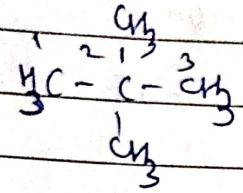
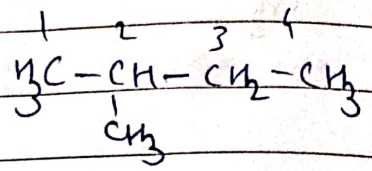
12-A ORGANIC CHEMISTRY

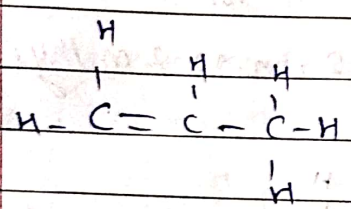
1. Write IUPAC names of the following

(a) 

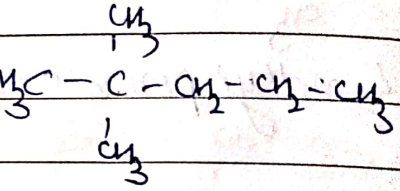
→ 2,2 dimethyl propane

(b) 

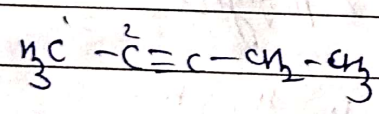
→ 2, methyl butane

(c) 

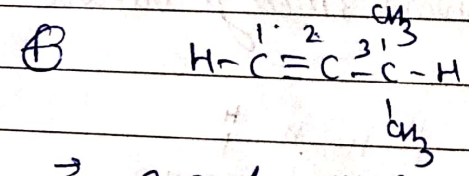
→ prop-1-ene

(d) 

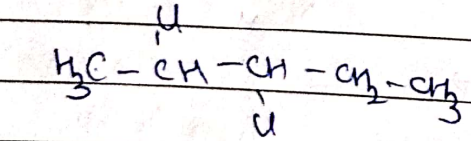
→ 2,2 dimethyl pentane

(e) 

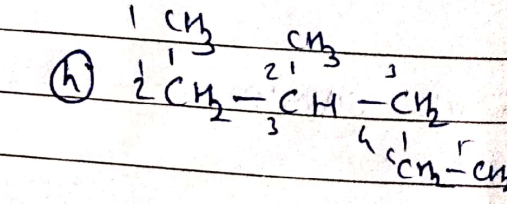
→ pent-2-yne

(f) 

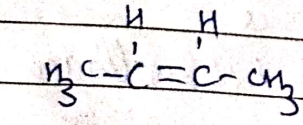
→ 3,3 dimethyl-prop-1-yne

(g) 

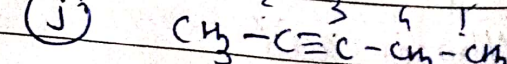
→ 2,3-dichloro pentane

(h) 

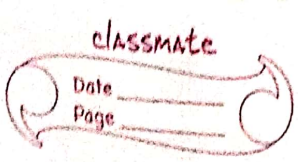
→ 2-methyl heptane

(i) 

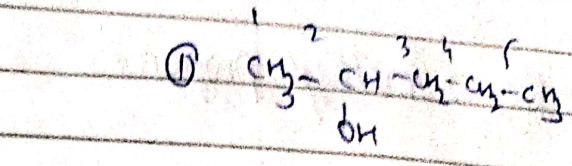
→ but-2-ene

(j) 

