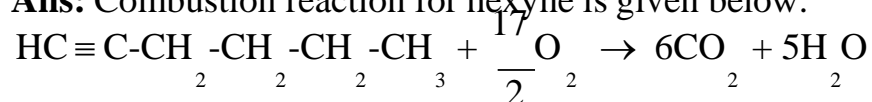
**Ans:** The general formula of alkynes is  $C_nH_{2n-2}$ .

**24. Name the simplest alkyne.**

**Ans:** Ethyne ( $C_2H_2$ )

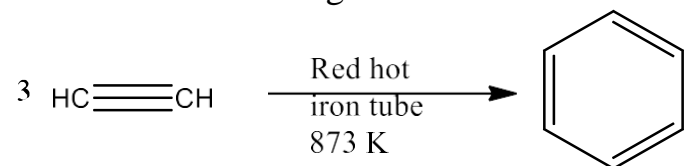
**25. Write combustion reaction for hexyne.**

**Ans:** Combustion reaction for hexyne is given below:



**26. How will you convert ethyne to benzene?**

**Ans:** The reaction is given below:



**27. What are benzenoids?**

**Ans:** Benzene ring is recognised as aromatic hydrocarbon compound.

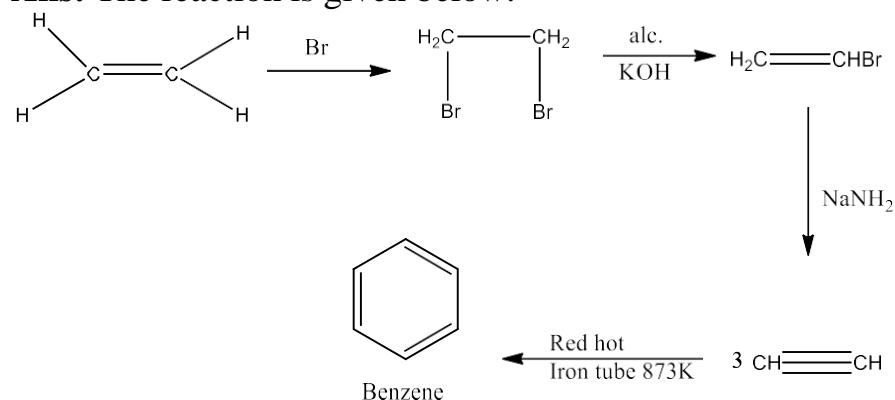
**28. Although benzene is highly unsaturated; it does not undergo addition reactions. Give reason.**

**Ans:** Contrary to olefines, benzene  $\pi$ -electrons are relocated (resonance), and hence they are not reactive in terms of further reactions.

**29. How will you convert the following compounds into benzene?**

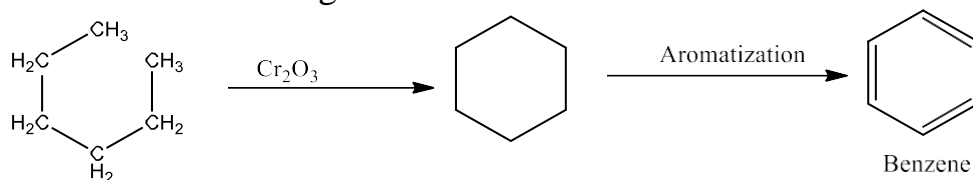
**(i) Ethene**

**Ans:** The reaction is given below:



## (ii) Hexane

**Ans:** The reaction is given below:



### Short Answer Questions

2 Marks

**30. The boiling point of hydrocarbons decreases with increase in branching. Give reason.**

**Ans:** The outcome is a more compact structure (almost spherical). This decreases the efficient surface area and therefore the strength of the forces of the Vander wall, which reduces the boiling point.

**31. Unsaturated compounds undergo addition reactions. Why?**

**Ans:** Unsaturated hydrocarbon molecules include two- or three-fold bonds of carbon. The  $\pi$ -bond is a multiple bond, which becomes unstable and hence adds across numerous bonds.

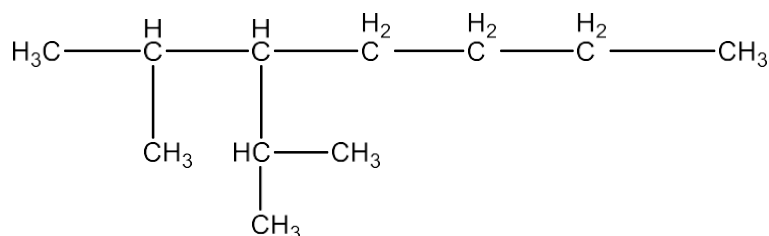
**32. To which category of compounds does cyclohexane belong?**

**Ans:** Saturated alicyclic hydrocarbons.

**33. Draw the structure of the following compounds all showing C and H atoms.**

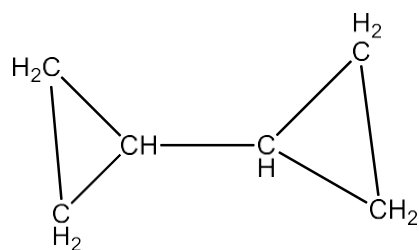
**(a) 2-methyl -3-iso propyl heptanes**

**Ans:** The compound is drawn below:



**(b) Dicyclopropyl methane**

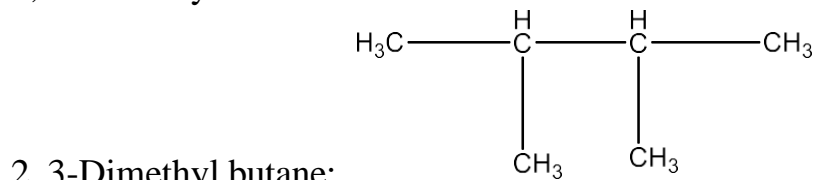
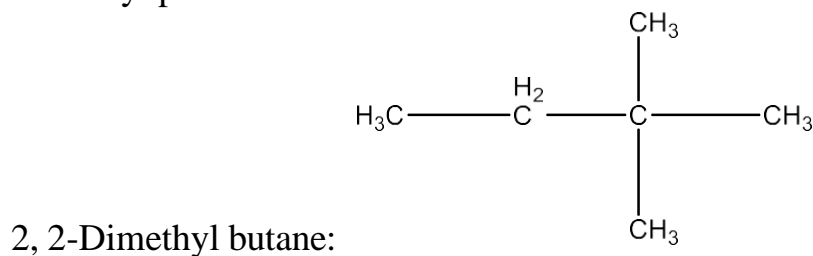
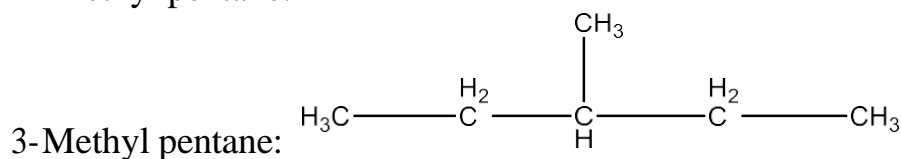
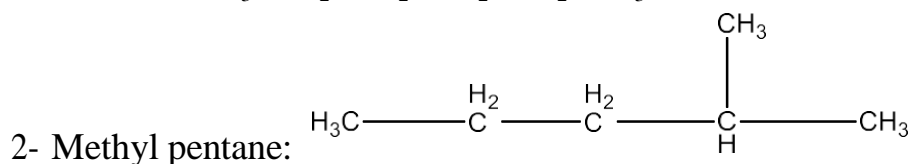
**Ans:** The compound is drawn below:



**34. Draw all the possible structural isomers with the molecular formula  $C_6H_{14}$ , Name them.**

**Ans:** These are given below:

n- Hexane:  $CH_3-CH_2-CH_2-CH_2-CH_2-CH_3$



**35. Sodium salt of which acid will be needed for the preparation of propane? Write chemical equation for the reaction.**

**Ans:** Butanoic acid. The reaction is given below:

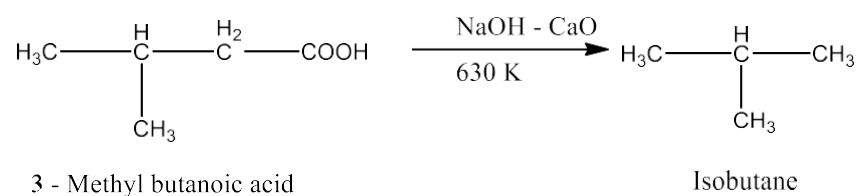


**36. Cyclobutane is less reactive than cyclopropane. Justify.**

**Ans:** The C-C-C bond angle in the cyclobutane molecule is  $90^\circ$  and in cyclopropane  $60^\circ$ . It demonstrates that in cyclobutane the difference between the bond angle of the tetrahedral ( $109^\circ 28'$ ) and cyclopropane is smaller. In other words, compared with cyclobutane, cyclopropane is under severe strain and is hence more reactive.

**37. How will you prepare isobutane?**

**Ans:** Isobutane comes from 3-methyl butanoic acid decarboxylation with 630K of soda lime. The reaction is given below:



**38. The boiling point of alkanes shows a steady increase with increase in molecular mass. Why?**

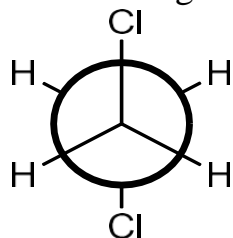
**Ans:** This is because the intermolecular van der Waals forces increase when the molecular size or the surface of the molecule increases.

**39. Pentane has three isomers i.e; pentane, 2-methyl butane and 2,2-dimethyl propane. The b.p of pentane is 309.1K whereas 2,2-dimethyl propane shows a b.p of 282.5K. Why?**

**Ans:** The molecule becomes spherical by increasing the number of branch chains. This leads to less contact and hence a weak molecular inter-force, which is addressed by comparatively lower temperature between spherical molecules.

**40. Draw the Newman's projection formula of the staggered form of 1,2-dichloroethane.**

**Ans:** The figure is given below:



**41. All the four C-H bonds in methane are identical. Give reasons.**

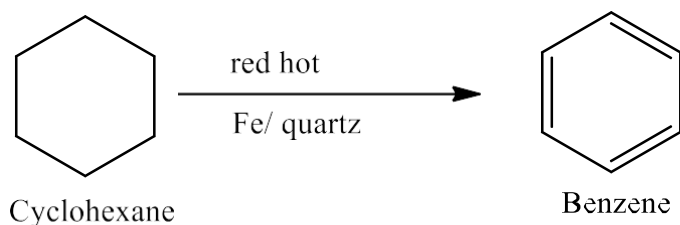
**Ans:** The four C-H methane bonds are similar as they originate by overlapping the same sort of orbital: carbon and hydrogen hybrid orbital.

**42. When alkanes are heated, the C-C bonds rather than the C-H bonds break. Give reason.**

**Ans:** The C-C connection instead of the C-H bond breaks when the alkanes are warmed up because the bond C-C has a lower energy bond ( $\Delta H = 83 \text{ K cal/ mole}$ ) than the bond C-H ( $\Delta H = 99 \text{ K cal/ mole}$ ).

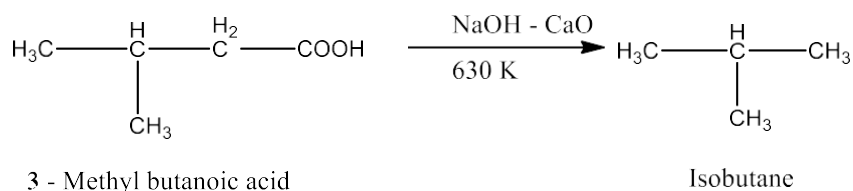
**43. How would you convert cyclohexane to benzene?**

**Ans:** In a red hot tube, cyclohexane is oxidised in order to produce benzene when handled with iron or quartz. The reaction is given below:



**44. How is iso-butane prepared?**

**Ans:** By decarboxylation of 3 – methyl butanoic acid with soda lime at 630 K. The reaction is given below:



**45. Why the addition of inert gas does not change the equilibrium?**

**Ans:** The inert gas does not affect the partial pressure or molar concentration of the material involved in the reaction by adding it in a continuous volume.

**46. The equilibrium constant of a reaction increases with rise in temperature. Is the reaction exo – or endothermic?**



---

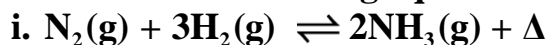
**Ans:** As the temperature rises, the equilibrium constant rises with it. As a result, the reaction is an endothermic one.

**47. Using Le – chatelier principle, predict the effect of**

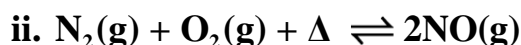
**(a) decreasing the temperature**

**(b) increasing the temperature**

**in each of the following equilibrium systems:**



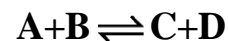
**Ans:** For an exothermic reaction increase in temperature shifts the equilibrium to the left and decrease in temperature shifts it to the left.



**Ans:** For an endothermic reaction increase in temperature shifts the equilibrium to the right and decrease in temperature shifts it to the left.

**48.**

**i. In the reaction equilibrium**



**What will happen to the concentrations of A, B and D if concentration of C is increased.**

**Ans:** For the given reaction:  $A+B \rightleftharpoons C+D$

$$K_c = \frac{[C][D]}{[A][B]}$$

When the concentration of a product is raised, the concentration of other components varies, resulting in a reduction in the concentration of C, and vice versa.

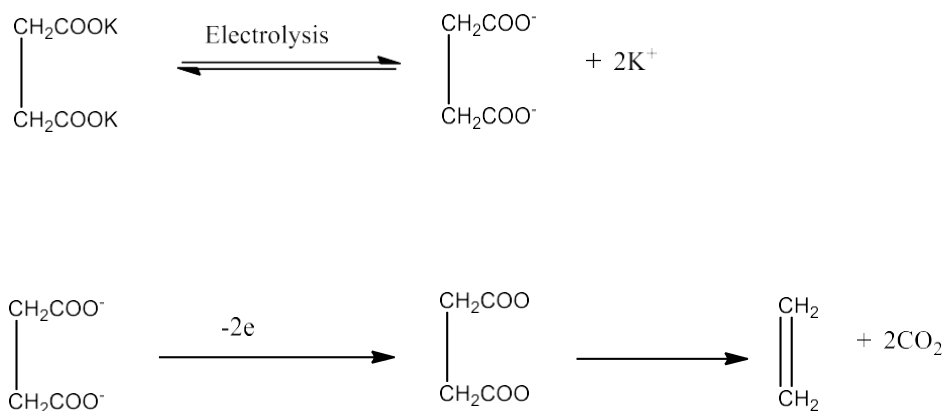
If the conc of C is increased, the conc of D will drop, but the concs of A and B will concurrently rise, resulting in the same numerical value of  $K_c$ , and vice versa. The balance of power shifts to the left.

