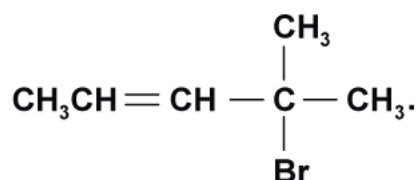


Q1. Draw the structure of 2-bromopentane

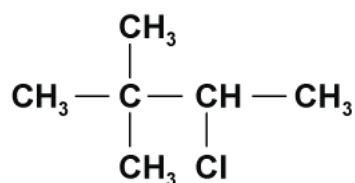
Q2. Write the IUPAC name of $\text{CH}_3 - \underset{\text{Cl}}{\text{CH}} - \text{CH}_2 - \text{CH} = \text{CH}_2$.

Q3. Write the IUPAC name of



Q4. Write the IUPAC name of $(\text{CH}_3)_2\text{CHCH}(\text{Cl})\text{CH}_3$.

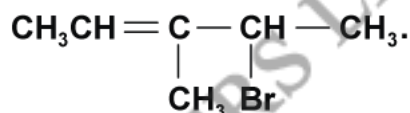
Q5. Write the IUPAC name of the following compound:



Q6. Write the structure of the following compound: 1-bromo-4-sec-butyl-2-methylbenzene.

Q7. Write the structure of the following compound: 2-(2-chlorophenyl)-1-iodooctane.

Q8. Give IUPAC name of the following organic compound:



Q9. Write the structure of the following compound: 2-(2-Bromophenyl)butane.

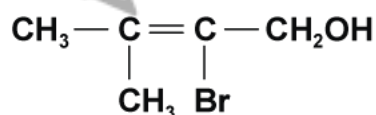
Q10. Write the structure of the following compound: 1,4-dibromobut-2-ene.

Q11. Write the IUPAC name of the following compound: $\text{CH}_2 = \text{CHCH}_2\text{Br}$.

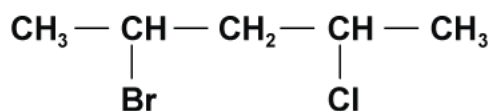
Q12. Write the IUPAC name of the following compound: $\text{CH}_2 = \underset{\text{CH}_3}{\text{C}} - \text{CH}_2\text{Br}$.

Q13. Write the IUPAC name of the following compound: $(\text{CH}_3)_3\text{CCH}_2\text{Br}$.

Q14. Write the IUPAC name of the following:



Q15. Write the IUPAC name of the following compound:

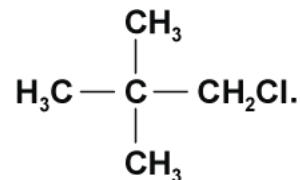


Q16. State the IUPAC name of the following compound: 

Q17. Write the IUPAC name of the following compound: $\text{CH}_3\underset{\text{Cl}}{\text{CH}} - \underset{\text{Br}}{\text{CH}} - \text{CH}_3$.

Q18. Write the structure of the compound 1-chloro-4-ethylcyclohexane.

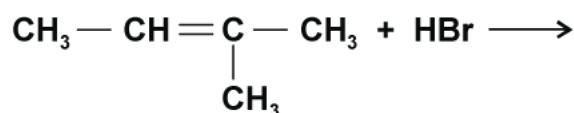
Q19. Write the IUPAC name of the following compound:



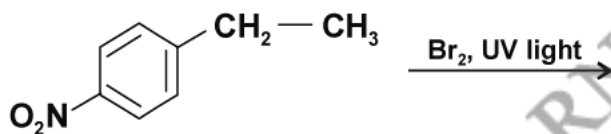
Q20. Write the structure of the compound: 4-*tert*-butyl-3-iodoheptane.

Q21. A hydrocarbon C_5H_{12} gives only one monochlorination product. Identify the hydrocarbon.

Q22. Write the structure of the major product in the following reaction:



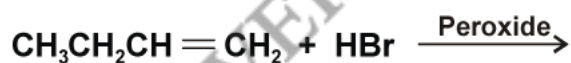
Q23. Write the major products in the following:



Q24. How do you convert: Propene to 1-iodopropane?

Q25. Write the IUPAC name of $\text{ClCH}_2\text{C} \equiv \text{CCH}_2\text{Br}$.

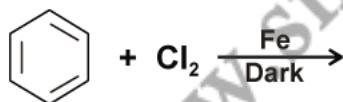
Q26. Complete the following chemical equation:



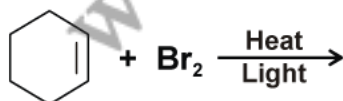
Q27. What happens when bromine attacks



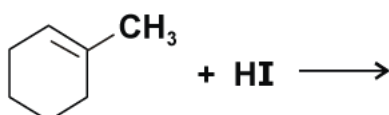
Q28. Draw the structure of major monohalogen product in the following reaction:



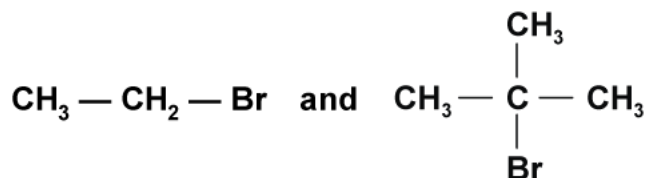
Q29. Draw the structure of major monohalogen product in the following reaction:



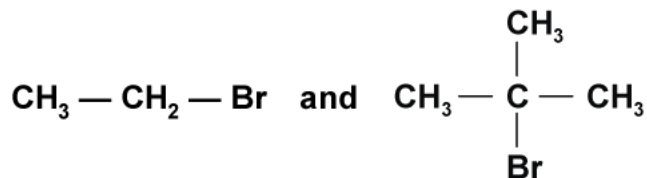
Q30. Draw the structure of major monohalogen product formed in the following reaction:



Q31. Which would undergo S_N1 reaction faster in the following pair:



Q32. Which would undergo S_N2 reaction faster in the following pair and why?



Q33. Write the structure of an isomer of compound C_4H_9Br which is most reactive towards S_N1 reaction.

Q34. Out of $\begin{array}{c} \text{CH}_3 - \text{CH} - \text{CH}_2 - \text{Cl} \\ | \\ \text{CH}_3 \end{array}$ and $\begin{array}{c} \text{CH}_3 - \text{CH}_2 - \text{CH} - \text{Cl} \\ | \\ \text{CH}_3 \end{array}$, which is more reactive towards S_N1 reaction and why?

Q35. Out of ethyl bromide and ethyl chloride which has higher boiling point and why?

Q36. Answer the following: Haloalkanes easily dissolve in organic solvents, why?

Q37. Explain the following: Alkyl halides, though polar, are immiscible with water.

Q38. Why does *p*-dichlorobenzene have a higher m.p. than its *o*- and *m*-isomers?

Q39. Why are alkyl halides insoluble in water?

Q40. Give reason: *n*-Butyl bromide has higher boiling point than *t*-butyl bromide.

Q41. A solution of KOH hydrolyses $\text{CH}_3\text{CHClCH}_2\text{CH}_3$ and $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{Cl}$. Which one of these is more easily hydrolysed?

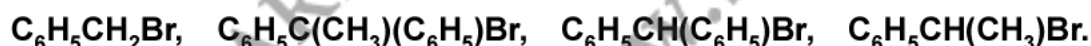
Q42. Which will react faster in S_N1 displacement reaction:

1-Bromobutane or 2-bromobutane and why?

Q43. Which will react faster in S_N2 displacement, 1-bromopentane or 2-bromopentane and why?

Q44. Give a chemical test of distinguish between C_2H_5Br and C_6H_5Br .

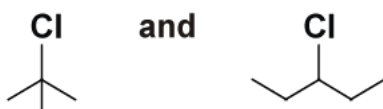
Q45. Predict the order of reactivity of the following compounds in S_N1 reaction.



Q46. Predict the order of reactivity of four isomeric bromobutanes in S_N1 reaction.

Q47. Account for the following: Grignard's reagents should be prepared under anhydrous conditions.

Q48. Which compound in the following pair undergoes faster S_N1 reaction?

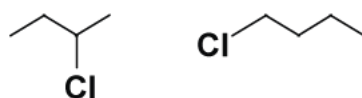


Q49. Why (±)-butan-2-ol is optically inactive?

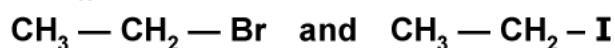
Q50. What happens when ethyl chloride is treated with aqueous KOH?

Q51. What happens when $\text{CH}_3 - \text{Br}$ is treated with KCN?

Q52. Identify the chiral molecule in the following pair.



Q53. Which would undergo $\text{S}_{\text{N}}2$ reaction faster in the following pair and why?



Q54. Which halogen compound in each of the following pairs will react faster in $\text{S}_{\text{N}}2$ reaction:



Q55. State one use each of DDT and iodoform.

Q56. Write the balanced equation for the following:

(a) When chloroform is oxidised by air.

(b) Chloroform reacts with chlorine.

Q57. Explain why in the pair, $(\text{CH}_3)_3\text{CCl}$ and CH_3Cl will react faster in $\text{S}_{\text{N}}2$ reaction with OH^- ?

Q58. How may methyl bromide be preferentially converted to methyl isocyanide?

