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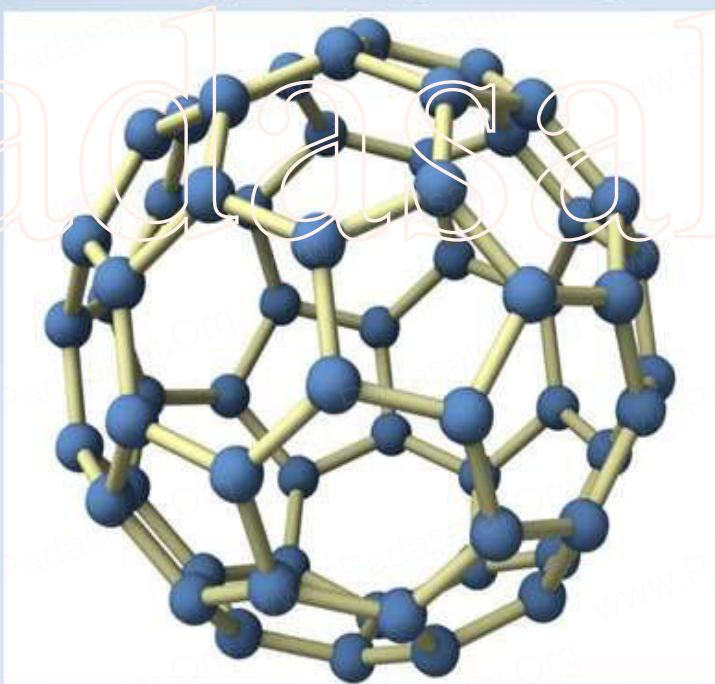
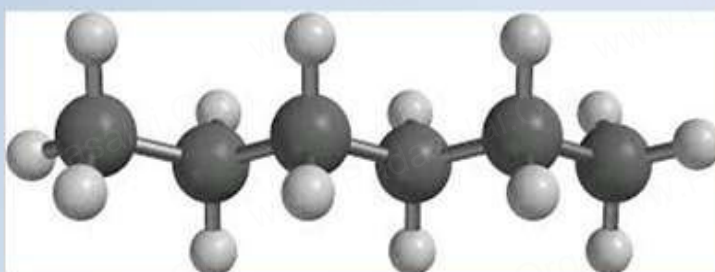
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ORGANIC CHEMISTRY

STD – XI

UNIT - 12 & 13



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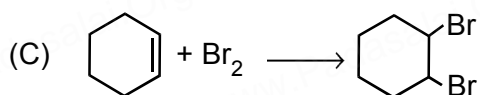
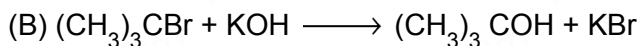
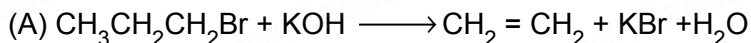


Unit - 12

Basic concepts of organic reactions

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1. For the following reactions



Which of the following statement is correct?

(a) (A) is elimination, (B) and (C) are substitution

(b) (A) is substitution, (B) and (C) are elimination

(c) (A) and (B) are elimination and (C) is addition reaction

(d) (A) is elimination, B is substitution and (C) is addition reaction.

2. What is the hybridisation state of benzyl carbonium ion?

(a) sp^2 (b) sp^2d (c) sp^3 (d) sp^2d

3. Decreasing order of nucleophilicity is

(a) $\text{OH}^- > \text{NH}_2^- > ^-\text{OCH}_3 > \text{RNH}_2$ **(b) $\text{NH}_2^- > \text{OH}^- > ^-\text{OCH}_3 > \text{RNH}_2$** (c) $\text{NH}_2^- > \text{CH}_3\text{O}^- > \text{OH}^- > \text{RNH}_2$ (d) $\text{CH}_3\text{O}^- > \text{NH}_2^- > \text{OH}^- > \text{RNH}_2$

4. Which of the following species is not electrophilic in nature?

(a) Cl^+ (b) BH_3 **(c) H_3O^+** (d) $+\text{NO}_2$

5. Homolytic fission of covalent bond leads to the formation of

(a) electrophile

(b) nucleophile

(c) Carbo cation

(d) free radical

6. Hyper Conjugation is also known as

(a) no bond resonance

(b) Baker - nathan effect

(c) both (a) and (b)

(d) none of these

7. Which of the group has highest +I effect?

(a) CH_3- (b) CH_3-CH_2- (c) $(\text{CH}_3)_2-\text{CH}-$ **(d) $(\text{CH}_3)_3-\text{C}-$**

8. Which of the following species does not exert a resonance effect?

(a) $\text{C}_6\text{H}_5\text{OH}$ (b) $\text{C}_6\text{H}_5\text{Cl}$ (c) $\text{C}_6\text{H}_5\text{NH}_2$ **(d) $\text{C}_6\text{H}_5\text{NH}_3^+$**

9. -I effect is shown by

(a) $-\text{Cl}$ (b) $-\text{Br}$ **(c) both (a) and (b)**(d) $-\text{CH}_3$

10. Which of the following carbocation will be most stable?

(a) Ph_3C^+ (b) $\text{CH}_3-\text{CH}_2^+$ (c) $(\text{CH}_3)_2-\text{CH}^+$ **(d) $\text{CH}_2=\text{CH}-\text{CH}_2^+$**

11. Assertion: Tertiary Carbocations are generally formed more easily than primary Carbocations ions.

Reason: Hyper conjugation as well as inductive effect due to additional alkyl group stabilize tertiary carbonium ions.

