

Question Bank

Organic Chemistry II

1. What are saturated and unsaturated hydrocarbons. Classify the following as saturated and unsaturated hydrocarbons.



Ans. Compounds of hydrogen and carbon in which all the valencies of carbon atoms in the main chain are satisfied by a single covalent bond are called saturated hydrocarbons.

Compounds of hydrogen and carbon in which there are double or triple covalent bond between two carbon atoms in the main carbon chain are called unsaturated hydrocarbons.

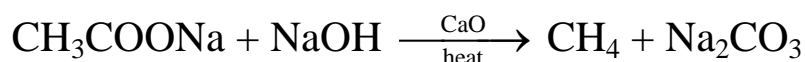
Saturated hydrocarbons : CH_4 and C_2H_6

Unsaturated hydrocarbons : C_2H_4 , C_2H_2 , C_3H_6 and C_4H_8

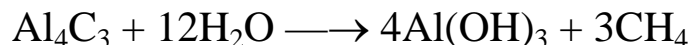
2. (a) How is methane gas prepared in the laboratory? [3]
 (b) What do you understand by the term substitution reaction? [1]
 (c) How does chlorine in excess react with methane? [4]

Ans. (a) Laboratory preparation of methane gas :

1. It is prepared by heating a mixture of soda lime and sodium acetate.

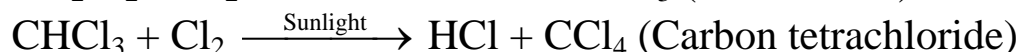
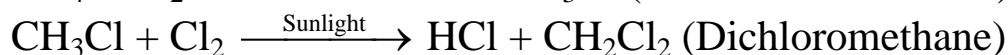
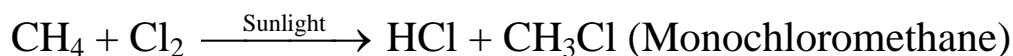


2. It is prepared by the action of water on aluminium carbide.

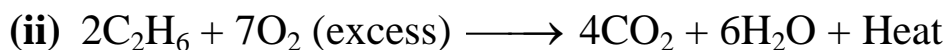
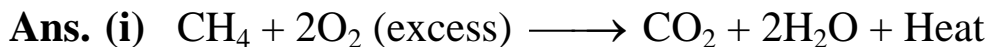


(b) A reaction in which hydrogen atoms of a hydrocarbon are replaced by more reactive elements such as chlorine, bromine, etc., is called a substitution reaction.

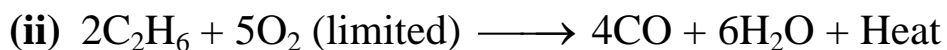
(c) **Reaction of chlorine with methane.**



3. Write chemical equations when (i) methane, (ii) ethane burns in excess of air (oxygen).

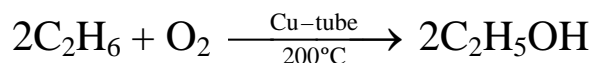
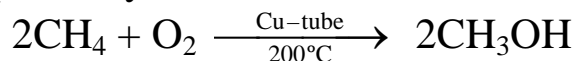


4. Write chemical equations when (i) methane, (ii) ethane is burnt in limited amount of air (oxygen).

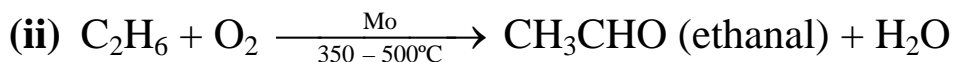
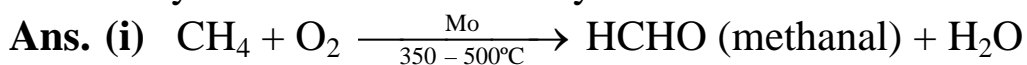


5. How is (i) methane (ii) ethane are oxidised catalytically using copper as catalyst. Write chemical equations for the reactions. [4]

Ans. When a mixture of 1 volume of methane or ethane and 9 volumes of air at a pressure of 100 atms. are passed slowly through a copper tube maintained at 200°C, they are oxidised to methanol or ethanol respectively.