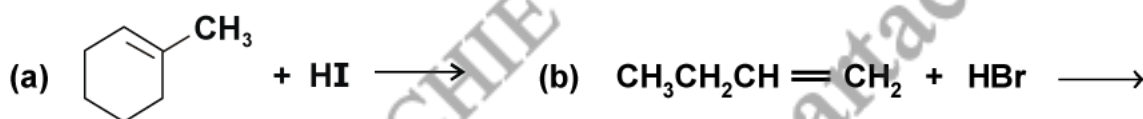
Q59. Why is the following occur: Chloroform is stored in closed dark coloured bottles completely filled so that air is kept out.

Q60. Explain the following reactions with an example: Friedel-Crafts reaction.

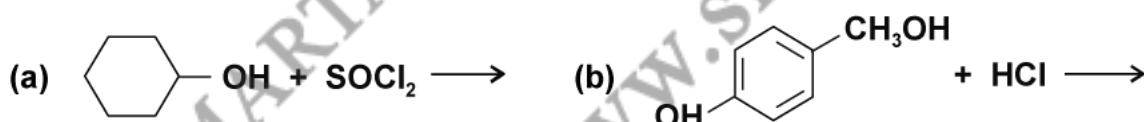
Q61. Write the IUPAC names of the following compounds:



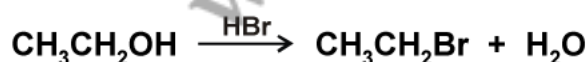
Q62. Complete the following reaction equations:



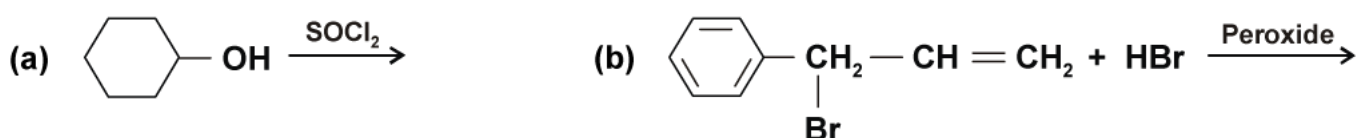
Q63. Complete the following reaction equations:



Q64. Write the mechanism of the following reaction:



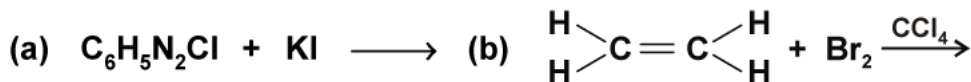
Q65. Draw the structure of major monohalo product in each of the following reactions:



Q66. Explain why

- the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride?
- alkyl halides, though polar, are immiscible with water?

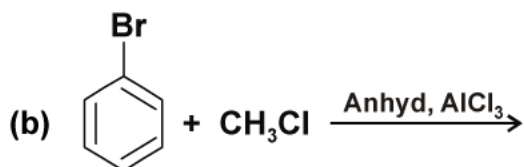
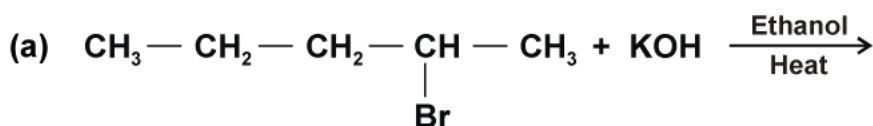
Q67. Complete the following reaction equations:



Q68. (a) Why is butan-1-ol optically inactive but butan-2-ol is optically active?

- Although chlorine is an electron withdrawing group, yet it is *ortho*-, *para*-directing in electrophilic aromatic substitution reactions. Why?

Q69. Write the structure of the major product in each of the following reactions:



Q70. Give reasons:

- Racemic mixture is optically inactive.
- The presence of nitro group ($-\text{NO}_2$) at *o/p* positions increases the reactivity of haloarenes towards nucleophilic substitution reactions

Q71. Write the major product(s) in the following:



Q72. Give reasons:

- C — Cl bond length in chlorobenzene is shorter than C — Cl bond length in $\text{CH}_3 - \text{Cl}$.
- $\text{S}_{\text{N}}1$ reactions are accompanied by racemization in optically active alkyl halides.

Q73. Give reasons for the following:

- Ethyl iodide undergoes $\text{S}_{\text{N}}2$ reaction faster than ethyl bromide.
- C — X bond length in halobenzene is smaller than C — X bond length in $\text{CH}_3 - \text{X}$.

Q74. Account for the following:

- The C — Cl bond length in chlorobenzene is shorter than that in $\text{CH}_3 - \text{Cl}$.
- Chloroform is stored in closed dark brown bottles.

Q75. Chlorobenzene is extremely less reactive towards a nucleophilic substitution reaction. Give two reasons for the same.

Q76. What are ambident nucleophiles? Explain with an example.

Q77. Write chemical equations when

- methyl chloride is treated with AgNO_2 .
- bromobenzene is treated with CH_3Cl in the presence of anhydrous AlCl_3 .

Q78. Halokanes undergo nucleophilic substitution whereas haloarenes undergo electrophilic substitution. Explain.

Q79. Write the mechanism of the following reaction:



Q80. Answer the following:

- What is known as a racemic mixture? Give an example.
- Of the two bromoderivatives, $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$ and $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$, which one is more reactive in $\text{S}_\text{N}1$ substitution reaction and why?

Q81. (a) Why is sulphuric acid not used during the reaction of alcohols with KI in the conversion of a alcohol to the alkyl iodide?

- Why are haloarenes less reactive than haloalkanes towards nucleophilic substitution reactions?

Q82. Which compound in the following couple will react faster in $\text{S}_\text{N}2$ displacement why?

- 1-Bromopentane or 2-bromopentane
- 1-Bromo-2-methylbutane or 2-bromo-2-methylbutane.

Q83. How would you account for the following:

- Grignard reagents are prepared strictly under anhydrous conditions?



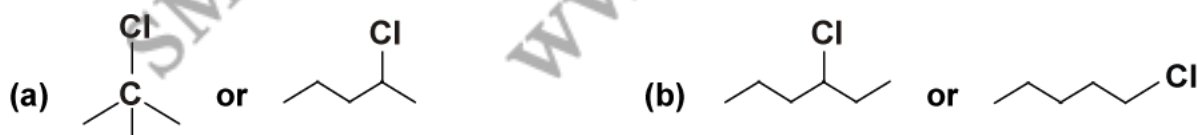
Q84. Give reasons for the following observations:

- Haloarenes are less reactive than haloalkanes towards nucleophilic substitution reactions.
- The treatment of alkyl chloride with aqueous KOH leads to the formation of alcohol but in the presence of alcoholic KOH , alkene is the major product.

Q85. Suggest a possible reason for the following observations:

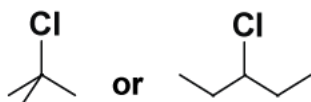
- The order of reactivity of haloalkanes is $\text{RI} > \text{RCI} > \text{RBr}$.
- Neopentyl chloride $(\text{CH}_3)_3\text{CCH}_2\text{Cl}$ does not follow $\text{S}_\text{N}2$ mechanism.

Q86. Which one in the following pairs undergoes $\text{S}_\text{N}1$ substitution reaction faster and why?



Q87. (a) Why is it that haloalkanes are more reactive than haloarenes towards nucleophiles.

- Which one of the following reacts faster in an $\text{S}_\text{N}1$ reaction and why?



Q88. Give one example of each of the following reactions:

(a) Wurtz reaction.

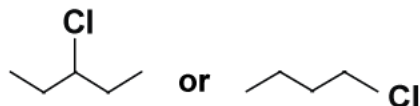
(b) Wurtz-Fitting reaction.

Q89. What is Saytzeff rule? Illustrate with suitable example.

Q90. Discuss the mechanism of S_N1 reaction of haloalkanes.

Q91. (a) Why are haloalkanes more reactive towards nucleophilic substitution reactions than haloarenes?

(b) Which one of the following two substances undergoes S_N1 reaction faster and why?



Q92. How do you convert?

(a) Chlorobenzene to biphenyl

(b) 2-bromobutane to but-2-ene.

Q93. Write chemical equations when

(a) ethyl chloride is treated with aqueous KOH.

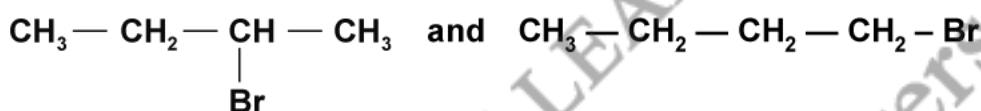
(b) chlorobenzene is treated with CH_3COCl in presence of anhydrous AlCl_3 .

Q94. How are the following conversions carried out?

(a) Benzyl chloride to benzyl alcohol.

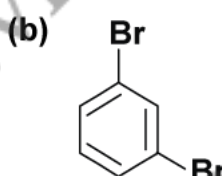
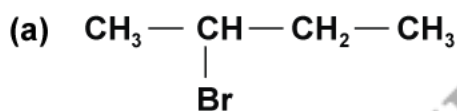
(b) Methyl magnesium bromide to methylpropan-2-ol.

Q95. (a) Which alkyl halide from the following pairs would you expect to react more rapidly by an S_N2 mechanism and why?

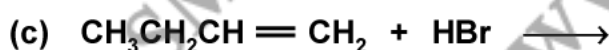
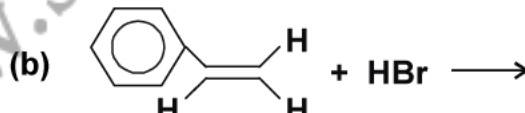
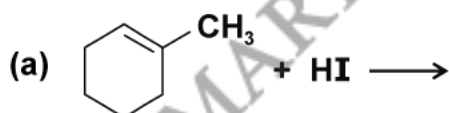


(b) Racemisation occurs in S_N1 reactions. Why?

