Organic Chemistry

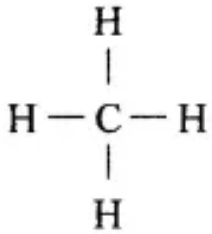
QUESTIONS
2004

Question 1.
Write the equation for the preparation of ethylene from ethyl alcohol.

Answer:
$$C_2H_5OH \xrightarrow{(Conc.\ H_2SO_4)} C_2H_4 + H_2O$$

Question 2.
State the general formula for a saturated hydrocarbon and give one example and structural formula of the same.

Answer:
General formula for a saturated hydrocarbon (alkanes): C_nH_{2n+2} Example of saturated hydrocarbons (alkanes): $C_2H_{2\times1+2}$ Or C_1H_4
Structural formula of CH_4 (Methane)



Question 3.

Name a compound which will give acetylene gas when treated with water.

Answer:
CaC_2; (calcium carbide)

2005

Question 1.
Define the term 'catenation'.

Answer:
It is the property of elements by virtue of which atoms of the element can link to each other to form chains or rings of different sizes.

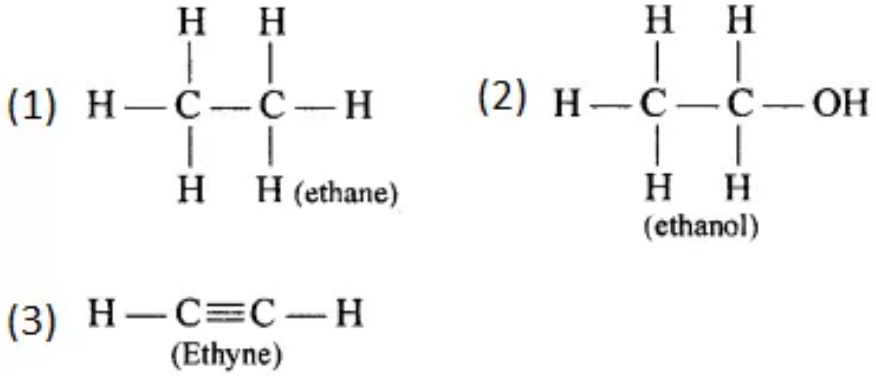
Question 2.
State the term for: – Compounds having the same general formula, and similar chemical properties.

Answer:
Homologous series.

Question 3.
Draw the structural formula of a compound with two carbon atoms in each of the following cases:

1. An alkane with a carbon to carbon single
2. An alcohol containing two carbon atoms.
3. An unsaturated hydrocarbon with a carbon to carbon triple bond

Answer:



Question 4.
Ethane, Ethene, Ethanoic acid, Ethyne, Ethanol — From the compounds, name :

1. The compound with — OH and with — COOH,
2. Homologue of homologous series with general formula $C_n H_{2n}$.

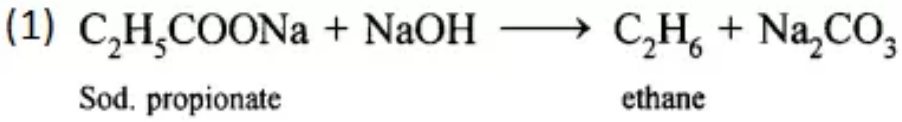
Answer:

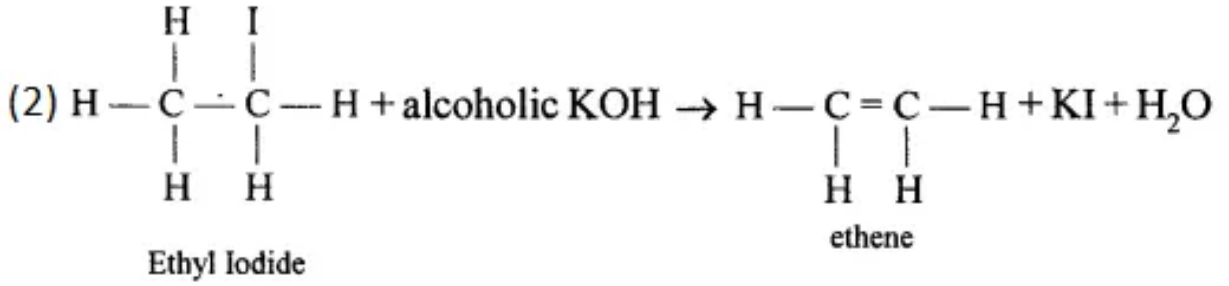
1. **Compound with — OH group:** Ethanol (C_2H_5OH)
2. **Compound with — COOH group:** Ethanoic acid (CH_3COOH)
3. **Homologue of homologous series with G.F. C_nH_{2n}:**Ethene (C_2H_4)

Question 5.
Write the equations for the following laboratory preparations:

1. Ethane from Sodium propionate.
2. Ethene from Iodoethane.
3. Ethyne from Calcium carbide.
4. Methanol from Iodomethane.

Answer:





(3) $CaC_2 + 2H_2O \rightarrow HC \equiv CH + Ca(OH)_2$

2006

Question 1.
Which one of the elements — Li, Be, B, C, O, F, Ne shows the property of catenation.

Answer:
C (carbon).

Question 2.
Write a balanced equation for:

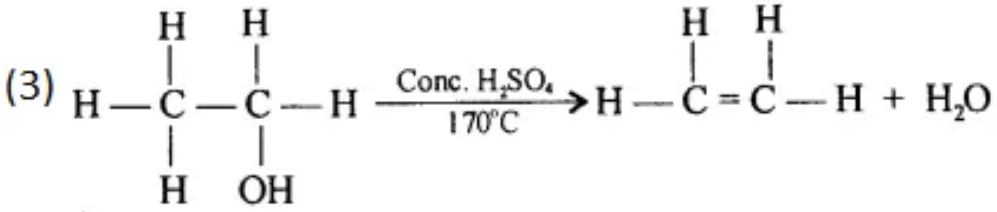
1. Reaction of ethane and oxygen in presence of molybdenum oxide.
2. Preparation of CH_4 from anhydrous sodium ethanoate (sodium acetate).
3. Reaction of heating ethanol at 170° C in the presence of cone. H_2SO_4.
4. Preparation of carbon tetrachloride from methane.

Answer:

(1) $C_2H_6 + O_2 \xrightarrow{M_oO} CH_3CHO + H_2O$

(2) $CH_3COONa + NaOH \xrightarrow[\Delta]{CaO} CH_4 + Na_2CO_3$

soda lime

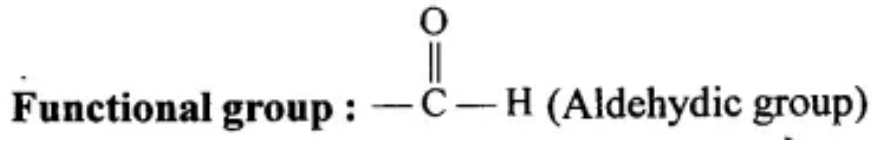


(4) $CH_4 + 4Cl_2 \xrightarrow[\Delta]{CuCl_2} CCl_4 + 4HCl$

Question 3.
Give the IUPAC name and the functional group for :

1. $CH_3 — CH_2 — CHO$
2. $H_3C — CH_2 — CH_2 — OH$

Answer:
(1) **IUPAC name:** Propanal

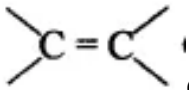


(2) **IUPAC name:** Propan-l-ol

Functional group: OH (Alcoholic group)

Question 4.
Draw the structural formula of ethyne. How does the structure of alkynes differ from that of alkenes.

Answer:
Structural formula of ethyne
H —C ≡ C —H
In alkynes there are — C ≡ C — triple covalent bonds but in alkenes there are



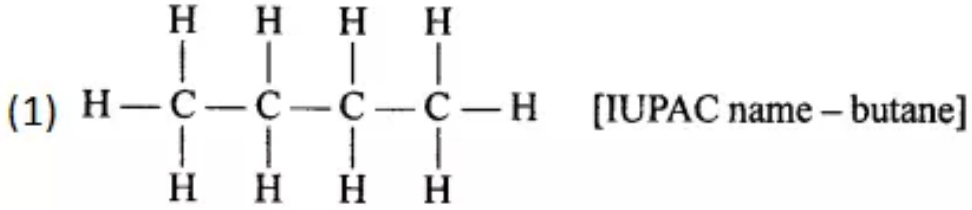
double covalent bonds.

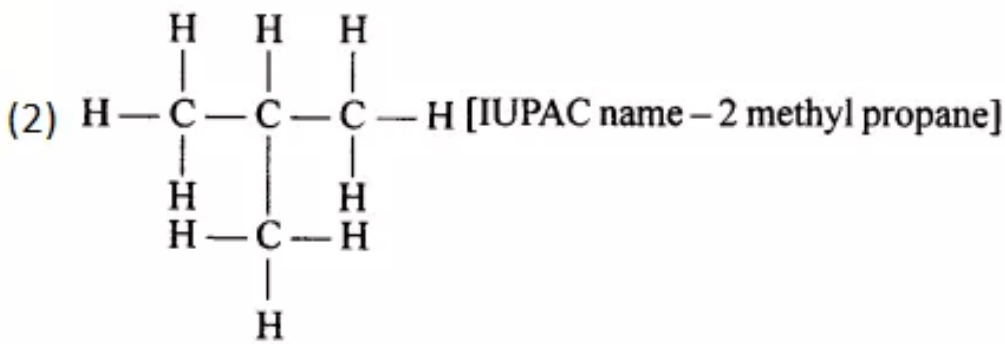
Question 5.

Fill in the blanks with the correct words:
Alkenes are the_____ (analogous / **homologous**) series of_____ (saturated / **unsaturated)** hydrocarbons. They differ from alkanes due to the presence of_____ (**double** / single) bonds. Alkenes mainly undergo_____ (**addition** / substitution) reactions.

Question 6.
Draw the structural formulae of the two isomers of Butane. Give the correct IUPAC name of each.

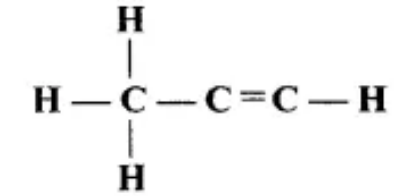
Answer:

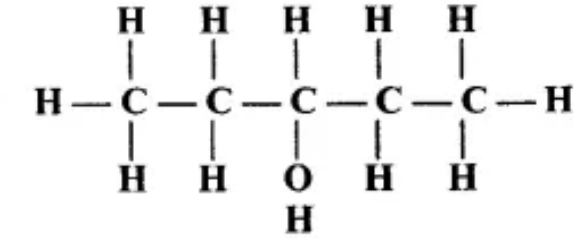


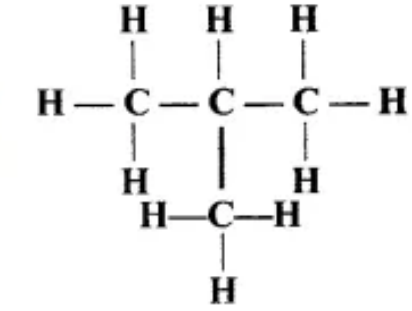


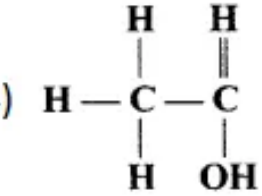
2007

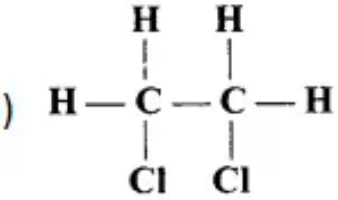
Question 1.
Give the IUPAC names of the compounds numbered (i) to (v).

(1)  [$CH_3 - C \equiv CH$]

(2) 

(3) 

(4)  [$CH_3 - COOH$]

(5) 

Answer:

1. Propyne
2. Pentan-3-ol
3. 2-Methylpropane
4. Ethanoic acid
5. 1,2-Dichloroethane

Question 2.
Copland complete the table which relates to three homologous series of

Hydrocarbons :

General Formula	C_nH_{2n}	C_nH_{2n-2}	C_nH_{2n+2}
IUPAC name – of the homologous series			
Characteristic bond type			Single bond
IUPAC name–of the first member of the series			
Type of reaction – with chlorine		Addition	

Answer:

1. Alkenes, Alkynes and Alkanes
2. Double, Triple, Single
3. Ethene, Ethyne, Methene
4. Addition Substitution

Question 3.
Name the type of reaction by which X (compound of C and Br) can be prepared from ethane.

Answer:
By substitution reactions.

2008

Question 1.
The formation of 1, 2-dibromoethape from ethene and bromine is an example of :
A. Substitution
B. Dehydration
C. Dehydrohalogenation
D. Addition

Question 1.
Name the organic compound prepared by each of the following reactions :

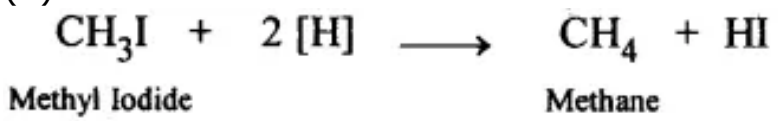
1. $C_2H_5COONa + NaOH \rightarrow$
2. $CH_3I + 2[H] \rightarrow$
3. $C_2H_5Br + KOH$ (alcoholic soln.) $\rightarrow$
4. $CaC_2 + 2H_2O \rightarrow$

Answer:
(1)

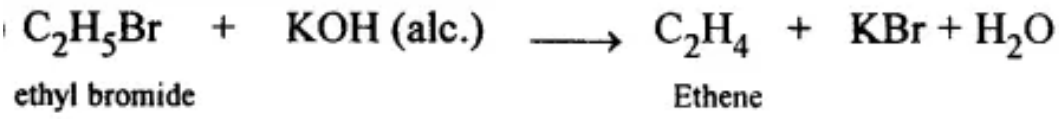
$$C_2H_5COONa + NaOH \longrightarrow C_2H_6 + Na_2CO_3$$

Sodium propanoate — Sodium hydroxide — Ethane

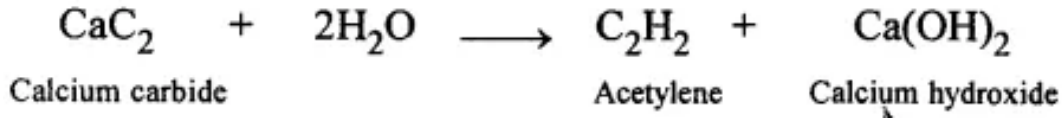
Organic compound formed is Ethane.
(2)



Organic compound formed is Methane
(3)



Organic compound formed is Ethene.
(4)



Organic compound formed is Acetylene.

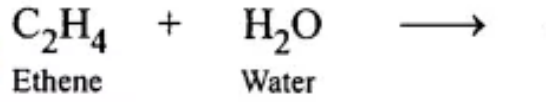
Question 3.
Write the equation for the following :

1. Calcium carbide and water
2. Ethene and water (steam)
3. Bromoethane and an aqueous solution of sodium

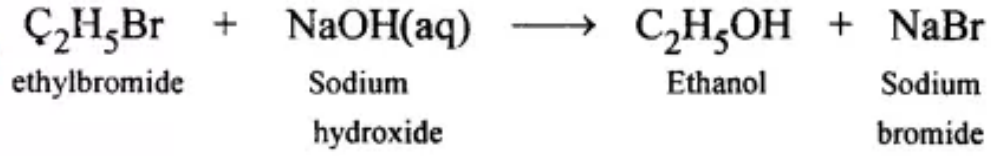
Answer:

(1)

(2)



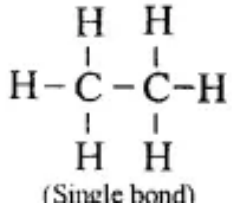
(3)

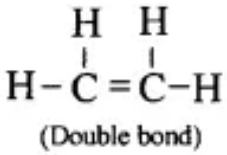


Question 4.
Distinguish between the saturated hydrocarbon ethane and the unsaturated hydrocarbon ethene by drawing their structural formulae.

Answer:

Saturated hydrocarbon (ethane)	Unsaturated hydrocarbon (ethene)


(Single bond)


(Double bond)

Question 5.
Which type of reaction i.e. addition or substitution is shown by ethane and ethene ?

Answer:
ethane→ Substitution, ethene → addition reaction

Question 6.
Write the equation for the complete combustion of ethane.

Answer:
$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O\ \Delta$

Question 7.
Name the alcohol, aldehyde and acid formed when ethane is oxidised.