(a) both assertion and reason are true and reason is the correct explanation of assertion.

(b) both assertion and reason are true but reason is not the correct explanation of assertion.

(c) Assertion is true but reason is false

(d) Both assertion and reason are false

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12. Heterolytic fission of C-Br bond results in the formation of

- (a) free radical (b) Carbanion
(c) Carbocation (d) **Carbanion and Carbocation**

13. Which of the following represent a set of nucleophiles?

- (a) BF_3 , H_2O , NH_2^- (b) AlCl_3 , BF_3 , NH_3
(c) **CN^- , RCH_2^- , ROH** (d) H^+ , RNH_3^+ , $:\text{CCl}_2$

14. Which of the following species does not act as a nucleophile?

- (a) ROH (b) ROR (c) PCl_3 (d) **BF_3**

15. The geometrical shape of carbocation is

- (a) Linear (b) tetrahedral (c) **Planar** (d) Pyramidal

16. Write short notes on (a) Resonance (b) Hyperconjugation

(a) Resonance

Certain organic compounds can be represented by more than one structure and they differ only in the position of bonding and lone pair of electrons. Such structures are called resonance structures

(b) **Hyperconjugation** The delocalisation of electrons of σ bond is called as hyper conjugation

17. What are electrophiles and nucleophiles? Give suitable examples for each.

Electrophiles :

Electrophiles are reagents that are attracted towards negative charge or electron rich center.

They are either positively charged ions or electron deficient neutral molecules

Neutral electrophiles

: AlCl_3 , CO_2 , BF_3 , FeCl_3 , $:\text{CCl}_4$

Positively charged electrophiles

: R^+ , H^+ , H_3O^+ , NO_2^+

Nucleophiles :

Nucleophiles are reagents that have high affinity for electro positive centers.

Neutral Nucleophiles

: H_2O , R-OH , NH_3 , R-O-R ,

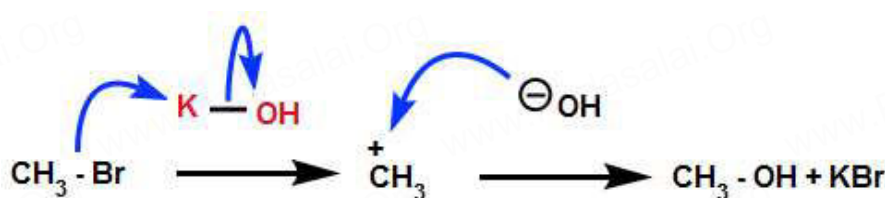
Negatively charged nucleophiles

: OH^- , Cl^- , CN^- , RCOO^- , RO^-

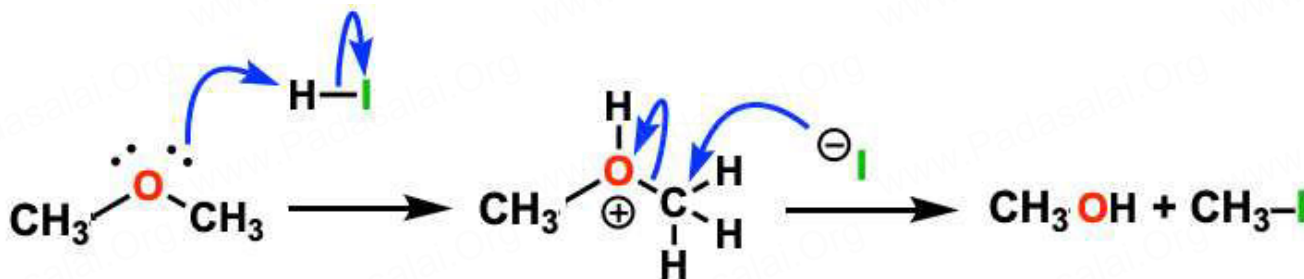
18. Show the heterolysis of covalent bond by using curved arrow notation and complete the following equations. Identify the nucleophile in each case.



i)



ii)

**19. Explain inductive effect with suitable example.**

Inductive effect is defined as the change in the polarisation of a covalent bond due to the presence of adjacent bonds, atoms or groups in the molecule. This is a permanent phenomenon.

Their ability to release or withdraw the electron through sigma covalent bond is called **+I effect** and **-I effect** respectively

Electron withdrawing or -I group : -F, -Cl, -COOH, -NO₂, NH₂

Electron donating or +I groups : CH₃O⁻, C₂H₅O⁻, COO⁻ etc

The order of the -I effect of some groups are given below

NH₃⁺ > NO₂ > CN > SO₃H > CHO > CO > COOH > COCl > CONH₂ > F > Cl > Br > I > OH >

OR > NH₂ > C₆H₅ > H

The relative order of +I effect of some alkyl groups is given below

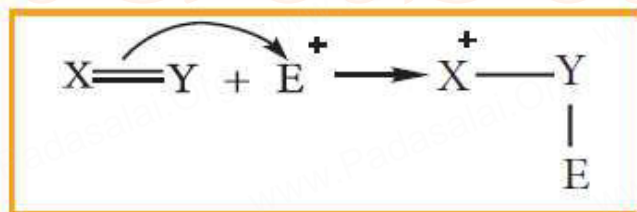
-C(CH₃)₃ > -CH(CH₃)₂ > -CH₂CH₃ > -CH₃

20. Explain electromeric effect.

Electromeric effect is a **temporary effect** and observed only in organic compounds with multiple bonds in the presence of an attacking reagent.