Q96. Give the IUPAC names of the following compounds:

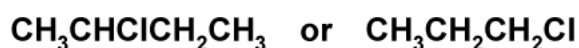


Q97. Compute the following reaction equations:

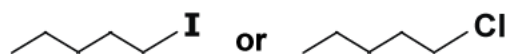


Q98. Answer the following questions:

- (a) What is meant by chirality of a compound? Give an example.
(b) Which one of the following compounds is more easily hydrolysed by KOH and why?



- (c) Which one undergoes $\text{S}_{\text{N}}2$ substitution reaction faster and why?



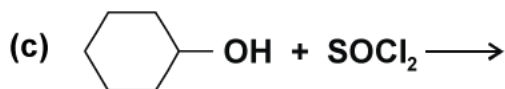
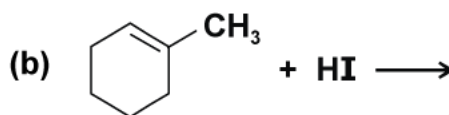
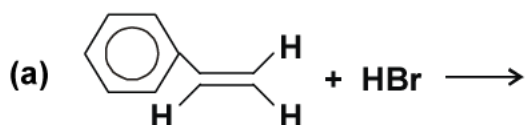
Q99. Differentiate between $\text{S}_{\text{N}}1$ and $\text{S}_{\text{N}}2$ mechanisms and give examples.

Q100(a) Write a chemical test to distinguish between:

- (i) Chlorobenzene and benzyl chloride. (ii) Chloroform and carbon tetrachloride.

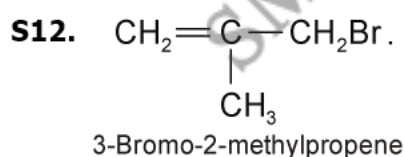
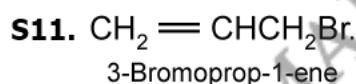
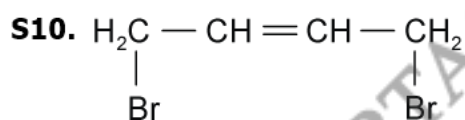
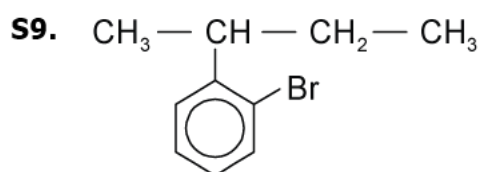
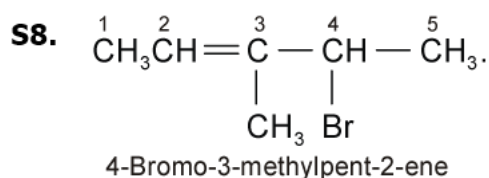
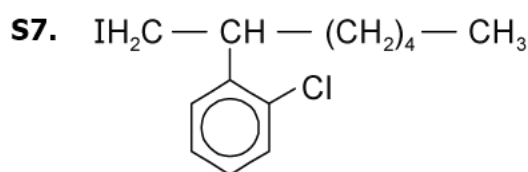
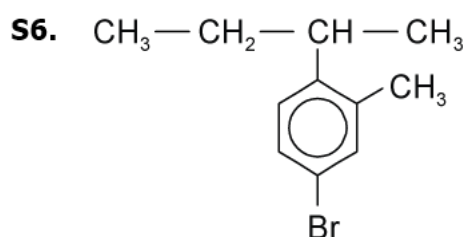
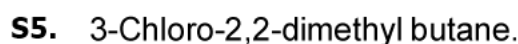
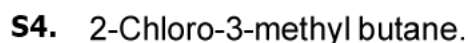
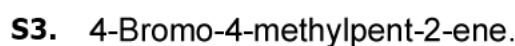
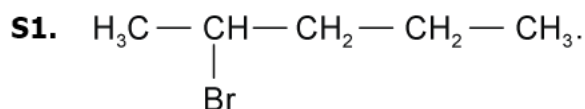
- (b) Why is methyl chloride hydrolysed more easily than chlorobenzene?

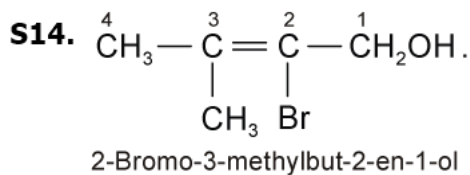
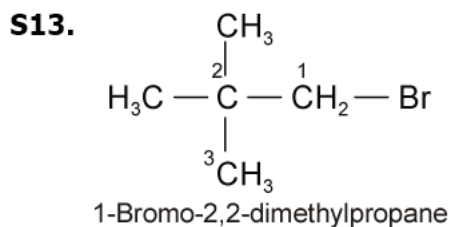
Q101 Complete the equation for the following reactions:



Q102 Rearrange the compounds of each of the following sets in order of reactivity towards $\text{S}_{\text{N}}2$ displacement:

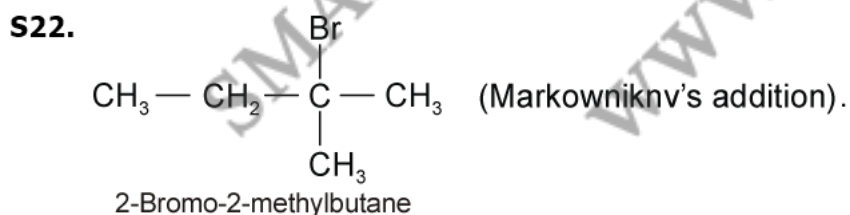
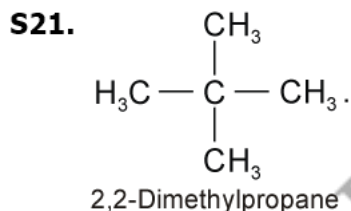
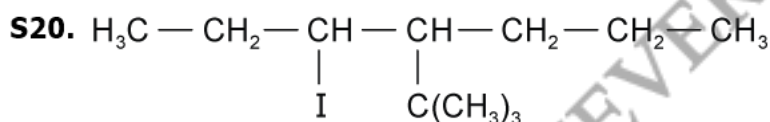
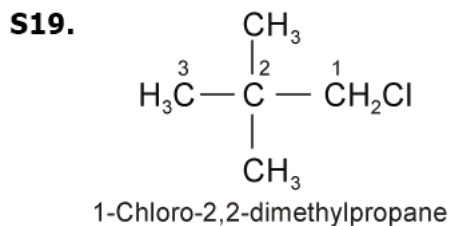
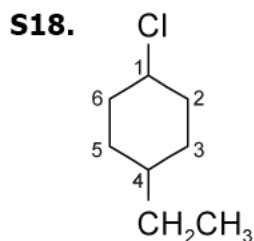
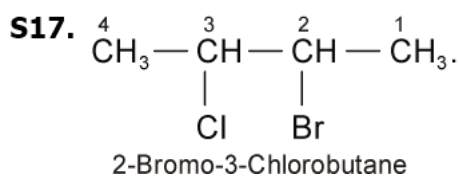
- (a) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane.
(b) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 3-Bromo-2-methylbutane.
(c) 1-Bromobutane, 2-Bromo-2,2-dimethylpropane, 1-Bromo-2-methylbutane.

