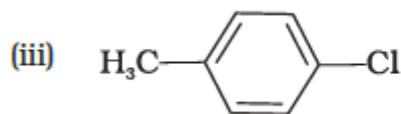
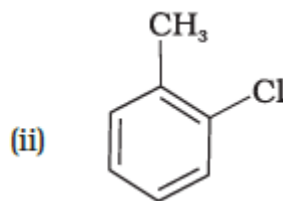
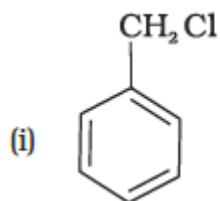


4. The major organic compound formed when 2-Bromobutane is heated with alcoholic KOH is
- (i) Butan-2-ol (iii) 2-Bromopropane
(ii) But-2-ene (iv) But-1-ene
5. Which of the following alkyl halides will undergo S_N1 reaction most readily?
- (i) CH_3CH_2Cl (iii) $(CH_3)_2CHCl$
(ii) CH_3Cl (iv) $(CH_3)_3CCl$
6. Which is the correct IUPAC name for $(CH_3)_3CCH_2Br$?
- (i) 2-Bromo-1,1-dimethylpropane (iii) 1-Bromo-2-methylbutane
(ii) 2-Methyl-1-bromobutane (iv) 1-Bromo-2,2-dimethylpropane
7. The reaction of toluene with chlorine in the presence of iron and in the absence of light yields _____.



(iv) Mixture of (ii) and (iii)

8. Which of the following molecules does not contain a chiral carbon?
- (i) 2-Bromobutane (iii) 2-Bromopropane
(ii) 1-Bromo-1-chlorobutane (iv) 2-Bromopentane
9. Which of the following isomer has the highest melting point?
- (i) 1,4-Dichlorobenzene (iii) 1,2-Dichlorobenzene
(ii) 1,3 -Dichlorobenzene (iv) All isomers have same melting points

10. Assertion (A): The boiling points decrease in the order $RI > RBr > RCl > RF$

Reason (R): van der Waals forces of attraction decrease in the order $RI > RBr > RCl > RF$

- (i) Both (A) and (R) are true and (R) is the correct explanation of (A)
(ii) Both (A) and (R) are true and (R) is not the correct explanation of (A).
(iii) Assertion (A) is true, but Reason (R) is false
(iv) Assertion (A) is false, but Reason (R) is true

(2025 MARCH BQ)

Read the given passage and answer the questions that follow:

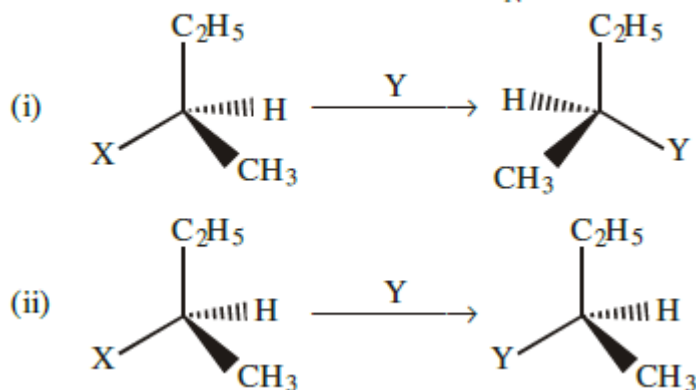
One or more hydrogen atoms of alkanes can be replaced by halogens. Halogenation takes place either at higher temperature (573-773 K) or in the presence of diffused sunlight or ultraviolet light. Free radical chlorination or bromination of alkanes gives a complex mixture of isomeric mono- and polyhaloalkanes, which is difficult to separate as pure compounds. Consequently, the yield of any one compound is low.

11. Among the isomeric alkanes of molecular formula C_5H_{12} , identify the one that on photochemical chlorination yields 4 monochlorides.
12. Is halogenation of alkane in presence of UV an addition or substitution reaction?
13. Identify the final organic product if methane is treated with excess chlorine in UV.
14. How many monochlorides are formed when Butane undergoes halogenation in presence of UV?
15. Name the catalyst used when aryl chlorides are prepared by electrophilic substitution of arenes with chlorine.