**ii. What will happen if concentration of A is increased?**

**Ans:** When the conc of A is increased, the conc of B decreases, but the concs of C and D rise at the same time, resulting in the numerical value of  $K_c$  remaining the same, and vice versa. The balance shifts rightward.

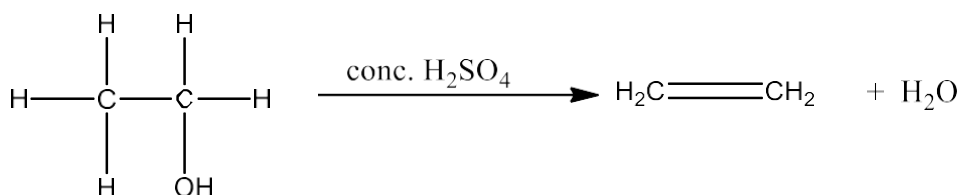
#### 49. How is alkene produced by Kolbe's electrolytic method?

**Ans:** The reaction is given below:



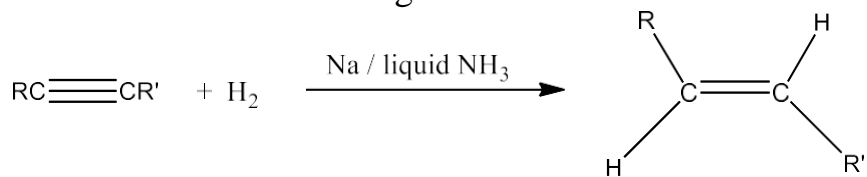
#### 50. How is alkene prepared from alcohol by acidic dehydration?

**Ans:** When alcohols are heated with concentrated sulfuric acid, one water molecule is removed, resulting in alkenes. The reaction is given below:



#### 51. How are trans alkenes formed by alkynes?

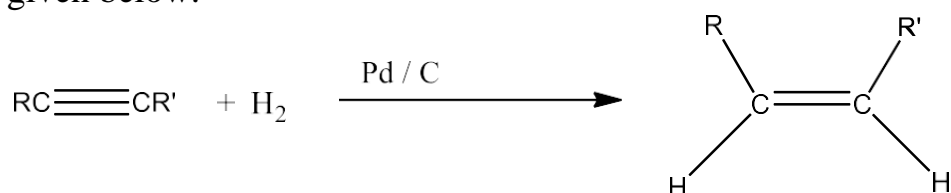
**Ans:** Trans alkenes are formed when alkynes are reduced with sodium in liquid ammonia. The reaction is given below:



#### 52. How are cis – alkenes formed by alkynes?

**Ans:** Cis-alkene is formed when alkenes are partially reduced with a specified amount of dihydrogen in the presence of palladised charcoal and then partially

deactivated with poisons such as sulphur compounds or quinoline. The reaction is given below:

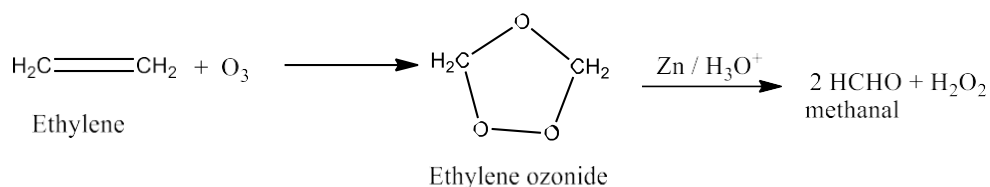


### 53. State Markownikov's Rule.

**Ans:** It states that when a polar compound is added to an unsymmetrical alkenes, or alkynes positive part goes to the most substituted carbon atom and negative part goes to the least substituted carbon atom.

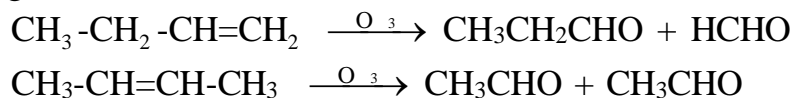
### 54. Write the chemical equations of reactions involved in ozonolysis of alkenes.

**Ans:** Alkenes react with ozone to generate ozonide, which is then reduced in the presence of Zn to produce aldehyde and ketones. The reaction of an example is given below:



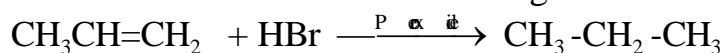
### 55. How will you distinguish between butene – 1 and butene – 2?

**Ans:** Butenes 1 and 2 can be differentiated by ozonolysis or oxidation with an acidic KMnO<sub>4</sub> solution, resulting in distinct carbonyl products. The reactions are given below:



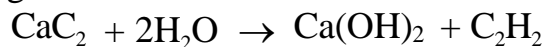
### 56. State kharasch effect.

**Ans:** It claims that when peroxides such as benzoyl peroxide are present, the addition of HBr (but not HCl or HI) to unsymmetrical alkenes violates Markontkov's rule. The reaction is given below:



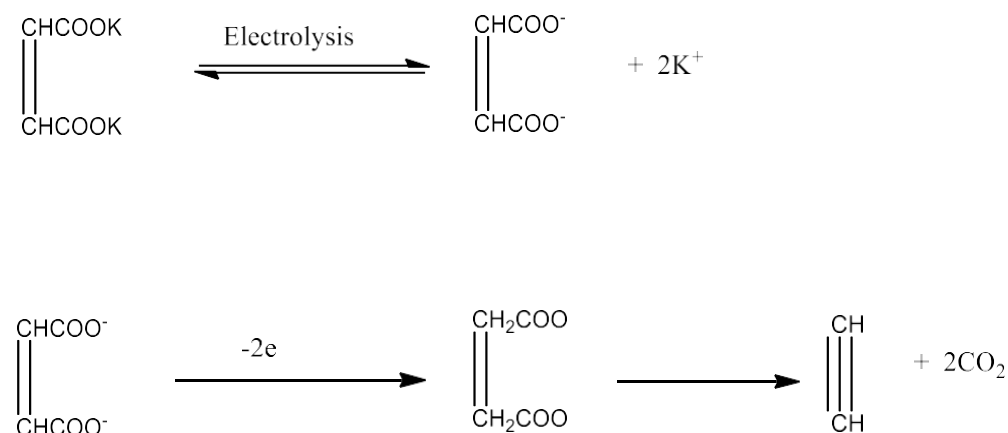
### 57. How is alkyne prepared from calcium carbide?

**Ans:** Ethyne is produced by treating calcium carbide with water. The reaction is given below:



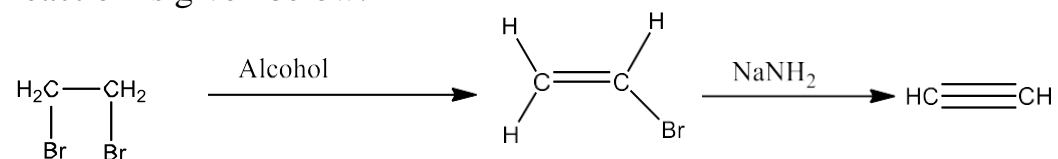
### 58. How is alkyne prepared by Kolbe's method?

