31.Aug.2018 Friday

Chapter: 13
"HydroCarbons"

- Review Questions:

Q2: Give short ~~qus~~ answers.

(i) Give three examples of unsaturated hydrocarbons.

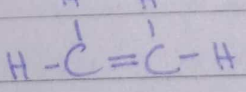
- **Unsaturated Hydrocarbons:**

Unsaturated hydrocarbons are defined as:
"Hydrocarbons containing carbon-carbon multiple bonds are called unsaturated hydrocarbons."

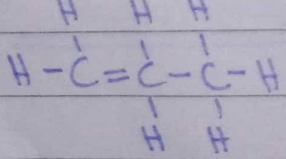
- **Example:**

Alkenes:

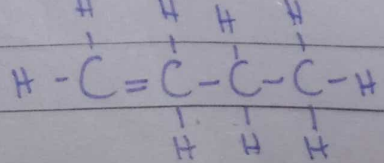
i- Ethene



ii- Propene



iii- Butene



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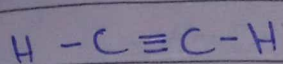
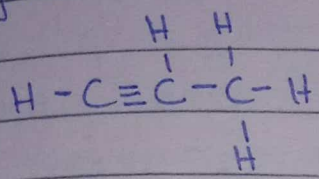
- **Alkynes:**

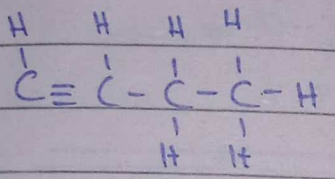
i- Ethyne



ii- Propyne

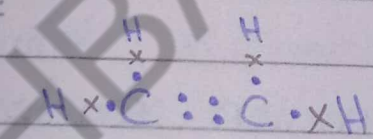


iii- Butyne



(ii) Draw electron dot and cross structure for ethene.

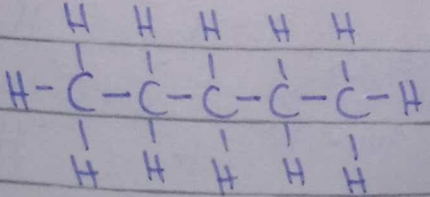
- **Ethene:**



(iii) Draw structural formulas of an alkane, an alkene and an alkyne containing five carbon atoms.

- **ALKANES:**

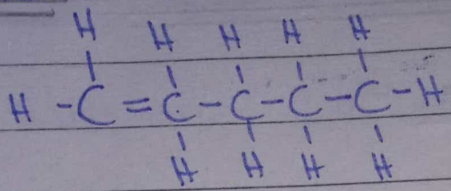
Pentane:



31.Aug.2018 Friday

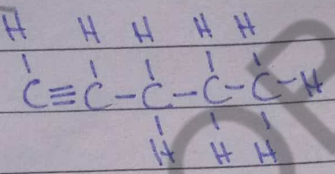
- **ALKENES:**

Pentene:



- **ALKYNES:**

Pentyne:



(v) What do you mean by dehydration reaction? Give one example.

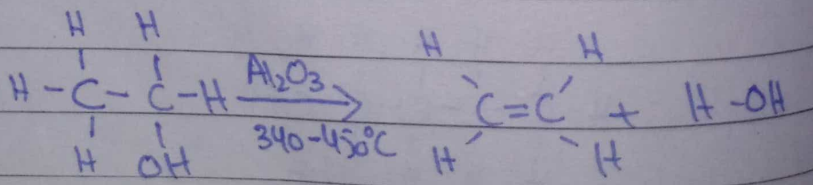
- **DEHYDRATION REACTION:**

A dehydration reaction is defined as:

"An elimination reaction in which there is loss of hydrogen water."

- **EXAMPLE:**

Alcohols dehydrate when their vapour are passed over heated alumina.



14.Sep.2018 Friday

Chapter: 13
"HydroCarbons"

- **Review Exercise:**

Q3: How can you convert.

(i) ethene into ethane.

