

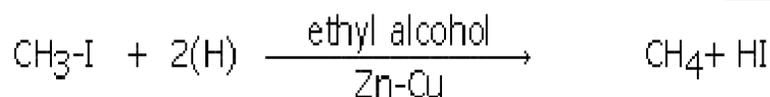
Class: 11
Subject: Chemistry
Topic: Hydrocarbons
No. of Questions: 25

Q1. Give any two methods for the preparation of methane.

Sol. Methane can be prepared by any of the two methods.

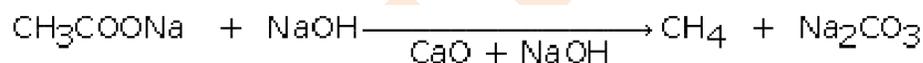
Reduction of methyl halides:

Methyl halides are reduced with reagents like Zn + CH₃COOH, Zn + NaOH, HI + P or Zn – Cu couple in ethyl alcohol to methane.



Decarboxylation reaction:

Methane is formed when sodium acetate is heated with soda lime. Soda-lime is a mixture of CaO and NaOH .



Q2. What are the terms ortho, meta and para stands for?

Sol. The aromatic compounds containing the two groups at the adjacent positions, i.e. the 1,2-positions are called ortho, denoted as 'o'.

The aromatic compounds containing the two groups at the alternate positions, i.e. the 1,3-positions are called meta, denoted as 'm'.

The aromatic compounds containing the two groups at the diagonal positions, i.e. the 1,4-positions are called para-, denoted as 'p'.

Q3. Compare the rate of nitration under similar conditions of Ph-O-Me and Ph-S-Me. Explain.

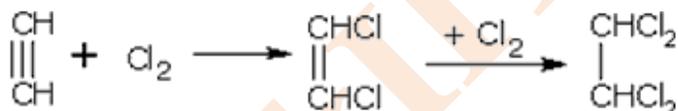
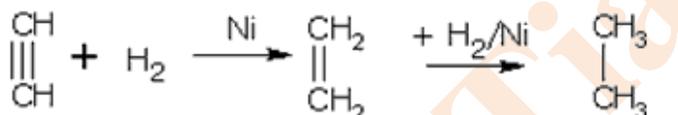
Sol. PhOMe > PhSMe . The π bond from O (which uses a 2p orbital) to the ring carbon is shorter and stronger than the comparable bond from S (which uses a 3p orbital) to the ring Carbon and -OCH₃ being an activating group has higher rate of nitration.

- Q4. Write equations for the following chemical conditions:
- When alkynes burns in air or oxygen.
 - When ethyne reacts with hydrogen in the presence of catalyst (Pt or Ni) at 250°C.
 - When ethyne reacts with chlorine.
 - When ethyne reacts with water in the presence of suitable reagent.

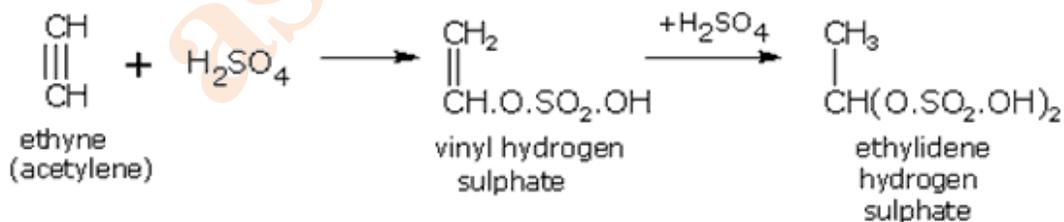
Sol. a) Alkynes burn with sooty flame when treated with oxygen



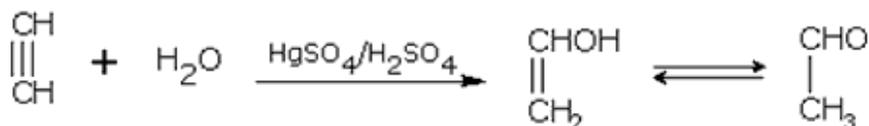
- b) An ethyne reacts with hydrogen in the presence of catalyst (Pt or Ni) at 250°C, first forming alkenes and finally alkane.



- c) When ethyne reacts with sulfuric acid, it forms ethylidene hydrogen sulphate.