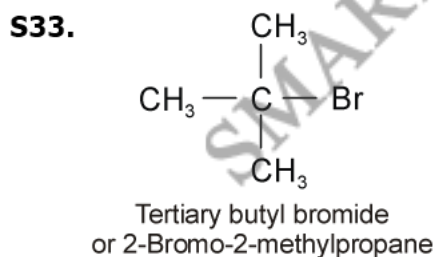
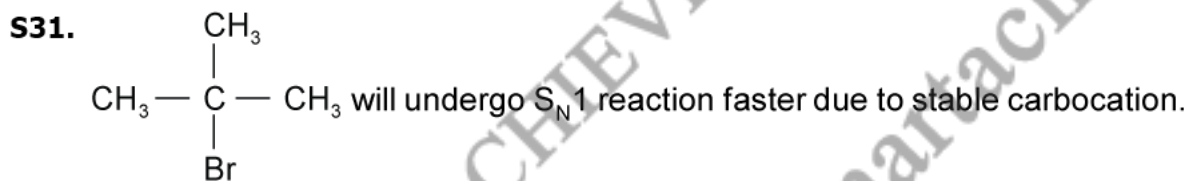
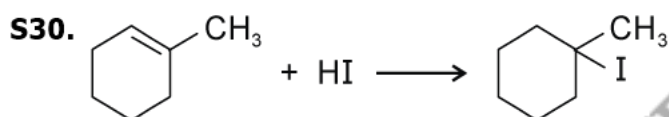
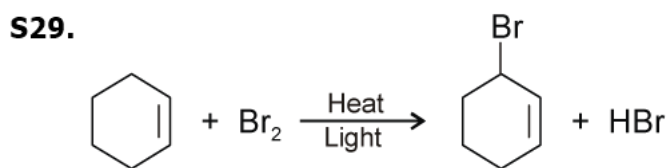
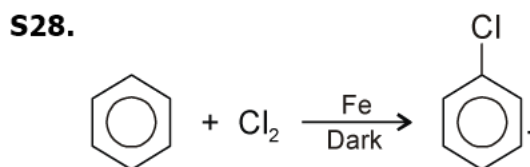
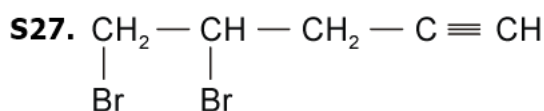
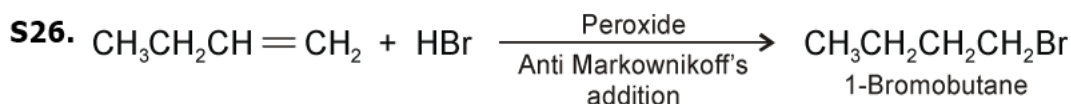
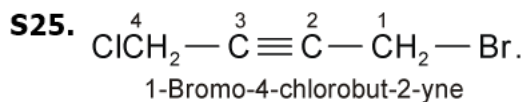
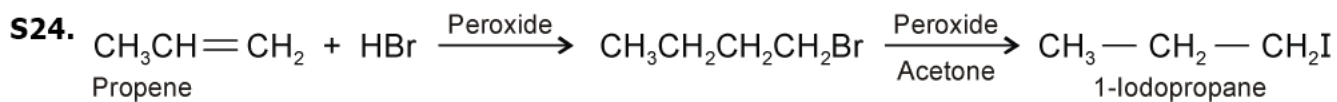
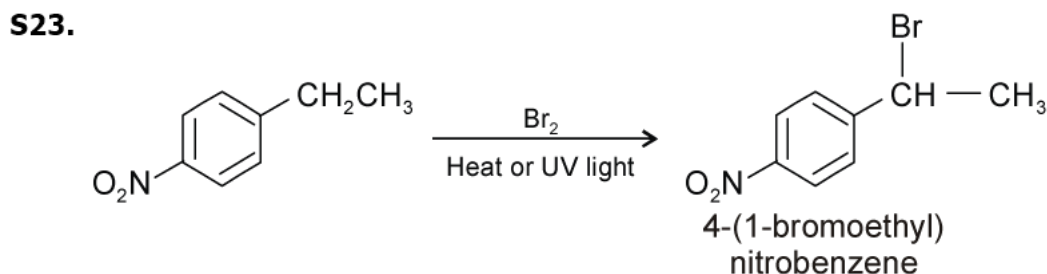




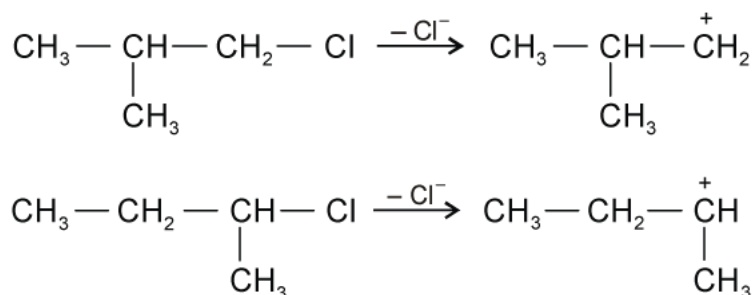
S15. 2-Bromo-4-chloropentane.

S16. 1-Bromobut-2-ene.



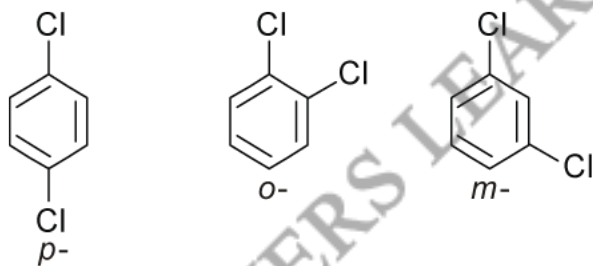


- S34.** The S_N1 reaction proceeds through carbocation formation thus, the compound which forms more stable carbocation will be more reactive.



As, 2° carbocation is more stable than 1° carbocation thus, 2-chlorobutane is more reactive towards S_N1 reaction.

- S35.** The boiling point of ethyl bromide is higher due to the greater magnitude of the van der Waals forces which depend upon molecular size and mass.
- S36.** Haloalkanes dissolve in organic solvents because the intermolecular attractions between haloalkanes and organic solvent molecules have the same strength as in the separate haloalkanes and solvent molecules.
- S37.** Alkyl halides are polar but are insoluble in water because energy required to break the intermolecular H-bond among water molecules is much higher than energy released by water halide interaction.
- S38.** *p*-Dichlorobenzene has higher melting point than those of *o*- and *m*-isomers because it is more symmetrical and packing is better in solid form. Hence, it has stronger intermolecular force of attraction than *o*- and *m*-isomers.



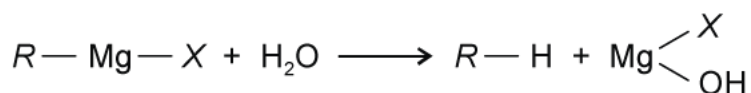
- S39.** Alkyl halides are polar but are insoluble in water because energy required to break the intermolecular H-bond among water molecules is much higher than energy released by water halide interaction.
- S40.** *n*-Butyl bromide, being a straight chain molecule have strong intermolecular forces whereas *t*-butyl bromide being a branched chain molecule have weaker intermolecular forces due to smaller surface area.
- Hence, boiling point of *n*-butyl bromide is higher than that of *t*-butyl bromide.
- S41.** $\text{CH}_3\text{CH}_2\underset{\text{Cl}}{\text{CH}}\text{CH}_3$ hydrolyses easily with KOH because it is secondary halide.
- S42.** 2-bromobutane will react faster in S_N1 displacement reaction because it will form more stable secondary carbocation intermediate.
- S43.** 1-bromopentane is a primary alkyl halide, hence reacts faster in S_N2 displacement than secondary halide 2-bromopentane.

S44. C₂H₅Br reacts with AgNO₃ to give yellow precipitate of AgBr while C₆H₅Br.

S45. C₆H₅C(CH₃)(C₆H₅)Br > C₆H₅CH(C₆H₅)Br > C₆H₅CH(CH₃)Br > C₆H₅CH₂Br.

S46. (CH₃)₃CBr > CH₃CH₂CH(Br)CH₃ > (CH₃)₂CHCH₂Br > CH₃CH₂CH₂CH₂Br.

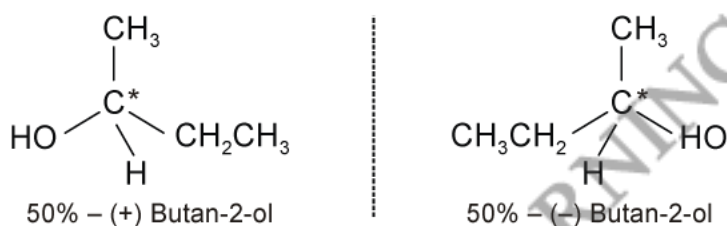
S47. Grignard's reagents react with water to form alkanes.



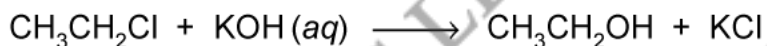
So, they must be prepared under anhydrous conditions.

S48. Tertiary halide $\begin{matrix} Cl \\ | \\ \text{---} \\ | \\ \text{---} \end{matrix}$ reacts faster than the secondary halide because of the greater stability of *tert*-carbocation.

S49. The (±)-butan-2-ol is optically inactive because it exists in two enantiomeric forms which are non-superimposable mirror images of each other. Both the isomers are present in equal amounts therefore, it does not rotate the plane of polarized light and is optically inactive.



S50. When ethyl chloride is treated with aqueous KOH, ethanol is formed,



S51. CH₃CN is formed by nucleophilic substitution reaction.



S52. $\begin{matrix} \text{---} \\ | \\ \text{---} \\ | \\ Cl \end{matrix}$ is a chiral molecule.

S53. Since I⁻ is a better leaving group than Br⁻, thus, CH₃CH₂I undergoes S_N2 reaction faster than CH₃CH₂Br.

S54. (a) CH₃I will give faster S_N2 reaction.

(b) CH₃Cl will give faster S_N2 reaction.

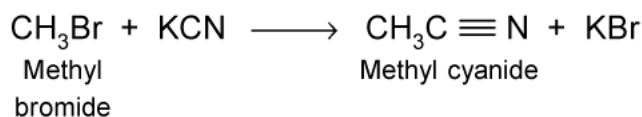
S55. DDT is used as an insecticide and iodoform is used as a mild antiseptic.

S56. (a) $2CHCl_3 + O_2 \xrightarrow{\text{Light}} 2COCl_2 + 2HCl$
Chloroform Carbonyl chloride

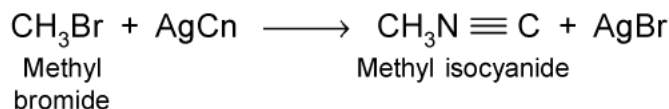
(b) $CHCl_3 + Cl_2 \longrightarrow CCl_4 + HCl$
Chloroform Carbon tetrachloride

S57. CH_3Cl will react faster in $\text{S}_{\text{N}}2$ reaction with OH^- .

S58. KCN is predominantly ionic and provides cyanide ions in solution



AgCN is mainly covalent in nature and nitrogen is free to donate electron pair forming isocyanide as main product.