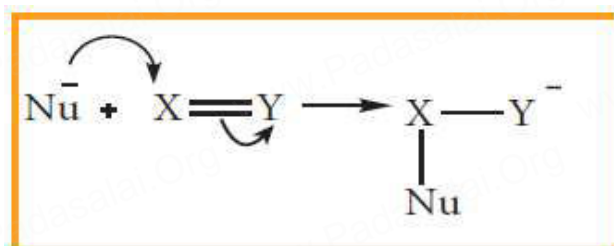
+ve Electromeric effect.

When the **σ** electron is transferred towards the attacking reagent, it is called +E (positive electromeric) effect.



-ve Electromeric effect.

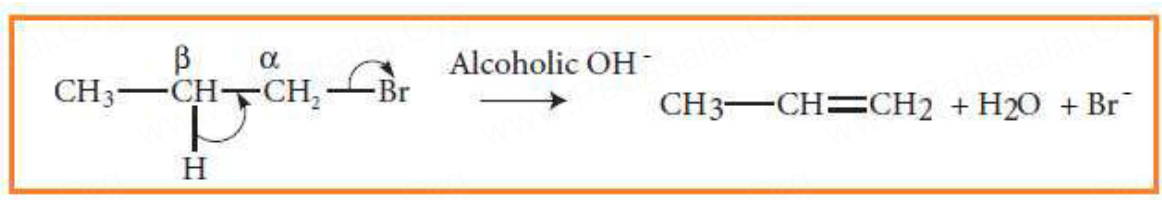
When the **π** electron is transferred away from the attacking reagent, it is called, -E (negative electromeric) effect



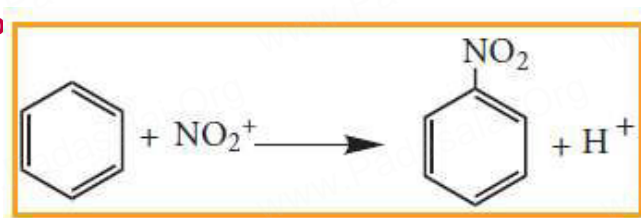
21. Give examples for the following types of organic reactions

(i) β - elimination (ii) electrophilic substitution.

(i) {



(ii) electrophilic sub

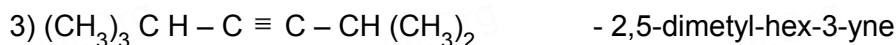
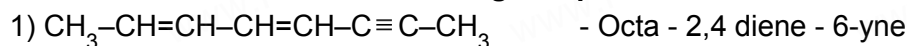


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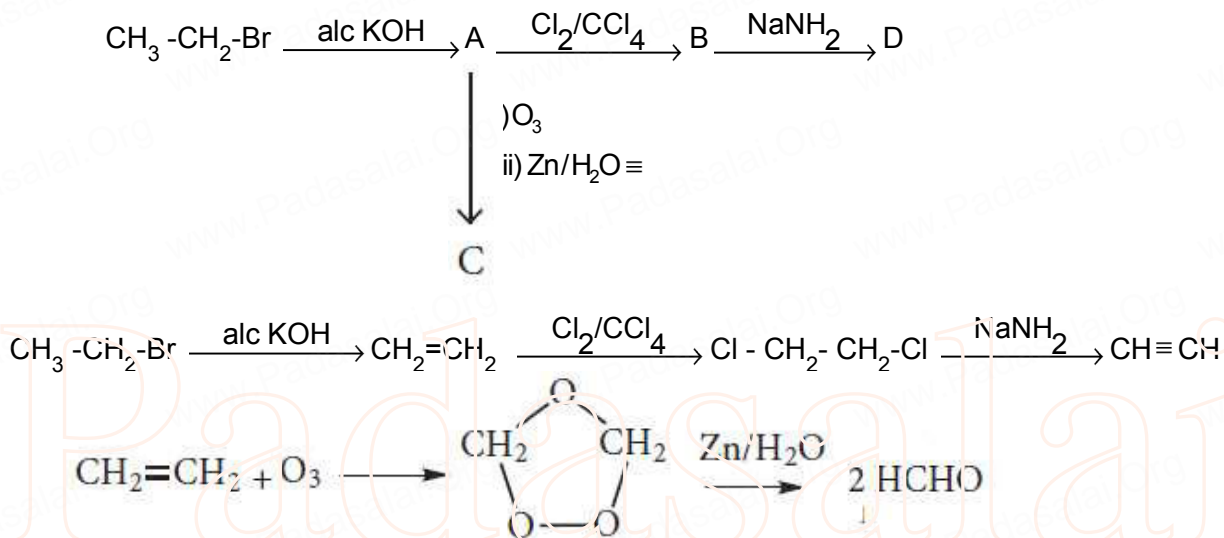
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Hydrocarbons

31. Give IUPAC names for the following compounds



32. Identify the compound A, B, C and D in the following series of reactions



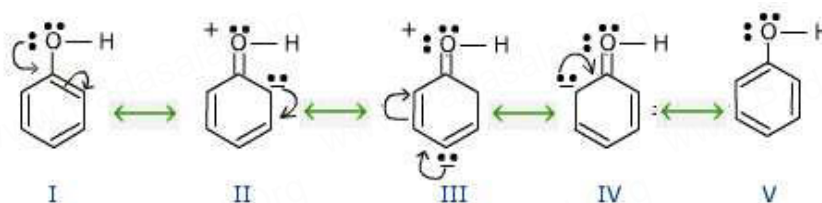
A- Ethene B - 1,2 dichloro ethane C- Formaldehyde D - ethyne