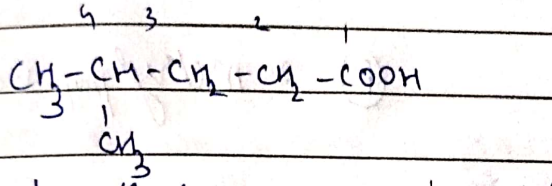
→ hept-2-yne



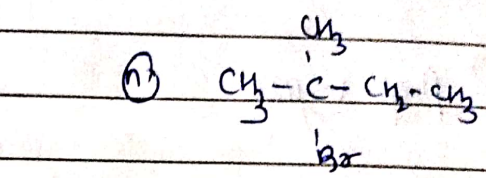
5,5 dimethyl hexanal

① 

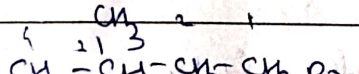
→ 2-pentanol



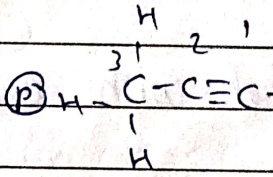
4 methyl, pentan-1-oic acid

③ 

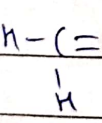
→ 2, bromo 2 methye butane

⑤ 

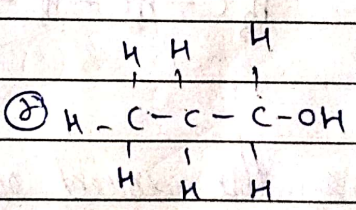
1-bromo, 3 methyl butane

⑥ 

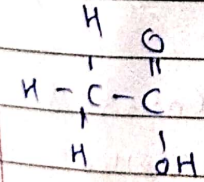
→ prop-1-yne

⑦ 

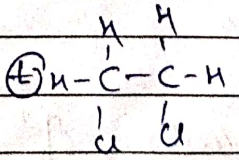
Methanal / formaldehyde

⑧ 

→ propanol

⑨ 

→ ethanoic acid

⑩ 

→ 1,2 dichloro ethane

(2) Write the structures of the following

(1) prop-1-ene

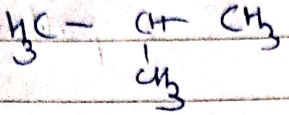
→ $HC \equiv CH - CH_3$

(2) 2,3 dimethyl butane

→ 

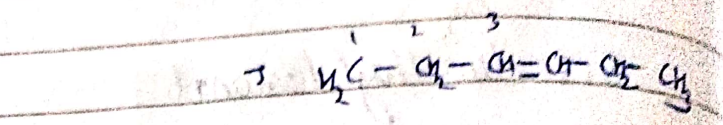
(e) 2-methyl propane

→



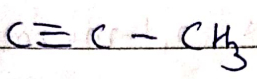
(d) 3-hexene

→



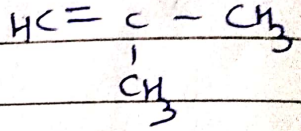
(c) Prop-1-yne

→

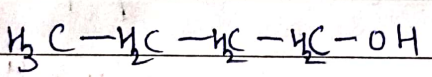


(f) 2-methyl prop-1-ene

→



(g) Alcohol with molecular formula $C_4H_{10}O$



3. Choose the correct option/answer

(a) C_5H_{11} is an

(i) alkane (ii) alkene (iii) alkyne (iv) alkyl group

→ alkyl group

(b) A hydrocarbon of general formula C_nH_{2n} is

(i) $C_{15}H_{30}$ (ii) $C_{12}H_{24}$ (iii) C_8H_{20}

(iv) C_6H_{14}

→ $C_{15}H_{30}$

(c) A hydrocarbon with molecular mass 72 is

(i) an alkane (ii) an alkene (iii) an alkyne

→ an alkane

(d) The total number of different carbon chains that four carbon atoms form is alkane is

→ (i) 5 (ii) 4 (iii) 3 (iv) 2

2

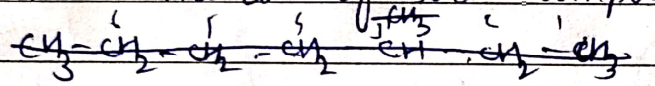
(e) CH_3-CH_2-OH and CH_3-O-CH_3 are

(i) position isomers (ii) chain isomers (iii) homologous

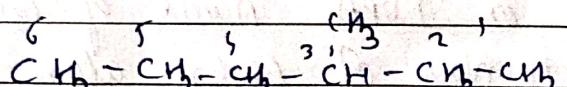
(iv) functional group isomers

→ functional-group isomers

(f) The IUPAC name of the compound is



→ (i) 3-trimethylhexane (ii) 3-methyl hexane (iii) 4-methyl-hexa



→ 3-methyl hexane

4. Fill in the blanks

(a) Propane and ethane are homologous. (homologous, isomers)

(b) A saturated hydrocarbon does not participate in an addition reaction. (addition, substitution)

(c) Succeeding members of a homologous series differ by CH_2. (CH, CH_2, CH_3)

As the molecular mass of hydrocarbons increases, their boiling points increases and melting points do increases (increase, decrease)

$C_{25}H_{52}$ and $C_{50}H_{102}$ belong to same homologous series (the same, different)

CO is an inorganic compound. (organic, inorganic)

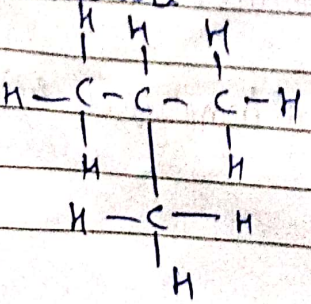
The chemical properties of an organic compound are largely decided by the functional group the physical properties of an organic compound are largely decided by the no. of carbon atoms (functional group, number of carbon atoms.

CHO is a functional group of an aldehyde. (alcohol, aldehyde)

The root in IUPAC name of an organic compound depends upon the number of carbon atoms in principal chain (any chain, principal chain)

But-1-ene and but-2-ene are the examples of position isomerism (chain, functional, position)

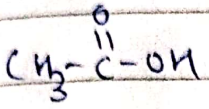
Draw structural formula for each of the following isomer of n-butane



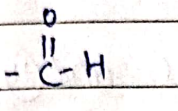
iso-butane

(b) Vinegar

CH_3-COOH



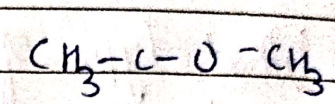
(d) ethanal



or

CH_3-CHO

(c) acetone



$= C_3H_6O$

(f) diethyl ether

~~CH_3~~ $C_2H_5O-C_2H_5$

(5) (a) What is special feature of structure : (i) C_2H_4

(ii) C_2H_2

(b) What type of reaction is common to both the above compounds? Why methane does not undergo this type of reaction?