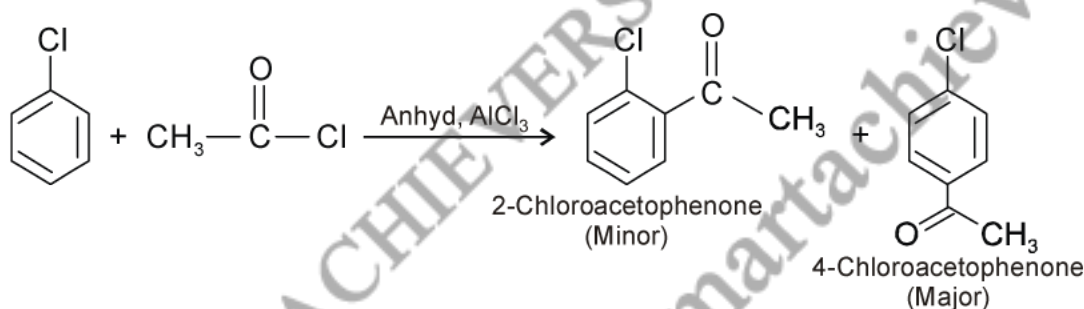
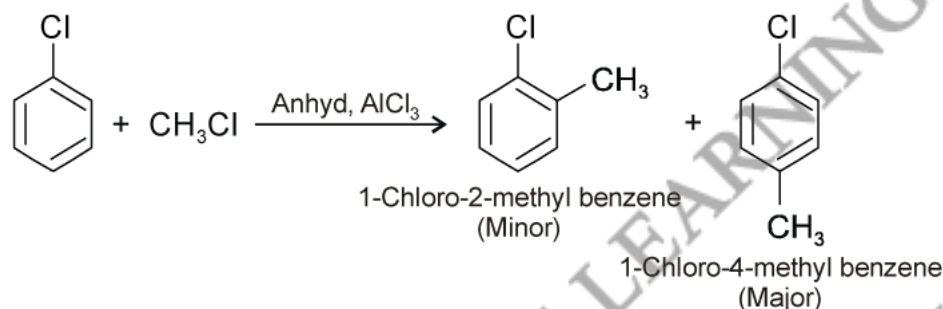


S59. Chloroform when exposed to air and sunlight changes to phosgene which is a poisonous gas.

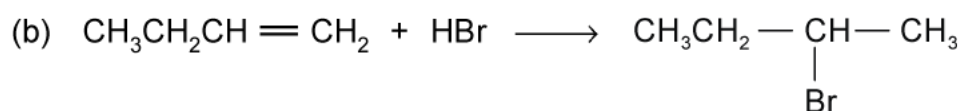
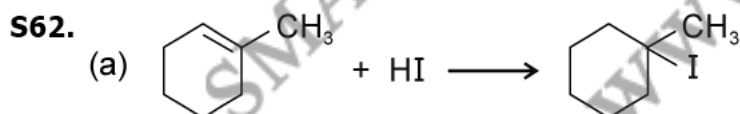


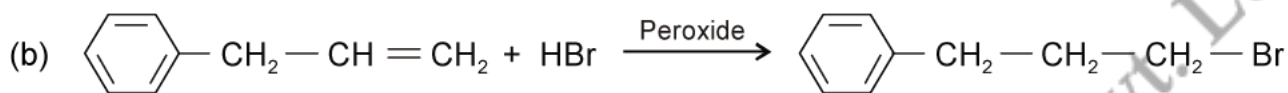
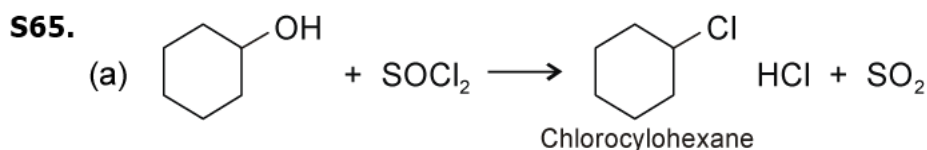
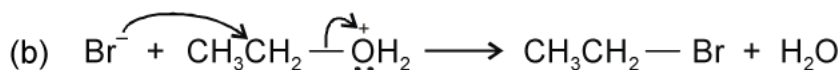
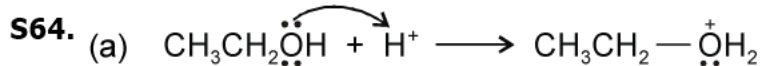
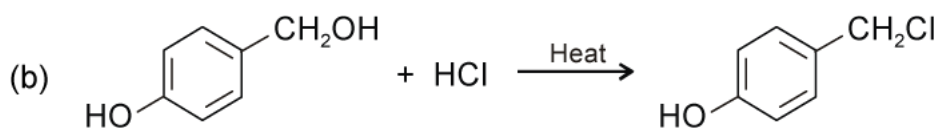
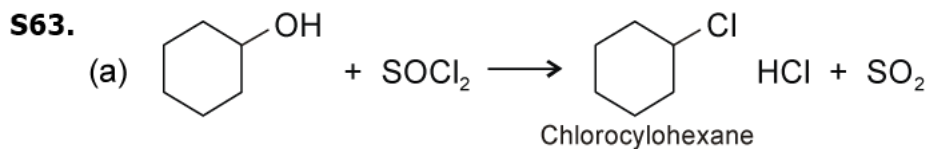
It is kept in dark coloured bottles to prevent the oxidation.

S60. Haloarenes can undergo both freidal craft alkylation (with alkyl halide) or freidal craft acylation (with acid halide) in presence of Lewis acid catalyst to give a mixture of *o*- and *p*-haloalkyl benzene or *o*- and *p*-haloacylbenzene.



S61. (a) $\text{CH}_2 = \text{CHCH}_2\text{Br}$. 3-Bromoprop-1-ene (b) 2-(Trichloromethyl)-1,1,1,2,3,3,3-heptachloropropane

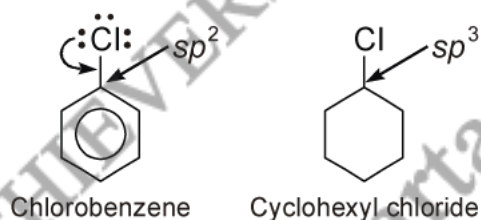




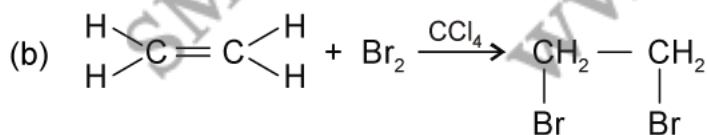
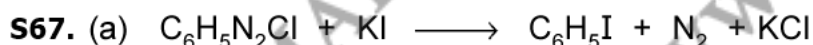
S66. (a) There are two reasons:

- In case of chlorobenzene, carbon to which chlorine is attached is sp^2 hybridised and is more electronegative than the corresponding carbon in cyclohexyl chloride which is sp^3 hybridised. So the net dipole moment is lower in chlorobenzene.
- In chlorobenzene C — Cl bond has some double bond character so its bond length is smaller.

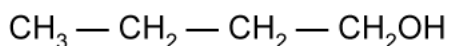
Hence dipole moment is smaller than cyclohexyl chloride which has a longer C — Cl single bond.



- (b) Alkyl halides are polar but are insoluble in water because energy required to break the intermolecular H-bond among water molecules is much higher than energy released by water halide interaction.

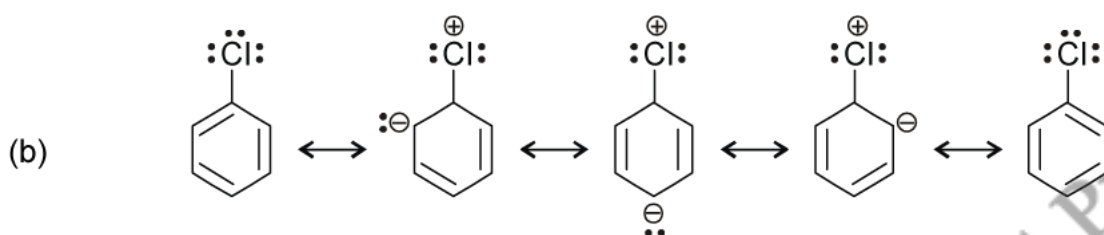
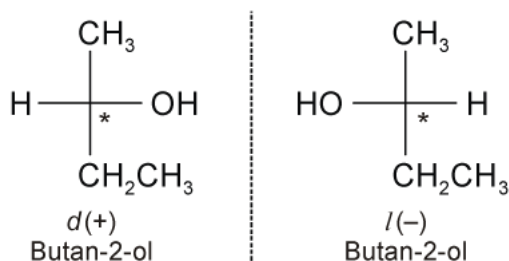


- S68.** (a) Butan-1-ol is achiral, *i.e.*, does not have chiral 'C' atom which is attached to four different groups, therefore, it is optically inactive.



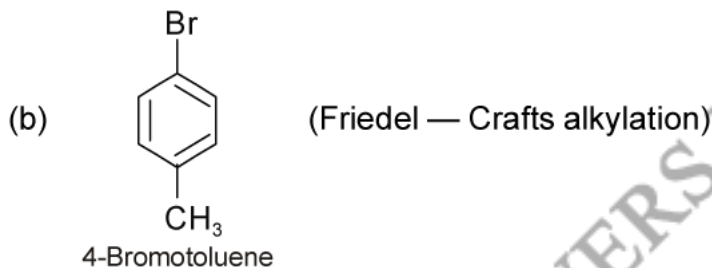
Butan-1-ol
(Optically inactive)
(No chiral carbon)

Butan-2-ol is chiral, *i.e.*, has chiral 'C' atom, attached to four different groups.