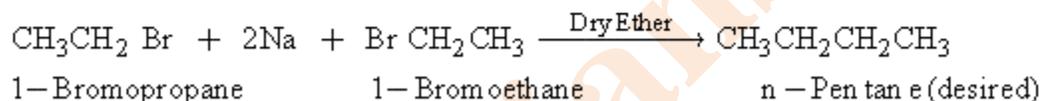
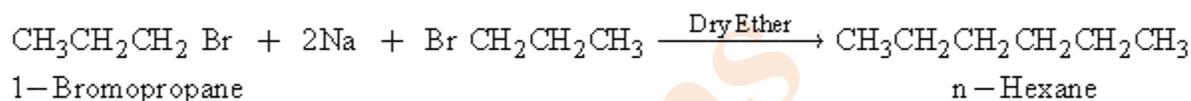
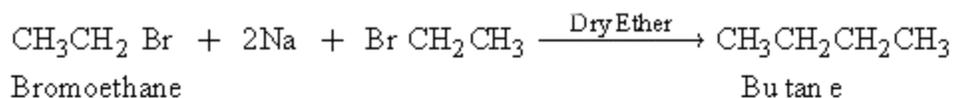


- d) On treatment with water ethyne undergo following reaction



Q5. Why is Wurtz reaction not preferred for the preparation of alkanes containing odd number of carbon atoms? Illustrate your answer by taking one example.

Sol. For preparing alkanes containing odd number of carbon atoms, a mixture of two alkyl halides has to be used. These two alkyl halides may react in three different ways producing a mixture of three alkanes instead of desired alkane. For example, Wurtz reaction between bromoethane and 1-bromopropane give the following three alkanes instead of a single alkanes of odd number of C-atoms.

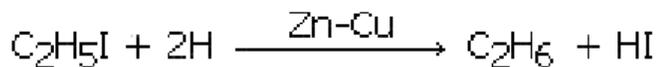


Q6. Why is Friedel-Crafts acylation but not alkylation of naphthalene practical?

Sol. Acylation introduces a deactivating group (-COR) that prevents further acylation from occurring. Introduction of an activating -R group induces polyalkylations which is not possible.

Q7. How will you prepare ethane from ethyl iodide? Give the reaction.

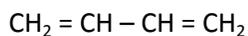
Sol. By reduction of ethyl iodide ethane can be prepared. The reduction is done with the reagents like Zn + CH₃COOH, Zn + NaOH, HI + P or Zn - Cu.



Q8. Is it possible to isolate pure staggered ethane or pure eclipsed ethane at room temperature?

Sol. It is not possible to isolate pure staggered form of ethane or pure eclipsed form of ethane at room temperature because of less difference in their energy they can get converted into each other very fast.

Q9. Give the IUPAC name of the following compound:

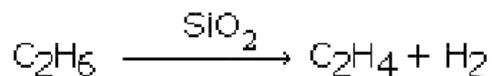


Sol. Buta – 1, 3 - diene

Q10. What is cracking process? Explain catalytic cracking.

Sol. When alkanes are heated to high temperatures in absence of air, mixture of saturated and unsaturated hydrocarbons is formed. This process can also be completed at a lower temperature by use of catalyst such as silica or alumina. This is called catalytic cracking.

Example:



Q11. Which salt on treatment with soda lime gives ethane?

Sol. Sodium propanoate.

Q12. Define the following:

- (a) Structural isomers
- (b) Chain isomers

Sol. (a) Structural isomers:

The difference in properties due to difference in their structures are known as Structural isomers.

(b) Chain isomers:

The structural isomers which differ in chain of carbon atoms are known as chain isomers.

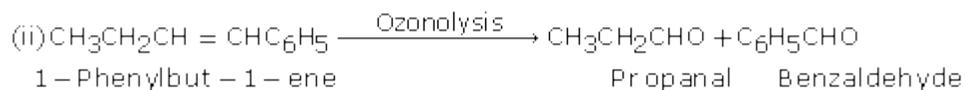
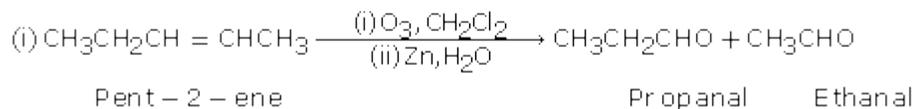
Q13. Write the IUPAC names of the products obtained by the ozonolysis of the following compounds:

(i) Pent-2-ene

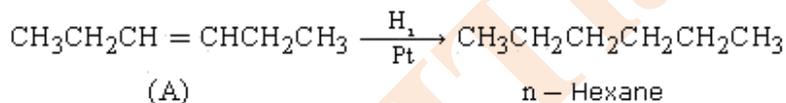
(ii) 1-

Phenylbut-1-ene

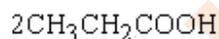
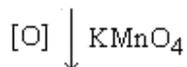
Sol.