By Hydrogenation:

An ethene can be converted into ethane by hydrogenation of alkene in the presence of Nickle at 200°C to 300°C

$$CH_2=CH_2 + H_2 \xrightarrow[200-300^\circ C]{Ni} CH_3-CH_3$$

(ethene) (ethane)

(ii) Methane into Carbontetrachloride:

Methane can be converted into carbon tetrachloride by halogenation:

$$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$$

Chloromethane

$$CH_3Cl + Cl_2 \rightarrow CH_2Cl_2 + HCl$$

Dichloromethane

$$CH_2Cl_2 + Cl_2 \rightarrow CHCl_3 + HCl$$

Trichloromethane

$$CHCl_3 + Cl_2 \rightarrow CCl_4 + HCl$$

Tetrachloromethane

(iii) ethene into glycol.

Reaction with $KMnO_4$:

When an alkene is treated with dilute alkaline aqueous solution of $KMnO_4$ (1%) addition of two hydroxyl groups occurs across the double bond. The pink colour of $KMnO_4$ solution is discharged during the reaction. This reaction is used as a test for the presence of an alkene and is known as Baeyer's test.

$$3\underset{\text{(Ethene)}}{CH_2=CH_2} + 2KMnO_4 + 4H_2O \longrightarrow$$

$$3\underset{\text{OH}}{CH_2}-\underset{\text{OH}}{CH_2} + 2MnO_2 + 2KOH$$

(Ethylene Glycol)

Ethylene glycol is used as an anti-freeze.

(iv) ethyl chloride into ethane.

- **By Reaction of alkyl halides:**

When an alkyl halide is treated with Zn in presence of an aqueous acid, an alkane is usually produced. Usually

aqueous solution of HCl or CH_3COOH is used:

$$CH_2-CH_3-Cl + 2[H] \xrightarrow[Zn/HCl]{} \underset{C_2H_6}{CH_4} + HCl.$$

(v) ethyl bromide into ethene.

- **Bydehydrohelogenation of alkyl halides:**

Dehydrohalogenation means loss of hydrogen halide. Alkyl halides on heating with alcoholic potassium hydroxide undergo dehydrohalogenation.

$$CH_3-\underset{Br}{CH_2} + KOH \xrightarrow{\text{alcohol}} CH_2=CH_2 + KBr + H_2O$$

Q7: Write chemical equations showing reaction of $KMnO_4$ with ethene and ethyne.

- **Reaction of $KMnO_4$ with Ethene:**

When an alkene is treated with dilute alkaline aqueous solution of $KMnO_4$ (1%)

addition of two hydroxyl groups occurs across the double bond. The pink colour of $KMnO_4$ solution is discharged during the reaction. This reaction is used as a test for the presence of an alkene and is known as Baeyer's test.

$$3\underset{\text{(ethene)}}{CH_2=CH_2} + 2KMnO_4 + 4H_2O \longrightarrow 3\underset{\text{(ethylene Glycol)}}{\underset{|}{CH_2}-\underset{|}{CH_2}}\ \begin{matrix}OH & OH\end{matrix} + 2MnO_2 + 2KOH$$

Ethylene Glycol is used as an anti-freeze.

- **Reaction of $KMnO_4$ with Ethyne:**

Alkynes donot react with dilute alkaline aqueous solution of $KMnO_4$. However, they are oxidized by strong alkaline solution of $KMnO_4$ to give oxalic acid. Four hydroxyl groups are added across the triple bond.

$$4KMnO_4 + 4KOH \longrightarrow 4K_2MnO_4 + 4[O]$$

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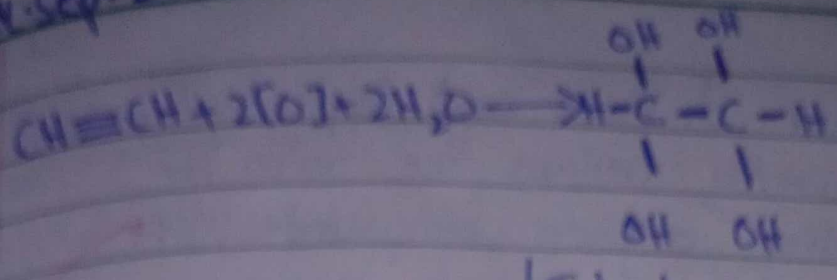
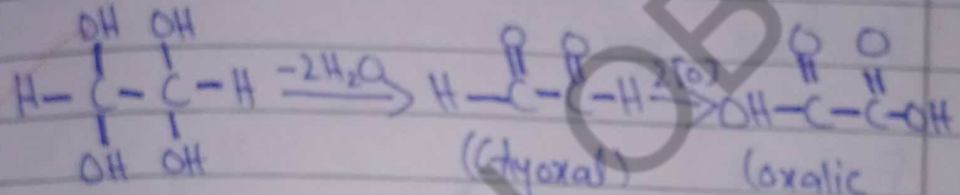


(Tetrahydroxy ethane)

Tetrahydroxy ethane is unstable compound; it loses two water molecules to form glyoxal which finally oxidizes to oxalic acid.