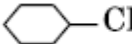


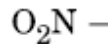
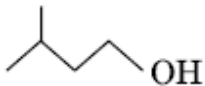
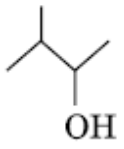
Question – Answer Type:

16. Why is it necessary to avoid even traces of moisture during the use of a Grignard reagent? 1
17. Among the following, which will have inversion of configuration on reaction with aqueous alkali? 1
(2025 MARCH BQ)
(i) 1-Chloropropane OR (ii) 2-Chloro-2-methylpropane

18. Which of the following reactions is S_N1 type? 1



19. Benzyl chloride is highly reactive towards S_N1 reaction. why? 1
20. Arrange the following compounds in order of increasing boiling points. 1
 Bromomethane, Bromoform, Chloromethane, Dibromomethane.
21. Which compound in the following couples will react faster in S_N1 displacement and why? 2
 i) 1-Bromopentane or 2-bromopentane
 ii) 1-Bromo-2-methylbutane or 2-bromo-2-methylbutane.
22. (i) Write the product formed when p-nitrochlorobenzene is heated with aqueous NaOH at 443 K followed by acidification. 2
 (ii) Why dextro and laevo rotatory isomers of Butan-2-ol are difficult to separate by fractional distillation?
23. Identify the major product, A or B. Give reason: (2025 March BQ) 2
 $CH_3CH_2CH(Br)CH_3 + alc. KOH \rightarrow CH_3CH_2CH=CH_2 + CH_3CH=CHCH_3$
A B
24. Complete the following reaction: 2
 i) $CH_3Cl + KCN \rightarrow$
 ii) $CH_3OH + SOCl_2 \rightarrow$
25. Account for the following : 2
 (a) Haloalkanes react with AgCN to form isocyanide as main product.
 (b) Allyl chloride shows high reactivity towards S_N1 reaction.
26. Write the main products when: 3
 (a) Methyl chloride is treated with KCN.
 (b) 2,4,6-trinitrochlorobenzene is subjected to hydrolysis.
 (c) Methyl chloride is treated with sodium in the presence of dry ether.
27. (a) Why are alkyl halides insoluble in water? 3
 (b) Why is Butan-1-ol optically inactive but Butan-2-ol is optically active?
 (c) Although chlorine is an electron withdrawing group, yet it is *ortho*-, *para*-directing in electrophilic aromatic substitution reactions. Why?

28. (a) Out of -Cl and , which one is more reactive towards S_N2 reaction and why? 3
- (b) Out of -Cl and , which one is more reactive towards nucleophilic substitution reaction and why?
- (c) Out of  and , which one is optically active and why?

29. Convert the following: 3
- Aniline to Chlorobenzene
 - Bromomethane to Fluoromethane
 - Chlorobenzene to Phenol

30. Among all the isomers of molecular formula C_4H_9Br , identify 3
- the one isomer which is optically active.
 - the one isomer which is highly reactive towards S_N1 .
 - the two isomers which give same product on dehydrohalogenation with alcoholic KOH.

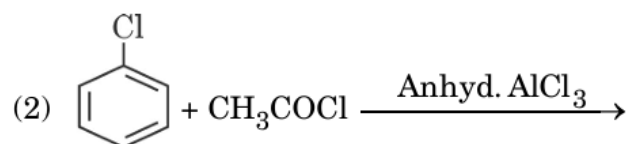
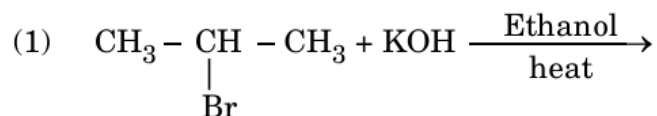
31. Give reasons: 3
- Density of Chloroethane is greater than that of Chloromethane.
 - Boiling points of alkyl halide are higher than their parent hydrocarbon
 - Finkelstein reaction takes place in presence of dry acetone.