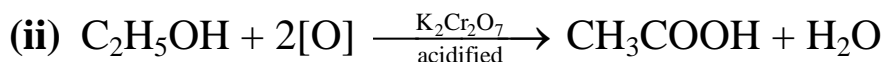
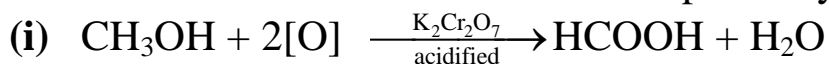


6. Write equations for the oxidation of (i) methane (ii) ethane, using molybdenum oxide as catalyst. [2]



7. Using acidified potassium dichromate as oxidising agent and stating experimental conditions, write chemical equation for the oxidation of methanol and ethanol. [4]

Ans. When methanol or ethanol under high pressure and low temperature is treated with acidified potassium dichromate, then they are oxidised to methanoic acid and ethanoic acid respectively.



8. How will you bring about the following conversions?

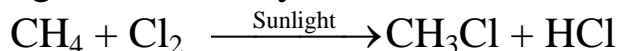
(i) Methane to methyl alcohol (ii) Methane to formic acid

(iii) Ethane to ethyl alcohol (iv) Ethane to acetaldehyde.

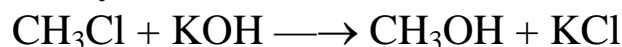
[2 each]

Ans. (i) Conversion of methane into methyl alcohol :

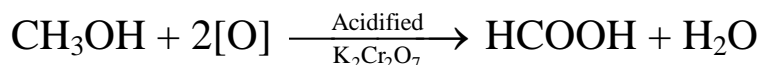
(a) When equal volumes of methane and chlorine are exposed to sunlight, then methyl chloride is formed.



(b) When methyl chloride is treated with potassium hydroxide solution, hydrolysis takes place, leading to the formation of methyl alcohol.

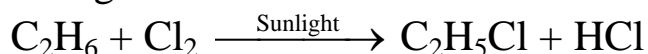


(ii) **Conversion of methane into formic acid :** First of all, methane is converted to methyl alcohol, as described above. When methyl alcohol is treated with acidified potassium dichromate solution, it is oxidised to formic acid.

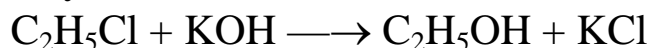


(iii) **Conversion of ethane to ethyl alcohol :**

(i) Ethane gas treated with chlorine in the presence of sunlight to form monochloro ethane.



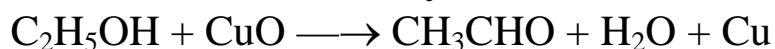
(ii) Monochloroethane is hydrolysed with KOH to form ethyl alcohol.



(iv) **Conversion of ethane into acetaldehyde :**

(i) Ethane is converted into ethyl alcohol as described above.

(ii) When the vapours of ethyl alcohol are passed over copper oxide at 300°C, then they are oxidised to acetaldehyde.



9. Give two uses of (i) methane and (ii) ethane. [2]

Ans. (i) Uses of methane :

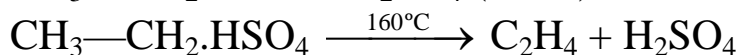
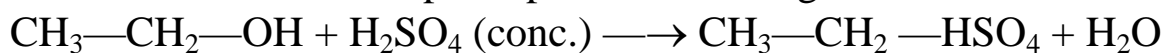
1. It is used as a household fuel. In liquefied form, it is used as a fuel for automobiles.
2. It is used in the preparation of hydrogen on industrial scale by the process of pyrolysis.
3. It is used in the manufacture of industrial compounds such as methyl alcohol, formic acid, chloroform, carbon tetrachloride, etc.

(ii) Uses of ethane :

- (i) It is used as a gaseous fuel. Liquefied ethane is used as a fuel in automobiles.
- (ii) It is used in the manufacture of hydrogen by pyrolysis.
- (iii) It is used in the manufacture of important organic compounds such as ethyl alcohol, acetaldehyde, acetic acid, etc.

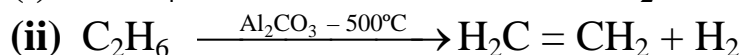
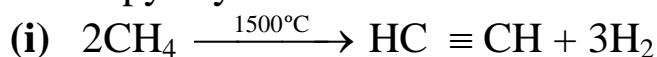
10. How will you prepare ethene gas in the laboratory? Support your answer by chemical equations. [3]

Ans. Laboratory preparation of ethene gas (ethylene gas) : It is prepared by dehydrating ethyl alcohol with conc. sulphuric acid. A mixture of one part of ethyl alcohol, two parts of conc. sulphuric acid and aluminium sulphate is heated to 160 °C, when the ethylene gas is evolved. Aluminium sulphate prevents frothing of reaction mixture.



