Unsaturated Hydrocarbons

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Solution 1:

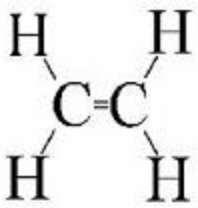
(i) The n signifies Number of carbon atoms where as 2n signifies Number of hydrogen atoms.

(ii) Butene

(iii) C_3H_6

(iv) Molecular formula of first member of alkene is: C_2H_4

Structural formula:



(v) Lower Homologues of alkene which contains four carbon atoms is : C_3H_6

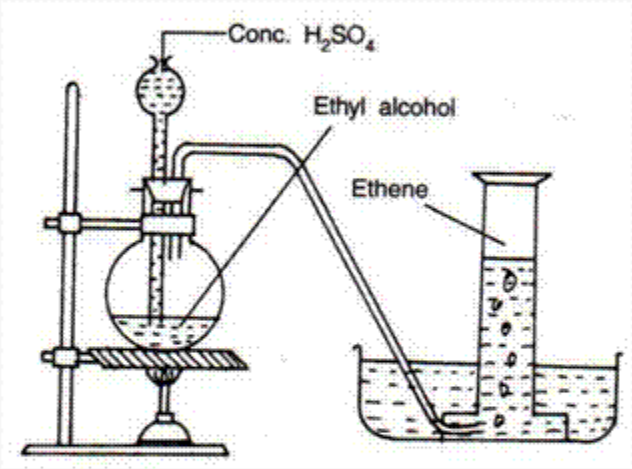
Higher Homologues of alkene which contains four carbon atoms is : C_5H_{10}

Solution 2:

Ethylene is prepared in the laboratory by dehydration of ethyl alcohol.

Reaction:

$$CH_3CH_2OH \xrightarrow[170^\circ C]{conc H_2SO_4} CH_2 = CH_2 + H_2O$$



Procedure:

Take one part of ethyl alcohol in a flask. Add two parts of concentrated sulphuric acid and heat to 170°C.Ethylene is evolved and small amount of aluminium sulphate is also added to the flask to avoid frothing.

Gas is prepared by reacting ethyl alcohol in presence of sulphuric acid and is collected by downward displacement of water.

The gas is dried by passing the gas through sodium hydroxide solution.

Solution 3:

(a) Ethene into 1,2 –dibromoethene:

When bromine gas is passed into inert solvent like CCl_4 containing dissolved ethene at room temperature, one molecule of Br_2 adds across the double bond to give ethylene dibromide.

$$CH_2 = CH_2 + Br_2 \rightarrow CH_2Br - CH_2Br$$

(b) Ethene to bromoethane:

Ethene reacts with halogen acids to form alkyl halides.

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

Solution 4:

Physical properties:

- State: colourless gas, neutral to litmus, faint sweet odour
- Solubility: slightly soluble in water, highly soluble in organic solvents.
- Density: slightly lighter than air
- Melting point: -169°C
- Boiling point: -104°C

Solution 5:

(a) Ethanol to ethene:

$$CH_3CH_2OH \xrightarrow[170^\circ C]{conc\,H_2SO_4} CH_2 = CH_2 + H_2O$$

(b) Ethene to ethanol:

$$CH_2 = CH_2 + H_2O \xrightarrow{H^+} CH_3 - CH_2OH$$

Solution 6:

When bromine solution is added to ethane and ethene, In case of ethene the orange colour of bromine disappears where as in case of ethane colour does not disappear.

Solution 7:

The addition of hydrogen across the double bond is called hydrogenation.

Ethene reacts with hydrogen gas when heated in presence of catalyst like nickel, to give ethane.

$$CH_2 = CH_2 + H_2 \xrightarrow[300^\circ C]{Ni} CH_3 - CH_3$$

Use of hydrogenation:

Hydrogenation of Oils: The oils can be converted into ghee which are semi solid at room temperature.

Solution 8:

Two equations:

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

(ii) $CH_2 = CH_2 + H_2O \xrightarrow{H^+} CH_3 - CH_2OH$

Solution 9:

Addition Reaction: The reactions in which molecules of the attacking reagent add across the double or triple bond of an unsaturated compound to yield saturated compound.
Ethene is a reactive compound due to presence of double bond. Hence undergo addition reactions.
Two examples:

(i) Addition of hydrogen: $CH_2 = CH_2 + H_2 \xrightarrow[300^\circ C]{Ni} CH_3 - CH_3$

(ii) Addition of halogens: $CH_2 = CH_2 + Br_2 \rightarrow CH_2Br - CH_2Br$

Solution 10:

Three uses of ethene are:

1. It is used for the manufacture of polythene
2. For the artificial ripening of fruits.
3. As a general anaesthetic.

Solution 11:

(i) When ethene is passed in bromine solution in CCl_4, the orange colour of bromine disappears due to formation of colourless ethylene bromide.

$$CH_2 = CH_2 + Br_2 \rightarrow CH_2Br - CH_2Br$$

(ii) When Baeyer's reagent reacts with ethene, colour of potassium permanganate gets discharged in this reaction.

$$CH_2 = CH_2 + H_2O + O \xrightarrow[KMnO_4]{25^\circ C - 30^\circ C} CH_2OH - CH_2OH$$