32. **Paragraph based question.** 4

The polarity of C-X bond of alkyl halides is responsible for their nucleophilic substitution, elimination and their reaction with metal atoms to form organometallic compounds. Alkyl halides are prepared by the free radical halogenation of alkanes, addition of halogen acids to alkenes, replacement of OH group of alcohols with halogens using phosphorus halides, thionyl chloride or halogen acids. Aryl halides are prepared by electrophilic substitution of arenes. Nucleophilic substitution reactions are categorised into S_N1 and S_N2 on the basis of their kinetic properties. Chirality has a profound role in understanding the S_N1 and S_N2 mechanism.

Answer the following questions :

- (i) What happens when bromobenzene is treated with Mg in the presence of dry ether ?
- (ii) Which compound in each of the following pairs will react faster in S_N^1 reaction with OH^- ?
- (1) $CH_2 = CH - CH_2 - Cl$ or $CH_3 - CH_2 - CH_2 - Cl$
- (2) $(CH_3)_3C - Cl$ or CH_3Cl
- (iii) Write the structure of the major products:

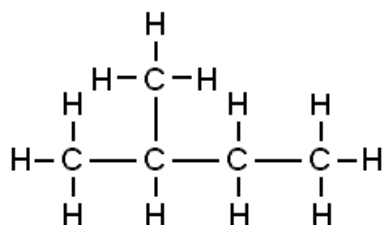


- 33.** (a) Why do tertiary alkyl halides undergo S_N1 reaction at a faster rate ? **5**
- (b) Define Enantiomers.
- (c) Why is chloroform stored in dark coloured air tight bottles?
- (d) Nucleophilic substitution of iodoethane is easier than chloroethane. Why?
- (e) Name the product obtained when 2-chloro-1-phenylpropane is treated with alcoholic KOH

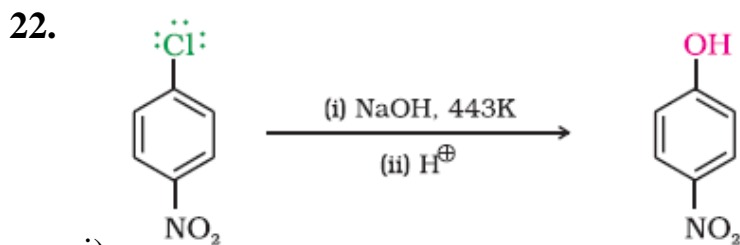
ANSWERS

1. (iii)
2. (ii)
3. (i)
4. (ii)
5. (iv)
6. (iv)
7. (iv)
8. (iii)
9. (i)
10. (i)

11.

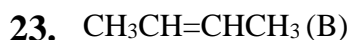


12. Substitution reaction
13. CCl_4
14. Two.
15. Iron or iron(III) chloride
16. Grignard reagents are highly reactive and react with any source of proton to give hydrocarbons. Even water, alcohols, amines are sufficiently acidic to convert them to corresponding hydrocarbons.
17. 1-Chloropropane
18. (ii)
19. Due to the stability of benzyl carbocation as it is stabilized by resonance.
20. Chloromethane < Bromomethane < Dibromomethane < Bromoform
21. i) 2-bromopentane.
It's a secondary haloalkane. Secondary carbocation is more stable than primary.
- ii) 2-bromo-2-methylbutane.
It's a tertiary haloalkane. Tertiary carbocation is more stable than primary.

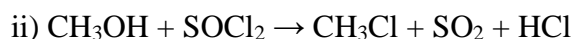


i)

ii) Enantiomers have same boiling points.

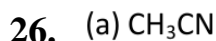


More alkyl groups attached to the double bonded carbon atoms / formed from more stable carbocation.