(c) What is IUPAC name of dimethyl ether.

→ (a) Special feature of structure C_2H_2 & C_2H_4 is that both contain triple bond and hence both are alkynes

(b) Both undergo addition reaction. Methane is a saturated hydrocarbon containing all single bonds hence it

doesn't undergo addition reaction

(c) IUPAC name of dimethyl ether is methoxymethane

$H_3C-O-CH_3$

7. What type of reaction will (i) ethane and (ii) ethene undergo?

Ethane will undergo substitution reaction and ethene will undergo addition reaction.

8. Choosing only words from the following list, write down appropriate words to fill in the blanks from (a) to (e) given below. Addition, carbohydrates, C_nH_{2n+2}, C_nH_{2n}, C_nH_{2n+2}, electrochemical, homologous, hydrocarbons, Saturated, substitution, unsaturated.

The alkanes form an (a) homologous series with the general formula (b) C_nH_{2n+2}. The alkanes are (c) hydrocarbons which generally undergo (e) substitution reaction

(9) Draw the structural formula of a compound with two carbon atoms in each of the following cases

(a) An alkane with a carbon carbon single bond.

(b) An alcohol containing two carbon atoms

(c) An unsaturated hydrocarbon with a carbon to carbon triple bond.

(a) $H_3C-CH_2-CH_2-CH_3$

butane

(b) CH_3-CH_2-OH

ethyl alcohol / ethanol

(c) $C\equiv C-CH_2CH_3$ / $H_3C-C\equiv C-CH_2CH_3$

butyne

2-pentyne

(10) Ethane, Ethene, ethanoic acid, ethyne, ethanol from the above name

(a) The compound with -OH as the part of its structure

(b) The compound with -COOH as the part of its structure

(c) Homologue of homologous series with general formula C_nH_{2n}

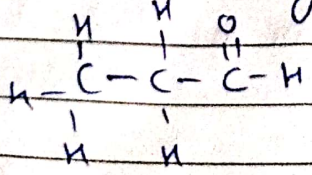
→ (a) ethanol

(b) Ethanoic acid

(c) Ethene

(9) Give the correct IUPAC name and the functional group for each of the compounds whose structural formulas are given below

(a)

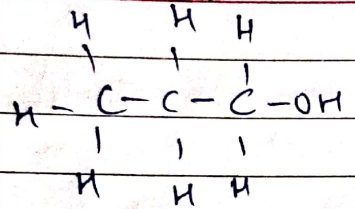


→ propanal

aldehyde is the functional group (CHO)

(a)

(b)



→ propanol

alcohol is the functional group (-OH)

classmate Date Page

12.B ALKANES

① State the sources of alkanes.

Sources of alkanes are as follows

(i) natural gas (methane, small amounts of ethane, propane & butane)

(ii) petroleum (fuels)

② Methane is a green house gas. Comment.

→ Natural gas is composed of methane. It absorbs outgoing radiations of earth (heat radiations) and cause greenhouse effect.

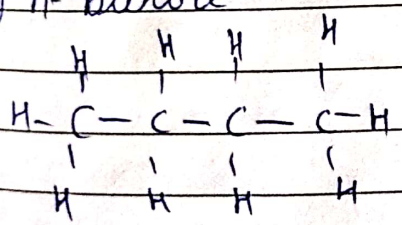
③ Give the general formula of alkanes.