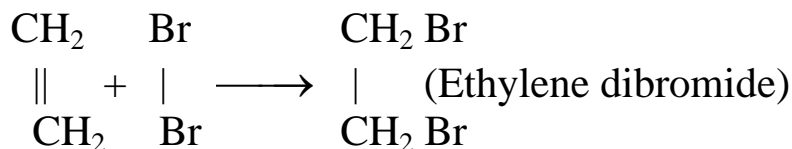
11. What do you understand by the term pyrolysis. Write chemical equations for the pyrolysis of
(i) methane (ii) ethane.

Ans. Thermal or catalytic decomposition of alkanes in the absence of air is called pyrolysis.

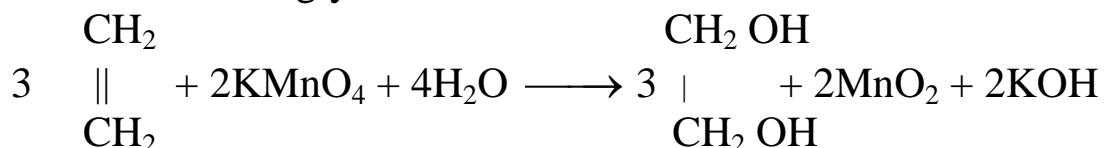


12. How does ethylene react with (i) bromine (ii) alkaline potassium permanganate (iii) HCl gas? [3]

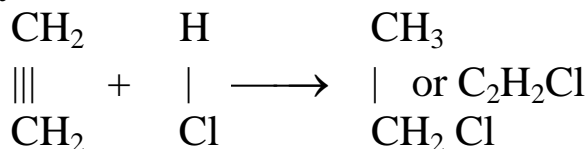
Ans. (i) Ethylene reacts with bromine to form ethylene dibromide.



(ii) Ethylene reacts with alkaline potassium permanganate solution to form glycol.



(iii) Ethylene reacts with HCl to form ethane monochloride.



13. State two uses of ethylene gas. [2]

Ans. **Uses of ethylene :**

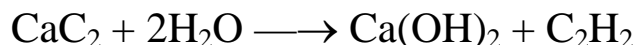
(i) It is used in the manufacture of ethyl alcohol and ethylene glycol.

(ii) It is used in the artificial ripening of fruits.

14. How is acetylene gas prepared in the laboratory? [3]

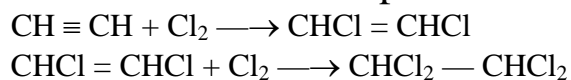
Ans. **Laboratory preparation of acetylene gas (ethyne gas) :**

When calcium carbide is treated with water, it forms calcium hydroxide, with the liberation of acetylene.

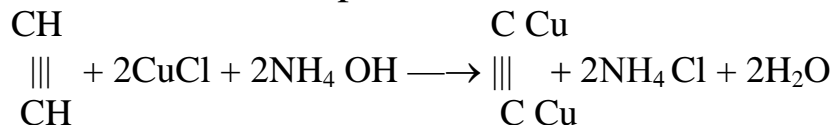


15. How does acetylene gas reacts with (i) chlorine (ii) ammonical cuprous chloride (iii) alkaline potassium permanganate? [2 each]

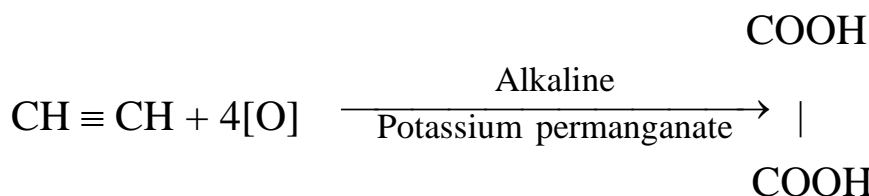
Ans. (i) It forms additive compounds with chlorine; bromine and HCl gas.



(ii) It forms reddish-brown ppt. of copper acetylide when treated with ammonical cuprous chloride solution.