**Ans:** The reaction is given below:



### 59. How is alkyne prepared from vicinal dihalides?

**Ans:** Vicinal dihalides are dehydrohalogenated when exposed to alcoholic potassium hydroxide. One hydrogen halide molecule is removed to generate alkenyl halide, which is then treated with sodiumamide to produce alkynes. The reaction is given below:



### 60. How will you distinguish between ethylene and methane?

**Ans:** Methane does not produce bromine water colour or Baeyer's reagent colour, but ethylene does.

### 61. Although acetylene is acidic in nature, it does not react with NaOH or KOH. Give reason?

**Ans:** Because acetylene is a weak acid ( $pK_a=25$ ), only a very strong base, such as the amide ion ( $NH_2^-$ ), can efficiently remove a proton.

**62. Write the conversion of ethene to ethyne.**

**Ans:** The reaction is given below:

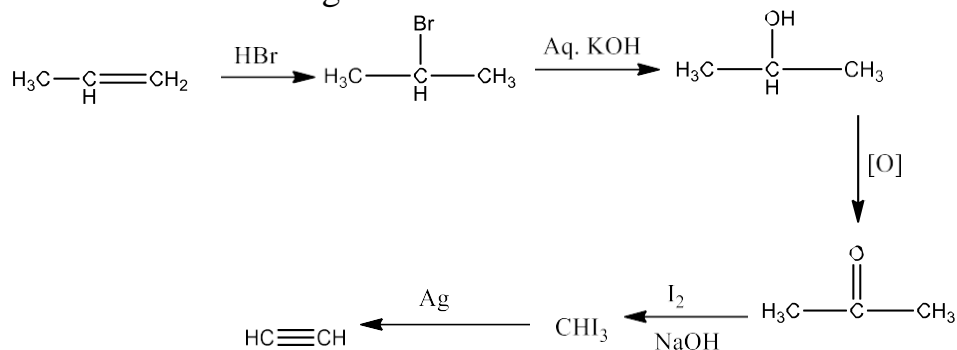


**63. How will you distinguish between butyne – 1 and butyne – 2?**

**Ans:** With an acetylene hydrogen atom, butyne – 1 ( $CH_3CH_2C\equiv CH$ ) produces white precipitate with ammonical silver nitrate and red precipitate with ammonical cuprous chloride. However, butyne – 2 ( $CH_3-C\equiv C-CH_3$ ), which lacks an acetylene hydrogen atom, is unresponsive to either reagent.

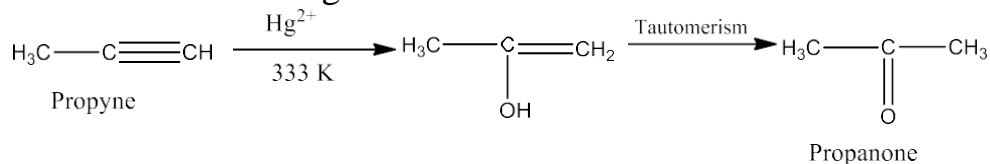
**64. How would you carry out the following conversion propene to ethyne.**

**Ans:** The reaction is given below:



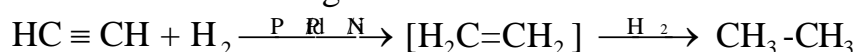
**65. How will you convert propyne to propanone?**

**Ans:** The reaction is given below:



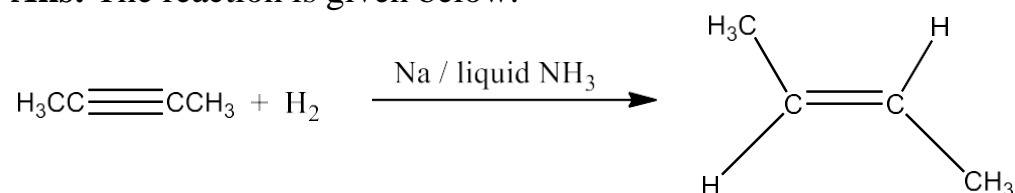
**66. How will you convert ethyne to ethane?**

**Ans:** The reaction is given below:



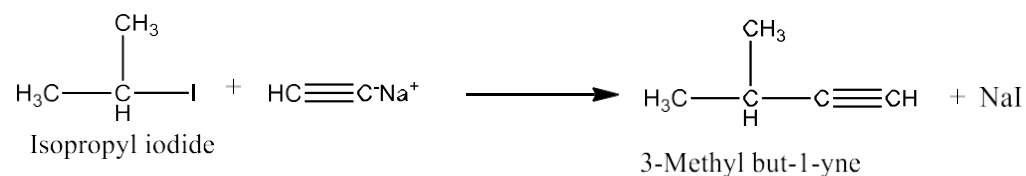
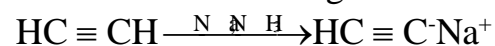
**67. Convert 2-Butyne to Trans-2-butene.**

**Ans:** The reaction is given below:

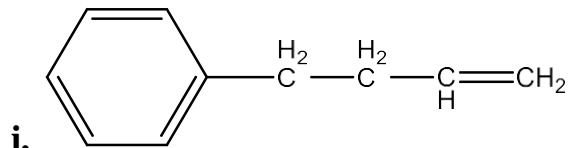


**68. How will you prepare 3-methyl but -1 – yne by starting with ethyne?**

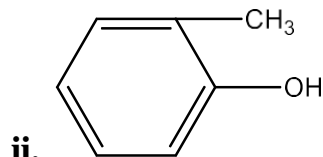
**Ans:** The reaction is given below:



**69. Write the IUPAC name of the following compound**



**Ans:** The IUPAC name of the compound is 4-Phenyl but-1-ene.



**Ans:** The IUPAC name of the compound is 2-Methyl phenol.

**70. What do you mean by delocalization?**

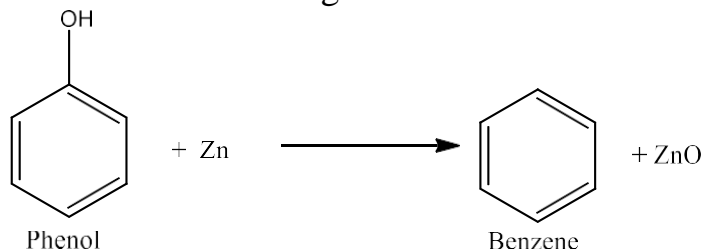
**Ans:** Delocalisation – Pairs of bonding electrons that extend over three or more atoms and belong to the entire molecule are said to be delocalized. Delocalized  $\pi$ -orbitals are much larger and therefore more stable than localised  $\pi$ -orbitals.

### 71. What do you understand by Resonance energy?

**Ans:** Resonance energy is the difference between the energy of the most stable contributing structure and the energy of the resonance hybrid. Benzene has resonance energy of 147 KJ/mole.

### 72. How is phenol reduced to benzene?

**Ans:** The reaction is given below:



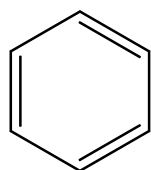
### 73. How is aromaticity of a compound judged?