Answer:
Alcohol obtained from ethane is ethyl alcohol [C_2H_5OH]. The aldehyde obtained from ethane is acetaldehyde [CH_3 CHO]. The acid obtained from ethane is acetic acid [CH_3COOH].

Question 8.
Why is pure acetic acid known as glacial acetic acid ?

Answer:
Pure acetic acid is known as glacial acetic acid because it freezes below 16.5°C to an icy mass (glacier).

Question 9.
What type of compound is formed by the reaction between acetic acid and an alcohol ?
Answer:

Ester is formed by the reaction between acid and an alcohol.

$$CH_3COOH + C_2H_3OH \xrightarrow{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$

Ethanoic acid (acid) | Ethanol (alcohol) | Ethyl ethanoate (ester)

Question 10.
By what type of reaction could a compound containing C, H and Cl – be obtained from ethyne ?

Answer:
Addition reaction

$$CH \equiv CH + Cl_2 \rightarrow \underset{\text{ethyne}}{CH = CH} + Cl_2 \longrightarrow \underset{\text{1,1,2,2 tetrachloro ethane}}{CHCl_2 - CHCl_2}$$

$$\underset{\text{1,2 dichloro ethene}}{\begin{matrix} | & | \\ Cl & Cl \end{matrix}}$$

Question 11.
State the term for the reaction in which the hydrogen of an alkane is replaced by chlorine.

Answer:
Substitution reaction.

2009

Question 1.
Which of the following statements is wrong about lkanes ?
(A) They are all saturated hydrocarbons.
(B) They can undergo addition as well as substitution reaction.
(C) They are almost non polar in nature.
(D) On complete combustion give out carbon dioxide and water.

Question 2.
Write balanced equation for : Acetic acid is warmed with ethanol in the presence of con. H_2SO_4.

Answer:

$$CH_3COOH + C_2H_5OH \xrightarrow{\text{conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$$

Question 3.
Find the odd one out in each case and explain your choice.

1. C_3H_8 ,C_5H_{10}, C_2H_6, CH_4
2. Formic acid, Nitric acid, Acetic acid, Propanoic acid.

Answer:

1. C_5H_{10} [All others are alkane, this is an alkene]
2. Nitric acid [This is the only inorganic acid rest all are organic acids]

Question 4.
Identity the substances 'S' based on the information given below:
The reddish brown liquid 'S' is dissolved in water. When ethyne gas is passed through it, ttirns colourless.

Answer:
Bromine solution

Question 5.
Fill in the blanks with the correct words from the brackets.

Generally ionic compounds exist in (i) ……. (**solid**/liquid/gas) state. Melting and boiling points of covalent compounds are generally (ii) …….. (**low**/high). The general formula for alkane is (iii)……. (C_nH_{2n} / C_n H 2n-2 t/**$C_n H_{2n+2}$**). For alkynes the geperal formula is (iv)…… (C_nH_{2n} / C_nH_{2n-2}/C_nH_{2n+2})

Question 6.
Give chemical equation for the following :

1. The laboratory preparation of methane from sodium acetate.
2. The reaction of one mole of ethene with one mole of chlorine gas.
3. The preparation of ethyne from 1, 2 – dibromoethane.

Answer:

(1) $CH_3COONa + NaOH \longrightarrow CH_4 + Na_2CO_3$
sodium acetate — sodium hydroxide — Methane sodium carbonate

(2) $CH_2=CH_2 + Cl_2 \longrightarrow CH_2(Cl)-CH_2(Cl)$
1, 2 dichloroethane

(3) $CH_2(Br)-CH_2(Br) + 2KOH(alc) \xrightarrow{\Delta} 2KBr + 2H_2O + CH \equiv CH$
Potassium Bromide — water — ethyne

Question 7.
State how the following conversions can be carried out:

1. Ethyl chloride to Ethyl alcohol.
2. Ethyl chloride to Ethene.

3. Ethene to Ethyl alcohol.
4. Ethyl alcohol to Ethene.

Answer:

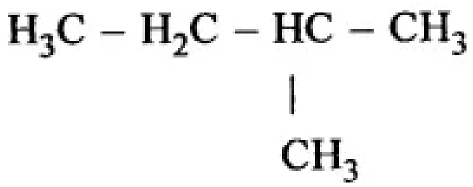
1. By treating ethyl chloride with aqueous KOH.
2. By heating ethyl chloride with alcoholic KOH.
3. By passing ethene into concentrated H_2SO_4 at 80°C and high pressure or by hydrating of ethene.
4. By heating ethyl alcohol with concentrated H_2SO_4 at 170°C.

Question 8.
Define isomerism. Give the IUPAC name of the isomer C_4H_{10} which has a branched chain.

Answer:
(1) Isomerism : Organic compounds having the same formula but different structural formulae are called isomers and this property is known as isomerism.
Example : n pentane & isopentane

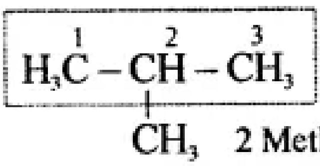
$$CH_3 - CH_2 - CH_2 - CH_2 - CH_3$$

n Pentane



Iso pentane

(2) C_4H_{10}



2 Methyl propane

2010

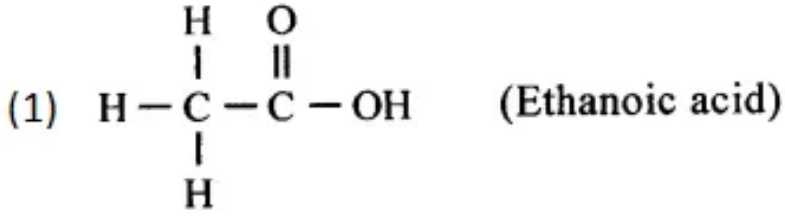
Question 1.
Select the correct answer

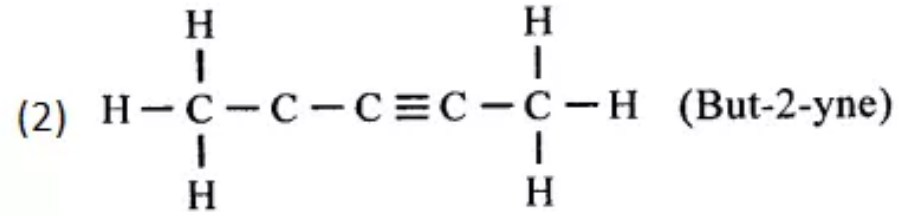
1. **The organic compound, which gives a red precipitate with ammoniacal cuprous chloride and undergoes an addition reaction –**
   (A) Ethane
   (B) Ethene
   (C) Ethyne
   (D) Ethanol
2. **The organic compound which when mixed with ethyle alcohol, [ethanol], makes it spurious.**
   (A) Methanol

(B) Methanoic acid
(C) Methanal
(D) Ethanoic acid

Question 2.
Draw the structural formula of—
1. Ethanoic acid
2. But-2-yne

Answer:





Question 3.
Compound 'X' is bubbled through bromine dissolved in CCl_4 and the product formed is $CH_2Br - CH_2Br$.

1. Draw the structural of X and state what type of reaction X has undergone.
2. State your observation for the above reaction.
3. Name the compound formed when steam reacts with A in the presence of phosphoric acid.
4. What is the procedure for converting the product of (b) (iii) back to X ?

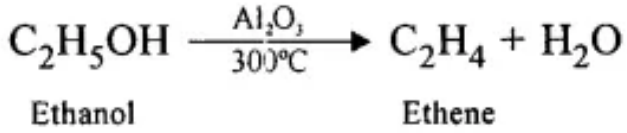
Answer:

1. $CH_2Br - CH_2Br$

The above reaction is called addition reaction,
2. The colour of bromine colour fades.

$$\underset{\text{Ethene}}{CH_2 = CH_2} + H_2O \xrightarrow[\text{acid}]{\text{Phosphoric}} \underset{\text{(Ethanol)}}{CH_3—CH_2—OH}$$

3.
4. Ethanol can be converted into ethene, by dehydrating it with cone, sulphuric acid.



2011

Question 1.
Name a gaseous hydrocarbon commonly used for welding purposes.

Answer:
Acetylene

Question 2.
Give reasons for the following –

1. almost 90% of all known compounds are organic in nature.
2. it is dangerous to burn methane in an insufficient supply of air.

Answer:

1. Because of ability of carbon to catenate i.e forms straight chain, branched chains or ring like compounds.
2. Because carbon monoxide is produced in an insufficient supply of air. This gas is extremely poisonous for human beings as it cuts off the oxygen supply by forming carboxy haemoglobin in the blood.

Question 3.
Choose the correct answer –

1. **The functional group present in acetic acid is:**
   (A) Ketonic C = O
   (B) Hydroxyl-OH
   (C) Aldehydic – CHO
   (D) Carboxyl – COOH
2. **Unsaturated hydrocarbons undergo** :
   (A) a substitution reaction
   (B) an oxidation reaction
   (C) an addition reaction
   (D) none of the above
3. **The number of C – H bonds in ethane molecule are:**
   (A) Four
   (B) Six
   (C) Eight
   (D) Ten

Question 4.
Select the correct answer the choices given :

1. The catalyst used for conversion of ethene to ethane is commonly…… [nickel/iron/cobalt]
   Ans: Nickel
2. Acetaldehyde when oxidized with acidified potassium dichromate, forms …… [ester/ethanol/ acetic acid]
   Ans: Acetic acid
3. Ethanoic acid reacts with ethanol in presence of cone. H_2SO_4, so as to form a compound and water. The chemical reaction which takes place is called……[dehydration/hydrogenation/esterification]
   Ans: Esterification

Question 5.
Write balanced chemical equations for the following :

1. Write the equation for the reaction taking place between 1, 2 – dibromoethane and ajcoholic potassium hydroxide.
2. Monochloro ethan is hydrolysed with aqueous KOH.
3. A mixture of sodalime and sodium acetate is heated.
4. Ethanol under high pressure and low temperature is treated with acidified potassium dichromate.
5. Water is added to calcium carbide.
6. Ethanol reacts with sodium at room temperature.

Answer:

(1) $CH_2(Br)\text{-}CH_2(Br) + 2\,KOH \rightarrow 2KBr + CH \equiv CH + 2H_2O$

1 , 2- dibromo ethane — Acetylene

(2) $CH_3CH_2Cl + KOH_{(aq)} \rightarrow CH_3CH_2OH + KCl$

Monochloro ethane — Ethanol

(3) $CH_3COONa + NaOH \xrightarrow{CaO} Na_2CO_3 + CH_4 \uparrow$

Sodium Ethanoate — Methane

(4) $CH_3CH_2OH \xrightarrow[K_2Cr_2O_7 / H_2SO_4]{2[O]} CH_3COOH + H_2O$

Ethanol — Ethanoic acid

(5) $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + CH \equiv CH$

Calcium carbine — Acetylene

(6) $2C_2H_5OH + 2Na \rightarrow 2\,C_2H_5ONa + H_2 \uparrow$

Ethanol — Sodium ethoxide

2012

Question 1.
State the observation : Bromine vapours are passed into a soln. of ethyne in carbon tetrachloride.

Answer:
Ethyne decolorizes the reddish brown colour of bromine solution.

Question 2.
From – Ethyne, ethanol, acetic acid, ethene, methane. Choose the one which relates to (i) to (iv).

1. An unsaturated hydrocarbon used for welding purposes.
   Ans: Ethyne
2. An organic compound whose functional group is carboxyl.
   Ans: Acetic acid
3. A hydrocarbon which on catalytic hydrogennation gives a saturated hydrocarbon.
   Ans: Ethene
4. An organic compound used as a thermometric liquid.
   Ans: Ethanol

Question 3.
(1) Why is pure acetic acid known as glacial acetic acid?
(2) Give a chemical equation for the reaction between ethyl alcohol and acetic acid.

Answer:

(1) Pure acetic acid freezes below 20°C to form a transparent solid which looks like ice and hence, it is called glacial acetic acid.

(2) $C_2H_5OH + CH_3COOH \xrightarrow{cons.H_2SO_4} CH_3COOC_2H_5 + H_2O$

Question 4.
Rewrite the correct statement with the missing word/s. Ethyl alcohol is dehydrated by sulphuric acid at a temperature of about 170°C.

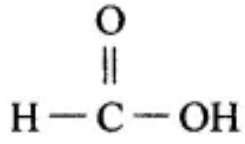
Answer:
Ethyl alcohol is dehydrated by concentrated sulphuric acid at a temperature of about 170°C.

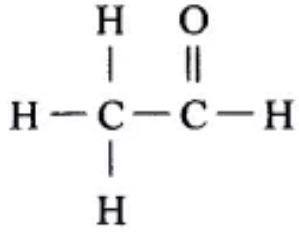
Question 5.
Give the structural formula for the following :

1. Methanoic acid
2. Ethanal
3. Ethyne
4. Acetone

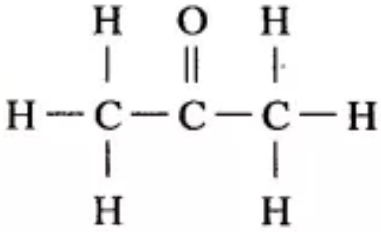
5. 2-methyl propane.

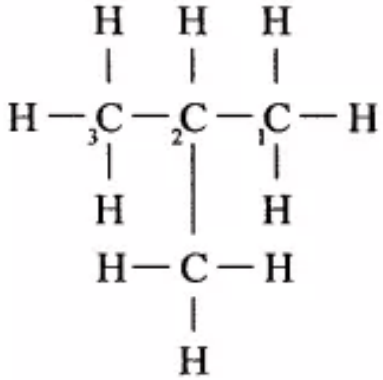
Answer:

(1)  (Methanoic acid)

(2)  (Ethanal)

(3)  (Ethyne)

(4)  (Acetone)

(5)  (2-methyl propane)

2013

Question 1.
Identify the gas evolved when : sodium propionate is heated with soda lime.

Answer:
Ethane gas

Question 2.
Give suitable chemical term for : A reaction in which hydrogen of an alkane is replaced by a halogen.

Answer:
Subsitution reaction

Question 3.
Give a chemical test to distinguish between : Ethene gas and ethane gas.

Answer:
To the given gas add few drops of bromine solution in carbon, tetra-chloride. In case of ethene gas, the reddish colour of bromine discharges. However, in case of ethane gas the reddish colour of bromine does not discharge.

Question 4.
Identify the statement that is incorrect about alkanes :
(A) They are hydrocarbons.
(B) There is single covalent bond between carbon and hydrogen
(C) They can undergo both substitution as well as addition reactions
(D) On complete combustion they produce carbon dioxide and water.

Question 5.
Give balanced equations for the laboratory preparations of:

1. A saturated hydrocarbon from iodomethane.
2. An unsaturated hydrocarbon from an alcohol.
3. An unsaturated hydrocarbon from calcium carbide.
4. An alcohol from ethyl bromide.

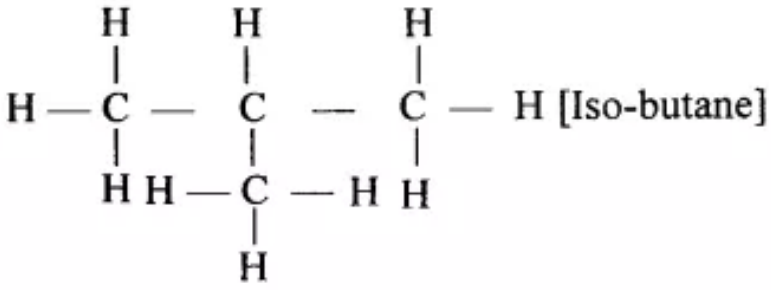
Answer:

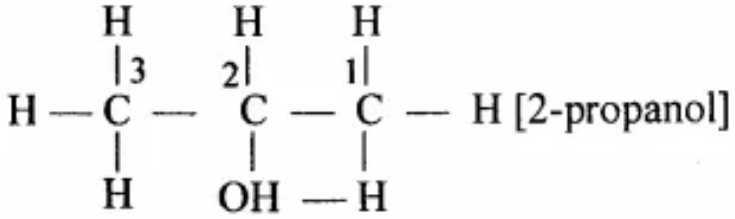
1. $CH_3I + 2H$ (from Zn/Cu couple) $\rightarrow CH_4 + HI$
2. $C_2H_5OH + H_2SO_4$ (conc) $\xrightarrow{160C} C_2H_4 + H_2SO_4.H_2O$
3. $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2$
4. $C_2H_5Br + KOH\ (aq) \rightarrow C_2H_5OH + KBr$

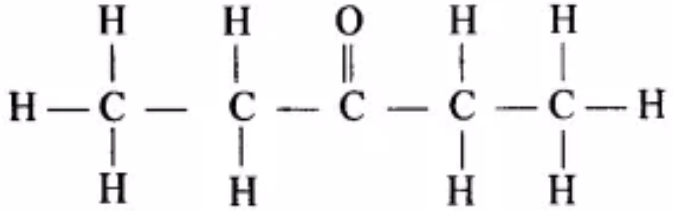
Question 6.
Give the structural formulae for :

1. An isomer of n-butane.
2. 2-propanol.
3. Diethyl ether.

Answer:

(1)  [Iso-butane]

(2)  [2-propanol]

(3)  [Di-ethyl ether]

Question 7.
Give reasons for :

1. Methane does not undergo addition reactions, but ethene does.
2. Ethyne is more reactive than ethane.
3. Hydrocarbons are excellent fuels.