(Glyoxal) (oxalic acid)

Q9: Explain why a systematic method of naming chemical compound is necessary.

- **IUPAC:**

Millions of organic compounds exist. To understand, recognize and classify these compounds, systematic naming of organic compounds is necessary. Organic chemists began in the last century to devise a system of naming organic compounds that depends on their structure. An internation body, the international

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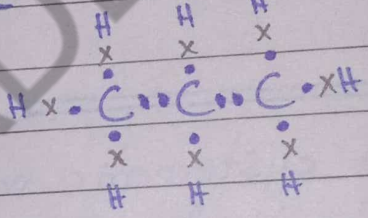
Union of Pure and Applied Chemistry constantly reviews the rules for naming organic compounds. IUPAC system of naming organic compounds is based on the following principle

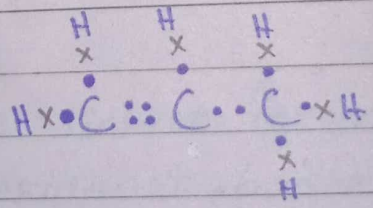
"Each different Organic Compound should have a different name."

Q1o: Draw electron dot and cross structure for

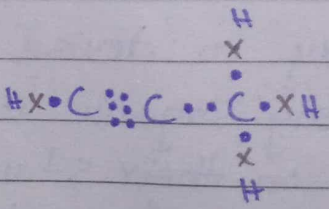
(a) Pentane



(b) Propane



(c) Propane



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• Think-Tank:

Q11: Write chemical equations for the preparation of propene from

(a) $CH_3-CH_2-CH_2-OH$

• By dehydration of Propanal:

$$CH_3-CH_2-CH_2-OH \xrightarrow[340-400^\circ C]{Al_2O_3} CH_3-CH=CH_2 + H_2O$$

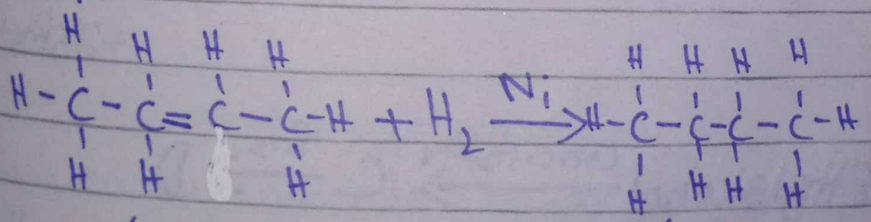
(b) $CH_3-C\equiv CH$

• By hydrogenation:

$$CH_3-C\equiv CH + H_2 \xrightarrow[200-300^\circ C]{Ni} CH_3-CH=CH_2$$

Q12: Write down structural formulas for the products which are formed when 1-butene is reacted with

(a) H_2/Ni



(Butene) (Butane)

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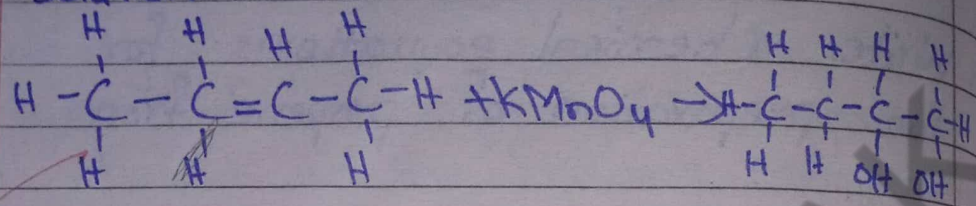
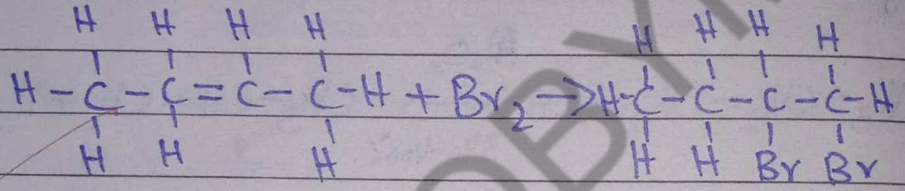
(b) dilute alkaline aqueous $KMnO_4$ solution.