→ C_nH_{2n+2}

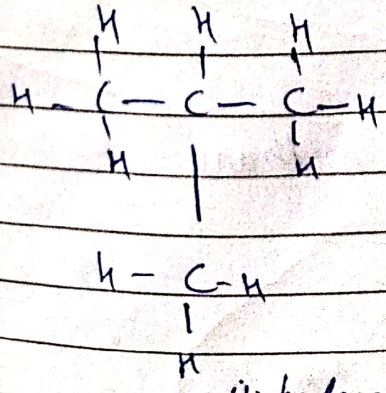
④ Draw the structures of isomers of

(a) butane

(i) n-butane



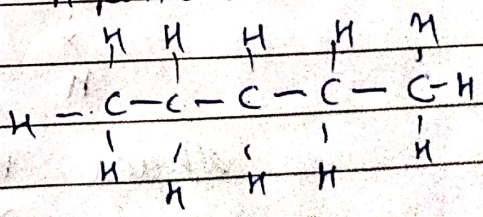
(ii) iso-butane



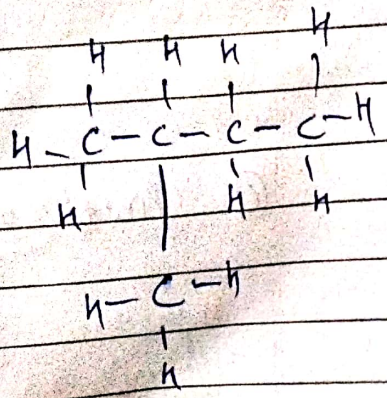
iso-butane

(b) pentane

(i) n-pentane



(ii) iso-pentane



5. Write the
   (a) molecular formula
   (b) electron dot formula and
   (c) structural formula of methane and ethane

→ (a) molecular formula

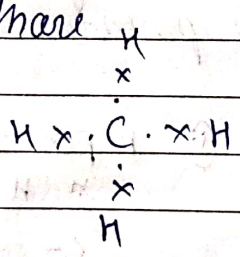
CH_4 for methan

$CH_3 - CH_3 = C_2H_6$

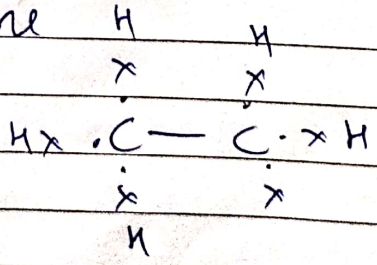
ethane

(b) electron dot formula

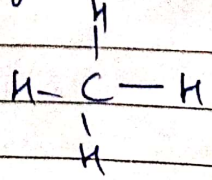
methane



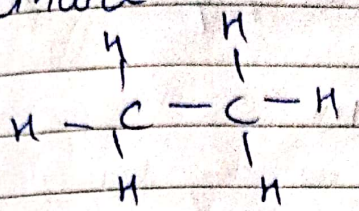
ethane



(c) structural formula of methane



Ethane



⑥ How is,
ⓐ methane and
ⓑ ethane prepared in the laboratory?

→ ⓐ Laboratory preparation of methane
Reactants: Sodium ethanoate and soda lime
Procedure: A mixture of sodium ethanoate and soda lime are taken in hard glass tube and is allowed to heat at 300°c with the help of bunsen burner. The gas is collected by downward displacement of water as it is slightly soluble in water and is lighter than air

$$CH_3COONa + NaOH \xrightarrow[300^\circ C]{CaO} Na_2CO_3 + CH_4 \uparrow$$

ⓑ Laboratory preparation of ethane
Reactants: Sodium propanoate and soda lime
Procedure: A mixture of sodium propanoate and soda lime is taken in boiling tube and heated with a bunsen flame.
Reaction: $C_2H_5COONa + NaOH \xrightarrow[300^\circ C]{CaO} Na_2CO_3 + C_2H_6 \uparrow$

Gas is accumulated by downward displacement of water.

(7) How are methane and ethane prepared from methyl iodide and ethyl bromide?

→ $CH_3I + 2[H] \rightarrow CH_4 + HI$

Iodomethane

$C_2H_5Br + 2[H] \rightarrow C_2H_6 + HBr$

ethyl bromide

(8) What is substitution reaction? Give reaction of chlorine with ethane and name the product formed.

→ When one element or atom is substituted by another atom or ~~mol~~ element is called as substitution reaction.

e.g.

$C_2H_5 + Cl_2 \longrightarrow C_2H_4Cl_2 + HCl$

chloroethane dichloroethane

(9) Name the compounds formed when methane burns in:

(a) Sufficient air

(b) insufficient air

Give a balanced equation

→

(a) Sufficient air

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

insufficient air

$2CH_4 + 3O_2 \rightarrow 2CO + 4H_2O$

$CH_4 + O_2 \rightarrow \underset{(Soot)}{C} + 2H_2O$ (with less oxygen)

(19) Write the names and the products formed when
(a) methane (b) ethane reacts with : (i) chlorine
(ii) bromine
Write chemical reaction

→ methane

$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$

$CH_4 + Br_2 \rightarrow CH_3Br + HBr$

ethane

$C_2H_6 + Cl_2 \rightarrow$ ~~C_2H_5Br~~ $+ C_2H_5Cl + HCl$

$C_2H_6 + Br_2 \rightarrow C_2H_5Br + HBr$

(11) Name the compound prepared from
(a) Sodium propionate (b) methyl iodide and
(c) ethyl bromide.