Answer:

1. All the four covalent bonds between the carbon and hydrogen are fully shared. Thus the hydrogen atom can only be substituted by more reactive atoms or group of atoms. There is no scope of addition of reactive atoms in its molecule.
   However, in case of ethene there is a double bond between the two carbon atoms. These bonds are under strain and hence can be easily broken by more reactive atoms to form addition compounds which are saturated in nature.
2. Ethyne has a triple covalent bond (—C = C —) between two carbon atoms, whereas ethene has a double covalent bond (—C = C —) between the two carbon atoms. So, the strain in the bounding of ethyne is far more than ethene. This accounts of the reactivity of ethyne as its bonds break more easily than that of ethene.
3. All the constituents of hydrocarbon (carbon and hydrogen) are highly combustible and do not have any uncombustible content. So, hydrocarbons are excellent fuels.

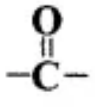
2014

Question 1.
The I.U.P.A.C. name of acetylene is,
(A) propane
(B) propyne
(C) ethene
(D) ethyne.

Question 2.
Ethanol reacts with sodium to give……(sodium ethanoate, sodium ethoxide, sodium propanoate)

Answer:
sodium ethoxide

Question 3.
Give one word or phrase for – hydrocarbons containing a

 functional group

Answer:

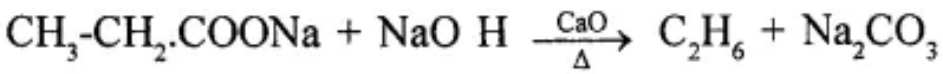
Hydrocarbons containing a  functional group → Alkan one or Ketonic functional group.

Question 4.
Write balanced equation for preparation of

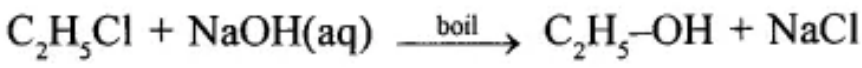
1. ethane from sodium propionate.
2. ethanol from monochloroethane and aq. sodium hydroxide.

Answer:

1. Preparation of ethane from sodium propionate.



2. Preparation of ethanol from monochloroethane and aq. sodium hydroxide.



Question 5.
Distinguish between : Ethane and ethene (using alkaline potassium permanganate solution)

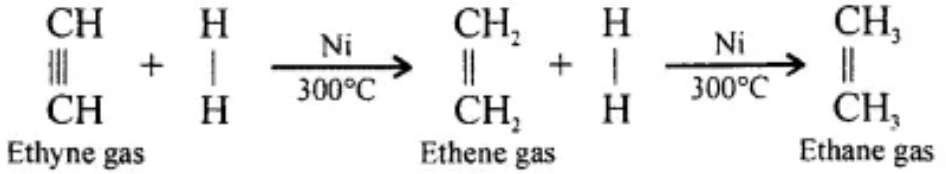
Answer:
Ethane and ethene (using alkaline $KMnO_4$)
Ethene decolourises the colour of alkaline $KMnO_4$ but ethane does not

Question 6.
State the conditions required for :

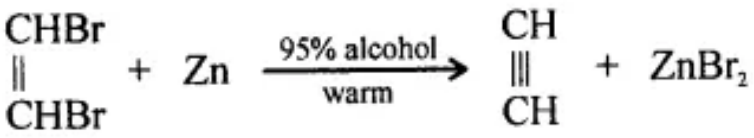
1. Catalytic hydrogenation of ethyne.
2. Preparation of ethyne from ethylene dibromide.

Answer:

(1) One volume of ethyne gas is mixed with two volumes of hydrogen gas and passed over heated nickel at 300°C, when an addition reaction takes place with the formation of ethane gas.

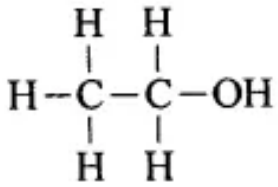


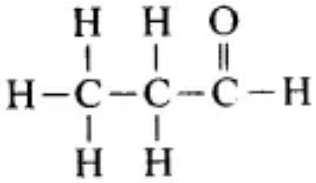
(2) Zinc dust is added to a mixture of 95% ethyl alcohol and 5% of ethylene dibromide. The mixture is gently warmed when ethyne gas is liberated.

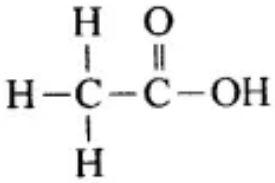


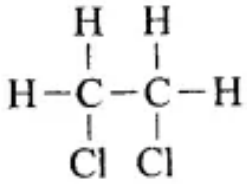
Question 7.
Write structural formula of:
(1) Ethanol
(2) 1-propanal.
(3) ethanoic acid.
(4) 1, 2, dichloroethane.

Answer:
Give the structural formula:

(1) Ethanol 

(2) 1-propanal 

(3) Ethanoic acid 

(4) 1, 2, dichloroethane 

Question 8.
Match A and B with (i) and (ii) :
A: alkynes (1) C_nH_{2n+2}
B: alkane (2) C_nH_{2n-2}

Answer:

A: alkynes (2) C_nH_{2n-2}
B: alkane (1) C_nH_{2n+2}

2015

Question 1.
Select from the list — Ammonia, ethane, hydrogen chloride, hydrogen sulphide, ethyne

1. The gas is used for welding purposes.
   Ans: Ethyne
2. This gas is also a saturated hydrocarbon.
   Ans: Ethane

Question 2.

State which of the following statements does not describe the property of alkenes :
(A) They are unsaturated hydrocarbons
(B) They decolourise bromine water

(C) They can undergo addition as well as substitution reactions
(D) They undergo combustion with oxygen forming carbon dioxide and water.

Ans. (C) They can undergo addition and substitution reactions. Alkenes do not undergo substitution reaction.

Question 3.
State one appropriate observation when : The gaseous product obtained by dehydration of ethyl alcohol is passed through bromine water.

Answer:
The reddish brown colour of bromine solution gets decolourised.

Question 4.
Give balanced chemical equations for the following conversions:

1. Ethanoic acid to ethyl ethanoate.
2. Calcium carbide to ethyne.
3. Sodium ethanoate to methane.

Answer:

(1) Ethanoic acid to ethyl ethanoate

(2) $CH_3COOH + C_2H_5OH \xrightarrow[\text{Warm}]{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Ethyl ethanoate

$CaC_2 + 2\,H_2O \longrightarrow Ca(OH)_2 + CH \equiv CH$

Calcium carbide — Calcium hydroxide

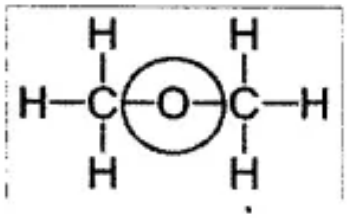
(3) $CH_3COONa + NaOH \xrightarrow[300^oC]{CaO} Na_2CO_3 + CH_4$

Methane

Question 5.
Using their structural formulae identify the functional group by circling them:
(1) Dimethyl ether.
(2) Propanone

Answer:
Dimethyl ether.

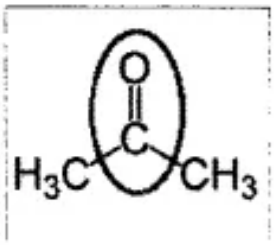
Dimethyl ether



Ether Group

Propanone

Propanone



Ketonic Group

Question 6.
Name the following :

1. Process by which ethane is obtained from ethene.
2. A hydrocarbon which contributes towards the greenhouse
3. Distinctive reaction that takes place when ethanol is treated with acetic acid.
4. The property of element by virtue of which atoms of the element can link to each other in the form of a long chain or ring structure.
5. Reaction when an alkyl halide is treated with alcoholic potassium hydroxide.

Answer:

1. Hydrogenation (addition)
2. Methane
3. Esterification
4. Catenation
5. Dehydrohalogenation

2016

Question 1.
Fill in the blanks : Conversion of ethene to ethane is an example of…… (hydration / hydrogenation).

Answer:
Conversion of ethene to ethane is an example of hydrogenation.

Question 2.
Write balanced chemical equations for : Preparation of ethanol from ethyl chloride.

Answer:
$C_2H_5C1 + NaOH(aq)\ C_2H_5OH + NaCl$

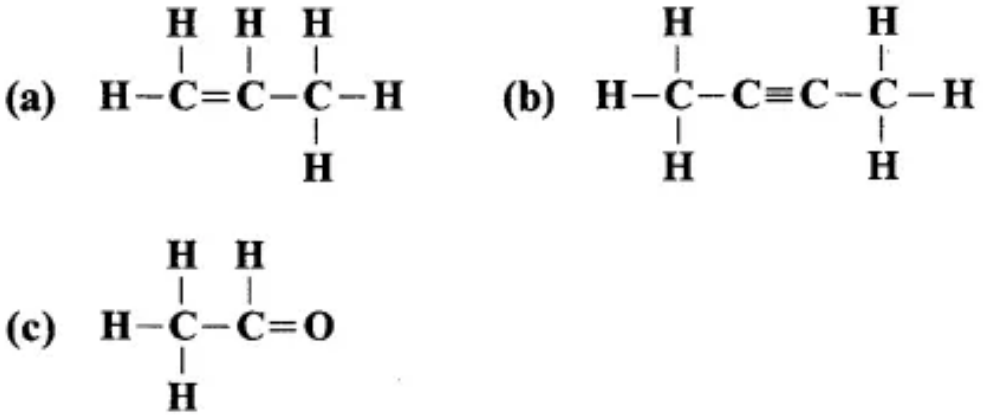
Question 3.
Identify the term/substance in each of the following :

1. The catalyst used in the conversion of ethyne to ethane.
2. The type of reactions alkenes undergo.

Answer:

1. Nickel or platinum or palladium.
2. Addition reactions.

Question 4.
Write the IUPAC names of:



Answer:
(a) Propene
(b) 2-butyne
(c) ethanal

Question 5.
Write a balanced chemical for :

1. Burning of ethane in plentiful supply of air.
2. Action of water on calcium carbide.
3. Heating of Ethanol at 170°C in the presence of cone, sulphuric acid.

Answer:

(1) $C_2H_6 + 7/2\ O_2 \rightarrow 2CO_2 + 3H_2O$
$2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$

(2) $CaC_2 + 2H_2O \rightarrow Ca(OH)_2 + C_2H_2\uparrow$

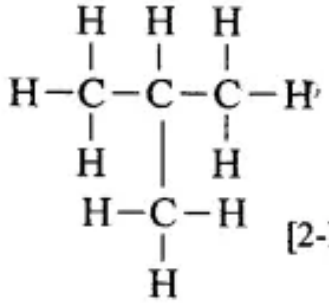
(3) $C_2H_5OH \xrightarrow{\text{Conc. } H_2SO_4} C_2H_4 + H_2O$

ethanol — ethylene

Question 6.
Give the structural formulae of:
(1) 2-methyl propane
(2) Ethanoic acid
(3) Butan – 2 – ol

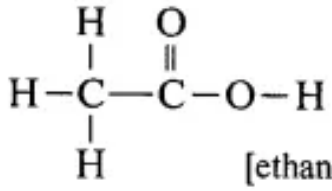
Answer:

(1)



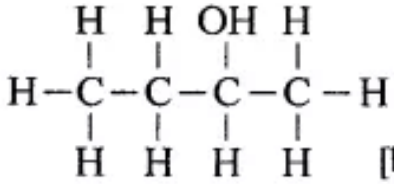
[2-Methyl propane]

(2)



[ethanoic acid]

(3)



[butan – 2 – *ol*]

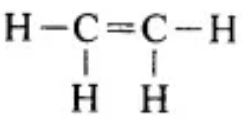
Question 7.
Compound A is bubbled through bromine dissolved in carbon tetrachioride is as follows :

$$A \xrightarrow{Br_2/CCl_4} \begin{matrix} CH_2Br \\ | \\ CH_2Br \end{matrix}$$

(1) Draw the structure if A.
(2) State your observation during this reaction.

Answer:

(1)



$$CH_2 = CH_2 + Br_2 \xrightarrow{CCl_4} \underset{\text{Br}}{CH_2} - \underset{\text{Br}}{CH_2}$$

(Orangish red) — 1, 2 dibromo ethane (colourless)

(2) Bromine water turns colourless.

2017

Question 1.
Fill in the blanks from the choices given in brackets – The compound formed when ethene reacts with hydrogen is…….. [CH4, C2H6, C3H8]

Answer:
The compound formed when ethene reacts with hydrogen is **C_2H_6.**

Question 2.
Choose the correct answer from the options given – If the molecular formula of an organic compound is $C_{10}H_{18}$ it is –
(A) Alkene
(B) Alkane
(C) Alkyne
(D) Not a hydrocarbon

Question 3..
Identify the substance underlined – An organic compound containing – COOH functional group.

Answer:
Ethanoic acid [CH_3—COOH]

Question 4.
Write the balanced chemical equation for – Preparation of methane from iodomethane

$$CH_3I + 2(H) \xrightarrow{Zn/Cu\ couple} CH_4 + HI$$

Question 5.
Identify the term or substance based on the descriptions given below:

1. Ice like crystals formed on cooling an organic acid sufficiently.
2. Hydrocarbon containing a triple bond used for welding purpose.
3. The property by virtue of which the compound has the same molecular formula but different structural formulae.
4. The compound formed where two alkyl groups are linked by $-\overset{\overset{O}{\|}}{C}-$ group.

Answer:

1. Glacial acetic acid
2. Ethyne or acetylene
3. Isomerism
4. Ketone or Alkanone

Question 6.
Give a balanced chemical equation for each of the following –

1. Preparation of ethane from sodium propionate.
2. Action of alcoholic KOH on bromoethane.

Ans:

1. $C_2H_5COONa + NaOH \rightarrow C_2H_6 + Na_2CO_3$
2. $CH_3Br + KOH \rightarrow CH_3OH + KBr$

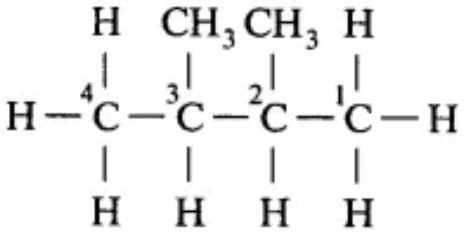
Question 7.
State one relevant observation for the following reaction – Addition of ethyl alcohol to acetic acid in the presence of concentrated sulphuric acid.

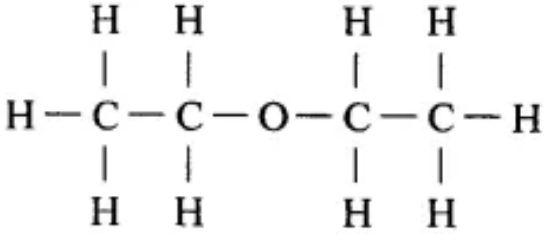
Answer:
On warming the mixture gives fruity smell.

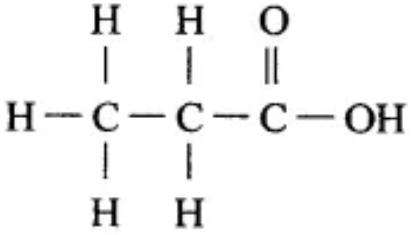
Question 8.
Draw' the structure formula for each of the following –

1. 2, 3 – dimethyl butane
2. Diethyl ether
3. Propanoic acid

Answer:

(1)

[2, 3 dimethyl butane]

(2)

[Diethyl ether]

(3)

[Propanoic acid]

ADDITIONAL QUESTIONS

Question 1.
Explain the term 'Organic Chemistry '. State the 'Natural sources ' and 'Importance' of organic compounds.