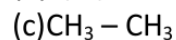


25. a) AgCN is mainly covalent in nature and only nitrogen is free to donate electron pair forming isocyanide as the main product.

b) Allyl carbocation formed is resonance stabilized.



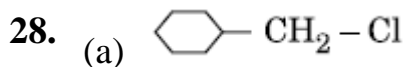
(b) 2, 4, 6 – trinitrophenol



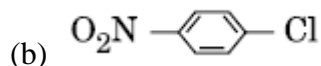
27. a) Haloalkanes are unable to form H-bonds with water molecules. Less energy is released when new attractions are set up between the haloalkane and the water molecules as these are not as strong as the original hydrogen bonds in water.

b) Due to the presence of chiral carbon in butan-2-ol.

c) Due to dominating +R effect over –I effect.

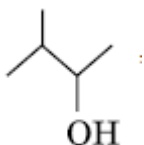


It's a primary haloalkane.



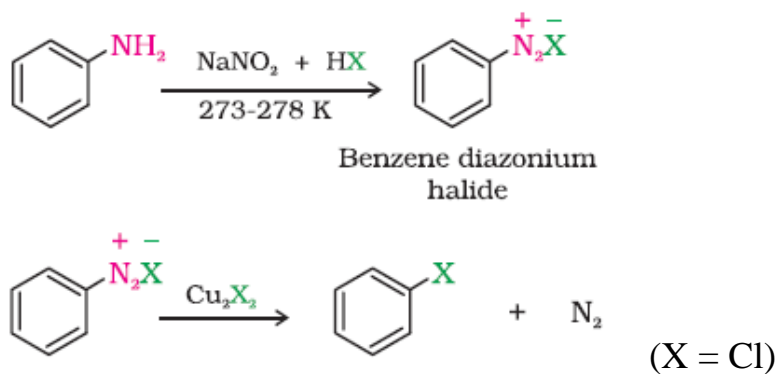
The presence of an electron withdrawing group ($-\text{NO}_2$) at *ortho*- and *para*-positions increases the reactivity of haloarenes.

(c)



It contains a chiral carbon.

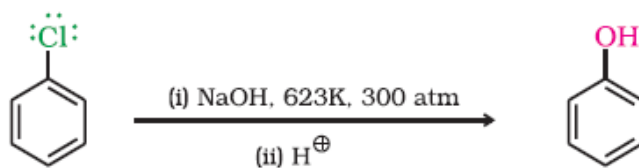
29. i)



ii)



iii)



30. (a) 2-Bromobutane

(b) 2-Bromo-2-methylpropane

(c) 2-Bromo-2-methylpropane and 1-Bromo-2-methylpropane

31. (a) The density increases with increase in number of carbon atoms.

(b) Alkyl halides are polar in nature while hydrocarbons are non-polar / strong dipole-dipole forces in alkyl halides.

(c) NaX formed during the reaction is precipitated in dry acetone and it facilitates the forward reaction.

32.

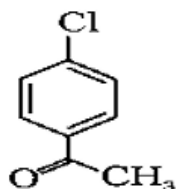
(i) $\text{C}_6\text{H}_5\text{MgBr}$ / Phenyl magnesium bromide is formed.

(ii) (1) $\text{CH}_2 = \text{CH} - \text{CH}_2 - \text{Cl}$

(2) $(\text{CH}_3)_3\text{C} - \text{Cl}$

(iii) (1) $\text{CH}_3 - \text{CH} = \text{CH}_2$

(2)



- 33.** (a) Due to the stability of tertiary carbocation.
- (b) Optically active isomers which are related to each other as non-superimposable mirror images.
- (c) Because chloroform is slowly oxidised by air in the presence of light to an extremely poisonous gas, carbonyl chloride (phosgene).
- (d) Due to the larger size of iodine, bond enthalpy of C-I bond is less than C-Cl bond.
- (e) 1-Phenylpropene

<i>Prepared by</i> <i>Mr. Anoop Stephen</i>	<i>Checked by</i> <i>HoD Science</i>
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