→ (a) Sodium propionate (b) Methyl iodide
→ ethane is prepared from → methane
sodium propionate

(c) ethyl bromide
→ ethane

Balanced equation

(a) $C_2H_5COONa + NaOH \xrightarrow[300^\circ C]{CaO} Na_2CO_3 + C_2H_6\uparrow$
ethane

(b) $CH_3I + 2[H] \rightarrow$ ~~$Na_2CO_3 + C_2H_6\uparrow$~~ $CH_4 + HI$

(c) $C_2H_5Br + 2[H] \rightarrow C_2H_6 + HBr$
ethane

(12) (a) Write the equation for the complete combustion of (i) methane (ii) ethane

(b) What is pyrolysis or cracking? Explain with an example

→ (a) (i) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$ – Complete combustion of methane

(ii) $2C_2H_6 + 7O_2 \rightarrow 4CO_2 + 6H_2O$ – Complete combustion of ethane

(b) The decomposition of a compound by heat in the absence of air is called as pyrolysis. When this process occurs in alkanes it is called as cracking.

e.g. $H_3C-CH_3 \xrightarrow[Al_2O_3]{500^\circ C} H_2C=CH_2 + H_2$
ethane → ethene

(13) Convert:
(a) methane into chloform
(b) Sodium acetate into methane
(c) methyl iodide into ethane
(d) Aluminium carbide into methane

→

(a) $CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$
chloform

(b) $CH_3COONa + NaOH \xrightarrow[300^\circ C]{CaO} Na_2CO_3 + CH_4\uparrow$

(c) $CH_3I + 2[H] \rightarrow CH_4 + HI$

(13)

classmate
Date
Page

(a) Aluminium carbide into methane

→ $Al_4C_3 + 12H_2O \longrightarrow 3CH_4 + 4Al(OH)_3$

(14) Give three uses of:
(a) methane
(b) ethane

→ (a) (i) It is a source of carbon monoxide and hydrogen
(ii) Employed as domestic fuel.
(iii) Used in preparation of useful compounds like ethyne, methanol, tetra-chloromethane etc.

(b) (i) It is used in preparation of ethene, ethanol, ethanoic acid etc.
(ii) Ethane is a good fuel.
(iii) Ethane forms ethyl chloride, which is used to make tetraethyllead. 1,1,1- trichloroethane is a solvent used in dry cleaning.

(15) Under what conditions does ethane get converted to
(a) ethyl alcohol (b) acetaldehyde (c) acetic acid

→ (a) $C_2H_6 + O_2 \longrightarrow 2C_2H_5OH$ (at 120 atm and 475K

(b) $C_2H_6 + O_2 \xrightarrow{MoO} CH_3CHO + H_2O$ (catalyst Molybdenum oxide)

(c) $C_2H_5OH + O_2 \xrightarrow{Pt} CH_3COOH + H_2O$ (platinum as catalyst)

(16) Using appropriate catalyst, ethane can be oxidized to an alcohol, an aldehyde and an acid. Name the alcohol, aldehyde and acid formed when ethane is oxidized.

→ $C_2H_6 \xrightarrow[K_2Cr_2O_7]{[O]} CH_3OH \xrightarrow[K_2Cr_2O_7]{[O]} CH_3CHO \xrightarrow[K_2Cr_2O_7]{[O]} CH_3COOH$

methyl alcohol — ethanal — ethanoic acid

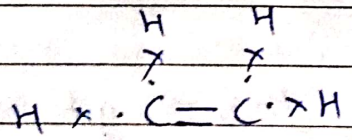
✱ ALKENES ✱

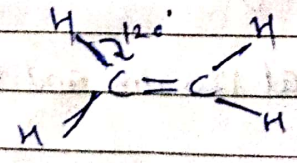
(17) Write: (a) molecular formula, (b) electron dot formula and (c) structural formula of ethene (ethylene)

→

(a) molecular formula

C_2H_4

(b)  electron dot formula

(c)  structural formula

(18) The molecules of alkene family are represented by a general formula C_nH_{2n}. Answer the following

— Continue

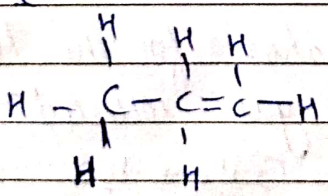
(a) What do n & 2n signify?

(b) What is the name of alkene when n=4?
When n=4, C_4H_8 i.e $C_4H_{2\times4} = C_4H_8$ = butene

(c) What is the molecular formula of alkene when n=4?
C_4H_8

(d) What is the molecular formula of alkene if there are ten hydrogen atoms?
formula is C_nH_{2n}
if H=10
C= 5
$\therefore C_5H_{10}$ is the molecular formula

(e) What is the structural formula of third member of alkene family
Third member is C_3H_6



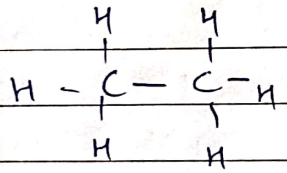
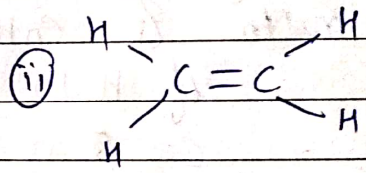
propene

(f) Write the molecular formula of lower and higher homologous series of an alkene which contains four carbon atoms.
lower homologous alkenes with four carbons is C_3H_5

Higher homologous series of alkenes is C_5H_{10}

(3) (a) Distinguish between the saturated hydrocarbon ethane and the unsaturated hydrocarbon ethene by drawing their structural formulae.