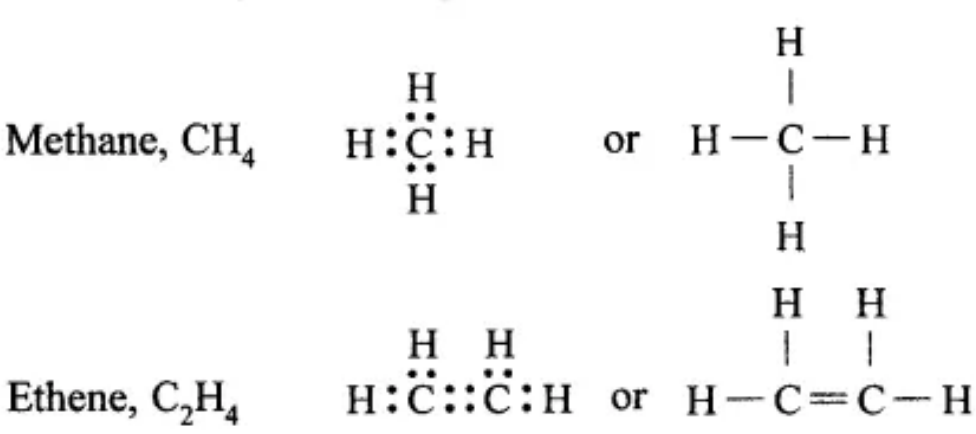
Answer:

1. Organic Chemistry-It is the chemistry of specific carbon compounds except – oxides, carbonates, bicarbonates and metallic carbides.
2. Plants, Animals, Petroleum, dyes and drugs are all natural sources.
3. Compounds of organic origin are : Food – carbohydrates, vitamins Dyes-azodyes Clothing – cotton, silk and wool Fuels – petrol Medicines – penicillin Explosives – trinitrotoluene.

Question 2.
Explain the 'unique nature of carbon atom' with specific reference and meaning to —
(a) 'Tetravalency' — leading to formation of single, double and triple bonds
(b) 'Catenation' — leading to formation of straight chain, branch chain and cyclic compounds.

Answer:
Some unique properties shown by carbon atom are :
(a) Tetravalency
(b) Catenation
(c) Ability to form multiple bonds.

(a) Tetravalency : Atomic number of carbon is 6. Its electronic configuration is 2, 4. Therefore, it has four electrons in its valence shell. Carbon atom can neither lose nor gain electrons to complete its octet (not possible from energy point of view). Therefore, carbon atom completes its octet by sharing four electrons with other atoms, i.e., it can form four covalent bonds, called its tetracovalency.
For example:



(b) Catenation: The property by virtue of which a large number of atoms of the same element get linked together through single or multiple covalent bonds, forming straight or branched chains and rings of different sizes, is called catenation. Carbon shows catenation to the maximum extent due to strong carbon-carbon bonds and its tetracovalency.

In this process of catenation, carbon atoms form straight or branched chains and cyclic rings of various sizes and can involve single, double or triple covalent bonds.

Question 3.
State reasons for 'Justification of a separate branch' for 'Organic Chemistry.

Answer:
This is due to the following reasons:

1. The number of known organic compounds is very large as compared to the number of known inorganic compounds.
2. Organic compounds involve only a few elements (C, H, O, N, S, P, F, Cl, Br, I etc.), whereas inorganic compounds involve all the known elements.
3. Organic compounds have complex nature and have high molecular mass.
4. Organic compounds involve covalent bonds whereas inorganic compounds involve electrovalent bonds.
5. Organic compounds show isomerism whereas inorganic compounds do not show isomerism.
6. The properties of organic compounds are different from inorganic compounds.
   All these facts convince us to study organic chemistry as a separate branch of chemistry.

Question 4.
State five differences between the characteristics of organic and inorganic compounds. State how organic compounds are classified.

Answer:
(a) Characteristics of organic compounds :

1. These are made up of only a few elements C, H, O, N, S,X(C1, Br,l)
2. These involve covalent bonds.
3. These are generally gases or liquids
4. They have low melting and boiling points.
5. They are combustible.
6. They show molecular reations.
7. They show isomerism.
8. These are non-conductors of electrocity.
9. There are generally insoluble in water but soluble in organic solvents.

Characteristics of inorganic compounds :

1. These are made up of all the known elements.
2. These involve ionic bonds.
3. These are generally solids.
4. They have high melting and boiling points.
5. They are non-combustible.
6. They show ionic reactions.

7. They don't show isomerism.
8. These are generally good conductors of electricity.
9. These are generally soluble in water but insoluble in organic solvents.

(b) Classification of Organic Compounds Aliphatic – Open Chain Compounds

Hydrocarbons

[Compounds containing carbon and hydrogen only]

Saturated	**Unsaturated**
Alkanes	**Alkenes**
Methane	Ethene [C_2H_4]
Ethane [C_2H_6]	
	Alkymes
	Ethyne (C_2H_2)

Cyclic - Closed Chain Compounds

Homocyclic	**Heterocyclic**
(only C atoms)	(C, O, N, S atoms)
Aromatic	**Aromatic**
e.g., Benzene	*e.g.*, Pyridine

Question 5.
Explain the term 'Homologous series'. State the general characteristics of members of the series with special reference to molecular mass or molecular formula.

Answer:
Homologous series is a series of organic compounds, that are grouped into a smaller number of series of compound.
General Characteristics of homologous series :

1. The members of a series have same functional group.
2. Two consecutive members of a homologous series differs each other in their composition
   by – CH_2unit
   Example :
   Alcohol (-OH)
   $CH_3 – OH$, $CH_3 – CH_2 – OH$, $CH_3 – CH_2 – CH_2 – OH$
3. The members of a homologous series can be represented by same general formula.
   Example :
   Alcohol-$C_nH_{2n+1}OH$

Aldehyde — $C_nH_{2n+1|}CHO$
Carboyxlic acid — $C_nH_{2n+1}COOH$

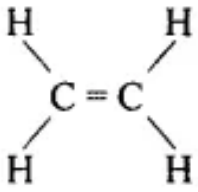
4. The members of a particular homologous series have almost same chemical properties due to presence of same functional group.
5. The physical properties (like solubility, melting point, boiling point, state) of members of a homologous series either gradually increase or decrease with increase in molecular mass.
6. The members of a homologous series can be prepared by same or common general method of preparation.
7. The first member of homologous series generally shows certain different chemical behavior than other members of the series.

Question 6.
Differentiate between — 'Molecular formula' and 'Structural formula' — of an organic compound. Write the 'condensed structural formula and 'branched structural formula' of ethene.

Answer:

Molecular formula	**Structural formula**
It shows all the atoms in a molecule or formula unit.	It shows the actual arrangement of atoms in a molecule.

The 'condensed structural formula' and 'branched structural formula' of ethene :

Molecular formula	**Condensed Structural formula**	**Branched Structural formula**
C_2H_4	C_2H_4 $(H_2C = CH_2)$	

Question 7.
State what are 'Alkyl groups '. State the alkyl group of the parent alkane — methane and ethane.

Answer:
Alkyl Group : It is obtained by removing one hydrogen atom from a molecule of an alkane.
Methane : Methyl (Alkyl group)
Ethane : Ethyl (Alkyl group)

Question 8.
State what are 'Functional groups'. Name the following functional groups —

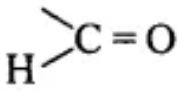
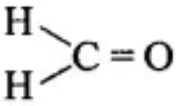
$>C=C<$; $-C\equiv C-$; $-OH$; $-CHO$; $-COOH$;

X = -F, -Cl, -Br, -I ; -C=O; -C-O-C

Answer:

Functional Groups : An atom, radical or bond which defines the structure of an organic compound and give if its characteristic properties

Functional group	Name	Example
$>C=C<$	C – C double bond	$H_2C = CH_2$ (Ethene or ethylene)
$-C\equiv C-$	C – triple bond	$HC \equiv CH$ (Ethyne or acetylene)
$-OH$	Alcoholic	$H_3C - OH$ (Methanol or methylalcohol)
$-CHO$	Aldehyde	$H - CHO$ (Methanal or formaldehyde)
$-F$	Fluoride	$H_3C - F$ (Fluoromethane or methyl flouride)
$-Cl$	Chloride	$H_3C - Cl$ (Chloromethane or methyl chloride)
$-Br$	Bromide	$H_3C - I$ (Iodomethane or methyl iodide)
$-\overset{\downarrow}{C}=O$	Ketone	$H_3C-\overset{\overset{O}{\|}}{C}-CH_3$ (Propanone or acetone)

	Aldelyde	 (Methanal or formaldenyde)
–C–O–C	Ether	$H_3C - O - CH_3$ (Methoxymethare or dimethyl ether)

Question 9.
Explain the terms — 'Isomers' and 'Isomerism'. State the 'Characteristics of isomers' with reference to —
Properties of isomers ; Number of isomers with relation to carbon atoms in the isomer.
Differentiate between — 'Chain isomerism' and 'Position isomerism ' – with suitable examples.

Answer:
Two or more compounds having the same molecular formula but different physical and chemical properties are called isomers and this phenomenon is known as isomerism.

Isomers have the same number of atoms of each element in them and the same atomic weight but differ in other properties. For example, there are two compounds with the molecular formula C_2H_6O. One is ethanol (ethyl alcohol), CH_3CH_2OH, a colorless liquid alcohol; the other is dimethyl ether, CH_3OCH_3, a colorless gaseous ether.

Alkanes with more than three carbon atoms form isomers. The various isomers differ in the framework of the carbon chains.

Differentiate between — 'Chain isomerism' and 'Position isomerism'

Chain isomers: Compounds having same molecular formula with difference in carbon chain pattern like linear or branch are called chain isomers. 1-Pentyne is chain isomer for 3-methyl Butyne.
$CH_3 – CH_2 – CH_2 – C = CH$ and $CH_3– C(CH_3) – C = CH$

Position isomers: Compounds having same molecular formula ^ with difference in position of the functional group are called position isomers. 1-Butyne and 2-Butyne are position isomers.
$CH_3– CH_2– C=CH$ and $CH_3 – C = C – CH_3$.

Question 10.
Explain the term – 'Nomenclature'. State its need with reference to organic compounds. State the basic rules of Nomenclature by the trivial system – with suitable examples. Explain the longest chain rule and the smallest number for functional groups rule of Nomenclature by the IUPAC system – with suitable examples.

Answer:

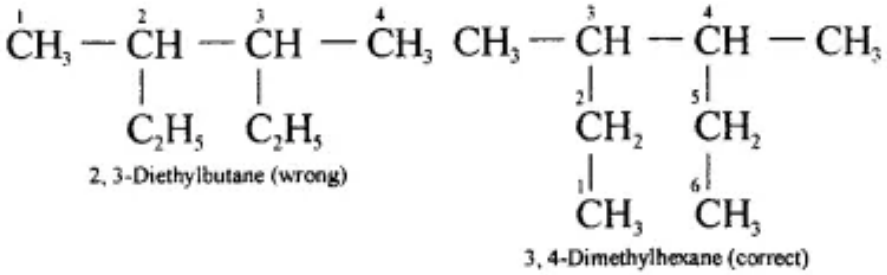
(a) Nomenclature :
Nomenclature is the system of assignment of names to organic compounds.
Need for Nomenclature : Very large number of organic compounds with varying molecular structure need a systematic method of nomenclature. Further many a times same molecular formula represents two or more compounds (isomerism).

(b) Nomenclature by Trivial System:
In this method, name of an organic compound is derived from its;

1. Source (e.g., benzoic acid is obtained by distillation from gum benzoin, fructose or fruit sugar from fruits etc).
2. Latin or Greek origin (e.g., formic acid, HCOOH is present in sting of red ants, formicus in Latin means an ant).
3. Properties (e.g., palmitic acid is an acid derived from palm oil etc).

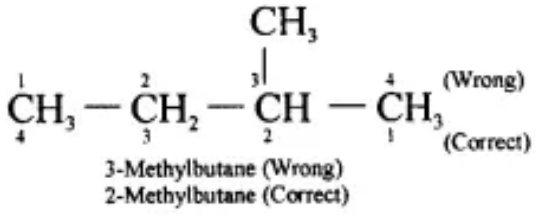
(c) Longest Chain Rule :

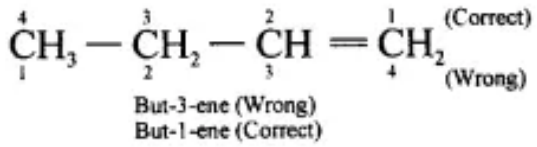
1. In the nomenclature of alkanes, the longest continuous chain if C-atoms is selected. For this, alkyl groups, if present, are written in the expanded form.
   For example,



2. Smallest Number for Substituent : Once the principal chain is selected, it is numbered in such a say that the substituent gets the lowest number.

For example,





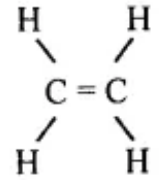
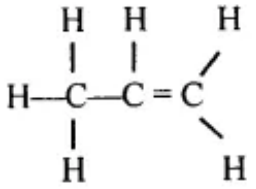
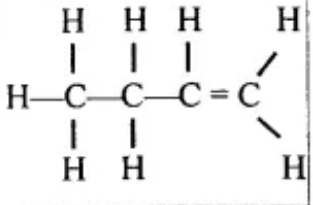
Question 11.
Explain the term – 'Hydrocarbons'. State the two main groups of hydrocarbons with examples. Draw a chart differentiating — 'Alkanes, Alkenes andAlkynes' — with respect to:

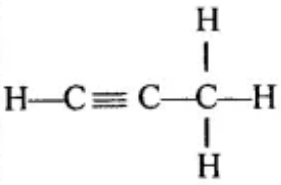
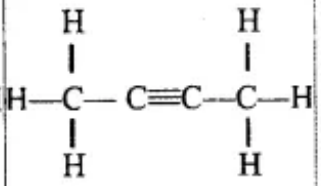
1. General formula
2. Characteristic bond
3. IUPAC and the common name of the first three members and condensed/branched/electronic structural formula of each
4. Availability of electrons
5. Reactivity
6. Characteristic reaction.

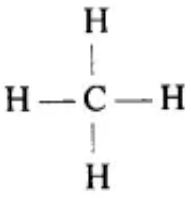
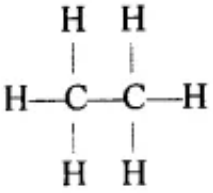
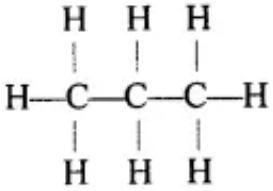
Answer:

Hydrocarbons — They are aliphatic open chain organic compounds containing carbon and hydrogen only.
Molecular formula is C_xH_y where X and Y are whole numbers.