33. Write short notes on ortho, para directors in aromatic electrophilic substitution reactions.

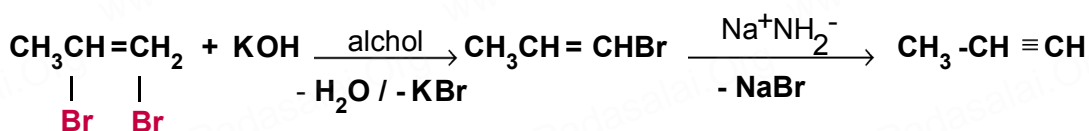
Those which increases electron density at 'ortho' and 'para' position are known as ortho-para directors. All the activating groups are 'ortho-para' directors.

Example $-\text{OH}$, $-\text{NH}_2$, $-\text{NHR}$, $-\text{NHCOCH}_3$, $-\text{OCH}_3$, $-\text{CH}_3$, $-\text{C}_2\text{H}_5$

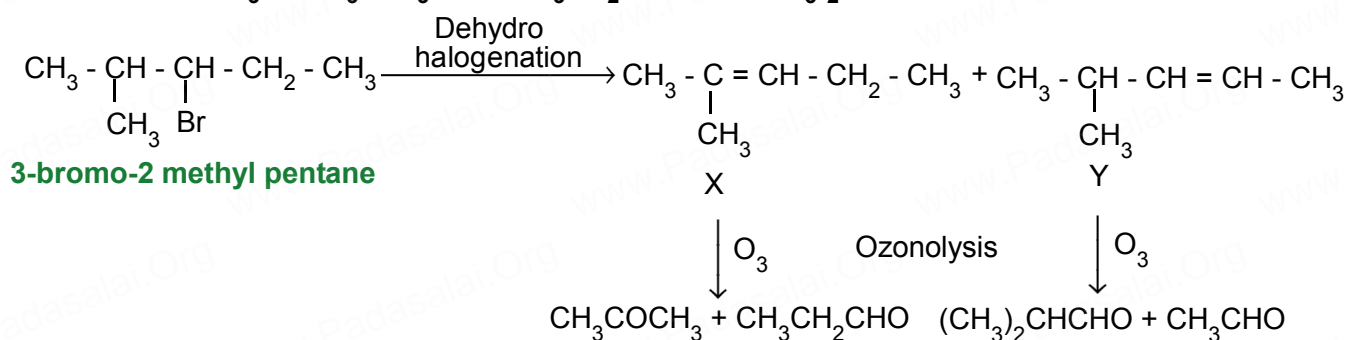
Let us consider the directive influences of phenolic ($-\text{OH}$) group. Phenol is the resonance hybrid of following structures.



34. How is propyne prepared from an alkylene dihalide ?



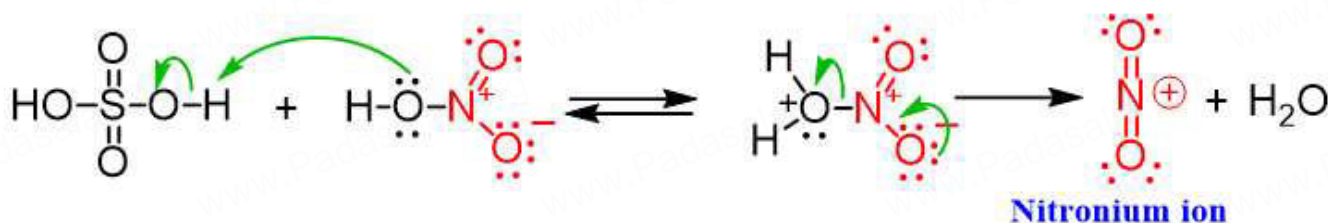
35. An alkylhalide with molecular formula $C_6H_{13}Br$ on dehydro halogenation gave two isomeric alkenes X and Y with molecular formula C_6H_{12} . On reductive ozonolysis, X and Y gave four compounds CH_3COCH_3 , CH_3CHO , CH_3CH_2CHO and $(CH_3)_2CHCHO$. Find the alkylhalide.



36. Describe the mechanism of Nitration of benzene.

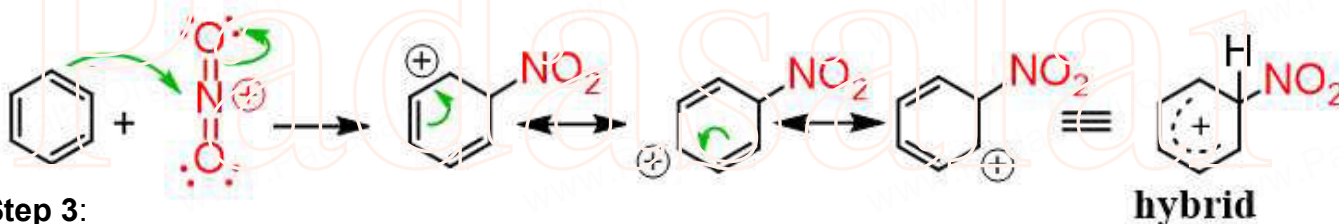
Step 1:

Nitric acid accepts a proton from sulphuric acid and then dissociates to form nitronium ion.