Although Cl is electron withdrawing (*I* effect) but still *o*- and *p*-directing as due to +*R* effect, electrons density is maximum at *o*- and *p*-positions.

- S69.** (a) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_3$ (Saytzeff rule)



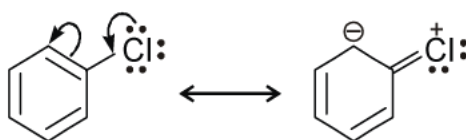
- S70.** (a) Racemic mixture contains equal amount of *d* and *l* forms, hence rotation due to one enantiomer is cancelled by another.

(b) The presence of nitro group at *o*- and *p*-positions withdraws electrons from the benzene ring and thus, facilitates the attack of the nucleophile on haloarenes. The carbanion thus formed is further stabilised by resonance.

- S71.** (a) $\text{CH}_3 - \underset{\text{CH}_3}{\text{CH}} - \underset{\text{CH}_3}{\text{CH}} - \text{CH}_3$ (b) $\text{CH}_3\text{CH}_2\text{NC}$.

- S72.** (a) In halobenzene C — X bond has partial double bond character due to resonance while $\text{CH}_3 - \text{X}$ bond is single bond.

Thus, bond length of C — X bond in halobenzene is smaller than that in $\text{CH}_3 - \text{X}$.



- (b) In S_N1 reaction carbocation intermediate is formed which is a planar molecule so, an incoming nucleophile can attack from either side and a equimolar mixture of two components are formed and resulting mixture is optically inactive.

S73. (a) Since I^- is a better leaving group than Br^- , thus, CH_3CH_2I undergoes S_N2 reaction faster than CH_3CH_2Br .

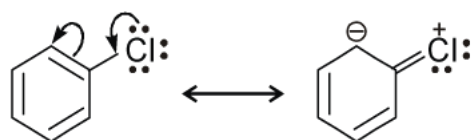
- (b) In halobenzene C — X bond has partial double bond character due to resonance while $CH_3 — X$ bond is single bond.

Thus, bond length of C — X bond in halobenzene is smaller than that in $CH_3 — X$.

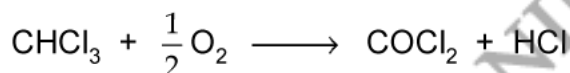


S74. (a) In halobenzene C — X bond has partial double bond character due to resonance while $CH_3 — X$ bond is single bond.

Thus, bond length of C — X bond in halobenzene is smaller than that in $CH_3 — X$.



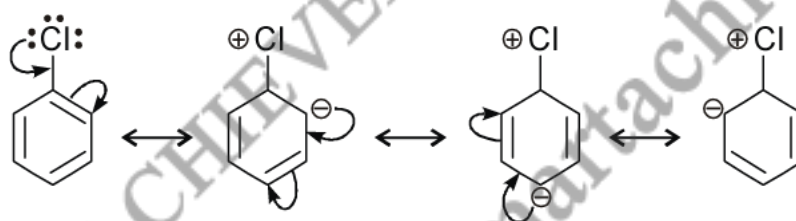
- (b) Chloroform when exposed to air and sunlight changes to phosgene which is a poisonous gas.



It is kept in dark coloured bottles to prevent the oxidation.

S75. Haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions due to the following reasons.

- (a) **Resonance effect:** In haloarenes the electron pairs on halogen atom are in conjugation with π -electrons of the ring and the following resonating structures are possible.

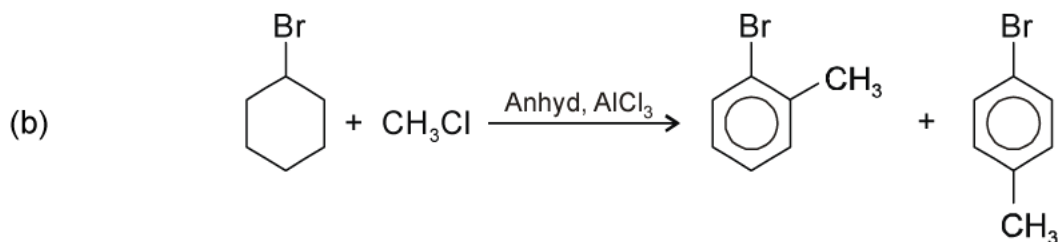
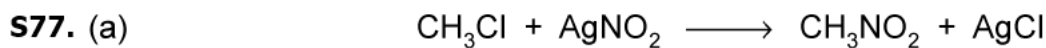


C — Cl bond acquires a partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, are less reactive towards nucleophilic substitution reaction.

- (b) Difference in hybridisation of carbon atom in C — X bond.

S76. A nucleophile which can attack from more than one centres, is known as ambident nucleophile.

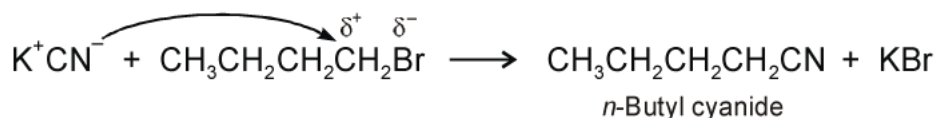
e.g., $^{\ominus} \ddot{C} \equiv N:$ Cyanide ion.



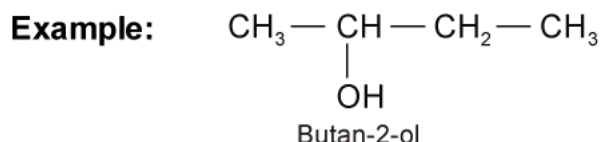
S78. In haloarenes –ve charge gets localised on arenes using resonance, therefore they undergo electrophilic substitution.

Haloalkanes have electrophilic carbon centre due to polarity of $\text{C} \rightarrow \text{X}$ bond.

S79. Normal butyl bromide will give $\text{S}_{\text{N}}2$ reaction:

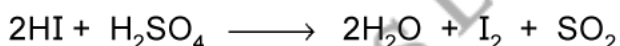
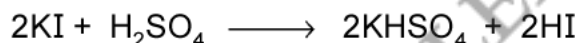


S80. (a) An equimolar mixture of a pair of enantiomers is called racemic mixture. A racemic mixture is optically inactive due to external compensation.



(b) Of the two bromoderivatives, $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$ and $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$, The $\text{C}_6\text{H}_5\text{CH}(\text{C}_6\text{H}_5)\text{Br}$ is more reactive than $\text{C}_6\text{H}_5\text{CH}(\text{CH}_3)\text{Br}$ for $\text{S}_{\text{N}}1$ reaction because its carbocation is resonance stabilised by two phenyl groups.

S81. (a) H_2SO_4 is an oxidant. KI reacts with H_2SO_4 and give HI and H_2SO_4 oxidises HI to I_2 .

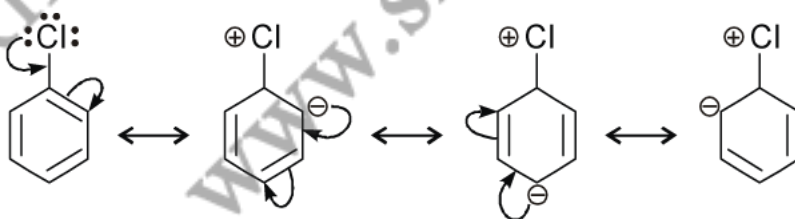


Thus, HI will not be available for reaction with alcohol to form alkyl iodide.

This is why sulphuric acid is not used during the reaction of alcohols with KI.

(b) Haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions due to the following reasons.

(i) **Resonance effect:** In haloarenes the electron pairs on halogen atom are in conjugation with π -electrons of the ring and the following resonating structures are possible.

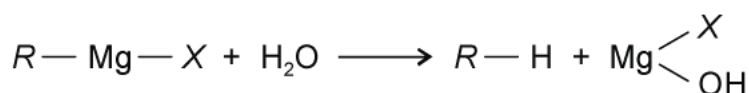


$\text{C} - \text{Cl}$ bond acquires a partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, are less reactive towards nucleophilic substitution reaction.

(ii) Difference in hybridisation of carbon atom in $\text{C} - \text{X}$ bond.

- S82.** (a) 1-Bromopentane, as it is a primary alkyl halide.
 (b) 1-Bromo-2-methylbutane, as it is a primary alkyl halide.

- S83.** (a) Grignard's reagents react with water to form alkanes.

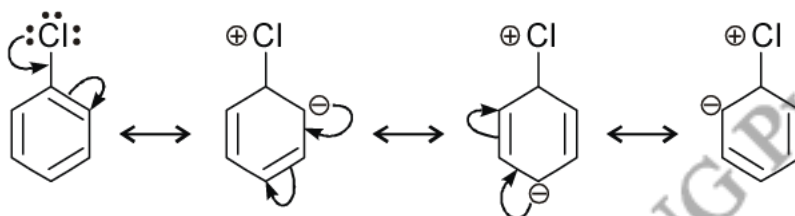


So, they must be prepared under anhydrous conditions.

- (b)  undergoes faster S_N1 reaction.

- S84.** (a) Haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions due to the following reasons.

- (i) **Resonance effect:** In haloarenes the electron pairs on halogen atom are in conjugation with π -electrons of the ring and the following resonating structures are possible.



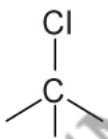
C — Cl bond acquires a partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, are less reactive towards nucleophilic substitution reaction.