1. Saturated hydrocarbons — Homologous series of alkanes.
2. Unsaturated hydrocarbons — Series of alkynes and alkenes.
    - **General formula :**
      Alkanes — C_nH_{2n+2}
      Alkenes — C_nH_{2n}
      Alkynes — C_nH_{2n-2}
    - **Characteristic bond**
      Alkanes → C – C < single bond
      Alkenes → C = C < double bond
      Alkynes → C = C < triple bond
    - **IUPAC Name Condensed/branched/electronic structural formula of each**

ALKENES				
C_2H_4	ETHENE	Ethylene	$H_2C = CH_2$	
C_3H_6	PROPENE	Propylene	$H_3C \cdot CH{=}CH_2$	
C_4H_8	1-BUTENE	1-Butylene	$H_3C \cdot CH_2 \cdot CH{=}CH_2$	

ALKYNES				
C_2H_2	ETHYNE	Acetylene	$HC{\equiv}CH$	
C_3H_4	PROPYNE	Methyl acetylene	$H_3C{-}C{\equiv}CH$	
C_4H_6	1-BUTYNE	Ethyl acetylene	$H_3C{-}CH_2{-}C{\equiv}CH$	

Homologous Series	IUPAC Name	Common Name	Condensed Structural formula	Branched Structural formula
ALKANES CH_4	METHANE	Methane	CH_4	
C_2H_6	ETHANE	Ethane	H_3C-CH_3	
C_3H_8	PROPANE	Propane	$H_3C-CH_2-CH_3$	

- **Availability of electrons**
  Alkanes — Not available
  Alkenes — Available Alkynes — Available
- **Reactivity**
  Alkanes — Less reactive
  Alkenes — More reactive
  Alkynes — Most reactive
- **Characteristic Reaction**
  Alkanes — Substitution reaction
  Alkenes — Addition reaction
  Alkynes — Addition reaction

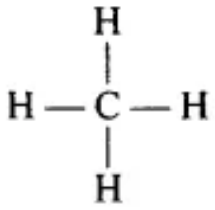
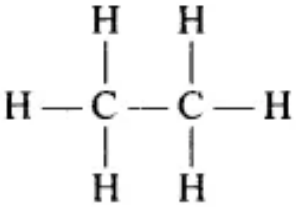
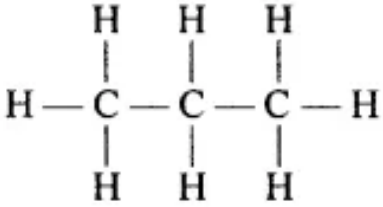
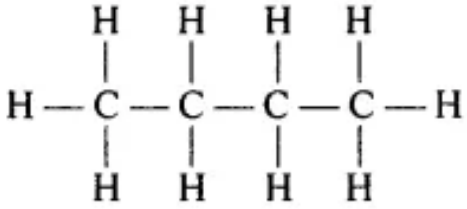
Question 12.
Draw the structural formula of each of the following :

ALKANE	ALKENE	ALKYNE
(a) Methane	(a) No corresponding alkene	(a) No corresponding alkyne
(b) Ethane	(b) Ethene	(b) Ethyne
(c) Propane	(c) Propene	(c) Propyne
(d) Butane	(d) Butene	(d) Butyne

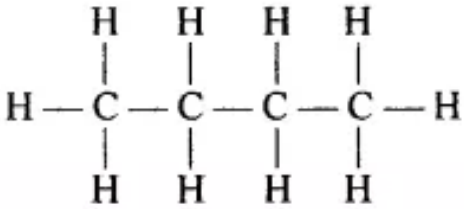
–Chain isomers	*–Position isomers*	*– Position isomers*
(i) 1-butane [*n*-butane]	(i) 1-butene (ii) 2-butene	(i) 1-butyne (ii) 2-butyne
(ii) 2-methyl propane [iso-butane]	*–Chain isomer* (i) 2-methyl prop 1-ene	
(e) Pentane	(e) Pentene	(e) Pentyne
–Chain isomers	*–Position isomers*	*– Position isomers*
(i) 1-pentane [*n*-pentane]	(i) 1-pentene	(i) 1-pentyne
(ii) 2-methyl butane [*iso-pentane*]	(ii) 2-pentene	(ii) 2-pentyne
	– Chain isomer	*– Chain isomer*
(iii) 2-2 dimethyl-propane[*neo-pentane*]	(i) 2-methyl but-1-ene	(i) 3-methyl but-1-yne
	(ii) 3-methyl but-1-ene	
ALCOHOL	ALDEHYDES	CARBOXYLIC ACIDS
(a) Methanol [*methyl alcohol*]	(a) Methanal [*formaldehyde*]	(a) Methanoic acid [*formic acid*]
(b) Ethanol [*ethyl alcohol*]	(b) Ethanal [*acetaldehyde*]	(b) Ethanoic acid [*acetic acid*]
(c) Propanol	(c) Propanal [*propionaldehyde*]	(c) Propanoic acid [*propionic acid*]
–Position isomers	(d) Butanal [*butraldehyde*]	(d) Butanoic acid [*butyric acid*]
		– Chain isomer

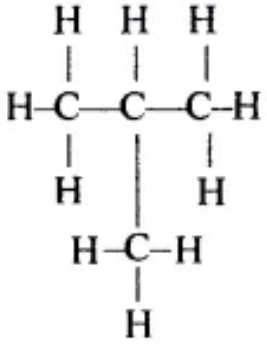
(i) 1-propanol [*n-propylalcohol*]		
(ii) 2-propanol [*iso-propylalcohol*]		(i) 2-methyl propanoic acid [*iso-butyricacid*]
(d) Butanol	KETONES	ALKYL HALIDES
–*Position isomers*	(a) Propanone [*acetone*]	(a) Monochloro methane
(i) 1-butanol	(b) 2-Butanone	(b) Bromoethane
(ii) 2-butanol	[*ethyl methyl ketone*]	[*ethyl bromide*]
–*Chair isomers*	(c) 3-Pentanone	
	[*diethyl ketone*]	(c) Iodomethane [*methyl iodide*]
(i) 2-methyl propan 1-ol		
(ii) 2-methyl propan-2-ol	ETHER	ESTER
(e) Pentanol	(a) Methoxy methane	(a) Methyl methanoate
	[*dimethyl ether*]	[*methyl formate*]
–*Position isomers*	(b) Methoxy ethane	(b) Methyl ethanoate
(i) 1-pentanol	[*ethyl methyl ether*]	[*methyl acetate*]
(ii) 2-pentanol	(c) Ethoxy ethane	(b) Ethyl ethanoate
(iii) 3-pentanol	[*diethyl ether*]	[*ethyl acetate*]

Answer:

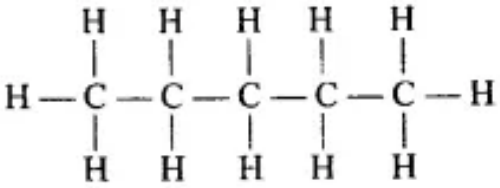
ALKANE	BRANCHED Structural formula	CONDENSED Structural formula
(a) Methane		C_4 $(H–CH_3)$
(b) Ethane		C_2H_6 $(H_3C–CH_3)$
(c) Propane		C_3H_8 $(H_3C–CH_2–CH_3)$
(d) Butane		C_4H_{10} $(H_3C–CH_2–CH_3)$

Chain isomers

(1) 1-butane  $CH_3–CH_2–CH_2–CH_3$

(2) 2-methyl propane  $(CH_3)_3–CH$

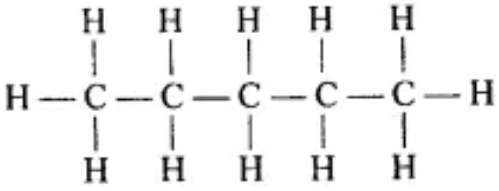
(e) Pentane



$H_3C–CH_2–CH_2–CH_2–CH_3$

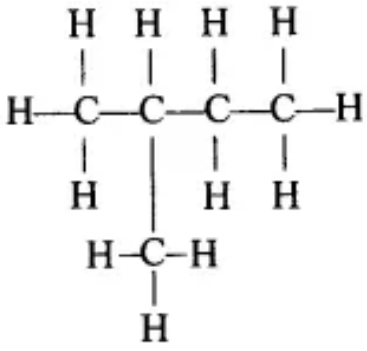
Chain isomers

(1) 1-pentane



$H_3C–CH_2–CH_2–CH_2–CH_3$

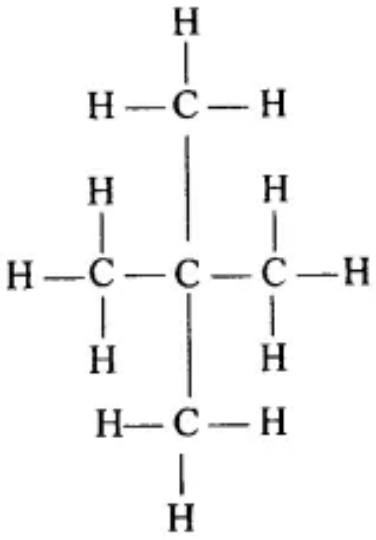
(2) 2-methyl butane

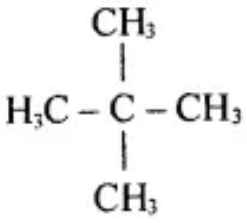


$H_3C – CH – CH_2 – CH_3$

CH_3

(3) 2-2 dimethylpropane

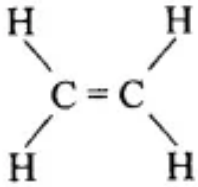




ALKENE

(a) No corresponding alkene

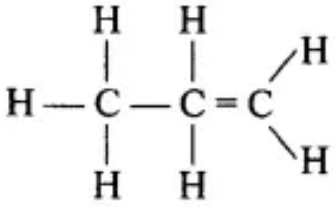
(b) Ethene



C_2H_4

$(H_2C = CH_2)$

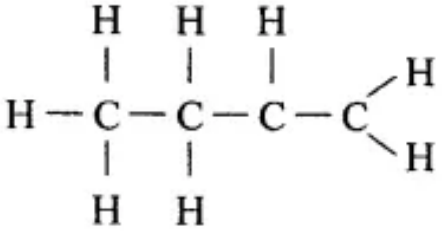
(c) Propene



C_3H_6

$(CH_3 - CH = CH_2)$

(d) Butene

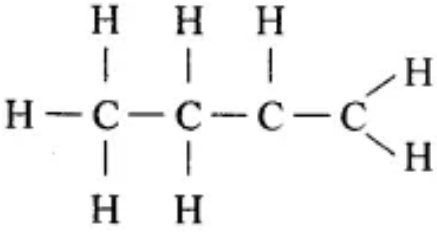


C_4H_8

$(H_3C - CH_2 - CH = CH_2)$

-Position isomers

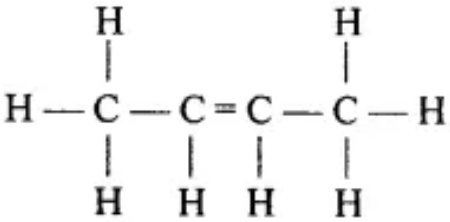
(1) 1-Butene



C_4H_8

$(H_3C - CH_2 - CH = CH_2)$

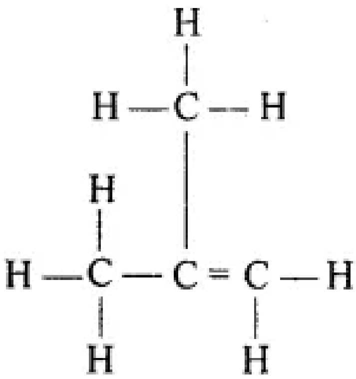
(2) 2-Butene



$H_3C–CH=CH–CH_3$

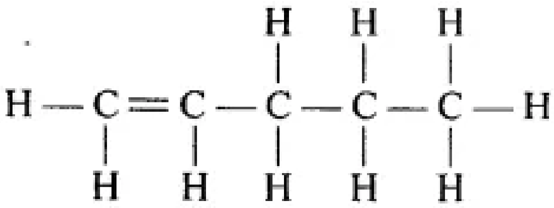
Chain Isomers

(3) 2-methyl prop-1ene



$CH_2 = C - CH_3$, with a CH_3 branch on the central C

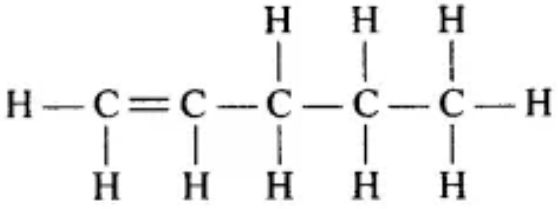
(e) Pentene



$H_2C{=}CH{-}CH_2{-}CH_2{-}CH_3$

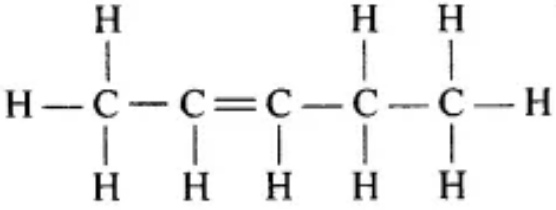
Position isomers

(1) 1-pentene



$H_2C{=}CH{-}CH_2{-}CH_2{-}CH_3$

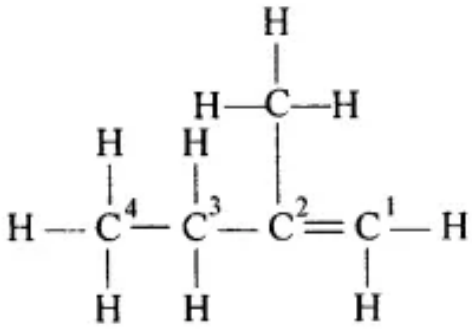
(2) 2-pentene

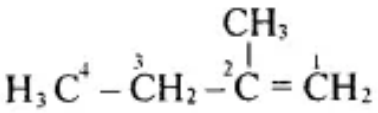


$H_3C{-}CH{=}CH{-}CH_2{-}CH_3$

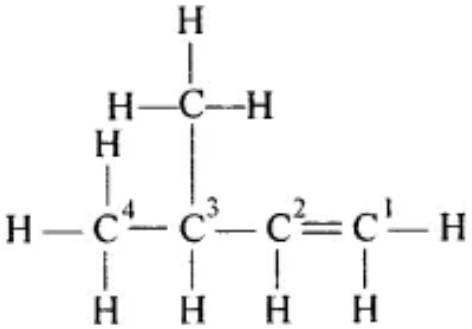
Chain isomers

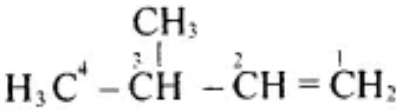
(1) 2-methyl but-1-ene





(2) 3-methyl but-1-ene

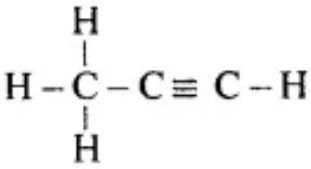




ALKYNE

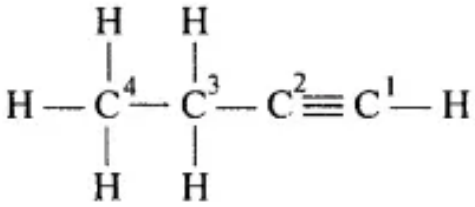
(a) No corresponding alkyne

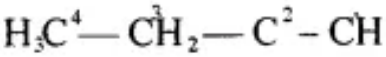
(b) Ethyne $H-C\equiv C-H$ $CH\equiv CH$