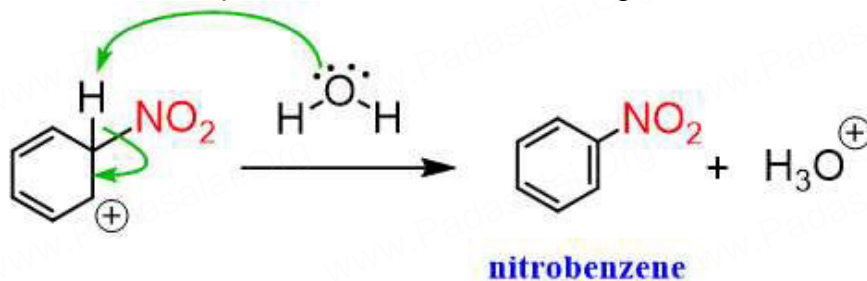
Step 2:

The nitronium ion acts as an electrophile in the process which further reacts with benzene to form an arenium ion.



Step 3:

The arenium ion then loses its proton to Lewis base forming nitrobenzene.

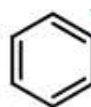


37. How does Huckel rule help to decide the aromatic character of a compound.

- Presence of $(4n+2) \pi$ electrons in the ring where n is an integer ($n=0,1,2,\dots$)
- All carbon atoms should be sp^2 hybridised.
- System should be cyclic.
- System should have conjugation.

Example : (i) The benzene is a planar molecule
 (ii) It has six delocalised π electrons
 (iii) $4n + 2 = 6$ $4n = 6 - 2$ $4n = 4$

$n = 1$ it obeys Huckel's $(4n+2) \pi$ electron rule with $n = 1$ hence, benzene is aromatic.



38. Suggest the route for the preparation of the following from benzene.

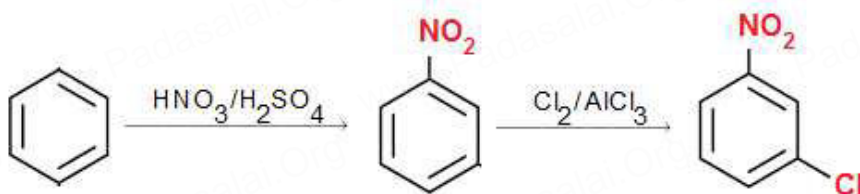
1) 3-chloro nitrobenzene

2) 4-chlorotoluene

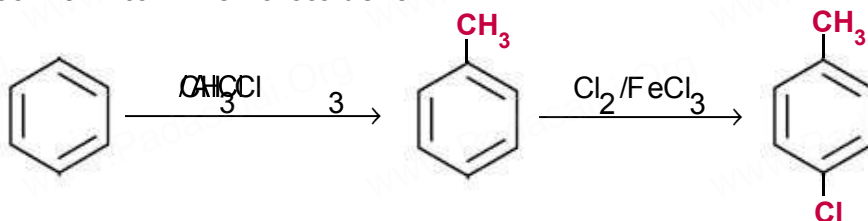
3) Bromo benzene

4) m-dinitro benzene

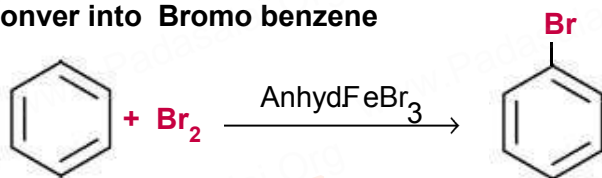
1) Benzene convert into 3-chloronitro benzene



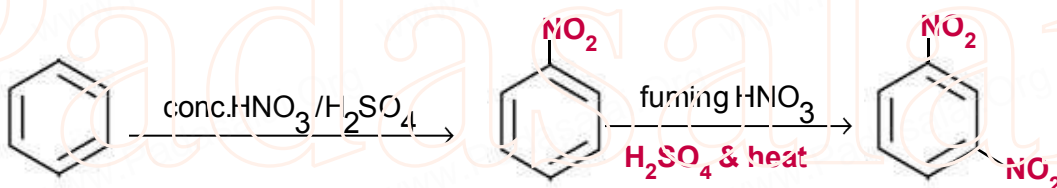
2) Benzene convert into 4-chlorotoluene



3) Benzene convert into Bromo benzene



4) Benzene convert into m-dinitro benzene



39. Suggest a simple chemical test to distinguish propane and propene.

Propene (unsaturated) is an alkene, whereas propane (saturated) is an alkane

Add bromine water (brown) to the test tubes

If the bromine water stays brown, the test tube contains propane

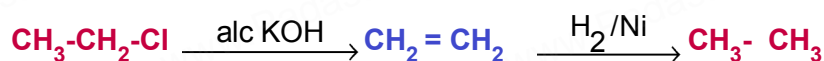
If the bromine water goes colourless, the test tube contained propene