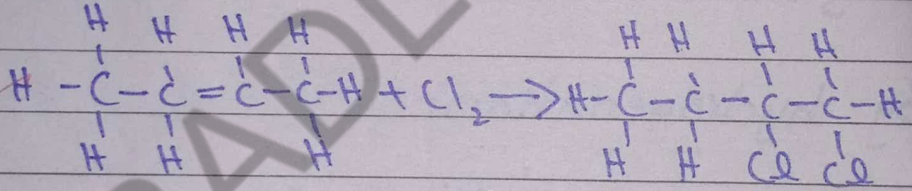


$+MnO_2 + KOH.$

(c) bromine water.

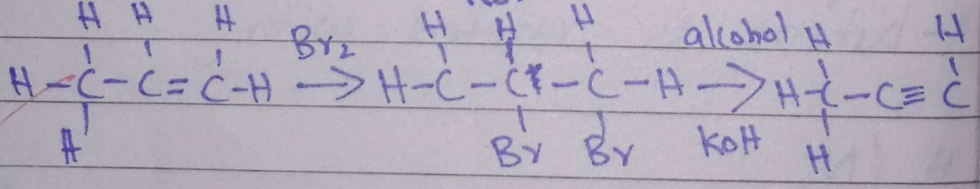


(d) Chlorine.



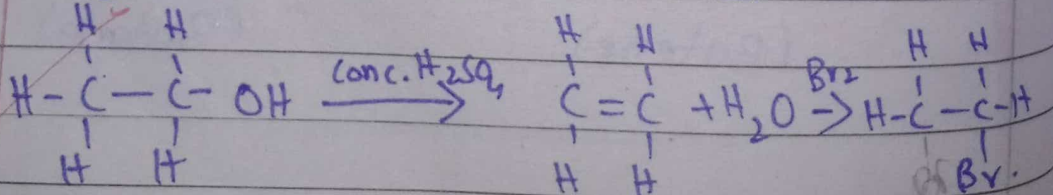
Q13. Identify A, B, C, D in the following reactions.

(i) Propene $\xrightarrow{Br_2}$ A $\xrightarrow[KOH]{alcohol}$ B



$+2KBr + 2H_2O.$

(ii) Ethylalcohol $\xrightarrow{Conc.\ H_2SO_4}$ C $\xrightarrow{Br_2}$ D



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Q14: Construct a scheme to convert ethene into ethyne.

$$\underset{\underset{Cl}{|}}{HC=CH_2} + KOH \xrightarrow{alcohol} \underset{(Ethyne)}{CH\equiv CH} + KCl + H_2O$$

Q15: You are given two flammable liquid hydrocarbons, One of them is an alkene and other is an alkane. Design an experiment to find out which is which.

- **Unsaturated Compound:**

Un-saturated compound discharge:

i- decolourization of reddish brown colour of bromine.

ii- Purple colour of iodine solution.

iii- Pink colour of $KMnO_4$.

- **Saturated Compound:**

Saturated compounds donot give these tests.

Q16: How many possible products are there when chlorine reacts with ethane? Sketch them all.