(c) Propyne  $H_3C-C\equiv C-H$

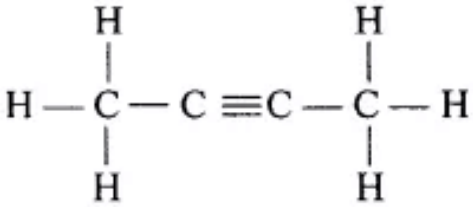
(d) Butyne — Position isomers

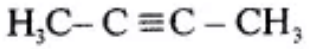
(1) 1-butyne





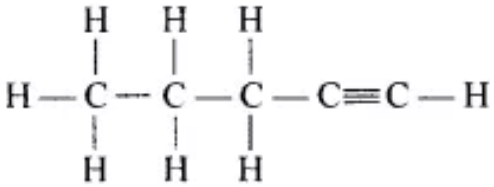
(2) 2-butyne

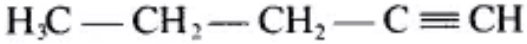




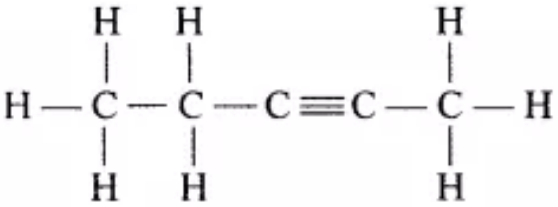
(e) Pentyne - *Position isomers*

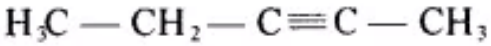
(1) 1-pentyne





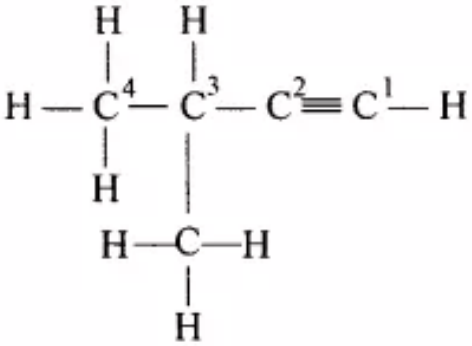
(2) 2-pentyne

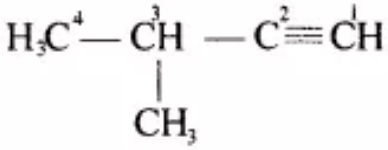




Chain isomers

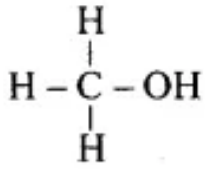
(3) 3-methyl 1but-1-yne





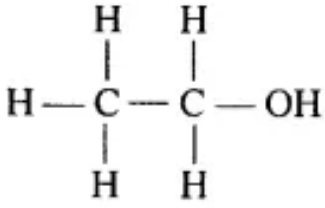
ALCOHOL

(a) Methanol



$H_3C - OH$

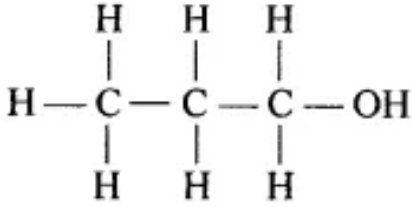
(b) Ethanol



$H_3C - CH - OH$

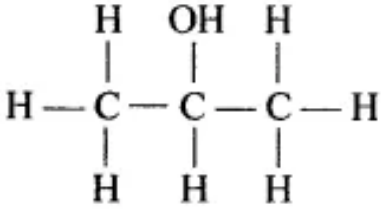
(c) Propanol - *Position isomers*

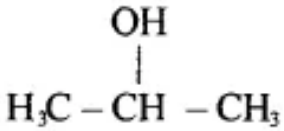
(1) 1propanol



$H_3C - CH_2 - CH_2 - OH$

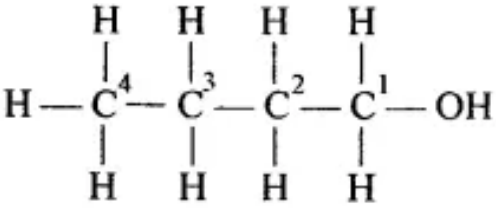
(2) 2-propanol





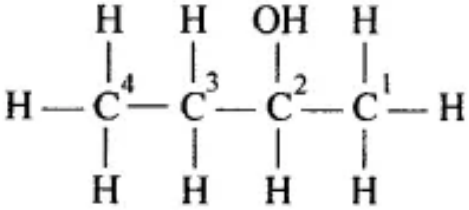
(d) Butanol - *Position isomers*

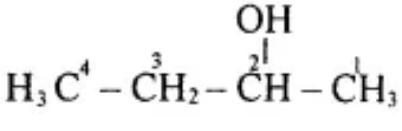
(1) 1-butanol



$H_3C^4 - \overset{3}{C}H_2 - \overset{2}{C}H_2 - \overset{1}{C}H_2 - OH$

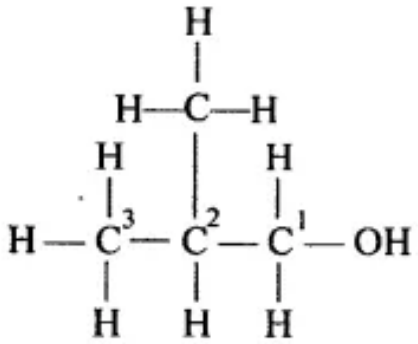
(2) 2-butanol

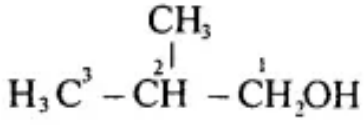




Chain isomers

(i) 2-methyl propan-1-ol



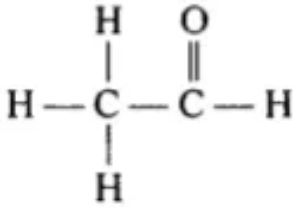


ALDEHYDES

(a) Methanol

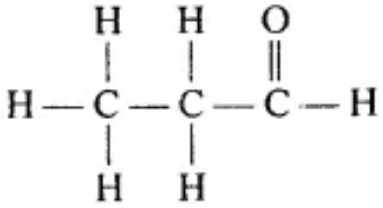
H — CH = O

(b) Ethanol



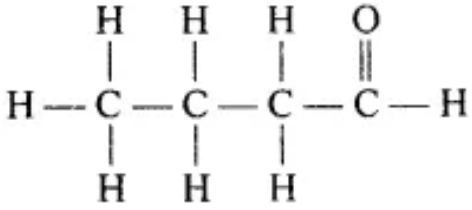
H_3C — CH = O

(c) Propanal



$H_3C-CH_2-CH=O$

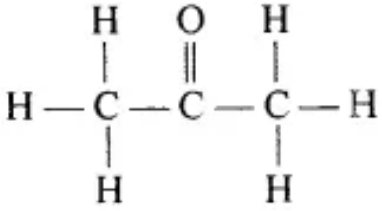
(d) Butanal

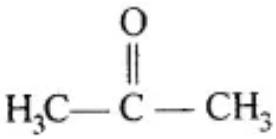


$H_3C-CH_2-CH_2-CHO$

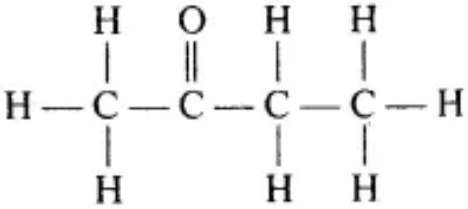
KETONES

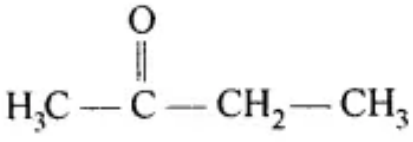
(a) Propanone



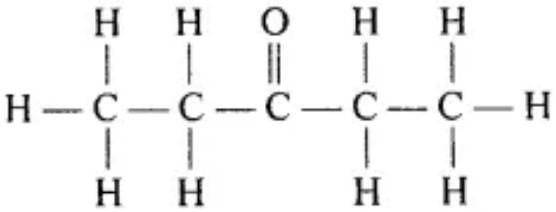


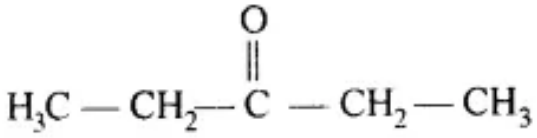
(b) 2-Butanone





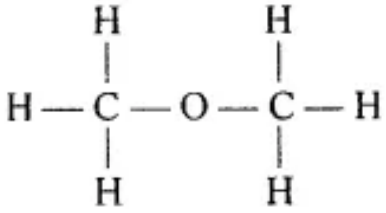
(c) 3-Pentanone





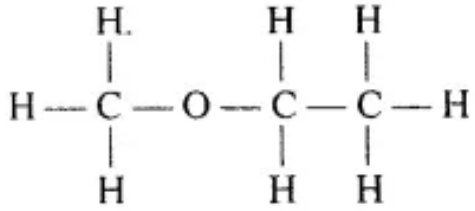
ETHER

(a) Methoxy methane



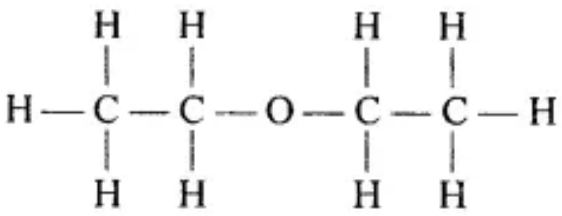
$H_3C - O - CH_3$

(b) Methoxy ethane



$H_3C - O - CH_2 - CH_3$

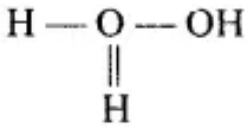
(c) Ethoxy ethane



$H_3C-CH_2-O-CH_2-CH_3$

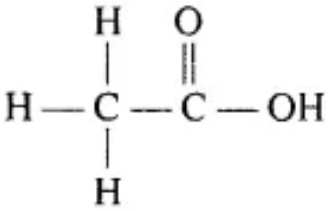
CARBOXYLIC ACIDS

(a) Methanoic acid



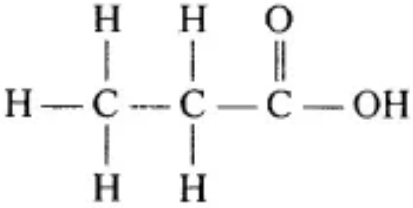
$H-COOH$

(b) Ethanoic acid



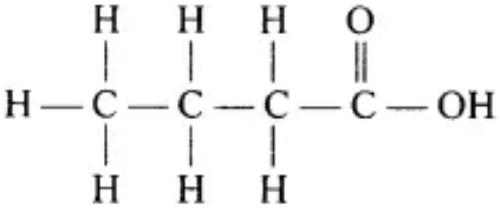
$H_3C-COOH$

(c) Propanoic acid



H_3C-CH_2-COOH

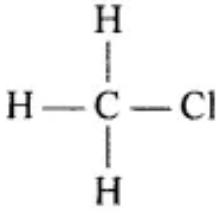
(d) Butanoic acid - *Chain isomers* — (i) 2-methyl-propanoic acid



$H_3C-CH_2-CH_2-COOH$

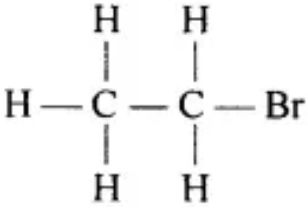
ALKYL HALIDES

(a) Monochloro methane



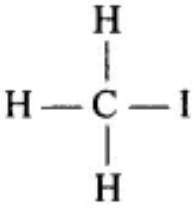
CH_3-Cl

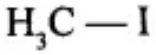
(b) Bromoethane



H_3C-CH_2-Br

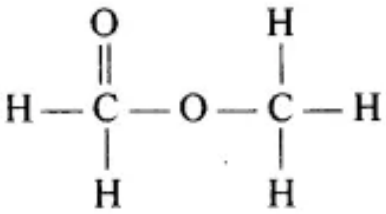
(c) Iodomethane

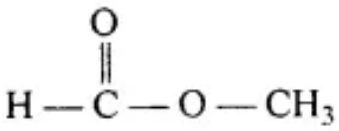




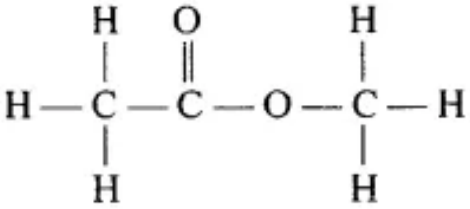
ESTER

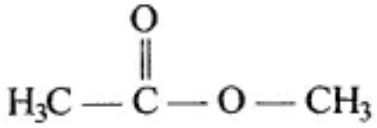
(a) Methyl methannoate



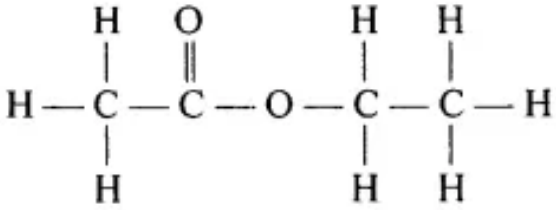


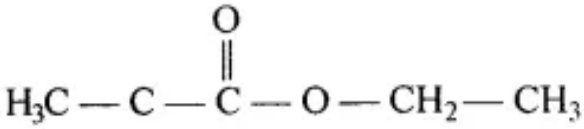
(b) Methyl ethannoate





(c) Ethyl ethannoate

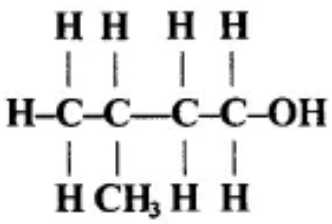




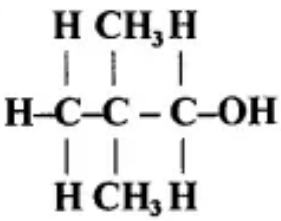
Question 13.

Give the IUPAC name of the compounds numbered (I) to (y).

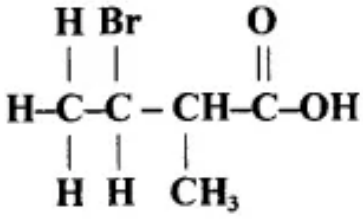
(i)



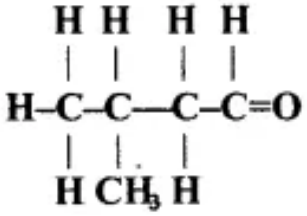
(ii)



(iii)



(iv)



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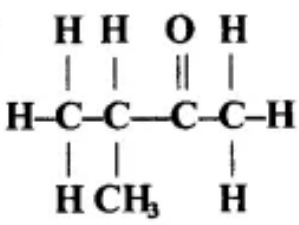


Answer:

1. Methyl butanol, 2-Methyl-1-butanol

2. 2, 2-dimethyl propanol
3. 2-Bromocyclo pentan- I -ol
4. 3-Methylbutanal
5. 3-Methyl-2-butanone

Question 14.

(a) METHANE [CH_4]	from - Sodium ethanoate [*sodium acetate*]	by - decarboxylation
(b) METHANE [CH_4]	from - Iodo methane [*methyl iodide*]	from - an alkylhalide
(c) ETHANE [C_2H_6]	from-Sodium propanoate [*sodium propionate*]	by - decarboxylation
(d) ETHANE [C_2H_6]	from-Bromo ethane [*ethyl bromide*]	from-an alkylhalide
(e) ETHENE [C_2H_4]	from-Ethanol [*ethyl alcohol*]	by - dehydration
(f) ETHENE [C_2H_4]	from-Bromoethane [*ethyle bromide*]	by-dehydrohalogenation
(g) ETHYNE [C_2H_2]	from-Calcium carbide	from-a calcium compound
(h) ETHYNE [C_2H_2]	from-1,2, dibromoethane [*ethylene dibromide*]	by-dehydrohalogenation
(i) ETHANOL [C_2H_5OH]	from-Bromo ethane [*ethyl bromide*]	by-hydrolysis of alkylhalide
(j) ETHANOL [C_2H_5OH]	from-Ethene [*ethylene*]	by-hydration of ethene
(k) ETHANOIC ACID [CH_3COOH]	from-Ethanol [*ethyl alcohol*]	by-oxidation of alcohol

Answer:

(a) $CH_3COONa + NaOH \rightarrow CH_4 + Na2CO_3$
(b) $CH_3I + 2|H| \rightarrow CH_4 + HI$
(c) $C_2H_5COONa + NaOH \rightarrow C_2H_6 + NaCO_3$
(d) $C_2H_5Br + 2(H) \rightarrow C_2H_6 + HBr$

e. $C_2H_5OH \xrightleftharpoons[170^\circ C]{\text{conc.}H_2SO_4\ (\text{excess})} CH_2 = CH_2 + H_2O$

ethanol ethene Dehydration of ethanol

Reaction with H_2SO_4 170°C

f. $C_2H_5Br + KOH \longrightarrow H-\overset{H}{\underset{|}{C}}=\overset{H}{\underset{|}{C}}-H + Br + H_2O$

g. $CaC_2 + 2HOH \longrightarrow C_2H_2 + Ca(OH)_2$

h. $C_2H_4 - Br_2 + KOH \longrightarrow \overset{CH}{\underset{CH}{\|\|}} + 2KBr + 2H_2O$

i. $C_2H_5 - Br + KOH \longrightarrow C_2H_5OH + KBr$

j. $C_2H_4 + H_2SO_4\ (conc.) \longrightarrow C_2H_5OH + SO_2$

k. $C_2H_5 - OH + O \longrightarrow CH_3COOH$

Question 15.
Give equations for the conversions of – Methane, Ethane, Ethene, Ethyne, Methanol, Ethanol and Ethanoic Acid.

Answer:

METHANE	ETHANE	
↓ to	↓ to	
(a) Carbon tetrachloride	(a) Hexachloro ethane	by – Substitution [diffused sunlight]
(b) Carbon dioxide	(b) Carbon dioxide	by – Oxidation – Complete
(c) Methanol	(c) Ethanol	by – Oxidation
↓ to	↓ to	(i) Catalytic using –
↓ Methanal	Ethanal	*catalyst copper* [*Cu*]
↓ to	↓ to	(ii) Controlled using –
Methanoic acid	Ethanoic acid	*acidified* $K_2Cr_2O_7$
(d) Methanal	(d) Ethanal	by – Oxidation - Catalytic- using *catalyst* MoO
(e) Ethyne	(e) Ethene	by – Pyrolysis [dehydrogenation]
ETHENE	**ETHYNE**	
(a) Ethane	(a) Ethane [2 steps]	by – Catalytic hydrogenation - H_2
(b) 1,2 dichloroethane	(b) 1,1,2,2 tetrachloroethane	by – Halogenation - Cl_2
(c) 1,2 dibromoethane	(c) 1,1,2,2 tetrabromoethane	- Br_2
(d) 1,2 diiodoethane	(d) 1,2 diiodoethene	- I_2

(e) Bromoethane/ Chloroethane	(e) 1,1-dibromo & 1,1-dichloro ethane	by – Halogen acids - HBr/ HCl
(f) Polyethylene		by – Polymerization
	(f) Copper or Silver Acetylide	by – Ammoniacal - $CuCl/AgNO_3$

ETHANOL [ethyl alcohol]

↓ to

(a) Carbon dioxide - by burning

(b) Ethanal

↓ to

Ethanoic acid - by oxidation using acidified $K_2Cr_2O_7$

(c) Sodium ethoxide - using - sodium

(d) Ethyl ethanoate - using - ethanoic acid and conc. H_2SO_4

(e) Ethene - using conc. H_2SO_4 at 170°C.