40. What happens when isobutylene is treated with acidified potassium permanganate?



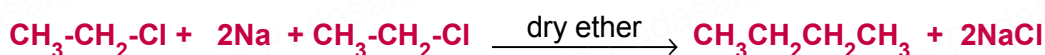
41. How will you convert ethyl chloride into i) ethane ii) n-butane

i) Ethyl chloride into ethane

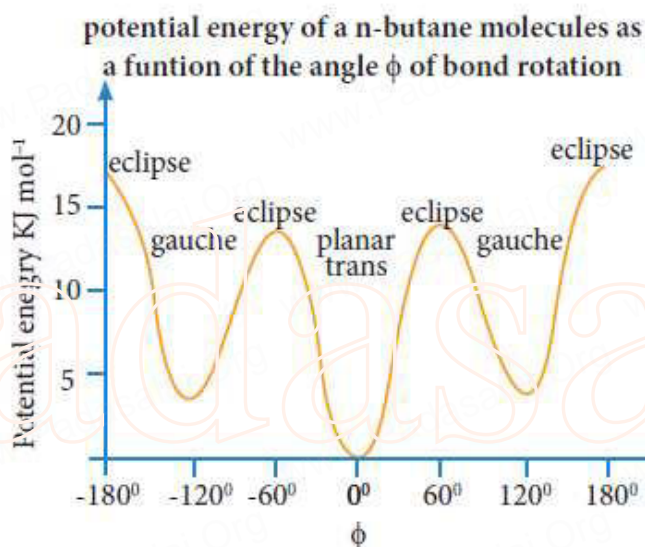
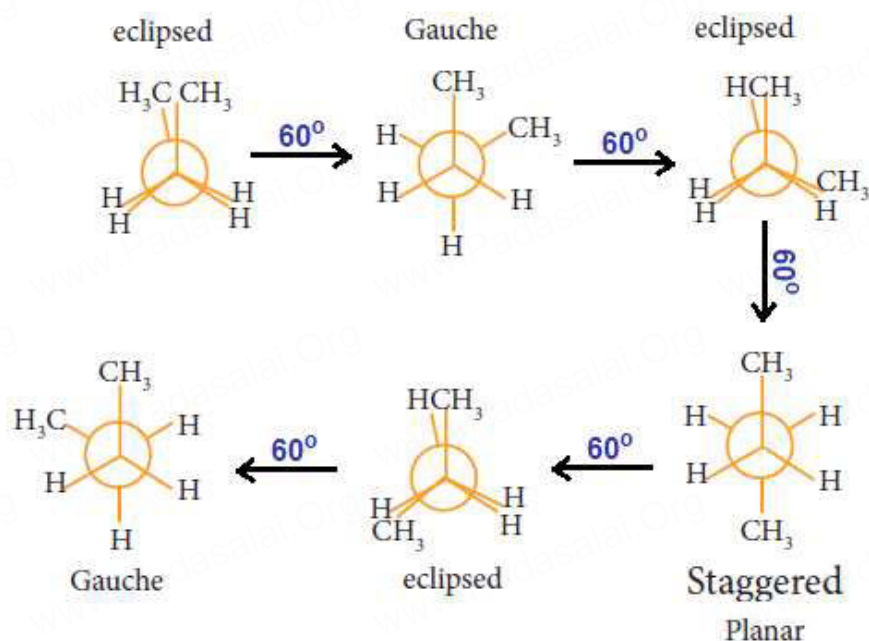


ii) Ethyl chloride into n-butane

Wurtz reaction.

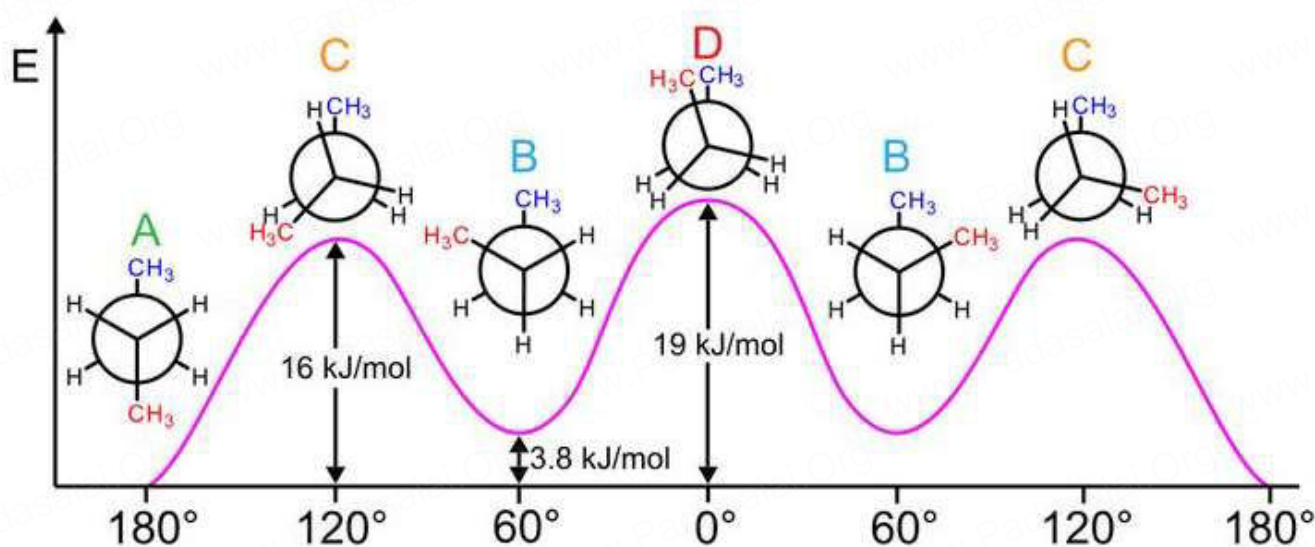


42. Describe the conformers of n - butane.

Conformations of n-Butane:

potential energy difference : **Eclipsed > Gauche > Staggered**

Stability order : **Staggered > Gauche > Eclipsed**



43. Write the chemical equations for combustion of propane



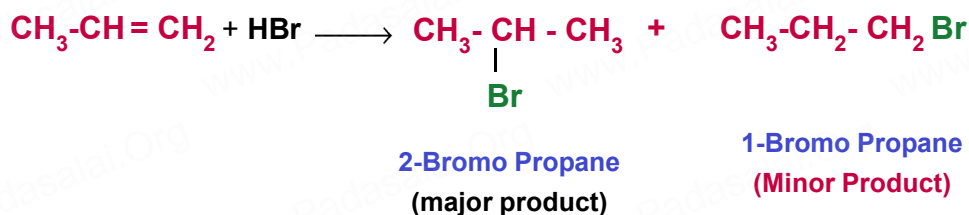
44. Explain Markownikoff's rule with suitable example.

"When an unsymmetrical alkene reacts with hydrogen halide, the hydrogen adds to the carbon that has more number of hydrogen and halogen add to the carbon having fewer hydrogen".

This rule can also be stated as in the addition reaction of alkene / alkyne, the most electro negative part of the reagent adds on to the least hydrogen attached doubly bonded carbon.

The order of reactivity of different hydrogen halides is $\text{HI} > \text{HBr} > \text{HCl}$.

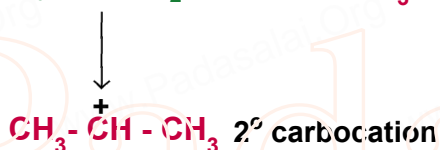
Example :



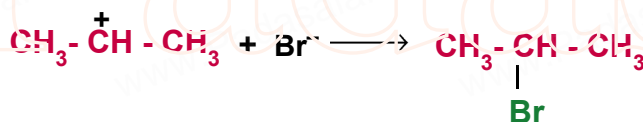
Mechanism:

Step: 1 Formation of electrophile: $\text{HBr} \longrightarrow \text{H}^+ + \text{Br}^-$

Step:2 Secondary carbocation is more stable than primary carbocation and it predominates over a the primary carbocation.



Step:3 The Br^- ion attack the 2° carbocation to form 2-Bromobutane, the major product.

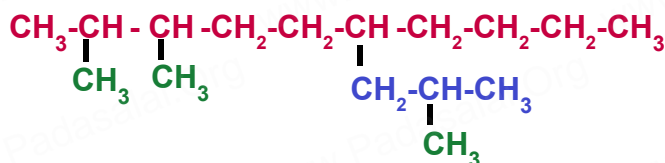


45. What happens when ethylene is passed through cold dilute alkaline potassium permanganate.

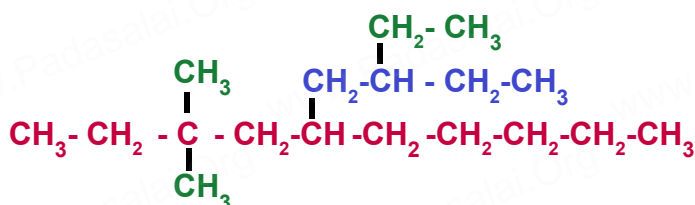


46. Write the structures of following alkanes.

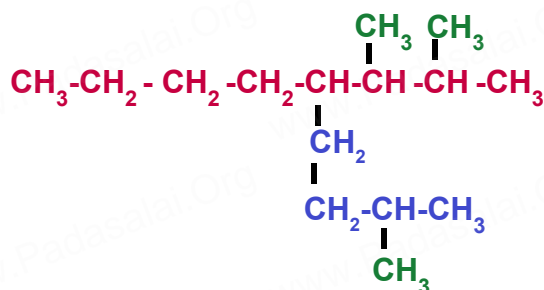
1) 2, 3 – Dimethyl – 6 – (2 – methyl propyl) decane



2) 5 – (2 – Ethyl butyl) – 3, 3 – dimethyldecane



3) 5 – (1, 2 – Dimethyl propyl) – 2 – methylnonane



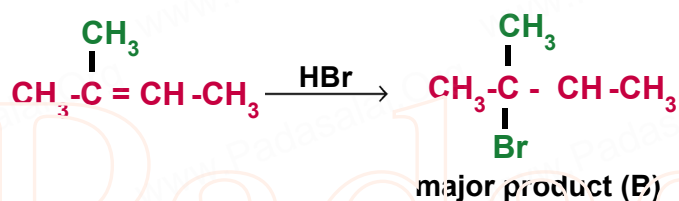
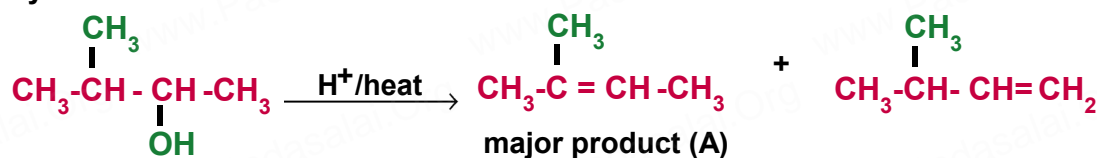
47. How will you prepare propane from a sodium salt of fatty acid ?

Sodium butanoate (sodium salt of butanoic acid) on heating with sodalime yields propane by decarboxylation.