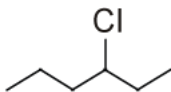
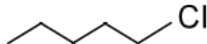
- (ii) Difference in hybridisation of carbon atom in C — X bond.

- (b) In aqueous solution, KOH is almost completely involved to give OH^- ion which being a better nucleophile gives a substitution reaction on alkyl halides to form alcohol. But an alcoholic solution of KOH containing alkoxide (RO^-) ions which being a much stronger base than OH^- ion preferentially snatches a H^+ ion from an alkyl chloride to form alkenes.

- S85.** (a) Among the various halides with same alkyl group the order of reactivity is $RI > RBr > RCl$. Due to increasing bond strength of C — I, C — Br and C — Cl the reactivity decreases.

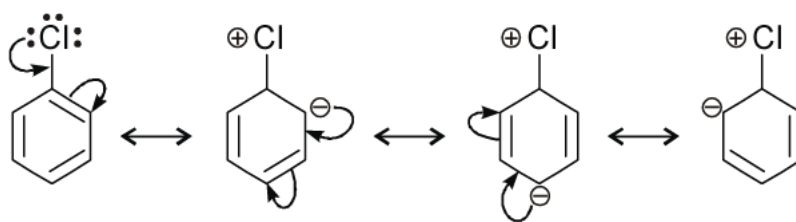
- (b) Neopentyl chloride being a primary halide reacts slowly through S_N1 and the carbon carrying halogen is sterically more hindered. Hence, it does not follow S_N2 mechanism.

- S86.** (a)  : Tertiary halide reacts faster than secondary halide because of the greater stability of *tert.* carbocation.

- (b)  reacts faster than  because of greater stability of secondary carbocation than primary.

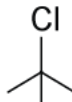
S87. (a) Haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions due to the following reasons.

- (i) **Resonance effect:** In haloarenes the electron pairs on halogen atom are in conjugation with π -electrons of the ring and the following resonating structures are possible.



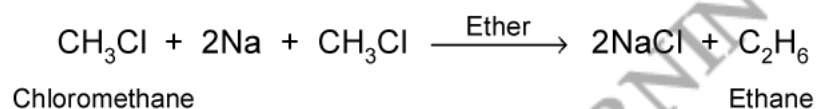
C — Cl bond acquires a partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, are less reactive towards nucleophilic substitution reaction.

- (ii) Difference in hybridisation of carbon atom in C — X bond.

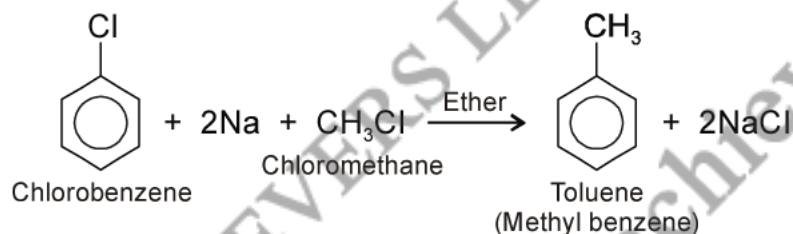
- (b) tertiary halide  reacts faster than the secondary halide because of the greater stability

of *tert*-carbocation.

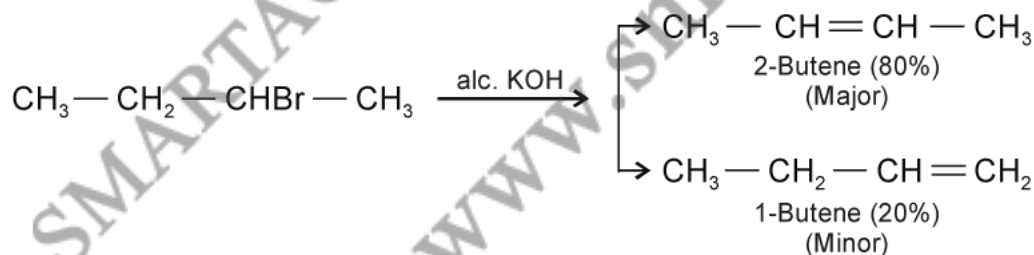
S88. (a) **Wurtz reaction:** It converts alkyl halide into higher alkane in presence of sodium metal and dry ether.



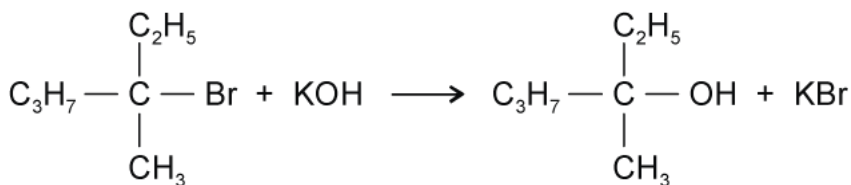
- (b) **Wurtz-Fitting reaction:** It converts aryl halide into alkyl arenes in presence of sodium metal and ether.



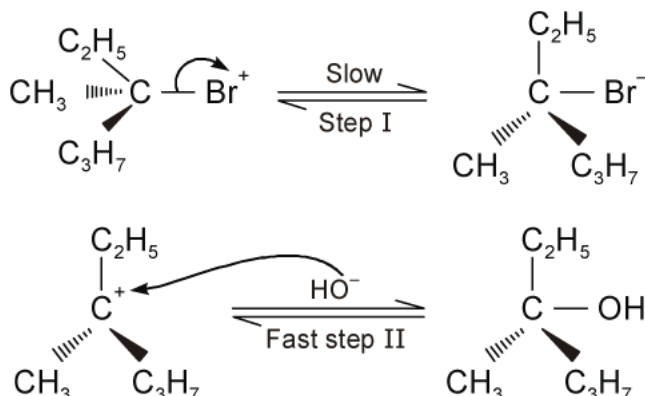
S89. Saytzeff rule: In elimination reaction alkene having the lesser number of hydrogen on the double bonded carbon atom is formed. This generalisation is known as Saytzeff rule for example.



S90. In $\text{S}_{\text{N}}1$ mechanism of substitution reaction, the rate of reaction depends upon the concentration of only one reactant. It is two steps reactant.

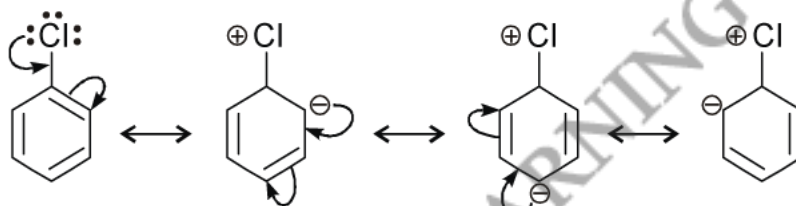


Mechanism:



S91. (a) Haloarenes are much less reactive than haloalkanes towards nucleophilic substitution reactions due to the following reasons.

(i) **Resonance effect:** In haloarenes the electron pairs on halogen atom are in conjugation with π -electrons of the ring and the following resonating structures are possible.

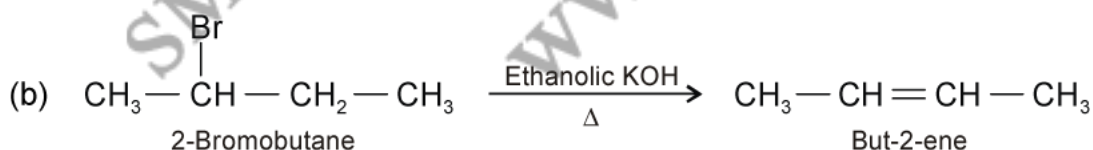
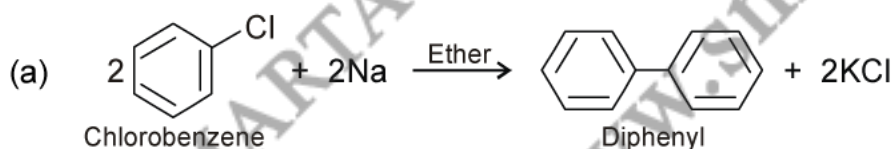


C — Cl bond acquires a partial double bond character due to resonance. As a result, the bond cleavage in haloarene is difficult than haloalkane and therefore, are less reactive towards nucleophilic substitution reaction.

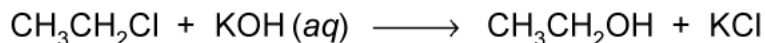
(ii) Difference in hybridisation of carbon atom in C — X bond.

(b) Due to greater stability of 2° carbocation over 1° carbocation, will react faster than in $\text{S}_{\text{N}}1$ reaction.