**Ans:** The following characteristics decide aromaticity of a compound:-

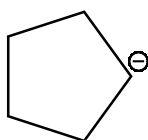
- Planarity
  - Complete delocalization of the  $\pi$ -electrons in the ring.
  - Presence of  $(4n+2)$   $\pi$ -electrons in the ring where  $n$  is an integer ( $n=0, 1, 2, \dots$ )
- This is often referred to as Huckel Rule.

### 74. Give some examples of aromatic compounds.

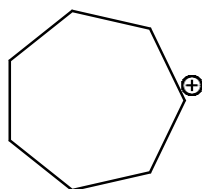
**Ans:** Some examples of aromatic compounds are benzene, cyclopentadienyl anion, cycloheptatrienyl cation, etc. Their structures are given below:



Benzene



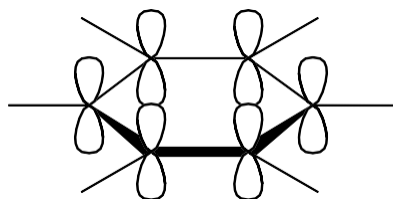
Cyclopentadienyl anion



Cycloheptatrienyl cation

### 75. How will you account for the structure of benzene?

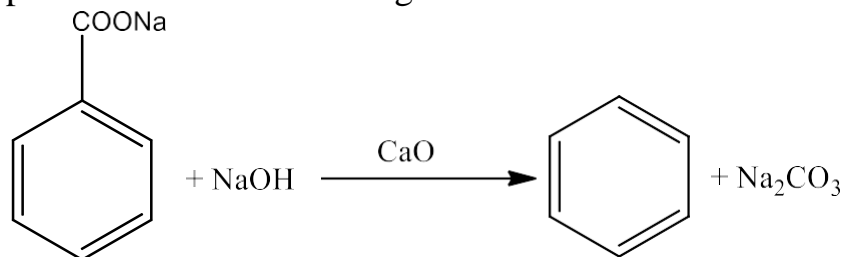
**Ans:** In benzene, all six carbon atoms are  $sp^2$  hybridized. Each carbon atom's two  $sp^2$  hybrid orbitals overlap with the  $sp^2$  hybrid orbitals of neighboring carbon atoms to create six C-C sigma bonds in the hexagonal plane. Each carbon atom's remaining  $sp^2$  hybrid orbital overlaps with a hydrogen atom's s-orbital to produce six C-H sigma bonds. One hybridized p-orbital perpendicular to the ring plane remains for each carbon atom.



The unhybridized p-orbital of the carbon atoms will form the pi-bond.

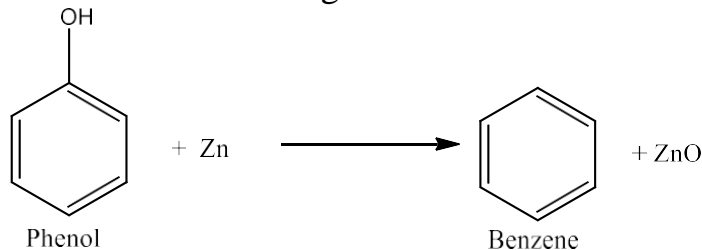
### 76. How is benzene prepared from aromatic acids?

**Ans:** When the sodium salt of benzoic acid is heated with soda lime, benzene is produced. The reaction is given below:



### 77. How is phenol reduced to benzene?

**Ans:** The reaction is given below:



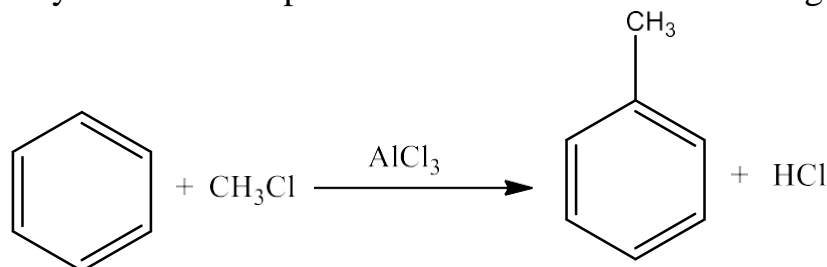
### 78. Why is benzene extra ordinarily stable though it contains three double bounds?



**Ans:** Due to resonance there are three double bonds which makes them extra stable.

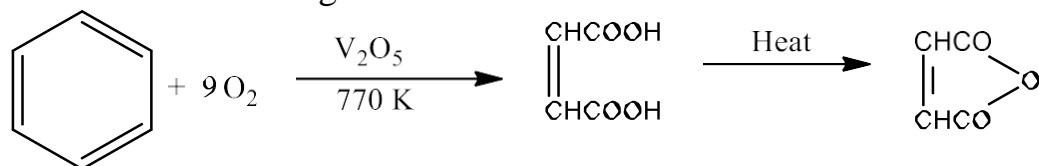
**79. What is Friedel craft's reaction? Give an example.**

**Ans:** Alkyl benzene is formed when benzene or a derivative of it interacts with an alkyl halide in the presence of  $\text{AlCl}_3$ . The reaction is given below:



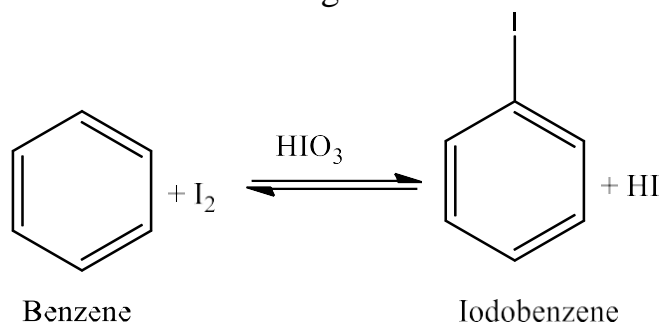
**80. What happens when benzene is oxidized at 770K in presence of  $\text{V}_2\text{O}_5$ ? Give chemical equation.**

**Ans:** The reaction is given below:



**81. How will you convert benzene to iodobenzene? Give chemical equation.**

**Ans:** The reaction is given below:



---

---

**82. What are electrophilic substitution reactions?**

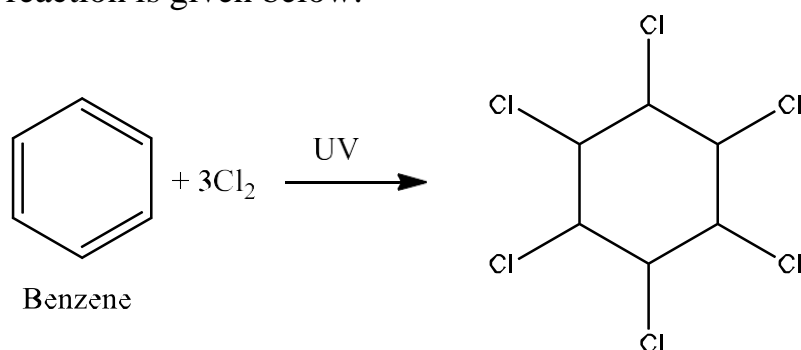
**Ans:** Electrophilic substitution reactions are those in which a weaker electrophile is replaced by a stronger electrophile.