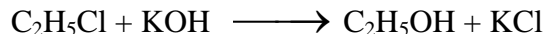
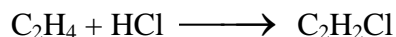
(iii) It is oxidised to oxalic acid by alkaline potassium permanganate solution.



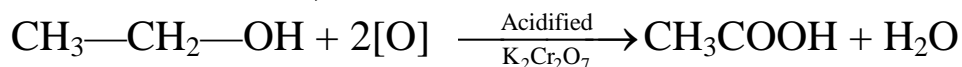
16. Starting from ethylene, how will you obtain acetic acid? [3]

Ans. Conversion of ethylene to acetic acid :

(i) Ethylene gas is mixed with HCl gas to form monochloroethane which is then hydrolysed with KOH to form ethyl alcohol.



(ii) When ethyl alcohol is treated with acidified potassium dichromate solution, it is oxidised to acetic acid.



17. How will you distinguish between alkanes, alkenes and alkynes? [3]

Ans. Distinguishing Tests for Alkanes, Alkenes and Alkynes :

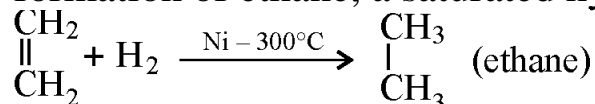
S. No.	Test	Alkanes	Alkenes	Alkynes
1.	Bromine Test. Add a few drops of sol. of bromine in carbon tetra-chloride to the hydrocarbon	No change takes place.	The red colour of bromine is decolorised.	The red colour of bromine is decolorised.
2.	Alkaline Potassium Permanganate Test. Add a few drops of alkaline pot. permanganate sol. To the hydrocarbon	No change takes place.	The purple colour of Potassium permanganate is decolorised.	The purple colour of potassium permanganate is decolorised.
3.	Ammoniacal Cuprous Chloride Test. Add a few drops of ammoniacal cuprous chloride sol. to the hydrocarbon.	No change takes place.	No change takes place.	A red ppt. of copper acetylide is formed.

18. How does ethane gas react with the following :

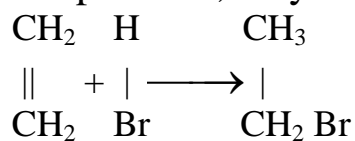
(i) Hydrogen, (ii) Halogen acid, (iii) sulphuric acid, (iv) Bromine.

Write chemical equation and experimental conditions. [8]

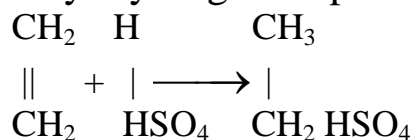
Ans. (i) When a mixture of ethene and hydrogen are passed over heated catalyst (Ni, Pd or Pt), an addition reaction takes place with the formation of ethane, a saturated hydrocarbon.



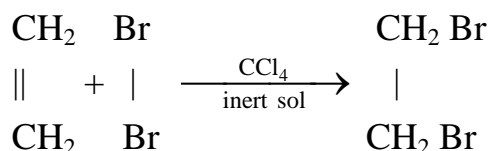
(ii) When vapours of ethene and hydrobromic acid are mixed at room temperature, they react to form addition product, bromoethane.



(iii) When ethene is passed through conc. sulphuric acid, an addition reaction takes place at room temperature with the formation of ethyl hydrogen sulphate.

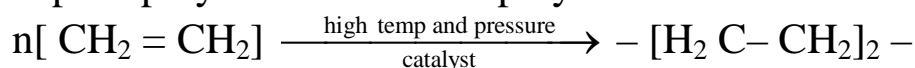


(iv) When bromine is passed through the inert solution of ethene, an addition reaction takes place with the formation of 1, 2, dibromoethane.



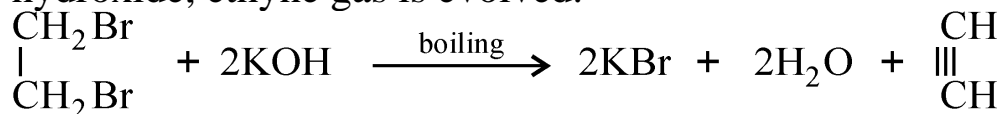
19. What do you understand by the term polymerization? Write chemical equation in support of your answer. [3]

Ans. The process by which simple organic molecules, under high temperature and pressure and in the presence of a catalyst form a large molecule, the process is called polymerization. Ethene under high temperature and pressure and in the presence of sulphuric acid vapour polymerizes to form polyethene.