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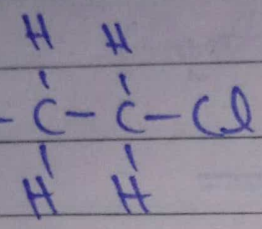
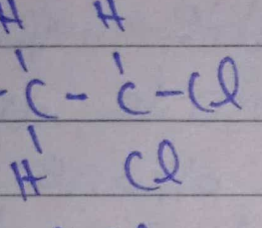
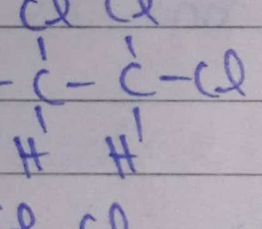
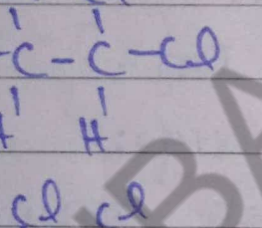
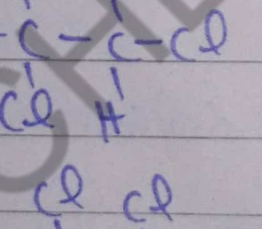
Six products are possible by replacement of all hydrogen from ethane. The seventh product will be HCl.

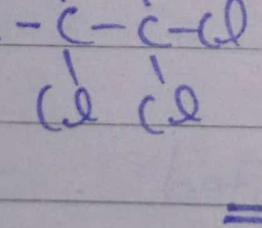
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi)  + 6HCl.

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Chapter: 12
"Hydrocarbons"

Q. Differentiate between ethene and ethyne.

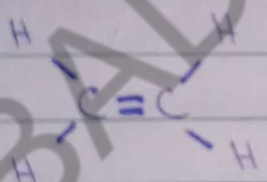
Ethene	Ethyne
Definition	
Ethene is unsaturated hydrocarbon that contains carbon-carbon double bond.	Ethyne is unsaturated hydrocarbon that contains carbon-carbon triple bond.
Bonds	
It contains one sigma and one pi bond.	It contains one sigma and two pi bonds.
Formation	
It is formed by dehyration of alcohol and dehydrohalogenation of alkyl halides.	It is formed by dehydrohalogenation of vicinal dihalides and dehalogenation of tetrahalides.
Reaction with $KMnO_4$	
It reacts	Ethyne does not

directly with $KMnO_4$ and produces ethylene glycol	react with dilute alkaline aqueous solution of $KMnO_4$. However, they are oxidized by strong alkaline solution of $KMnO_4$ to give oxalic acid.

Molecular formula

Ethene have molecular formula C_2H_4.	Ethyne have molecular formula C_2H_2.

Structure



$H-C\equiv C-H$

Q: Differentiate between reaction of $KMnO_4$ with alkene and alkyne.

Reaction of $KMnO_4$ with alkene	Reaction of $KMnO_4$ with alkyne
Concentration/Dilute Solution	
Alkenes react directly with dilute aqueous $KMnO_4$ solution.	Alkynes react indirectly with dilute aqueous $KMnO_4$ solution and are oxidized by strong

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alkaline solution of KMnO4.

Product

Its product is ethylene glycol.

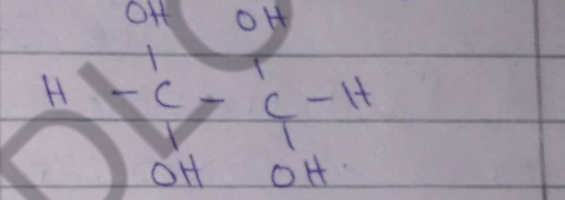
Its end point is oxalic acid.

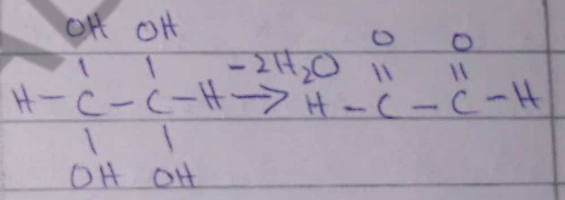
Reaction

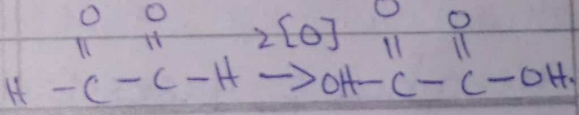
$2CH_2=CH_2+2KMnO_4+4H_2O \rightarrow 3\ CH_2(OH)-CH_2(OH)+2MnO_2+2KOH$

$4KMnO_4+KOH \rightarrow 4K_2MnO_4+4[O]$

$HC\equiv CH+2[O]+2H_2O \rightarrow$







Hydroxyl groups

Addition of two hydroxyl group occur across double bonds.

Addition of four hydroxyl group occur across triple bond.