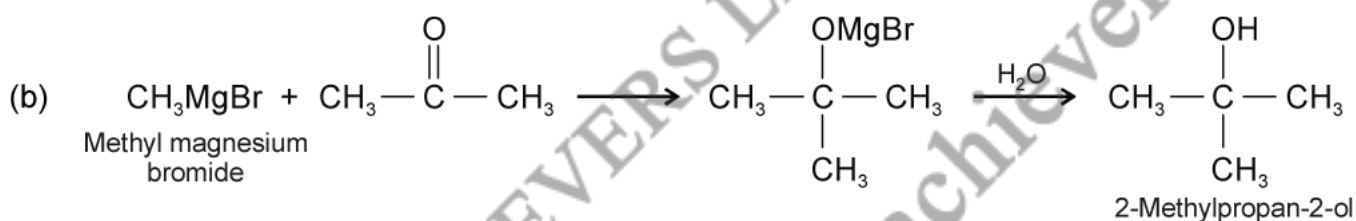
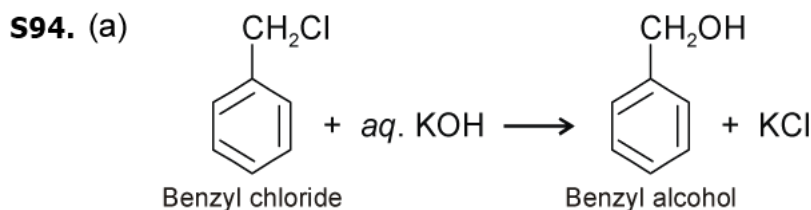
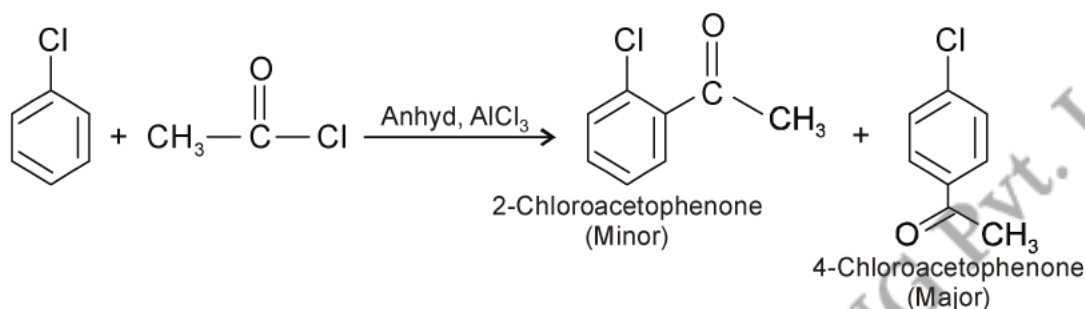
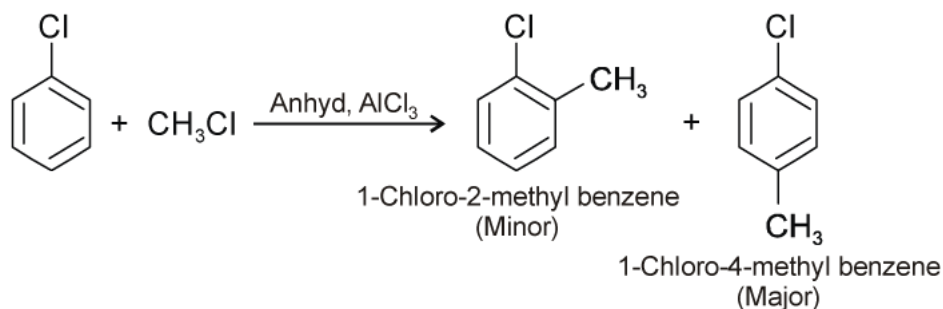
S92.



S93. (a) When ethyl chloride is treated with aqueous KOH, ethanol is formed,



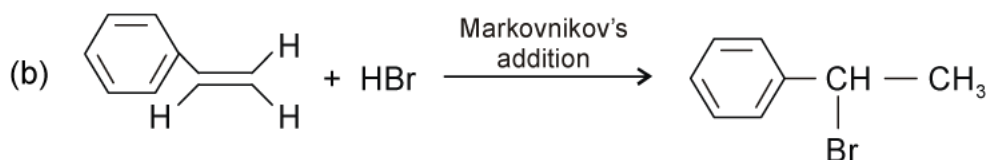
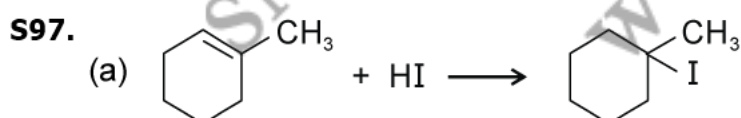
(b) Haloarenes can undergo both Friedel-Craft alkylation (with alkyl halide) or Friedel-Craft acylation (with acid halide) in presence of Lewis acid catalyst to give a mixture of *o*- and *p*-haloalkyl benzene or *o*- and *p*-haloacylbenzene.

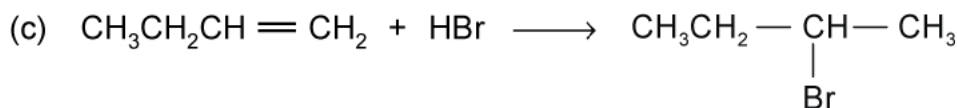


S95. (a) 1-Bromobutane is 1° alkyl halide while 2-bromobutane is 2° alkyl halide. Due to steric hindrance in 2° alkyl halides, 1° alkyl halide will react faster than 2° alkyl halide in $\text{S}_{\text{N}}2$ reaction.

(b) Carbocations are formed in $\text{S}_{\text{N}}1$ reaction which are planar species, thus, racemisation occurs.

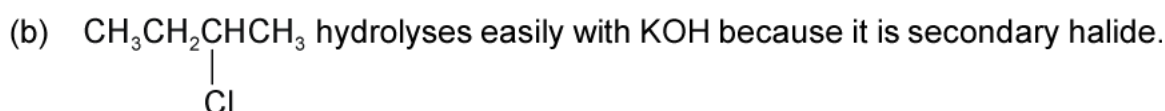
S96. (a) 2-Bromobutane. (b) 1,3-Dibromobenzene. (c) 3-Chloropropene.

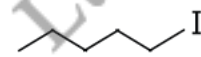
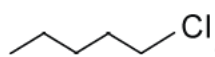


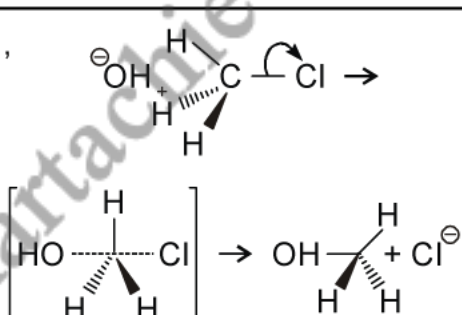


S98. (a) **Chiral object:** An object which has no plane of symmetry (cannot be divided into two identical halves) is called chiral (Greek; Chiral-Hand) or dissymmetric or asymmetric. A Chiral object is not superimposable on its mirror image.

e.g., left and right hand of a person are mirror images of each other and are not superimposable.



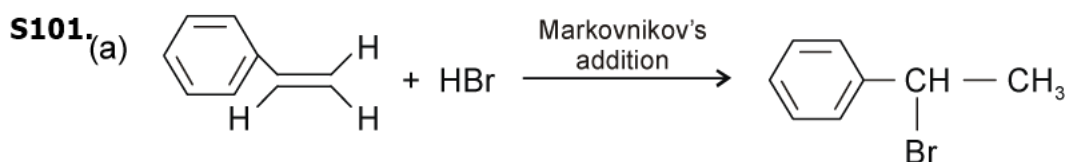
(c) As iodide is a better leaving group because of its large size, therefore,  undergoes $\text{S}_{\text{N}}2$ reaction faster than .

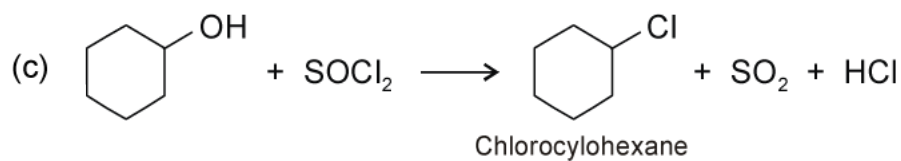
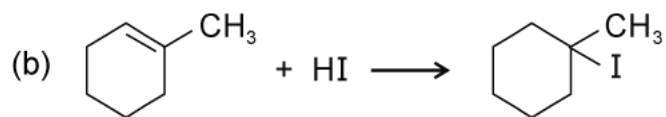
S99.	$\text{S}_{\text{N}}1$ mechanisms	$\text{S}_{\text{N}}2$ mechanisms
	1. It is two step process, carbocation intermediate is formed.	1. It is single step process. No intermediate is formed.
	2. It obeys 1 st order kinetics. Rate = k [Reactant]	2. It obeys 2 nd order kinetics. Rate = k [Reactant] [Nucleophile]
	3. Order of reactivity : $3^\circ > 2^\circ > 1^\circ$.	3. Order of reactivity : $1^\circ > 2^\circ > 3^\circ$.
	4. Optically inactive product is formed (racemic mixture).	4. Inversion of configuration takes place.
	5. e.g., $(\text{CH}_3)_3\text{CBr} + \text{OH}^-$ 2-Bromo-2-methylpropane \downarrow $(\text{CH}_3)_3\text{COH} + \text{Br}^-$ 2-Methylpropane-2-ol	5. e.g., 

S100(a) (i) Benzyl chloride gives white precipitate with AgNO_3 solution while chlorobenzene does not.

(ii) CHCl_3 with aniline in presence of alc. KOH gives foul smelling isocyanides whereas CCl_4 does not.

(b) CH_3Cl is hydrolysed easily than $\text{C}_6\text{H}_5\text{Cl}$ as chlorobenzene has partial double bond character between C — Cl bond which is difficult to break.





- S102.**(a) 1-Bromopentane > 2-Bromopentane > 2-Bromo-2-methylbutane.
(b) 1-Bromo-3-methylbutane > 3-Bromo-2-methylbutane > 2-Bromo-2-methylbutane.
(c) 1-Bromobutane > 1-Bromo-2-methylbutane > 1-Bromo-2,2-dimethylpropane.

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