20. How can you obtain ethyne gas from 1, 2 dibromoethane? Explain, why this reaction is called dehydro halogenation reaction?

Ans. When 1, 2 - dibromoethane is boiled with conc. alcoholic potassium hydroxide, ethyne gas is evolved.



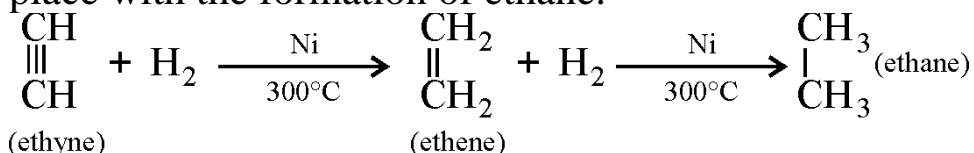
The above reaction is called dehydro halogenation reaction, because the atoms of hydrogen as well as bromine are removed from its composition.

21. How does ethyne reacts with the following.
(i) Hydrogen (ii) Bromine (iii) Hydrobromic acid
(iv) ammonical silver nitrate.

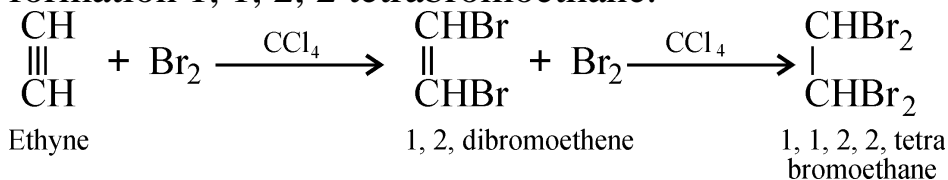
Write equations and experimental conditions.

[8]

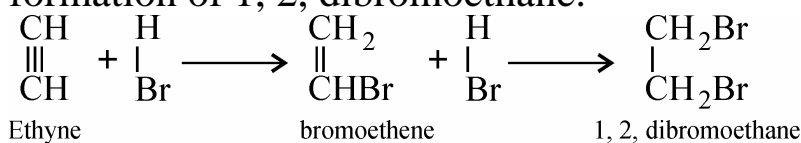
- Ans. (i)** When a mixture of ethyne and hydrogen is passed over heated catalyst [Ni, Pb or Pt], at 300°C, substitution reaction takes place with the formation of ethane.



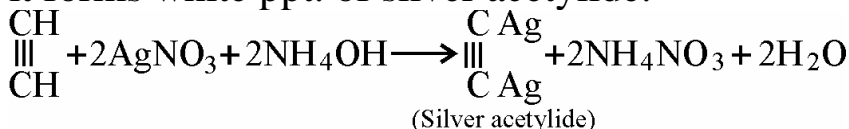
- (ii)** When bromine is passed through neutral solution of ethyne in carbon tetrachloride, addition reaction takes place with the formation 1, 1, 2, 2 tetrabromoethane.



- (iii)** When ethyne gas is passed through hydrobromic acid in the presence of sunlight, addition reaction takes place with the formation of 1, 2, dibromoethane.



- (iv)** When ethyne gas is passed through ammonical silver nitrate, it forms white ppt. of silver acetylide.



22. State four uses of acetylene gas.

Ans. (i) In the form of oxy-acetylene flame, it is used for cutting and welding purposes.

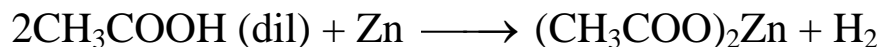
(ii) It is used in the artificial ripening of fruits.

(iii) It is used in the manufacture of important organic compounds, such as acetic acid, acetaldehyde, ethyl alcohol etc.

(iv) It is used in the manufacture of synthetic polymers [polyvinyl acetate], synthetic rubber and fibres.

23. Name the gas evolved and write chemical equations when ethanoic acid is treated with (i) Zinc metal (ii) sodium carbonate. [2 + 1]

Ans. (i) Hydrogen gas is evolved.



(ii) Carbon dioxide gas is evolved.