ETHANOIC ACID [acetic acid]

↓ to

(a) Sodium acetate - using alkali - NaOH

(b) Calcium acetate - using alkali - $Ca(OH)_2$

(c) Ammonium acetate - using alkali - NH_4OH

(d) Ethyl ethanoate - using - ethanol and conc. H_2SO_4 [ethyl acetate]

Answer:

Conversion of Methane (CH_4) to :

(a) Carbon tetrachloride

$$CH_4 + Cl_2 \xrightarrow{\text{diff.sunlight /uv/}\Delta} \underset{\text{methyl chloride}}{CH_3Cl} + HCl$$

$$\underset{\text{methyl chloride}}{CH_3Cl} + Cl_2 \rightarrow \underset{\text{dichloromethane}}{CH_2Cl_2} + HCl$$

$$CH_2Cl_2 + Cl_2 \rightarrow \underset{\text{trichloromethane}}{CHCl_3} + HCl$$

$$CHCl_3 + Cl_2 \rightarrow \underset{\text{carbon tetrachloride}}{CCl_4} + HCl$$

This reaction is a substitution reaction.

(b) Carbon dioxide (CO_2)

$$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$$

When methane is burnt in excess of air or oxygen with pale blue flame it gives carbon dioxide gas, water and heat energy. This reaction is complete oxidiation reaction.

(c) Conversion of Methane to Methanol $\xrightarrow{\text{to}}$ Methanal $\xrightarrow{\text{to}}$ Methonic acid

$$\underset{\text{methane}}{2CH_4} + O_2 \xrightarrow[473k\ 120\ atm.]{\text{Cu tube}} \underset{\text{methanol}}{2CH_3OH}\ .$$

This reaction is carried out in a copper tube. Cu acts as a catalyst. In this reaction, methane is oxidised to methanol or methyl alcohol. In this reaction, methane is heated up to a temp, of 200°C under a pressure of 120 atm.

$$CH_4 \xrightarrow[K_2Cr_2O_7/dil.H_2SO_4]{[O]} \underset{\text{methanol}}{CH_3OH} \xrightarrow[K_2Cr_2O_7/dil.H_2SO_4]{[O]} \underset{\text{methanal}}{HCHO}$$

$$\xrightarrow[K_2Cr_2O_7/dil.H_2SO_4]{[O]} \underset{\text{methanoic acid}}{HCOOH}$$

Methane can also be converted into methanol by controlled oxidation of methane in the presence of acidified K_2Cr_2O7.

$$2CH_4 + O_2 \xrightarrow[473k\ 120\ atm.]{Cu\ tube} CH_3OH$$

methane — methanol

$$CH_3OH \longrightarrow HCHO$$

$$CH_3OH \xrightarrow[K_2Cr_2O_7]{[O]} HCHO \xrightarrow[K_2Cr_2O_7]{[O]} HCOOH$$

methanal — methanoic acid

In this reaction, methane is oxidised in a copper tube methane is heated upto a tem. of 475 k under a pressure of 120 atm. Copper tube acts as a catalyst. This is carried out as catalystic oxidation.

(d) Conversion of methane to Methanal

$$CH_4 + O_2 \xrightarrow[350-500^\circ C]{MoO} HCHO + H_2O$$

methane — methanal

This reaction involves the catalytic oxidation. In this reaction, methane is heated with catalyst molybdenum oxide (MoO) it a temp, of 350 – 500°C, methanol is formed.

(e) Conversion of Methane to Ethyne (C_2H_2)

$$2CH_4 \xrightarrow{1500^\circ C} C_2H_2 + 3H_2$$

methane — ethyne

When methane is heated to about 1500°C in an electric arc and then suddenly cooled, the product is $C_2H_2$and Hydrogen.

Conversion of Ethane (C_2H_6) to
(a) Hexachloro ethane (C_2Cl_6)

$$C_2H_6 + Cl_2 \xrightarrow{diff.sunlight\ /uv/\Delta} C_2H_5Cl + HCl$$

$C_2H_4Cl_2 + Cl_2 \rightarrow C_2H_4Cl_2 + HCl$
$C_2H_4Cl_2 + Cl_2 \rightarrow C_2H_3Cl_3 + HCl$
$C_2H_3Cl_3 + Cl_2 \rightarrow C_2H_2Cl_4 + HCl$
$C_2H_2Cl_4 + Cl_2 \rightarrow C_2HCl_5 + HCl$
$C_2HCl_5 + Cl_2 \rightarrow C_2Cl_6 + HCl$
This reaction is a substitution reaction.

(b) Carbon dioxide (CO_2)

$2C_2H_6 + 7O_2$ (excess) $\rightarrow 4CO_2 + 6H_2O$

(c) Ethanol $\xrightarrow{\text{to}}$ Ethanal $\xrightarrow{\text{to}}$ Ethanoic acid

$$2C_2H_6 + O_2 \xrightarrow[200^\circ C]{\text{Cu tube}} 2C_2H_5OH$$

ethane — ethanol

$$C_2H_6 + O_2 \xrightarrow[350-500^\circ C]{MoO} CH_3CHO + H_2O$$

ethane — ethanal

$$C_2H_5OH + (O) \rightarrow CH_3CHO + H_2O$$

$$C_2H_5 + 2(O) \xrightarrow{K_2Cr_2O_7/dil.H_2SO_4} CH_3COOH + H_2O$$

(d) Ethanal (CH_3CHO)

$$C_2H_6 + O_2 \xrightarrow[350-500^\circ C]{MoO} CH_3CHO + H_2O$$

ethane — ethanal

(e) Ethene (C_2H_4)

$$C_2H_6 \xrightarrow[Al_2O_3]{500^\circ C} C_2H_4 + H_2$$

ethane — ethene

Conversion of Ethene to :

(a) Ethane (H_2C - CH_2)

H H

$$H_2C = CH_2 + H_2 \xrightarrow[300^\circ C]{\text{Nickel}} H_2C - CH_2$$ Ethane

ethene (ethylene)

H H

ethane

(b) **1,2, dichloroethane**

$$H_2C = CH_2 + Cl_2 \xrightarrow{CCl_4} H_2C - CH_2$$

ethene (ethylene)

Cl Cl

1, 2, dichloroethane

(c) **1, 2, dibromoethane**

$$H_2C = CH_2 + Br_2 \xrightarrow{CCl_4} H_2C - CH_2$$

ethene (ethylene)

Br Br (colourless)

1, 2, dibromoethane

(d) **1, 2 diiodoethane**

$$C_2H_4 + I_2 \longrightarrow C_2H_4I_2$$

1, 2 diiodoethane

(e) **Bromoethane**

$$H_2C = CH_2 + HBr_2 \xrightarrow[\text{temp.}]{\text{room}} H_2C - CH_2$$

ethene (ethylene)

H Br

Bromoethane

$$C_2H_4 + HCl \longrightarrow C_2H_5Cl$$

Chloroethane

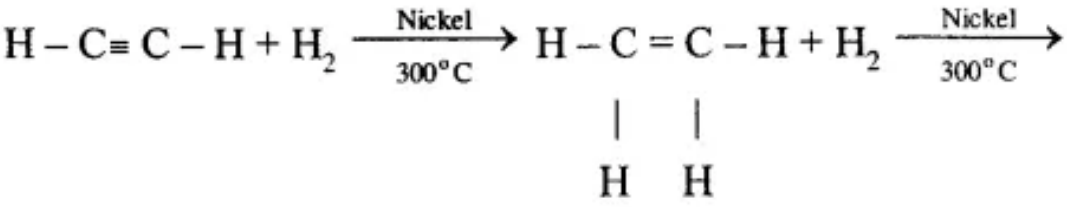
(f) **Polyethylene**

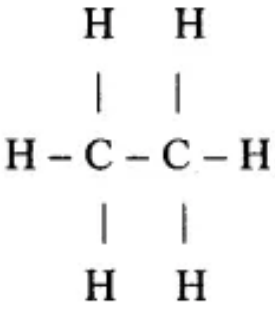
$$n\ H_2C = CH_2 \xrightarrow[\text{high presssure catalyst}]{\text{high temp.}} (H_2C - CH_2)n$$

Polyethylene

Conversion of Ethyne to :

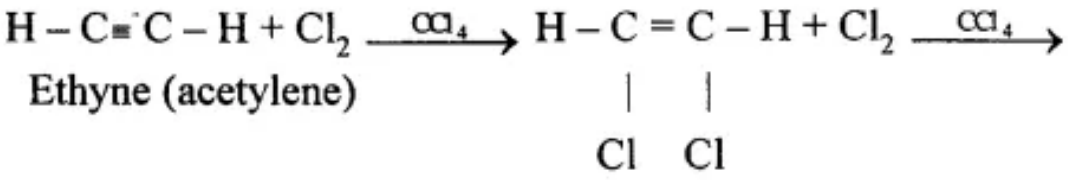
(a) Ethene

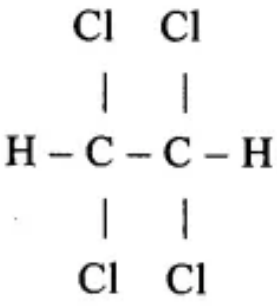




Ethane (alkane)

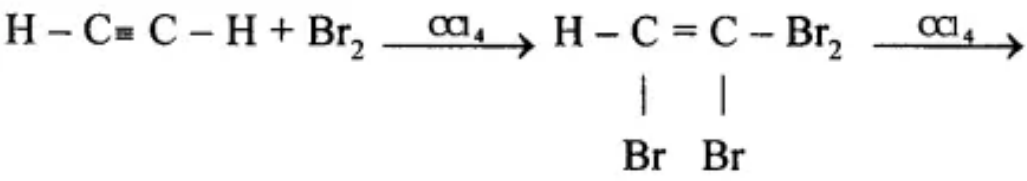
(b) 1,1,2,2, tetrachloroethane

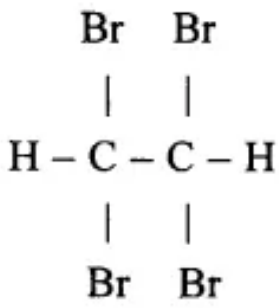




1, 1, 2, 2 tetrachloroethane

(c) 1,1,2,2 tetrabromoethane



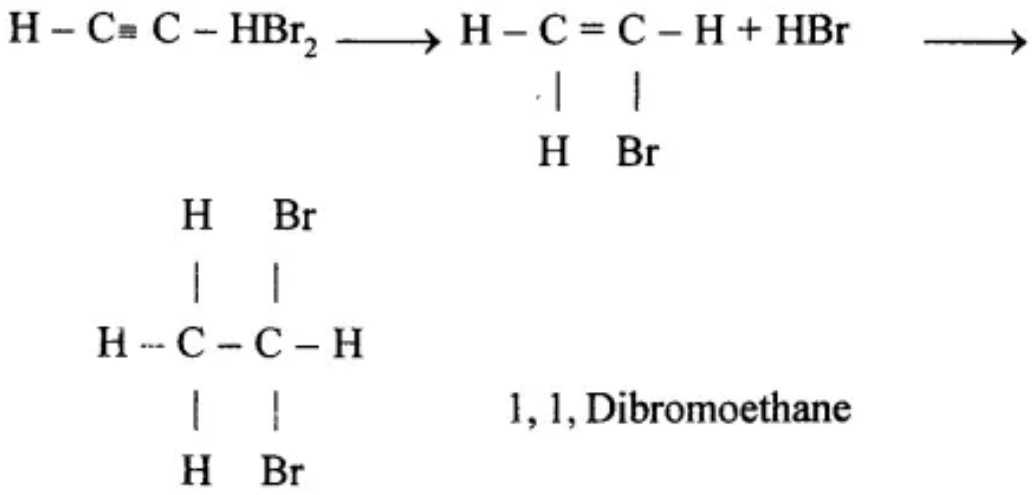


1, 1, 2, 2 tetrabromoethane

(d) 1,2 diiodoethane

$C_2H_2+I_2 \rightarrow C_2H_2I_2$ 1,2 diiodoethene

(e) 1,1,Dibromoethane



(f) Copper acetylide / Silver acetylide

$HC \equiv CH + 2CuCl + 2NH_2OH \rightarrow$
$Cu - C \equiv C - Cu + 2NH_2Cl + 2H2O$ Copper acetylide
$HC \equiv CH + 2AgNO_3 + 2NH_4OH \rightarrow$
$Ag - C = C - Ag + 2NH_2NO_4 + 2H_2O$ Silver acetylide
Conversion of Ethanol to :

(a) Carbon dioxide

$$C_2H_4 + H_2SO_4 \xrightarrow{80^\circ C} C_2H_5 - HSO_4$$

ethene conc. 30 atmos.

$$C_2H_5 - HSO_4 \xrightarrow{80^\circ C} H_2O \longrightarrow C_2H_5OH + H_2SO_4$$

ethyl hydrogen sulphate steam ethanol

$$C_2H_5OH + 3O_2 \longrightarrow 2CO_2 + 3H_2O$$

Combustion of ethanol

(b) Ethanal $\xrightarrow{to}$ Ethanoic acid

$$C_2H_5OH \xrightarrow[K_2Cr_2O_7/dil.H_2SO_4]{(O)} CH_3 - CHO \xrightarrow[K_2Cr_2O_7/dil.H_2SO_4]{(O)} CH_3-COOH$$

ethanol ethanal ethanoic acid

Oxidation of ethanol

(c) Sodium ethoxide

$$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$$

ethanol sodium sodium ethoxide Reaction with sodium

(d) **Ethyl ethanoate**

$$C_2H_5OH + CH_3COOH \underset{\text{or dry HCl gas}}{\overset{\text{conc.}H_2SO_4}{\rightleftharpoons}} CH_3 - COO - C_2H_5 + H_2O$$

ethanol — acetic acid — ethyle acetate - ester

Reaction with acetic acid

(e) **Ethene**

$$C_2H_5OH \underset{170^\circ C}{\overset{\text{conc.}H_2SO_4\ (\text{excess})}{\rightleftharpoons}} CH_2 = CH_2 + H_2O$$

ethanol — ethene — Dehydration of ethanol

Reaction with H_2SO_4 170°C

Conversion of Ethanoic Acid (Acetic Acid) to :

(a) **Sodium acetate (CH_3COONa)**

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$$

acetic acid — sod. acetate

Reaction with NaOH

(b) **Calcium acetate**

$$2CH_3COOH + Ca(OH)_2 \longrightarrow Ca(C_2H_3O_2)_2 + 2H_2O$$

acetic acid — calcium hydroxide — calcium acetate

(c) **Ammonium acetate**

$$CH_3COOH + NH_4OH \longrightarrow C_2H_3O_2NH_4 + H_2O$$

acetic acid — ammonium hydroxide — ammonium acetate

(d) **Ethyl ethanoate**

$$CH_3COOH + C_2H_5OH \underset{\text{or dry HCl gas}}{\overset{\text{conc.}H_2SO_4}{\rightleftharpoons}} CH_3COOC_2H_5 + H_2O$$

acetic acid — ethanol — ethyl acetate - ester

Question 16.
Give reasons for

1. alkanes are said to be saturated organic compounds
2. alkenes are known as olefins
3. alkenes are more reactive than alkanes
4. ethanoic acid is known as an aliphatic monocarboxylic acid.

Answer:

1. Alkanes do not undergo addition reactions and that is why they are called saturated hydrocarbons or saturated organic compounds. In alkanes all the four valencies of carbon atom are fully satisfied by forming single covalent bonds.
2. Alkenes are called olefins because alkenes on treatment with halogens form oily products. (Latin: oleum = oil, ficare = to make)
3. Due to the presence of C = C (carbon – carbon double bond) alkenes are more reactive than alkanes.
4. Ethanoic acid (CH_3 – COOH) contains only one – COOH group (carboxylic acid group) that is why it is called a monocarboxylic acid. As ethanoic acid does not contain a benzene right it is an alphatic monocarboxylic acid.

Question 17.
Explain the terms –

1. Denaturated alcohol
2. Glacial acetic acid
3. Esterification

Answer:

1. **Denaturated alcohol –** Ethyl alcohol containing pyridine or copper sulphate is termed – denaturated alcohol. It is used for – industrial applications only and hence made undrinkable.
2. **Glacial acetic acid –** Anhydrous acetic acid on cooling below 16.5°C crystallizes out in the pure form, forming a crystalline mass resembling ice. Hence pure acetic acid is called glacial acetic acid.
3. **Esterification –** It is known as condensation of an alcohol with an acid. Acetic acid on heating with an alcohol and dehydrating agent [cone. H_2SO_2] gives an ester – ethyl acetate.

Question 18.
Give a chemical test for to distinguish between

1. Ethane, ethene and ethyne
2. Ethanol and ethanoic acid.

Answer:

1. **Tests to distinguish between ethane, ethene and ethyne**
   - **Test — Br_2 water test**: Pass the gas through Br_2 water,
     Ethane : Brown colour of Br_2 water is not discharged.
     Ethene : Brown colour of Br_2 water is discharged,
     Ethyne : Brown colour of Br_2 water is discharged.
   - **Test — Baeyer's reagent : Pass the gas through** Baeyer's reagent (alkaline solution of $KMnO_4$).
     Ethane : Purple colour of Baeyer's reagent is not discharged.

Ethene : Purple colour of Baeyers reagent is discharged.
Ethyne : Purple colour of Baeyers reagent is discharged.

- **Test :** Pass the gas through ammoniacal cuprous chloride solution.
  Ethane : No ppt.
  Ethene : No ppt.
  Ethyne : Red ppt. of copper acetylide is formed.
- **Test :** Pass the gas through ammonical silver nitrate solution.
  Ethane : No ppt.
  Ethene : No ppt.
  Ethyne : White ppt. of silver acetylide is formed.

2. **Tests to distinguish between ethanol and ethanoic acid**
   1. **Test:** Add a few drops of blue litmus solution to the given liquid.
      Ethanol: No change in colour.
      Ethanoic acid : Blue litmus turns red.
   2. **Test:** Add a pinch of sodium carbonate to the given liquid. Ethanol: No action.
      Ethanoic acid : Brisk effervescence with the evolution of $C0_2$.

Question 19.
Give the main uses of –

1. Methane
2. Ethane
3. Ethene
4. Ethyne
5. Ethanol
6. Ethanoic acid.

Answer:
The main uses of:
(1) Methane and
(2) Ethane –

(a) Illuminant and domestic fuel: In the form of natural gas or gobar gas. [Hydrocarbons – have high calorific value. They are easily combustible and the reaction is exothermic – releasing heat energy. Hence they are excellent fuels]
(b) In manufacture of chemicals : Used as :

1. **Chloroform :** Solvent for rubber, waxes. As an anaesthesia.
2. **Carbon black :** A black pigment in shoe polishes, printers ink etc.
3. **Formaldehyde :** An antiseptic, preservative for biological specimens.
4. **Methanol :** Solvent for varnishes, anti-freeze for automobiles.
5. **Ethanol:** Solvent for resins, a low freezing liquid in thermometers.

(3) Ethene –

(a) Production of oxy-ethylene torch : For welding purposes and cutting metals.
(b) Ripening of green fruits : Artificial ripening and preservation of fruits.

(c) Catalytic hydrogenation: Used in hardening of oils.
(d) It is also used in manufacturing of :

1. **Synthetic chemicals :** Ethylene glycol [anti-freeze], di-ethyl ether [solvent], ethylene oxide [fumigant], mustard gas [chemical warfare],
2. **Polymers : P**olyetheylene, polyvinyl chloride [P.V.C.]- used in packaging, insulators, containers, rain coats etc.

(4) Ethyne –

(a) It is used for producing oxy-acetylene flame for welding and cutting purposes as it produces temperature as high as 3500°C.
(b) It is used as an illuminant in oxyacetylene lamp.
(c) It is used in the manufacture of solvent like westron ($C_2H_2C_{14}$) and westrosol (CHCl = CC_2).

(5) Ethanol – Main Uses of Ethanol

(a) As a solvent – For gums and resins
(b) In thermometers and spirit levels – Low freezing mobile liquid, [freezing point – 114.1°C].
(c) **In manufacture of chemicals –** Acetaldehyde [dyes], acetic acid [manufacture of vinegar], chloroform [antiseptic] diethyl ether [anaeshetic].

(6) Ethanoic acid –
Uses :

(a) It is used as a solvent for many organic reactions.
(b) It is used as vinegar for preparing pickles etc.
(c) It is used for preparing various organic compounds like acetone, acetic anhydride ester etc.
(d) It is used as cogulating agent in rubber industries.
(e) It is used for making perfumes and medicines.

UNIT TEST PAPER 8 — ORGANIC CHEMISTRY

Question 1.
Draw the branched structural formula of the following organic compounds whose IUPAC names are given below.

1. Pent-l-ene
2. But-2-yne
3. 3-methyl pentane
4. 2-methyl-prop-l-ene
5. Pentane-3-ol
6. 1, 1, 2, 2 tetrabromoethane
7. 2-methyl butan -2-ol
8. 2, 2 dimethylpropan-l-ol
9. 2, 2 dimethyl propane
10. 2-bromo-4-chloro pentane

Ans.

1. $H_3C - CH_2 - CH_2 - CH - CH_3$
2. $H_3C - C \equiv C - CH_3$
3. $H_3C - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$
4. $H_3C - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$
5. $H_3C - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CH_3$
6. $H - \underset{\displaystyle H}{\underset{|}{C}} - \underset{\displaystyle Br}{\underset{|}{C}} - H$ (H, Br above; H, Br below)
7. $H_3C - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$
8. $H_3C - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{C}} - CH_3 - OH$
9. $H_3C - \underset{\displaystyle CH_3}{\underset{|}{C}} - CH_3$

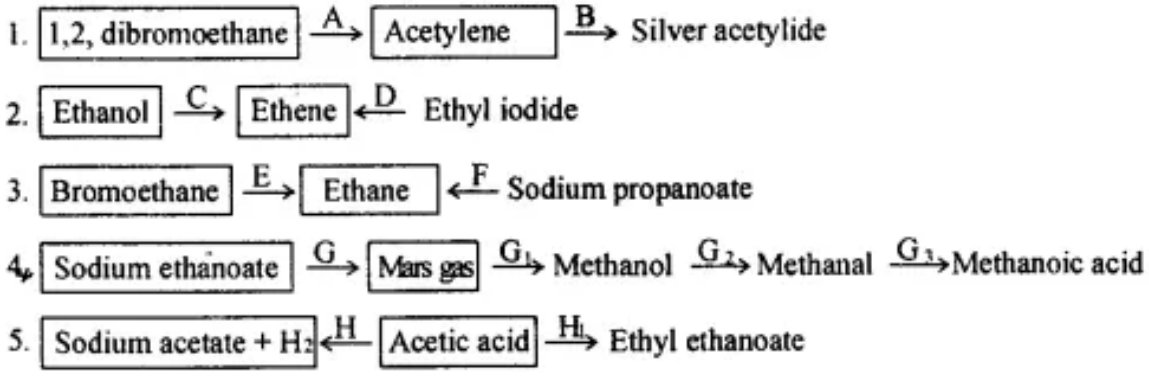
Question 2.
Select the correct answer from the choice in brackets.

1. The vapour density of the fifth member of the homologous series of alkanes. [22 / 36 / 29]
2. The isomer of pentane which has '1' C atom attached to '4' other C atoms [n – / iso- / neo-] pentane.
3. The IUPAC name of the product of reaction of ethylene with hydrogen

bromide, [ethyl bromide / bromoethane / dibromoethane]
4. The IUPAC name of methyl acetylene. [1-butyne / propyne / ethyne]
5. The functional group in ethanoic acid, [aldehydic / carboxyl / hydroxyl]
Ans:

1. 36
2. neo-pentane
3. bromoethane
4. propyne
5. carboxyl

Question 3.
Give balanced equations for the following conversions.



Answer:

1. $CH_2Br + 2KOH \longrightarrow CH \equiv CH + 2KBr + 2H_2O$

$H-C\equiv C-H + 2AgNO_3 + 2NH_4OH \xrightarrow{(B)} Ag-C\equiv C-Ag + 2NH_4NO_3 + 2H_2O$

Acetylene — Silver acetylide (white ppt.)

2. $CH_3CH_2OH \xrightarrow[170°C]{\text{Conc. } H_2SO_4} H-C(H)=C(H)-H + H_2O$

$CH_3-CH_2-I + NaOH\ (alc.) \rightarrow CH_2=CH_2 + NaI + H_2O$

Ethyl iodide — Ethene

3. $C_2H_5Br + 2[H] \xrightarrow{\text{ether}} C_2H_6 + HBr$

$CH_3-CH_2-COONa + NaOH(s) \xrightarrow[(F)]{CaO/\Delta} Na_2CO_3 + CH_3-CH_3\uparrow$

Sod. propanoate — Ethane

4. $CH_3COONa + NaOH \xrightarrow{CaO} CH_4 + Na_2CO_3$

$CH_4 + [O] \xrightarrow[\text{Oxidation } (G_1)]{K_2Cr_2O_7/H^+} CH_3OH$

Methane — Methanol

$CH_3OH + [O] \xrightarrow[(G_2)]{K_2Cr_2O_7/H^+} HCHO + 2H_2O$

Methanol — Methanal

$HCHO + [O] \xrightarrow[(G_3)]{K_2Cr_2O_7/H^+} HCOOH$

Methanol — Methanoic acid

5. $CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O$

$CH_3COOH + C_2H_5OH \xrightarrow[\text{Warm } (H_1)]{\text{Conc. } H_2SO_4} CH_3COOC_2H_5 + H_2O$

Acetic acid — Ethanol — Ethyl ethanoate

Question 4.
Select from the letters A to G the correct answer corresponding to the statements from 1 to 5 :

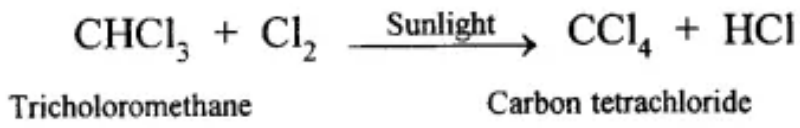
A :Ammoniacal $CuCl_2$,
B : Trichloromethane,
C : Trichloroethane,
D : Bromine soln.,

E : Aqueous KOH
F : Ethene,
G : Sodalime,
H : Ethanol,
I : Ethyne.

1. The organic compound which forms carbon tetrachloride on reaction with chlorine.
2. The reagent which can distinguish between ethene and ethyne.
3. The substance which reacts with bromoethane to give ethanol.
4. The substance which gives bromoethane on reaction with hydrogen bromide.
5. The substance which reacts with acetic acid to give $CH_3COOC_2H_5$

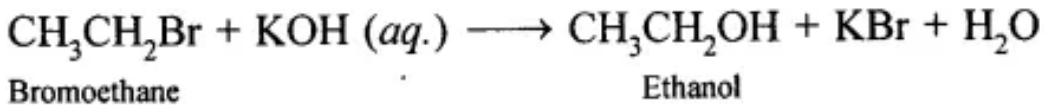
Answer:

(1) -B
Explination

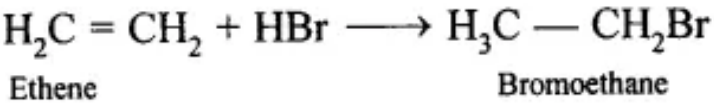


(2) – A
Explanation: [Only ethyne gives red ppt. of dicopper acetylide with ammoniacal Cu2Cl2 or CuCl]

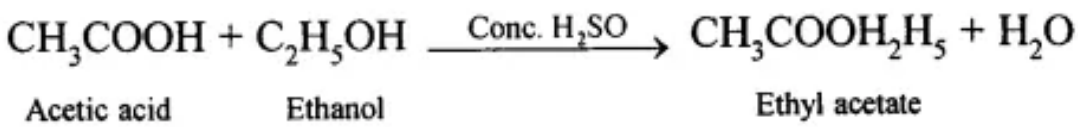
(3) -E
Explination



(4) -F
Eplination

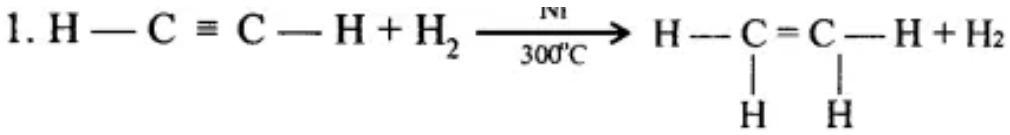


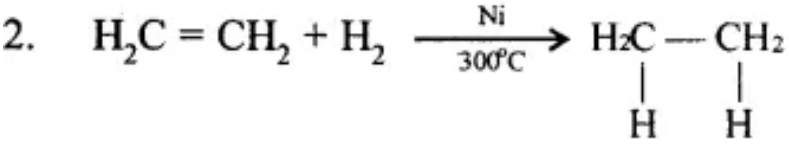
(5) -H
Explination

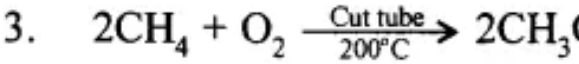


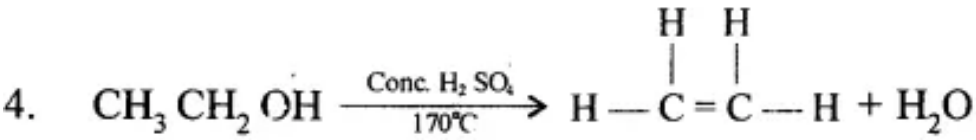
Question 5.
Give balanced equations for the following conversions.

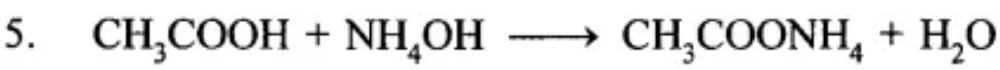
1. An alkyne to an alkene.
2. An alkene to an alkane.
3. An alkane to an alcohol.
4. An alcohol to an alkene.
5. A carboxylic acid to an ammonium salt







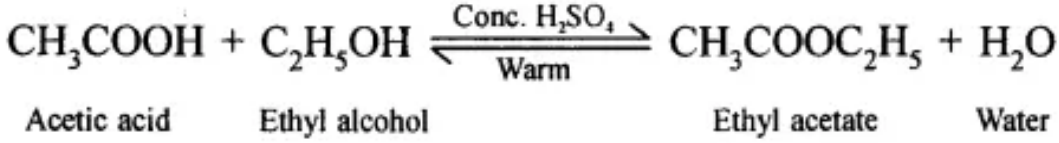




Question 6.
Give reasons for the following :

Question 6(1).
Concentrated sulphuric acid maybe added during esterification of acetic acid.

Answer:



Cone. H_2SO_4, a strong dehydrating agent helps in the removal of water thus shifting the equilibrium in the forward direction, resulting the formation of more of ethyl acetate (ester).

Question 6(2).
Isomers belonging to the same homologous series may differ in physical properties but not in chemical properties.

Answer:
Isomers of the same homologous series have the same functional group (if any) and as such have similar chemical properties. As isomeres are different compounds they differ in one or more of their physical properties.

Question 6(3).
A given organic compound can be assigned only one name on the basis of the

IUPAC system.

Answer:
This statement is not correct.Correct statement is : An organic compound may have more than one IUPAC name (out of all these one is a preferred IUPAC name) but two compounds cannot have the same IUPAC name because thismay lead to confusion.

Question 6(4).
Substitution reactions are characteristic reactions of saturated organic compounds only.

Answer:
Addition reactions are not possible in case of saturated organic compounds. Saturated organic compounds can only undergo substitution reactions.

Question 6(5).
Acetic acid is considered an aliphatic monocarboxylic acid.

Answer:
Acetic acid or ethanoic acid, CH_3COOH has one carboxylic acid group (—COOH). Hence it is a monocarboxylic acid. As it has no benzene ring in it, it is not aromatic and hence it is an aliphatic monocarboxylic acid.