→

	Ethane	Ethene
(i)	C_2H_6	C_2H_4
(ii)		
(iii)	Saturated hydrocarbons doesn't have double or triple bonds	
(iv)		Unsaturated hydrocarbons have double and triple bonds

(4) Give a balanced equation for the lab. preparation of ethylene. How is the gas collected?

→ $C_2H_5OH \xrightarrow[170^\circ C]{\text{Conc. } H_2SO_4} C_2H_4 + H_2O$

Gas is collected by downward displacement of water.

(5) How is ethene prepared by.

(a) dehydrohalogenation reaction?

(b) dehydration reaction?

@ dehydrohalogenation reaction

$C_2H_5Cl + KOH \xrightarrow[\text{ethere}]{\text{alc hot fuse}} C_2H_4 + KCl + H_2O$

$C_2H_5Br + KOH \xrightarrow[\text{ethere}]{} C_2H_4 + KBr + H_2O$

$C_2H_5I + KOH \xrightarrow[\text{ethere}]{} C_2H_4 + KI + H_2O$

(b) dehydration reaction

$C_2H_5OH + Al_2O_3 \xrightarrow{300°C} C_2H_4 + H_2O$

(5) (a) Ethylene when reacts with halogens (chlorine and bromine) form saturated products. Name them and write balanced equation.

$CH_2=CH_2 + Cl_2 \longrightarrow \underset{\text{1,2 dichloro ethane}}{CH_2(Cl)-CH_2(Cl)}$

$CH_2=CH_2 + Br_2 \longrightarrow \underset{\text{1,2 dibromo ethane}}{CH_2(Br)-CH_2(Br)}$

(b) Give the conditions and the main product formed by hydrogenation of ethylene

→ Ethene and hydrogen are passed over finely divided catalyst such as ~~palladium~~ platinum or palladium or nickel at temp 200°C to form ethane

$$C_2H_4 + H_2 \xrightarrow[Ni]{200^\circ C} C_2H_6$$
Ethene — Ethane

(7) Convert ethanol into ethene using
(a) Solid dehydrating agent
(b) hot conc. H_2SO_4?
Give one balanced equation

→ (a) $C_2H_5OH + Al_2O_3 \xrightarrow{300^\circ C} C_2H_4 + H_2O$

(b) $CH_3CH_2HSO_4 \xrightarrow[170^\circ C]{\text{excess } H_2SO_4} CH_2=CH_2 + H_2SO_4$
Ethene

(8) Write the following properties of ethene.
(a) Physical states
~~Gas~~ inflammable gas

(b) odour

→ faint sweetish odour

(c) density as compared to air
→ less denser than air

(d) Solubility
→ insoluble in water, soluble in organic solvents

(9) How would you convert
(a) ethene into 1,2-dibromoethane

→ $CH_2=CH_2 + Br_2 \rightarrow \underset{\underset{Br}{|}}{CH_2} - \underset{\underset{Br}{|}}{CH_2}$

1,2 dibromoethane

(b) ethene into ethyl bromide?

→ $CH_2=CH_2 + HBr \rightarrow CH_3-CH_2Br$

ethyl bromide

(10) Give balanced equations when:
(a) ethene is burnt in excess of oxygen
(b) ethene reacts with chlorine
(c) ethene combines with hydrogen chloride
(d) a mixture of ethene and hydrogen is passed over nickel at 200°C

→ (a) $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O + heat$

(b) $CH_2=CH_2 + Cl_2 \rightarrow \underset{\underset{Cl}{|}}{CH_2} - \underset{\underset{Cl}{|}}{CH_2}$

1,2 dichloro ethane

(c) $CH_2=CH_2 + HCl_{(aq)} \rightarrow CH_3-CH_2Cl$

ethyl chloride

(d) $C_2H_4 + H_2 \xrightarrow[Ni]{200^\circ C} C_2H_6$

ethene ethane

(11) Give the formula and names of A, B, C and D in the following equations

(a) $CH_4 \xrightarrow[-HCl]{Cl_2} \overset{A}{CH_3Cl} + HCl \xrightarrow[HCl]{Cl_2} \overset{B}{CH_2Cl_2} + HCl \xrightarrow[-HCl]{Cl_2} \overset{C}{CHCl_3} + H$

$\xrightarrow[-HCl]{Cl_2} \overset{D}{CCl_4} + HCl$

(b) $C_2H_2 \xrightarrow{H_2} \overset{A}{C_2H_4} \xrightarrow{H_2} \overset{B}{C_2H_6} \xrightarrow[-HBr]{Br_2} \overset{C}{C_2H_5Br} + HBr \xrightarrow[-HBr]{Br_2}$

$\overset{D}{C_2H_4Br_2} + HBr$

(c) $C_2H_4 + \overset{B}{H_2} \xrightarrow[Ni]{200^\circ C} C_2H_6$

(12) Write the name and formula of the product formed in each case below.