**83. How will you distinguish between Ethene and benzene**

**Ans:** While benzene does not produce bromine water color or Baeyer's reagent colour, ethene does.

**84. How is benzene converted to benzene hexachloride?**

**Ans:** Three chlorine molecules react with benzene to form benzene hexachloride,  $C_6H_6Cl_6$ , commonly known as gammaxane, when exposed to ultraviolet light. The reaction is given below:

**85. How will you convert benzene to hexachlorobenzene?**

**Ans:** Hexachlorobenzene ( $C_6Cl_6$ ) is produced by treating benzene with chlorine in the presence of anhydrous  $AlCl_3$  in the dark.

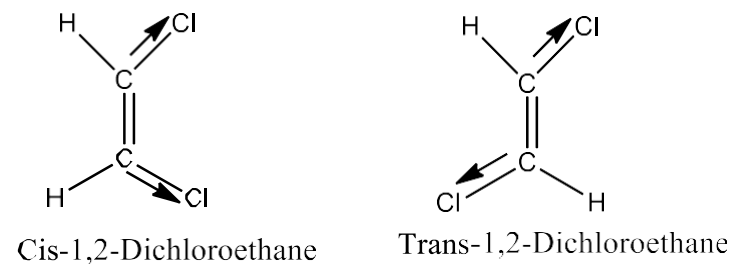
**Long Answer Questions****3 Marks****86. n – pentane has higher boiling point than neopentane but the melting point of neopentane is higher than that of n – pentane.**

**Ans:** The surface area and van der Waals forces of attraction in neopentane are much less than in n-pentane due to the existence of branches. As a result, neopentane has a lower boiling point than n-pentane.

The packing of molecules in the crystal lattice determines M.P. Because neopentane is more symmetrical than n-pentane, it packs significantly closer in the crystal lattice than n-pentane, giving it a substantially higher m.p. than n-pentane.

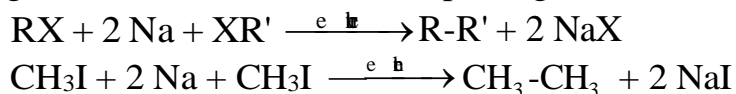
**87. The dipole moment of trans 1,2-dichloroethane is less than the cis – isomer. Explain.**

**Ans:** In comparison to the cis – isomer, the trans isomer has a more symmetrical structure. The dipole moments of the polar C-Cl bonds are expected to cancel them other out in the trans – isomer, resulting in a molecule with a dipole moment of practically zero. These, however, do not cancel in the cis –isomer. As a result, the cis isomer has a particular moment, whereas the trans isomer has none. The structures are given below:



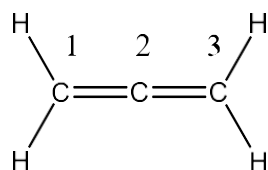
### 88. Explain wurtz reaction with an example.

**Ans:** Wurtz reaction – This reaction is used to create higher alkanes from lower alkane halides. Lower alkane halides are treated in ether with sodium metal. The general reaction and an example is given below:



### 89. Discuss the hybridization of carbon atoms in alkene $C_3H_4$ and show the $\pi$ -orbital overlaps.

**Ans:** The structure is given below:



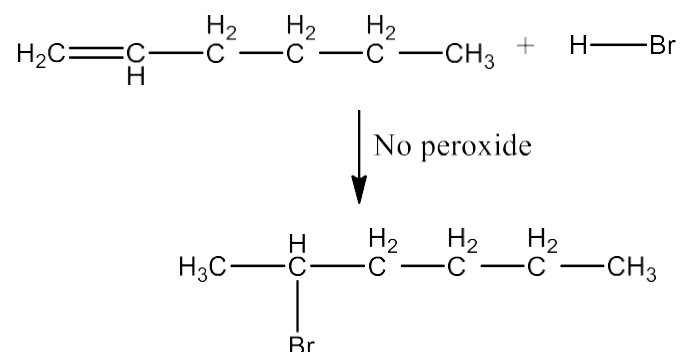
The carbon atom 1 and 3 are  $sp^2$  hybridized since each one of them is joined by a double bond. In contrast, carbon atom 2 is  $sp$  hybridized since it has two double bonds thus the two double bonds in alkenes are perpendicular to each other.

---

**90. Write IUPAC name of the products obtained by addition reactions of HBr to hex – 1 – ene.**

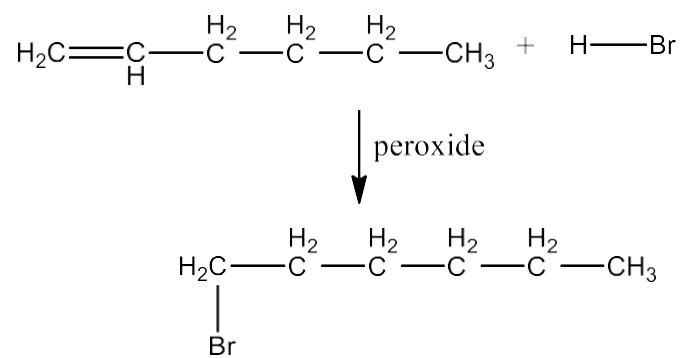
**i. In the absence of peroxide**

**Ans:** The product formed will be 2-Bromohexane. The reaction is given below:



**ii. In the presence of peroxide**

**Ans:** The product will be 1-Bromohexane. The reaction is given below:



**91. Explain the term polymerization with two examples.**

**Ans:** Polymerization is the process of combining two or more molecules of unsaturated compounds to produce a larger complex given the right conditions. The resulting product is known as a polymer, and the process is known as polymerization.

(a) Addition polymerization: Nothing is wasted during the process since the larger molecule (polymer) is an exact multiple of the smaller molecule.

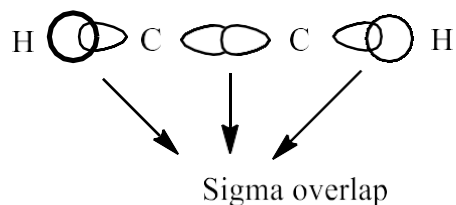
(b) Condensation polymerization: Molecules such as water, hydrochloric acid, and others are typically lost during this process. The polymer is not an exact multiple of the smaller molecule during polymerization.

---

**92. Draw the orbital picture of ethyne showing**

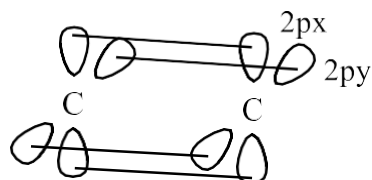
**(a) Sigma overlaps**

**Ans:** This is shown below:



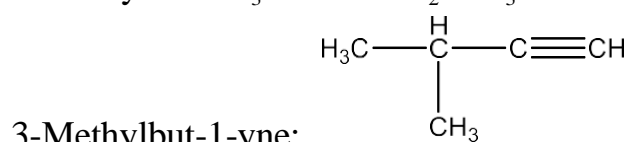
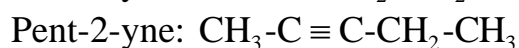
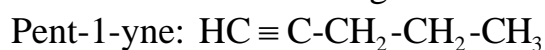
**(b) Pi overlaps**

**Ans:** This is shown below:



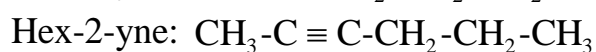
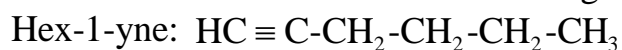
**93. Give the different isomers formed by  $C_5H_8$  along with their IUPAC name.**

