



# SHIKSHA CLASSES

Subject : Chemistry

BOARD ANSWER PAPER

Total Marks : 20

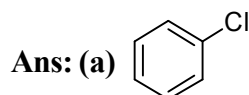
Class : XII

Topic: 10. Halogen Derivatives

## Section (A)

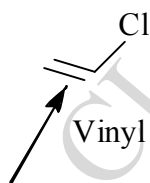
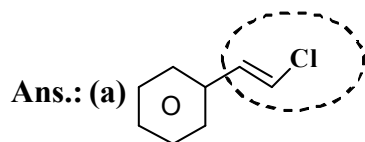
**Q. 1. (a) : Select and write the most appropriate answer from given alternatives in each sub-question [5]**

**i) The strongest C-Cl bond present in**



Aromatic C - Cl bond length is less than aliphatic C - Cl. Thus less bond distance stronger the bond.

**ii) Which of the following structure is Vinyl Chloride?**

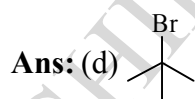


SP<sup>2</sup>-Hybridisation carbon atom

**iii) The halogenating reagent is**

Ans. : (d) All of these

**iv) Which of the following is better reactant for SN<sup>1</sup> Reaction?**



**v) IUPAC name of Allyl chloride is**

Ans: a) 3-chloroprop-1-ene

**Q.1 (b) : Very short answer type Question [2]**

**i) Write definition of enantiomer and racemic mixture?**

**Ans. : Enantiomer :** The optical isomer which are non superimposable mirror images of each other are called enantiomer.

**Racemic mixture :** An equimolar mixture of enantiomer (dextrorotatory and laevorotatory) is called racemic mixture.

**ii) What is primary Alkyl Halide?**

**Ans. :** In this type of alkyl halide, the carbon which is bonded to the halogen family will be only attached to one other alkyl group. It doesn't matter how much bulky group is attached to it.

## Section (B)

**Q. 2 Answer the following question.**

(Any three)

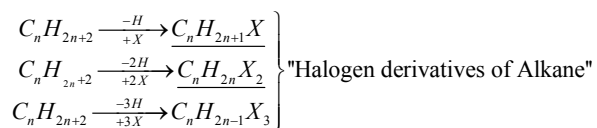
[6]

**i) What are the halogen derivatives of alkane, classified with examples?**

**Ans: Halogen derivatives of alkane :**

The hydrocarbon in which, replacement of one or more than one hydrogen atom by one more than one halogen atom is known as Halogen derivatives of hydrocarbon or alkane'.

The general molecular formula of Halogen derivative of alkane is



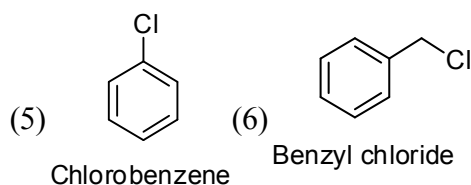
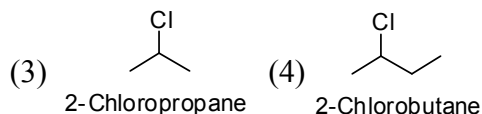
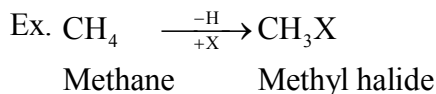
The halogen derivatives of alkanes are classified on the basis of number of halogen atom present in alkane.

1) Mono halogen derivative of Alkane.

2) Poly halogen derivative of Alkane.

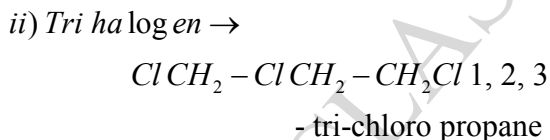
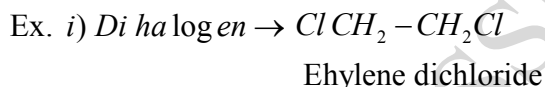
**1) Mono halogen derivative of Alkane :**

One halogen atom is present in hydrocarbon or "Replacement of one hydrogen atom by one halogen atom in hydrocarbon is known as Monohalogen derivative of alkane".



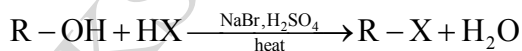
## 2) Poly halogen derivative of Alkane :

"Replacement of more than one hydrogen atom by more than one halogen atom in hydrocarbon is known as polyhalogen derivatives of alkane."



## ii) Give any one methods of preparation of alkyl halide?

**Ans. : From alcohols :** When alcohol react with hydrogen halide in presence of sodium bromide and hydrogen sulphide it gives alkyl halide.



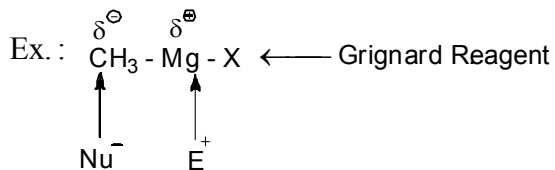
## iii) What are the Grignard Reagent? Explain with examples.

**Ans.:** In '1908' Victor Grignard discovered the 'R Mg X'

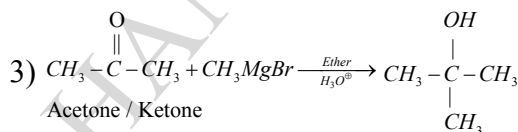
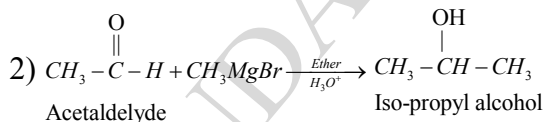
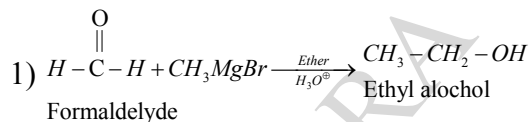
reagent i.e.                      R = alkyl  
    Mg = Magnesium metal  
    X = halide / Halogen

Alky Magnesium halide ( $\text{R}^- \text{Mg}^+ \text{X}$ )

## i) Grignard R.



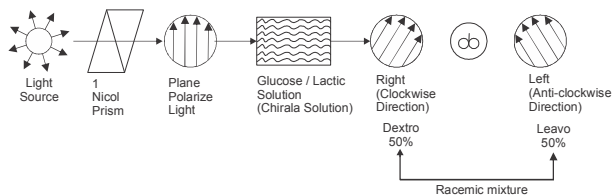
## Application :



## iv) What are Optical Activity? Explain with examples.

**Ans. : Optical Activity :** When plane polarized light is pass through glucose, lactic acid(organic solution), the plane polarized light gets rotated through certain angle either clockwise direction or anti-clockwise direction (right hand side & left hand side) the phenomenon is known as "optical activity".

**Example :** When an aqueous solution of certain organic compounds like sugar, lactic acid is placed in the path of plane polarized light, the transmitted light has oscillations in a different plane than the original. In other words, the incident light undergoes rotation of its plane of polarization. The plane of polarization rotates either to the right (clockwise) or to the left (anticlockwise).



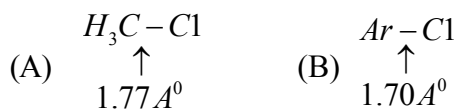
Thus, this process / phenomenon is known as “optical activity.”

**Q.3 Answer the following question (Any one)**

[3]

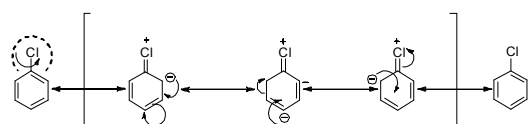
**i) Explain the nature of C-X bond in aliphatic and aromatic halogen compounds.**

**Ans. : Nature of C-X bond :**

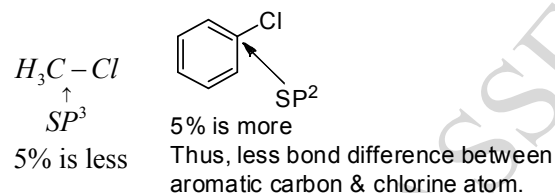


Aliphatic compound      Aromatic compound

(b)

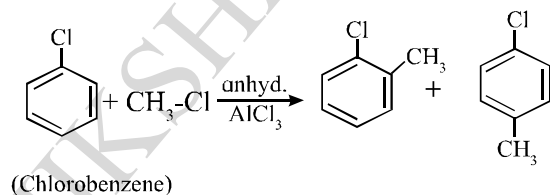


The lone pair ele. present on chlorine atom going to delocalization and thus create a  $\pi$ -bond between carbon of aromatic nucleus and chlorine atom thus bond distance automatically decreases than C-Cl aliphatic or single bond between C-Cl / C-X species.

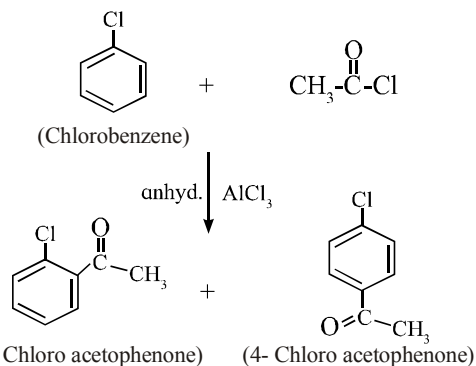


**ii) Explain Friedel Craft Alkylation and Acylation reaction with its examples.**

**Ans: Alkylation :** Aryl halide react with methyl chloride in presence of anhydrous  $AlCl_3$  it gives methyl arylhalide



**Acylation :** When Chlorobenzene react with acyl chloride in presence of unhydrous  $AlCl_3$  it gives 1-chloro acetophenone and 4-chloro acetophenone.

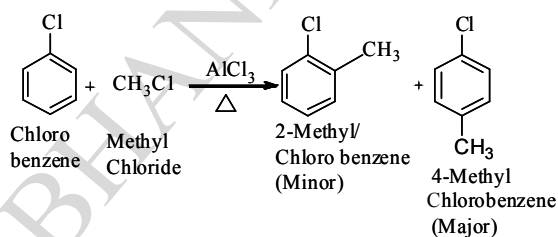


**Q.4 Answer the following question (Any one)**

[4]

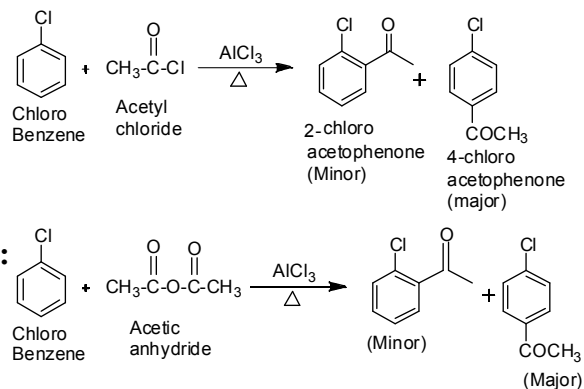
**i) Give the Friedel Craft Alkylation and Acylation reaction of chlorobenzene?**

**Ans. :- 1) Friedal Craft Alkylation Reaction of Chlorobenzene :**



When chlorobenzene is heated with methyl chloride in presence of aluminium trichloride to form 2-methyl chlorobenzene (minor) & 4-methyl chlorobenzene (major) products. Such types of reaction is “Fredel craft Alkylation Reaction of chlorobenzene.

**2) Friedal Craft Acylation Reaction of Chlorobenzene**



When chlorobenzene is heated with acetyl chloride or acetic anhydride in presence of aluminium trichloride (lewis acid) to form 2-chloro acetophenone (minor) and 4-chloro acetophenone is major and  $AlCl_3$  remain it (as -catalyst).

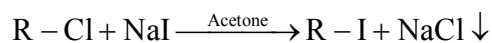
The 4-chloro acetophenone is major this is due

to absence of steric crowding between chlorine atom and acetyl group.

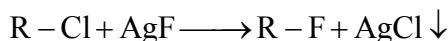
OR

**ii) What are Finkelstein and Swartz reaction?**

**Ans. : Finkelstein reaction :** Alkyl iodides are prepared conveniently by treating alkyl chlorides or bromides with sodium iodide in methanol or acetone. This reaction is called finkelstein reaction.



**Swartz Reaction :** Alkyl fluorides are prepared by heating alkyl chlorides or bromides with metal fluorides such as  $AgF$ ,  $Hg_2F_2$ ,  $AsF_3$ ,  $SbF_3$  etc. is called Swartz reaction.

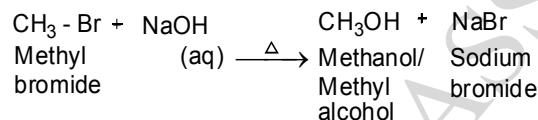


**iii) What are the  $SN^2$  reaction, explain with an example?**

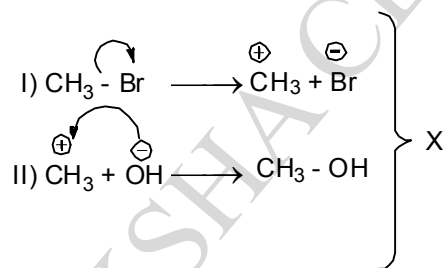
**Ans.:** Bimolecular Nucleophilic Substitution Reaction (BNSR)- is a second order one step reaction.

When methyl bromide is treated with sodium hydroxide formed methyl alcohol and NaBr- Sodium bromide as side product.

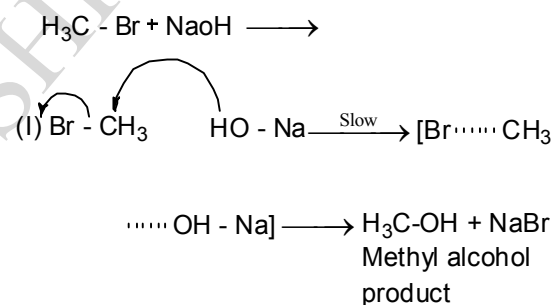
**Reaction :**



**Mechanism path (wrong) :**



**Mechanism path (offered) :**



The Nucleophilic Hydroxy group from sodium hydroxide i) attack on carbon atom of methyl bromide from backside and generate transition state and fast generate product.

Thus, this is an first step of reaction mechanism (Simultaneously nucleophile attack and Leaving of nucleophile).

**Kinetic :**

$$\text{Rate} \propto [CH_3Br] [NaOH]$$

$$\text{Rate} \propto [CH_3Br] [OH^{\ominus}]$$

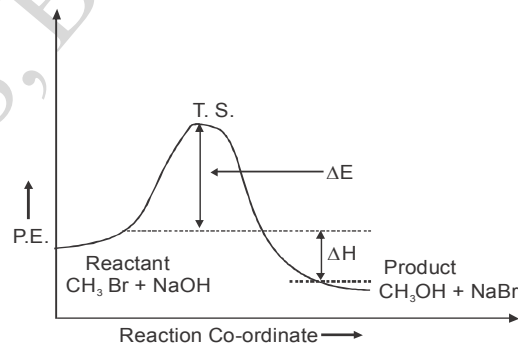
$$\therefore \text{Rate} = K [CH_3Br] [OH^{\ominus}]$$

K = Rate constant

The rate of reaction is depends upon both reactants i.e.  $CH_3Br + NaOH$ .

$\therefore$   $SN^2$  reaction is second order one step Reaction.

**EPD For  $SN^2$  Reaction :**



The graph is plotted potential energy verses reaction co-ordinate is energy profile diagram. The energy difference between reactant and product is heat of enthalpy ( $\Delta H$ ).

$$\therefore \Delta H = R - P.$$

The energy difference between reactant and transition state is known as "change in energy  $\Delta E$ "

$$\therefore \Delta E = R - T. \text{ State.}$$

On the basis of above representation.

In case heat is absorbed then  $\Delta H = \oplus$  ve (endothermic), then product formed is less stable, while heat is released then  $\Delta H$  is  $\ominus$  ve (exothermic) & product formed is stable.

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