(a) $C_2H_4 + Cl_2 \rightarrow C_2H_4Cl_2$ 1,2 dichloroethane

(b) $C_2H_5Br + KOH_{(aq)} \xrightarrow{\Delta} C_2H_4$ ethene

(c) $H_2C=CH_2 \xrightarrow{alk.\ KMnO_4}$ ethane 1,2 diol $\overset{OH}{\underset{|}{CH_2}}-\overset{OH}{\underset{|}{CH_2}}$

(d) $H_2C=CH_2 + HBr \longrightarrow CH_3-CH_2-Br$

ethyl bromide

(13) What do you observe when ethylene is passed through alkaline $KMnO_4$ solution?

→ Ethene gets oxidised with alkaline $KMnO_4$ at room temperature.

$$H_2C=CH_2 + H-O-H + [O] \rightarrow \underset{\text{1,2 - ethanediol}}{H_2C(OH)-CH_2(OH)}$$

(cold alkaline $KMnO_4$ solution [oxidising agent])

(14) Name three compounds formed by ethylene and give one use of each compound.

→ (i) Ethene is used in making polyethene, which is used in making carry bags

(ii) Used in making epoxyethane, which is used in manufacture of detergents

(iii) It is used in producing oxy-ethylene flame, which is used in cutting and welding.

ALKYNES

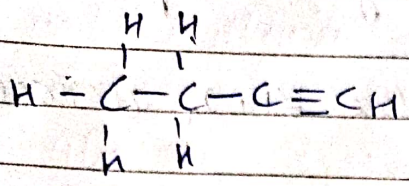
(1) What are the sources of alkynes? Give the general formula of alkynes.

→ Sources of alkynes are natural gas and petroleum.

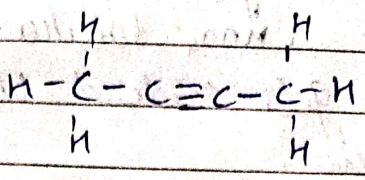
general formula- C_nH_{2n-2}

(2) Give an example of isomer shown by triple bond hydrocarbons ~~(Alkynes)~~ (alkynes) and write their IUPAC name.

→ Isomers shown by triple bond is butyne. Isomers are



But-1-yne



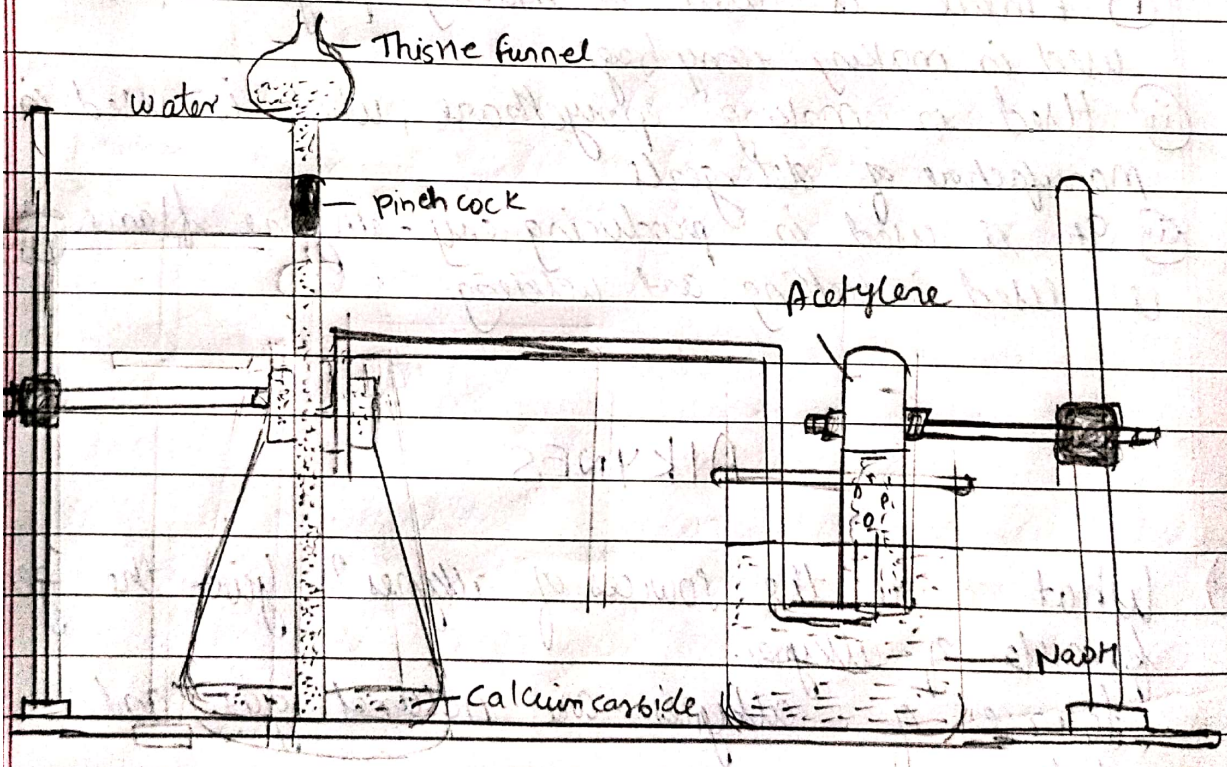
But-2-yne

How is acetylene prepared in the laboratory?