48. $\text{CH}_3 - \text{CH}(\text{CH}_3) - \text{CH}(\text{OH}) - \text{CH}_3 \xrightarrow{\text{H}^+/\text{heat}}$ (A) major product $\xrightarrow{\text{HBr}}$ (B) major product

Identify A and B



A- 2-methyl-2-butene

B- 2-Bromo-2-methyl-2-butane

49. Complete the following :

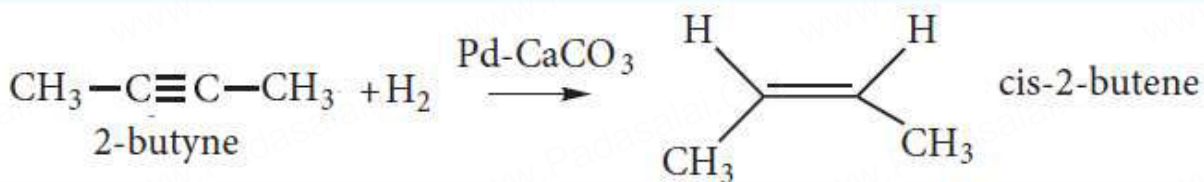
i) 2 – butyne $\xrightarrow{\text{Lindlar Catalyst}}$

ii) $\text{CH}_2 = \text{CH}_2 \xrightarrow{\text{I}_2}$

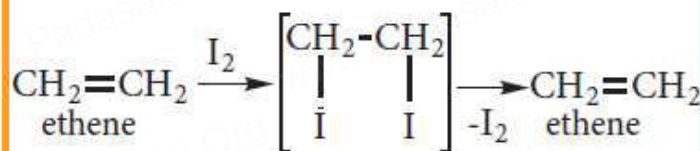
iii) $\text{CH}_2\text{Br} = \text{CH}_2\text{Br} \xrightarrow{\text{Zn/C}_2\text{H}_5\text{OH}}$

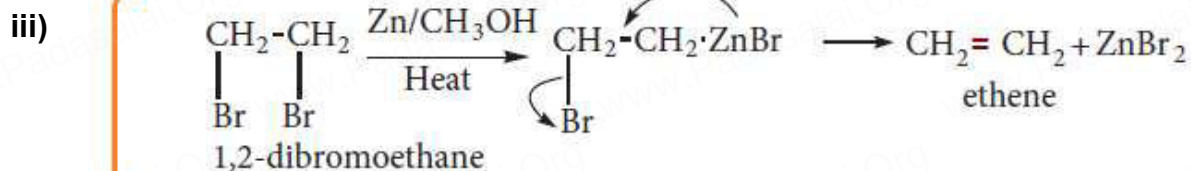
iv) $\text{CaC}_2 \xrightarrow{\text{H}_2\text{O}}$

i)

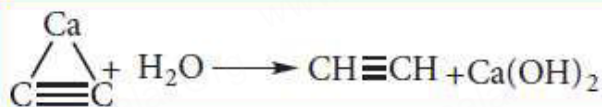


ii)





iv)



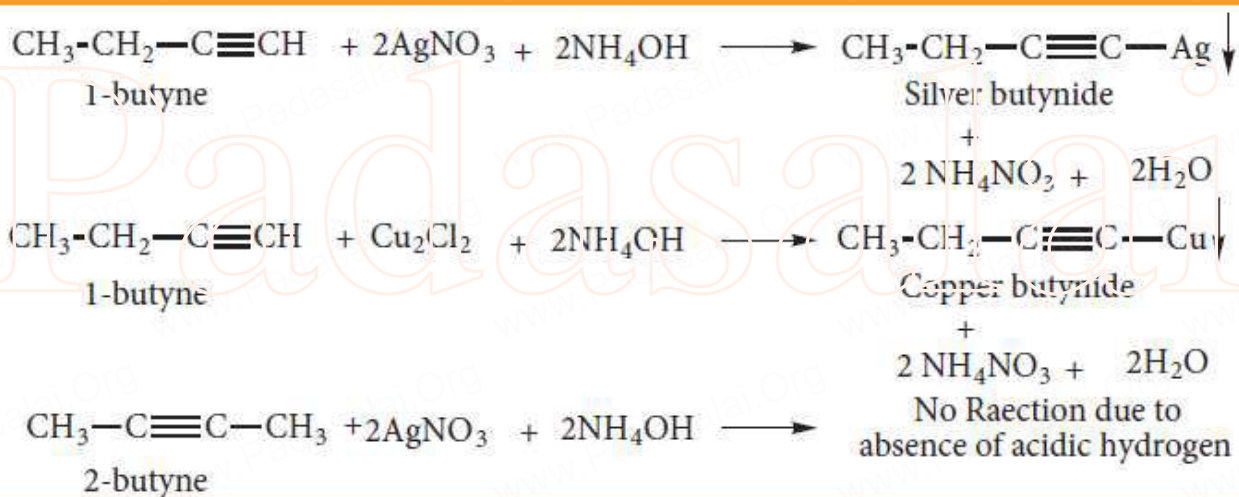
50. How will you distinguish 1 – butyne and 2 – butyne?

i) **1-butyne and 2-Butyne are distinguished by "Tollins reagent test ".**

1-butyne gives tollins reagent test but 2-Butyne doesn't.

ii) **There will be no reaction between butene-2 and Cu_2Cl_2 because it has no acidic hydrogen.**

In butyne-1 the terminal hydrogen is acidic ($\text{CH}_3\text{CH}_2-\text{C}\equiv\text{CH}$) so it will give a real ppt with ammonical Cu_2Cl_2



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