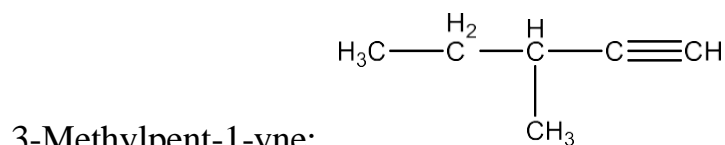
**Ans:** The structures are given below:



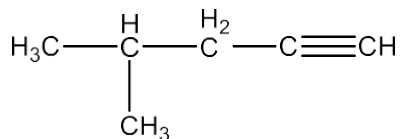
**94. Write structures of different isomers formed by  $C_6H_{10}$ . Also write IUPAC names of the all the isomers.**

**Ans:** All the structures and names are given below:

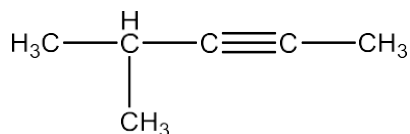




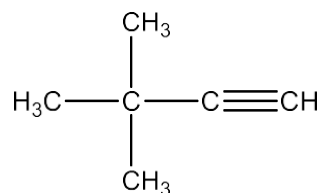
3-Methylpent-1-yne:



4-Methylpen-1-yne:



4-Methylpent-2-yne:



3,3-Dimethylbut-1-yne:

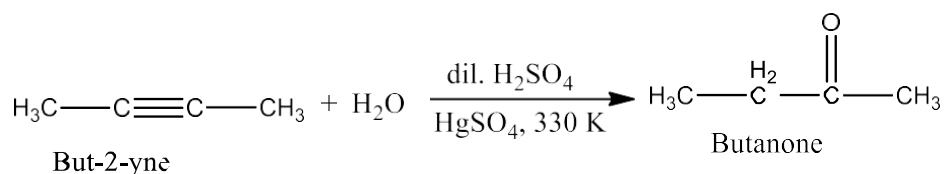
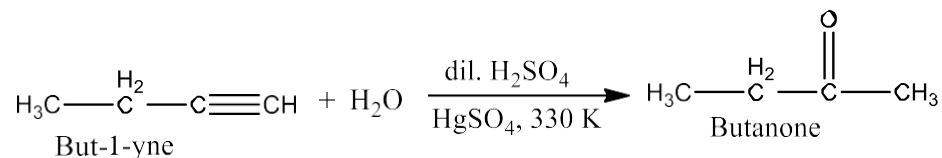
**95. Ethyne is acidic in nature in comparison to ethene and ethane. Why is it so?**

**Ans:** In ethyne, hydrogen atoms are connected to  $sp$  hybridized carbon atoms, but in ethene, they are attached to  $sp^2$  hybridized carbon atoms and in ethane, they are attached to  $sp^3$  hybridized carbons.

The  $sp$  hybridized orbitals of carbon atoms in ethyne molecules have the highest electronegativity (50%) due to the highest percentage of  $s$  – character (50%): This attracts the shared pair of the C-H bond of ethyne to a greater extent than the  $sp^2$  hybridized orbitals of carbon in ethene and the  $sp^3$  hybridized orbital of carbon in ethane. In comparison to ethene and ethane, hydrogen atoms may be released as protons more easily in the ethyne molecule.

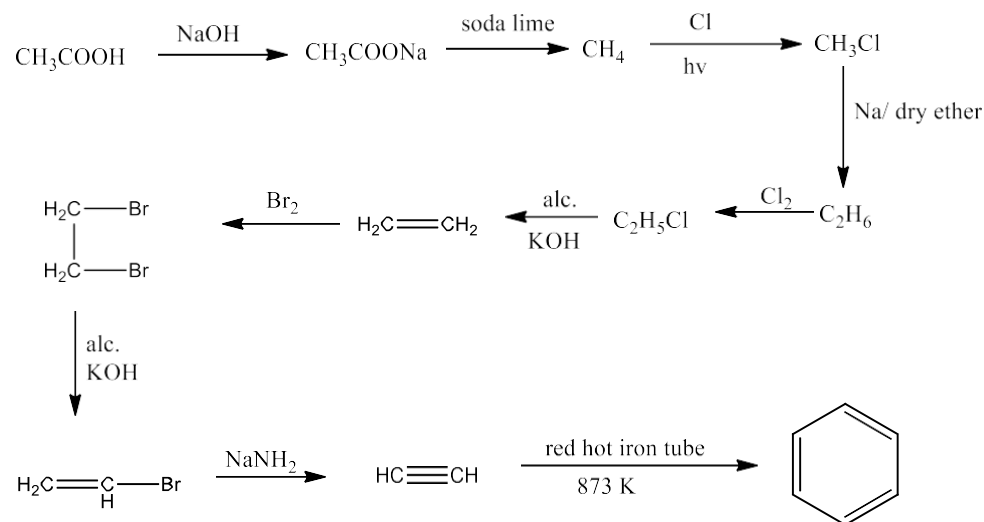
**96. Butanone is formed when an alkyne is passed through a dil sol of  $\text{H}_2\text{SO}_4$  at 330K in presence of mercuric sulphate. Write the possible structure of the alkyne.**

**Ans:** Because butanone has four carbon atoms, both but – 1- yne and but – 2 – yne will form butanone when hydrated. The reactions are given below:



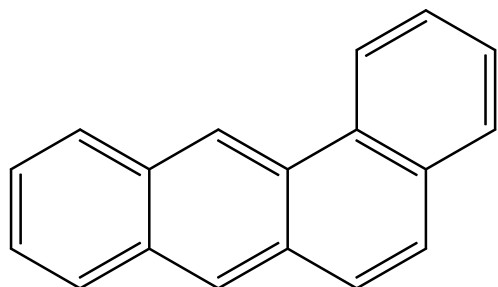
**97. How would you convert ethanoic acid into benzene?**

**Ans:** The reaction is given below:

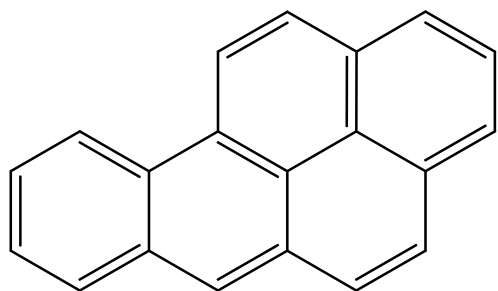


**98. Name some carcinogenic hydrocarbons.**

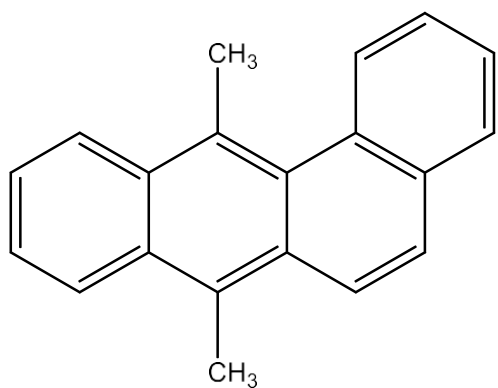
**Ans:** Some of the examples are 1, 2-Benzanthracene, 1, 2-Benzpyrene, 9, 10-Dimethyl-1,2-benzanthracene. Their structures are given below:



1, 2-Benzanthracene



1, 2-Benzpyrene

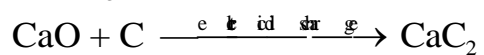
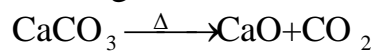


9, 10-Dimethyl-1,2-benzanthracene

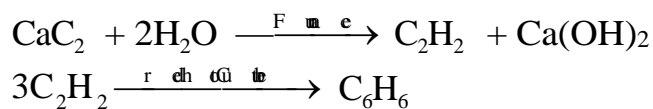
#### 4 Marks Question

**99. How would you prepare benzene from lime?**

**Ans:** There are many steps involved in the formation of benzene from lime. The reactions are given below:

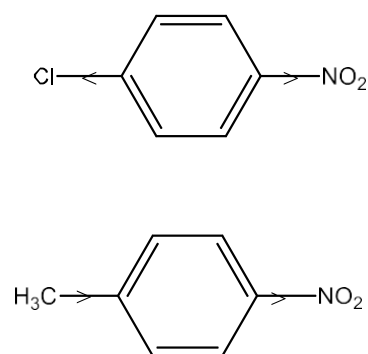






**100. p-chloro nitro benzene has less dipole moment (2.4 D) than p-nitro toluene (4.4 D). Why?**

**Ans:** Individual moments in p-chloro nitro benzene are in opposing directions and so partially cancel. Both moments in p-nitro toluene are in the same direction and so contribute to each other. These are given below:



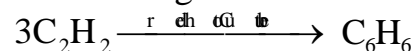
### Very Long Answer Questions

8 Marks

**101. How will you convert the following compounds to benzene?**

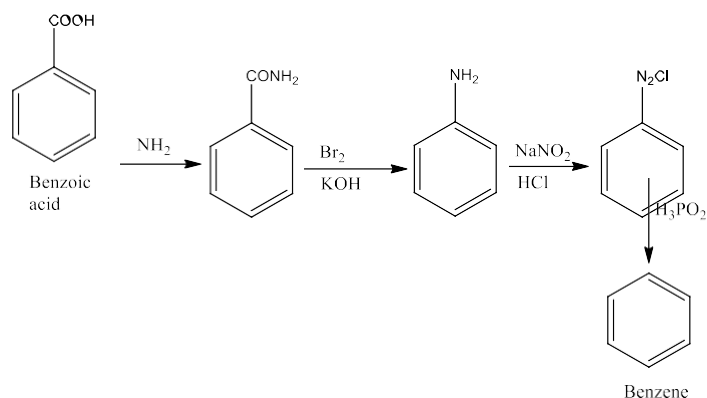
**(i) Acetylene**

**Ans:** Ethyne polymerizes into benzene when heated to a higher temperature. The reaction is given below:



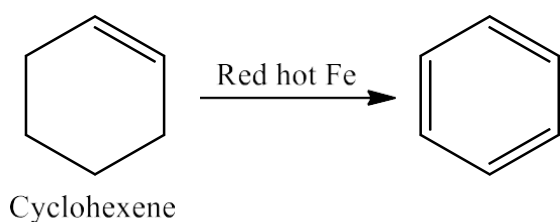
**(ii) Benzoic acid**

**Ans:** When benzoic acid is heated and treated with  $\text{NH}_3$ , it transforms to amide, which then converts to aniline, which then converts to diazonium salt, which then turns to benzene when acid is hydrolyzed. The reaction is given below:



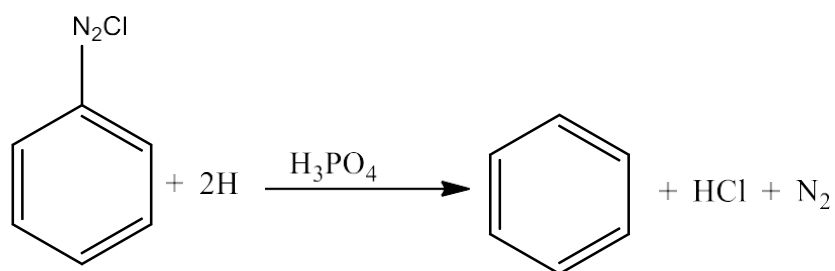
### (iii) Cyclohexane

**Ans:** When cyclohexane is exposed to iron or quartz in a red hot tube, it oxidises to produce benzene. The reaction is given below:



### (iv) Benzene diazonium chloride.

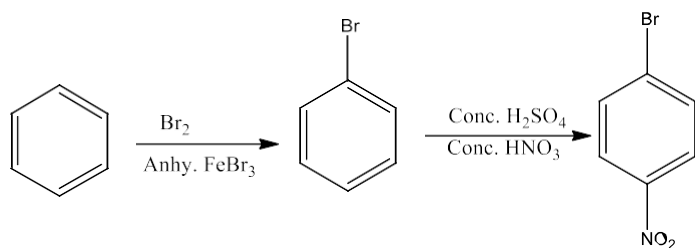
**Ans:** Benzene diazonium chloride is transformed to benzene in the presence of hypophosphorus acid. The reaction is given below:



## 102. How will you convert benzene into

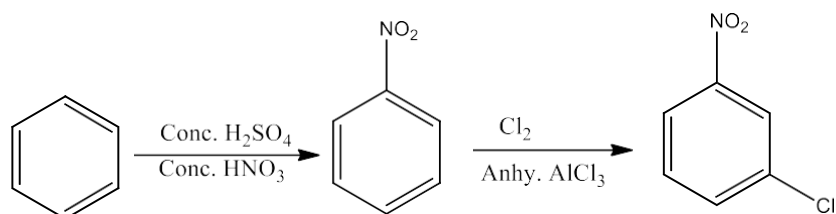
### (i) p – Nitro bromo benzene

**Ans:** Benzene will be treated with bromine to form bromobenzene. This bromobenzene will be treated with concentrated sulfuric acid and nitric acid to form p-Nitrobromobenzene. The reaction is given below:



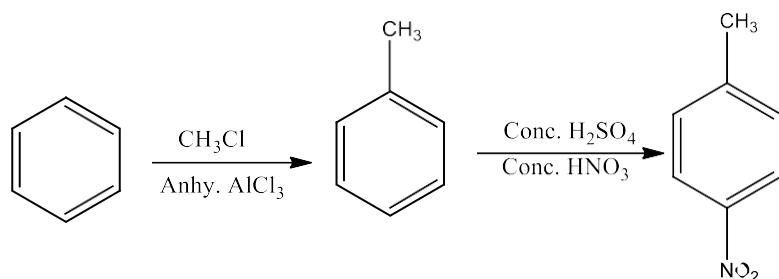
**(ii) m – Nitrochloro benzene**

**Ans:** Benzene will be treated with concentrated sulfuric acid and nitric acid to form nitrobenzene. This Nitrobenzene will be treated with chlorine to form m-Nitrochloro benzene. The reaction is given below:



**(iii) p – Nitro toluene**

**Ans:** Benzene will be treated with chloromethane to form Toluene. This toluene will be treated with concentrated sulfuric acid and nitric acid to form p-Nitrotoluene. The reaction is given below:



**(iv) Acetophenone**

**Ans:** When benzene will be treated with acetyl chloride, it will form Acetophenone. The reaction is given below:

