

UNIT.10

HALOALKANES AND HALOARENES

ONE MARKS QUESTIONS

- 1. What are haloalkanes?** [1]
A: Haloalkane is a derivative obtained by replacing hydrogen atom of alkane by halogen atom.
- 2. What is the hybridization of the carbon attached with vinylic halides (or) aryl halides?** [1]
A: sp^2 hybridisation.
- 3. Among phosphorus trihalides which halides are generated insitu ?** [1]
A: PBr_3 , PI_3
- 4. Free radical halogenation of hydrocarbons is not a best method to prepare haloalkanes. Why?** [1]
A: Because this method gives mixture of isomeric mono and poly haloalkanes, which is difficult to separate as pure compounds.
- 5. Why fluoro compounds cannot be prepared from electrophilic substitution reaction?** [1]
A: Due to high reactivity of fluorine.
- 6. What happens to the boiling point of isomeric haloalkanes with increase in branching?**[1]
A: decreases.
- 7. How density and atomic mass of halogen atoms in haloalkanes are related?** [1]
A: Directly
- 8. Why tertiary alkyl halide undergoes S_N1 reaction very fast?** [1]
A: Because of the high stability of tertiary carbocation
- 9. What is the order of reactivity of alkyl halides towards S_N1 and S_N2 reaction** [1]
A: Towards S_N1 reaction order of reactivity is $3^\circ > 2^\circ > 1^\circ$
Towards S_N2 reaction order of reactivity is $1^\circ > 2^\circ > 3^\circ$.
- 10. Allylic and benzylic halides are highly reactive towards S_N1 reaction. Why?** [1]
A: Because the carbocation formed from allylic and benzylic halides is more stable due to resonance.
- 11. Between S_N1 and S_N2 reaction which one proceeds with complete stereo chemical inversion?** [1]

A: S_N2 reaction.

12. **Between S_N1 and S_N2 reactions which one proceeds with racemisation?**

[1]

A: S_N1 reaction.

13. **What are optically active compounds?**

[1]

A: Certain compounds rotate the plane polarized light when it is passed through their solutions are called as optically active compounds.

14. **What are dextro rotatory compounds?**

[1]

A: The compound which rotates plane polarized light in clockwise direction is called as dextro rotatory compound.

15. **What is a laevo rotatory compound?**

[1]

A: The compound which rotates plane polarized light in anticlockwise direction is called as laevo rotatory compound.

16. **What are optical isomers?**

[1]

A: The dextro and laevo rotatory isomers of a compound are called as optical isomers.

17. **What is asymmetric carbon (or) stereocentre**

[1]

A: A carbon atom attached with four different substituent groups is called as asymmetric carbon (or) stereocentre.

18. **What are chirals?**

[1]

A: The objects which are non-superimposable on their mirror image are said to be chirals.

19. **What are achiral molecules?**

[1]

A: The molecules which are, superimposable on their mirror images are called achiral molecules.

20. **Between propan – 2- ol and butan – 2 – ol, identify the chiral molecule?**

[1]

A: Butan – 2- ol.

21. **What are enantiomers?**

[1]

A: The stereo isomers related to each other as non-superimposable mirror images are called enantiomers.

22. **What are racemic mixtures?**

[1]

A: A mixture containing two enantiomers in equal proportions will have zero optical rotation, are called as racemic mixture (or) racemic modification.

23. **What is racemization?** [1]

A: The process of conversion of enantiomer into a racemic mixture is known as racemization.

24. **Between α and β - hydrogen which one is removed during dehydrohalogenation of alkyl halides?** [1]

A: β - Hydrogen.

25. **What are organo-metallic compounds?** [1]

A: Most organic chlorides, bromides and iodides react with certain metals to give compounds containing carbon-metal bonds are known as organo – metallic compounds.

26. **Write the general formula of Grignard reagent?** [1]

A: RMgX .

27. **Name the product formed when Grignard reagent treated with water?**

A: Alkanes

28. **What is the hybridization of carbon atom in C-X bond of alkyl halides?** [1]

A: sp^3 hybridisation

29. **Mention the hybridization of carbon atom in C-X bond of aryl halides?** [1]

A: sp^2 hybridisation

30. **Why $\text{S}_{\text{N}}1$ mechanism is ruled out in haloarenes?** [1]

A: In case of haloarenes, the phenyl cation formed as a result of self-ionization will not be stabilized by resonance and therefore, $\text{S}_{\text{N}}1$ mechanism is ruled out.

31. **What happens to the reactivity of haloarenes towards nucleophilic substitution when electron withdrawing group present at ortho or para position?** [1]

A: Increases.

32. **What is wurtz-fitting reaction?** [1]

A: A mixture of an alkyl halide and aryl halide gives an alkylarene when treated with sodium in dry ether and is called as wurtz-fitting reaction.

33. **Expand DDT** [1]

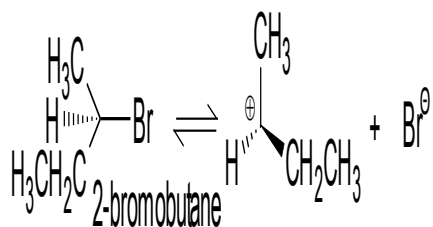
A: Dichlorodiphenyltrichloro ethane

34. **Among chloral, chloroform, DDT, carbontetrachlorides , which has more number of chlorides ?**

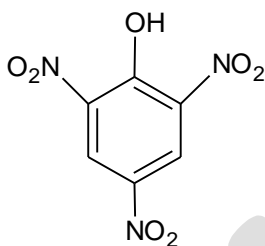
A; DDT

[1]

35. Identify the product.

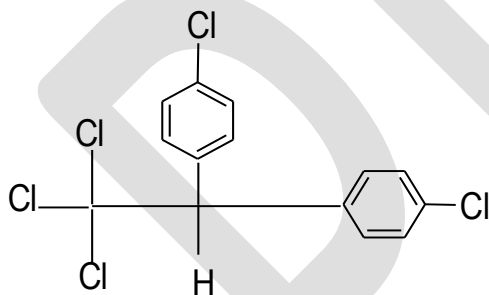


A:



36. Write the structure of DDT

A:



[1]

TWO MARKS QUESTIONS

37. Explain the classification of monohaloalkanes containing $\text{Sp}^3\text{C} - \text{X}$ bond

[2]

A: These are classified into three types





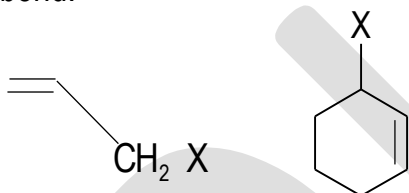
38. What is the difference between allylic acid and benzylic halides

[2]

A:

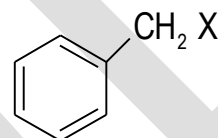
Allylichalide

These are the compounds where the halogen atom is bonded to a Sp^3 -hybridised carbon atom next to carbon-carbon double bond.



Benzylic halides

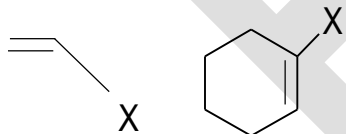
These are the compounds in which the halogen atom is bonded to an Sp^3 -hybridised carbon atom next to an aromatic ring.



39. What are vinylic halides? Give example?

[2]

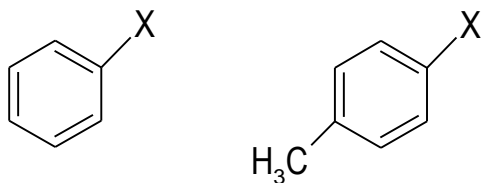
A: These are the compounds in which the halogen atom is bonded to a Sp^2 -hybridised carbon atom of a carbon-carbon double bond.



40. What are aryl halides? Give example?

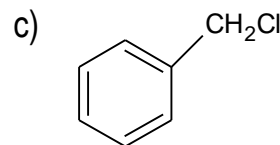
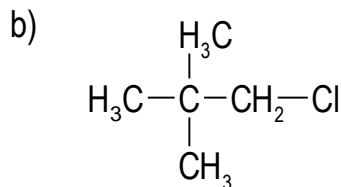
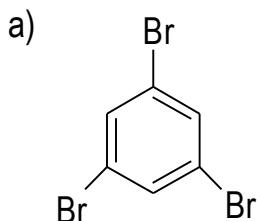
[2]

A: These are the compounds in which the halogen atom is bonded to the Sp^2 hybridised carbon atom of an aromatic ring.



41. Write the IUPAC name of the following compounds

[2]



d) $\text{CH}_2=\text{CH}-\text{Cl}$

A: a) 1, 3, 5 – tribromo,benzece

b) 1, chloro 2, 2 – dimethyl propane

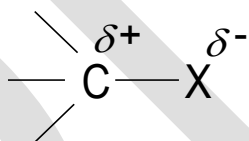
c) Chloro phenyl methane

d) Chloroethene

42. Explain nature of C-X bond in haloalkanes?

[2]

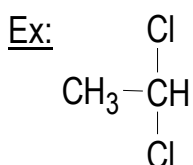
A: Haloalkanes are polar in nature because halogen atoms are more electronegative than carbon as a result the carbon atom bears a partial positive charge whereas the halogen atom bears a partial negative charge



43. What are geminal halides? Give example?

[2]

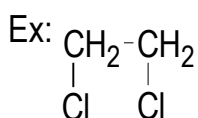
A: These are the dihalo compounds where two same halogen atoms are present on the same carbon atom

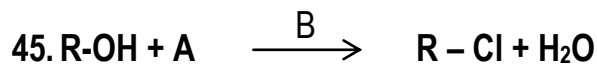


44. What are vicinal halides? Given example?

[2]

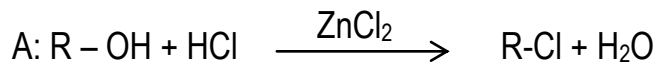
A: These are the dihalo compounds where two same halogen atoms are present on the adjacent carbon atoms





Identify A and B in the given reaction

[2]



A = HCl,

B = ZnCl₂

46. How do you prepare chloroalkane using reaction between alcohol and phosphorus pentachloride?

[2]



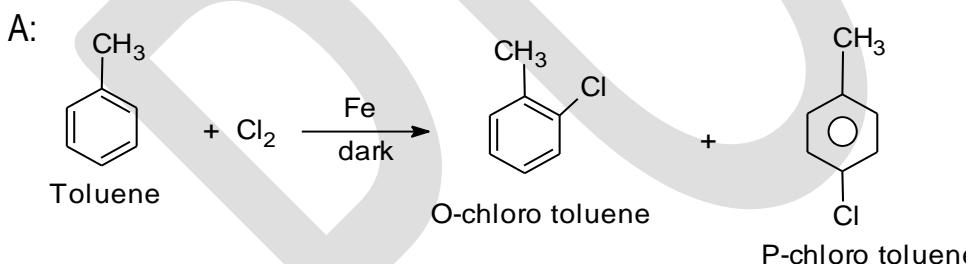
47. How do you prepare chloroalkane using alcohol and thionylchloride? Mention advantage of this reaction?

[2]



48. Explain the reaction between toluene and chlorine?

[2]



49. Why iodination of arenes by electrophilic substitution requires an oxidizing agent?

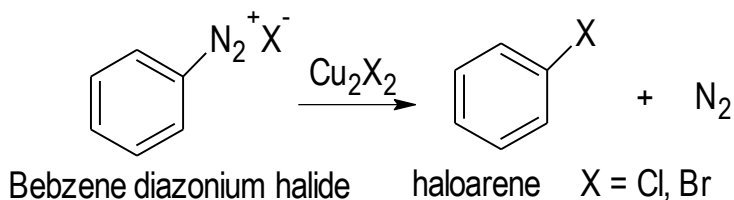
[2]

A: Because iodination of arenes is a reversible reaction due to formation of byproduct HI and presence of an oxidizing agent oxidises the HI formed, thereby prevents reversible reaction.

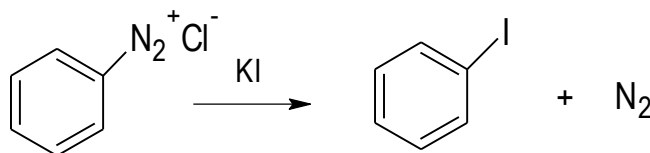
50. Explain Sandmeyer's reaction to prepare haloarenes (or) how do you convert benzene diazonium salt into haloarenes?

[2]

A:

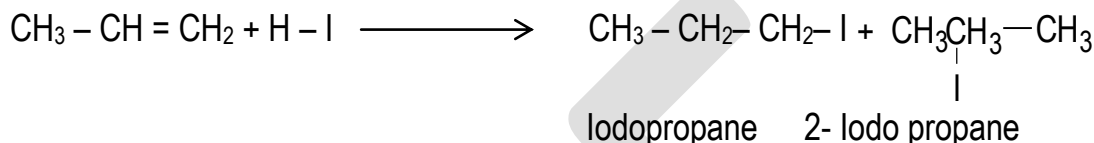


- ❖ In this reaction iodination of benzene diazonium halide does not require cuprous halide



51. Identify major product in the given reaction and give reason?

[2]



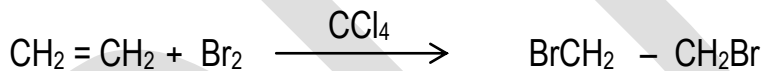
A: 2- Iodo propane

Because 2- Iodo propane involves stable 2° - carbocation.

52. What happens when ethane reacts with bromine in presence of CCl₄. Write the reaction

[2]

A: This reaction gives 1,2- dibromoethane product.



53. What is finkelstein reaction? Give its general reaction?

[2]

A: The reaction in which an alkyl chloride (or) bromides reacts with sodium iodide in dry acetone gives alkyl iodides is called finkelstein reaction.



54. How do you get fluoro methane from chloro (or) bromo methane and name the reaction?

[2]



Bromomethane. Silver fluoride

fluoro methane

This reaction is called as swart's reaction.

55. Why the boiling point of halides are higher than hydrocarbons of comparable molecular mass

[2]

A: Because of greater polarity as well as higher molecular mass as compared to the parent hydrocarbon, the inter molecular forces of attraction are stronger in the halogen derivatives.

56. Arrange the halides R-Br, R-Cl, R-F, R-I containing same alkyl group in the increasing order of their boiling point [1]

A: R-F < R-Cl < R-Br < R-I.

57. In isomeric dihalobenzenes, the para - isomers has high melting point than ortho and meta - isomers. Why? [2]

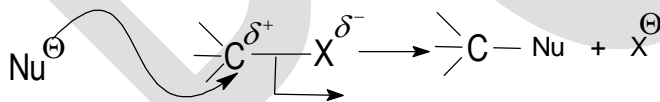
A: Because para - isomers are symmetric in nature and fits in crystal lattice better as compared to ortho and meta - isomers.

58. Haloalkanes are less soluble in water even though they are polar in nature. Why? [2]

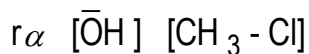
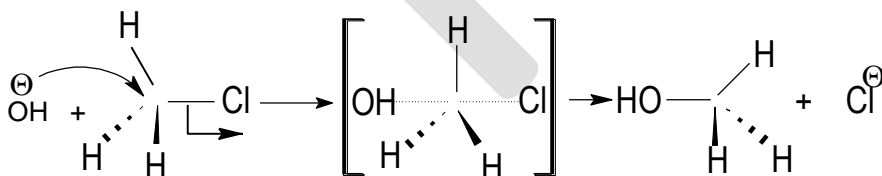
A: For a haloalkane to dissolve in water, energy is required to overcome and break the hydrogen bond between water molecules. Less energy is released when new attractions are set up between the haloalkane and water molecules as these are not as strong as the original hydrogen bonds in water.

59. Why haloalkanes undergoes nucleophilic substitution reaction? [2]

A: In haloalkanes due to difference in electronegativity of carbon and halogen, carbon bears partial positive charge and attracts nucleophile and halogen atom departs as halide ion



60. Write S_N2 mechanism [2]



$$\text{order} = 1 + 1 = 2$$

(Slow step)

61. In S_N2 reaction transition state cannot be isolated. Why? [2]

A: In the transition state, the carbon atom is simultaneously bonded to incoming nucleophile and the outgoing leaving group; as a result carbon atom in transition state is simultaneously bonded to five atoms and therefore is unstable.

62. Why tertiary haloalkanes are less reactive towards S_N2 reaction?

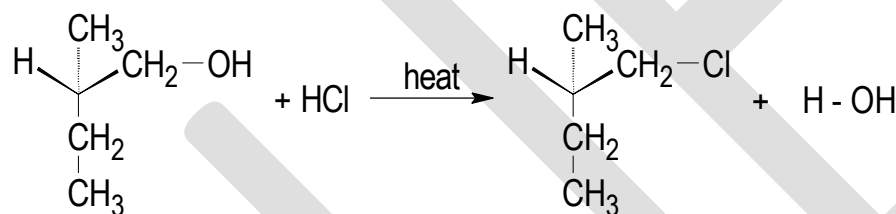
[2]

A: Because S_N2 reaction requires the approach of the nucleophile to the carbon bearing the leaving group, the presence of bulky substituent on (or) near the carbon atom like in 3° – haloalkane have a dramatic inhibiting effect.

63. What is retention of configuration? Give example

[2]

A: Retention of configuration is the preservation of integrity of the spatial arrangement of bonds to an asymmetric centre during a chemical reaction.

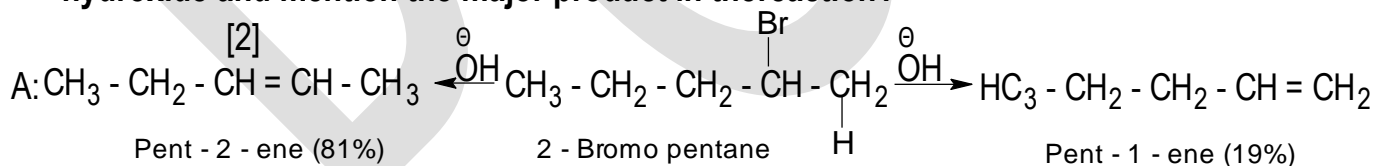


(-) - 2 methylbutan -1-ol

(+) - 1-chloro-2-methylbutane

64. Write the reaction between 2-bromopentane with alcoholic solution of potassium hydroxide and mention the major product in the reaction?

[2]



Pent-2-ene is the major product.

65. During dehydrohalogenation of 2-bromopentane, Pent-2-ene is the major product.

Why? [2]

A: According to saytzeff rule alkene which has the greater number of alkyl groups attached to the doubly bonded carbon atoms are stable.

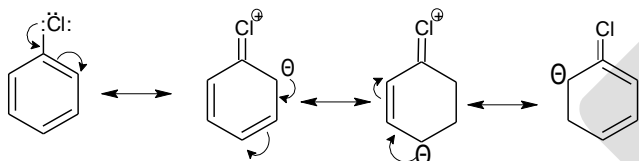
66. How do you prepare ethyl magnesium bromide from ethyl bromide?

[2]

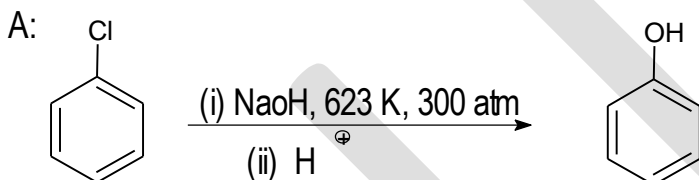


67. Aryl halides are extremely less reactive towards nucleophilic substitution reaction than alkyl halides. Why? [2]

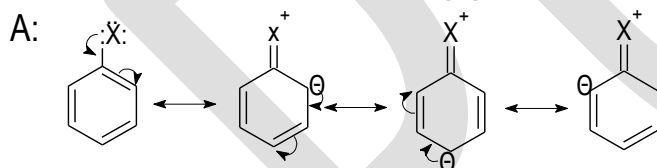
A: In haloarenes, the electron pairs on halogen atom are in conjugation with π - electrons of the ring and C-Cl bond acquires partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, they are less reactive towards nucleophilic substitution reaction.



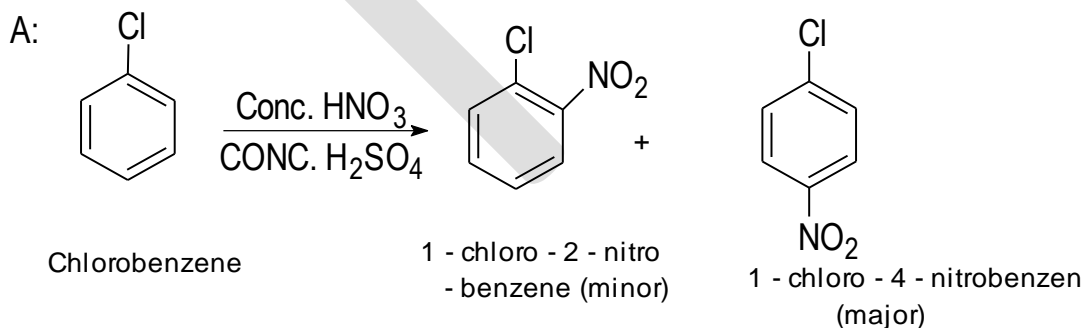
68. How do you convert chlorobenzene to phenol? [2]



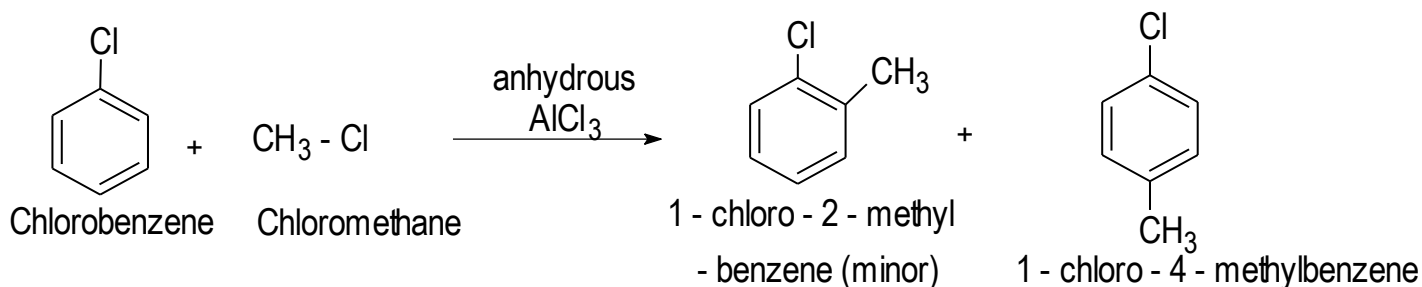
69. Write the resonance structure to show the halogen atom present on the haloarenes are ortho and para directing group? [2]



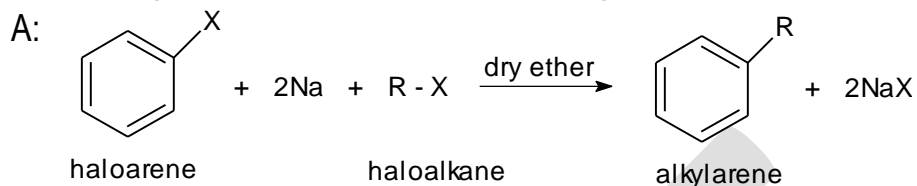
70. Write the reaction involved in the nitration of chlorobenzene? [2]



71. Explain methylation of chlorobenzene and name the reaction? [2]

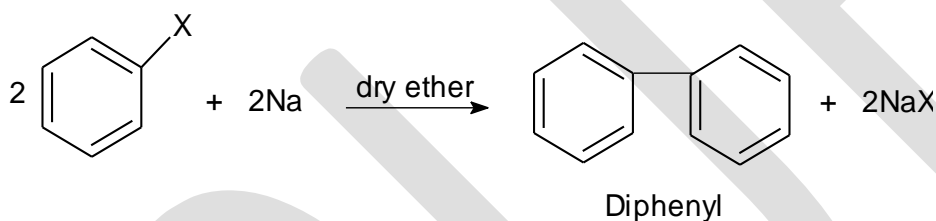


72. Write general equation of wurtz-fitting reaction? [2]



73. Explain fitting reaction with general equation? [2]

A: Two arylhalides reacts with sodium in presence of dry ether gives diphenyl. This reaction is called as fitting reaction.



74. What are freons? Give an example [2]

A: The fluoro, chloro compounds of methane or ethane collectively called as freons

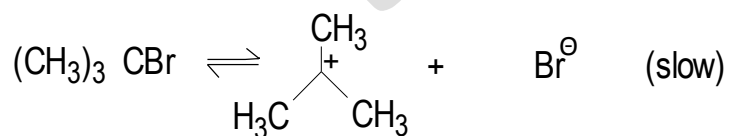
Ex: CCl_2F_2

THREE MARKS QUESTIONS

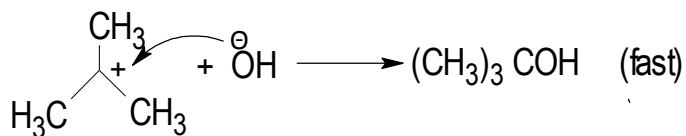
75. Explain $\text{S}_\text{N}1$ mechanism [3]



Step (1): formation of carbocation



Step (2): attack of nucleophile on carbocation



Rate of the reaction depends on slow step of the reaction

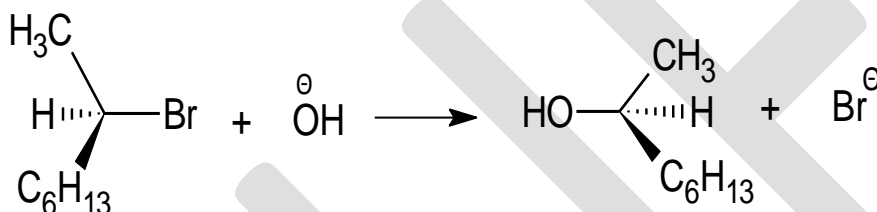
$$r \propto [(CH_3)_3C Br]^1$$

Order = 1

76. With example explain SN² reactions of optically active halides accompanied by inversion of configuration.

[3]

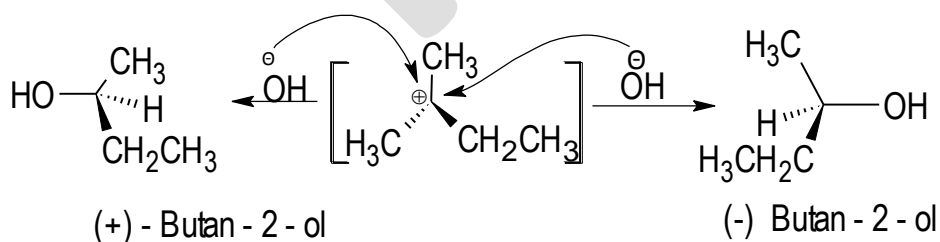
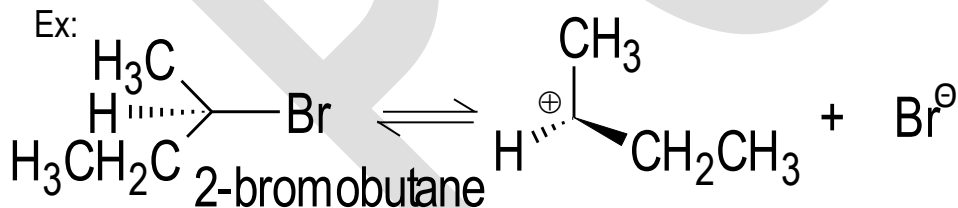
A: SN² mechanism of optically active halides has the inverted configuration because nucleophile attaches itself on the side opposite to the one where the halogen atom is present. For example when (-) - 2 - bromooctane is allowed to react with sodium hydroxide, (+) - octan - 2 - ol is formed with the - OH group occupying the position opposite to what bromide had occupied.



77. SN¹ reaction of optically active halides accompanied by racemisation. Explain with example? [3]

A: SN¹ reaction of optically active halides accompanied by racemization (but not 100% racemization) because carbocation formed in the slow step being sp² hybridised is planar. As a result the attack of the nucleophile may be accomplished from either side resulting in a mixture of products, one having the same configuration and the other having opposite configuration.

Ex:



(Please make correction of CH₃ as H in the transition state)