Q14. The hydrocarbon 'A' adds on mole of hydrogen in the presence of platinum to form n-hexane. When 'A' is oxidized vigorously with KMnO₄, a single carboxylic acid containing three carbon atoms is isolated. Give the structure of 'A' and explain.

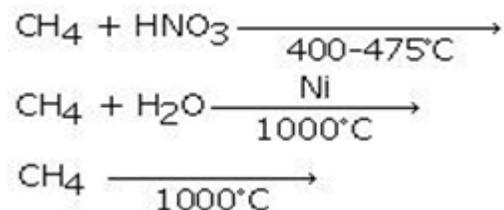


Sol.

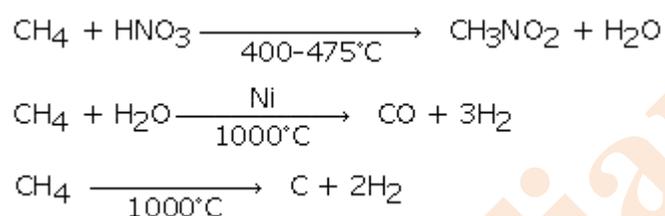


∴ A is Hex-3-ene.

Q15. Complete the following reactions:



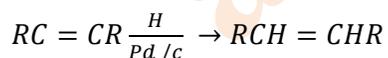
Sol.



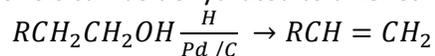
Q16. Give three methods for preparation of alkenes.

Sol. Preparation methods of alkene:

- Alkenes can be prepared when alkyl halides are dehydrohalogenated in the presence of alcoholic KOH, $\text{RCH}_2\text{CH}_2\text{X} \xrightarrow[\Delta]{\text{Alc.KOH}} \text{RCH}=\text{CH}_2$
- Alkynes can be reduced to alkenes through hydrogenation.



- Alcohols can be dehydrated to alkenes in the presence of suitable catalyst.



Q17. Account for the greater reactivity and the o, p-orientation in electrophilic substitution of biphenyl despite the electron-attracting inductive effect of the phenyl group.

Sol. In attack at the o-,p- positions the unreacted ring can stabilize the + charge on the attached C of the σ complex by electron-releasing delocalization that results in delocalizing the + charge to both rings. Such delocalization is impossible with the intermediate from meta substitution which does not have the + charge on the C bonded to the Ph substituent. The + charge cannot be incorporated into the second ring, and delocalization is confined to one ring.

Q18. What effect does the branching of an alkane has on its melting point?

Sol. Branching of an alkane decreases the melting point.

Q19. What types of isomerism is shown by alkenes?

Sol. Alkenes generally show following three types of isomerism:

- a) Position Isomerism
- b) Chain Isomerism
- c) Geometrical Isomerism

Q20. What are uses of alkynes?

Sol. Alkynes are generally used as the starting materials for the manufacture of a large number of organic compounds of industrial importance such as chloroprene, vinyl chloride etc.

Q21. What is Huckel's rule?

Sol. Huckel gave this simple rule for aromaticity. He proposed this rule for the monocyclic planar compounds. Huckel proposed that compounds with $(4n + 2)$ n electrons, where $n=0, 1, 2, 3$ etc., would have closed shells of delocalized n electrons and they must show exceptional stability.

Q22. What are polynuclear aromatic hydrocarbons?

Sol. Polynuclear aromatic hydrocarbons are a class of aromatic compounds. These compounds are widely present in crude oil, coal tar, and coal. These hydrocarbons generally exist as colorless, pale yellow or white solids.

They do not dissolve easily in water and generally do not burn.
Examples: Naphthalene, anthracene, phenanthrene, etc.

Q23. Name the two extreme type of conformation of ethane.

Sol. Staggered, Eclipsed

Q24. Trans form of alkene is:

- a) More polar than cis form
- b) Less polar than cis form
- c) Less dipole moment
- d) Both (2) and (3)

Sol. (b)
Trans form of alkene is less polar than cis form as the same groups are on opposite side thus lesser dipole moment.

Q25. Aromatic compound containing Benzene Ring are known as:

- a) Non-Benzenoids
- b) Arenes
- c) Alkynes
- d) Benzenoids

Sol. The compound containing Benzene ring is called Benzenoid.