(a) Draw a diagram

(b) Give an equation

(c) How is pure dry gas collected



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

Calcium carbide — Calcium hydroxide — acetylene

(c) Gas is collected by downward displacement of water, and it is insoluble in water.

(d) Give the method of preparation of ethyne by 1,2-dibromoethane

→

$$\begin{array}{l} CH_2\text{-}Br \\ | \\ CH_2\text{-}Br \end{array} + 2KOH \xrightarrow[\text{boiling}]{200^\circ C} \begin{array}{l} CH \\ \vdots\vdots \\ CH \end{array} + 2KBr + 2H_2O$$

(5) Name a hydrocarbon which is

(a) a tetrahedral molecule

→ methane

(b) a planar molecule

→ Ethene

(c) is a linear molecule

→ ethyne

(d) forms a red ppt with ammonical solution of copper(I) chloride

→ Ethyne

(e) is known a paraffin

→ Alkanes or Saturated hydrocarbons

(f) is known as olefin

→ Alkene

(g) a compound which will give acetylene gas when treated with water

→ Calcium carbide

(6) Classify the following compounds as alkanes, alkenes and alkynes: C_3H_4, C_3H_8, C_5H_8, C_3H_6

→ alkanes - C_3H_8, C_3H_6

alkynes - C_3H_4 and C_5H_8

(7) Give a chemical test to distinguish between
(a) Saturated and unsaturated compounds
(b) ethane and ethene
(c) ethene (ethylene) and ethyne (acetylene)

→ (a) When Br_2 water is added to unsaturated compounds, bromine water is ejected in red-brown colour. If an organic compound decolorises bromine water, it is an unsaturated hydrocarbon

(b) ethane and ethene

→ Dissolve ethane and ethene in two seperate test tube in carbon tetrachloride solution. Fill two test tubes with bromine gas. If colour changes the gas is ethene, if colour remains the same, the gas is ethane.

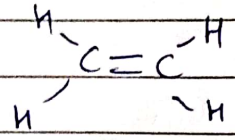
(c) Ethene and ethyne.

→ Pass the gas through an ammonical cuprous chloride solution. Ethene doesn't form any ppt while ethyne forms red coloured ppt

(8) Compound X is bubbled through bromine dissolved in CCl_4; X $\xrightarrow{Br_2 / CCl_4}$ CH_2Br | CH_2Br

(a) Draw the structure of X
(b) Note your observations during the reaction

(a)



(b) Bromine solution will be decolourised.

(9) Give balanced equations for the following
(a) An alkene to alkane
(b) An alkene to an alcohol
(c) An alkyne to an alkene

→ (a) $CH_2 + CH_2 + H_2 \xrightarrow[300^\circ C]{Ni} CH_3-CH_3$

(b) $CH_2=CH_2 + H_2O \longrightarrow CH_2-CH_2-OH$

(c) $C_2H_2 + H_2 \xrightarrow{Ni} C_2H_4$

(10) Name the products formed and write an equation when ethyne is added to the following in an inert solvent
→ (a) chlorine (b) bromine (c) iodine (d) hydrogen
(e) excess of hydrochloric acid

1,2 dichloro ethene and 1,1,2,2-tetrachloro ethane will be formed

$$C_2H_2 + Cl_2 \rightarrow C_2H_2Cl_2 + Cl_2 \rightarrow C_2H_2Cl_4$$

2 dibromo ethene and 1,1,2,2-tetrabromo will be formed

$$C_2H_2 + Br_2 \rightarrow C_2H_2Br_2 + Br_2 \rightarrow C_2H_2Br_4$$

1,2 di-iodoethene will be formed

$$C_2H_2 + I_2 \rightarrow C_2H_2I_2$$

$$C_2H_2 + H_2 \xrightarrow{Ni} C_2H_6$$

$$C_2H_2 + HCl \rightarrow C_2H_2Cl \text{ ie.}$$

$$\begin{matrix} CH \\ \vdots \\ CH \end{matrix} \xrightarrow{+HCl} \begin{matrix} CH_2 \\ \| \\ CHCl \end{matrix} \xrightarrow{+HCl} \begin{matrix} CH_3 \\ | \\ CHCl_2 \end{matrix}$$