CHAPTER 6

Haloalkanes and Haloarenes

1. CLASSIFICATION & NOMENCLATURE OF HALOALKANES & HALOARENES

Objective Qs [1 mark]

1. Which of the following belongs to the class of Vinyl halides?

(a) $CH_2 = CHCH_2CH_2Cl$

(b) $CH_2 = \underset{\displaystyle Br}{\underset{|}{C}}—CH_3$

(c) $CH_2 = CH—CH_2—Br$

(d) $CH \equiv C—Br$

[CBSE 2023]

2. Which of the following isomer of pentane (C_3H_{12}) will give three isomeric monochlorides on photochemical chlorination?

(a) $CH_3—\underset{\displaystyle CH_3}{\underset{|}{\overset{\displaystyle CH_3}{\overset{|}{C}}}}—CH_3$

(b) $CH_3CH_2CH_2CH_2CH_3$

(c) $CH_3—\underset{\displaystyle CH_3}{\underset{|}{CH}}—CH_2—CH_3$

(d) All of the above

[CBSE Term-1 2021]

Very Short & Short Qs [1-3 marks]

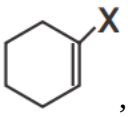
3. Write the IUPAC name of

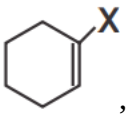
$$\overset{1}{CH_3}—\overset{2}{C}\equiv\overset{3}{C}—\underset{\displaystyle CH_3}{\underset{|}{\overset{4}{\overset{|}{C}}}}—\overset{5}{CH_3}$$
(with Br on C-4)

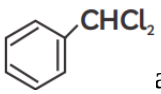
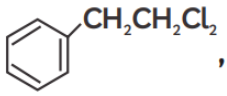
[CBSE 2019]

4. Write the structure of 1-Bromo-4-chlorobut2-ene.
   [CBSE 2017]

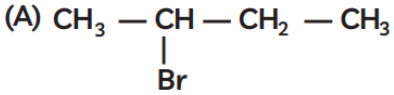
5. Write the structure of 3-Bromo-2-methyl prop-1-ene.
   [CBSE 2017]

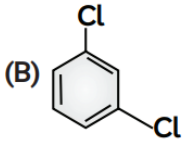
6. Out of  and  , which is an example of allylic halide?
   [CBSE 2017]

7. Out of  and  , which is an example of vinylic halide?
   [CBSE 2017]

8. Out of  and  , which is an example of benzylic halide?
   [CBSE 2017]

9. Give the IUPAC names of the following compounds:

   (A) 

   (B) 

   (C) $CH_2 = CHCH_2Cl$

   [CBSE 2015]

10. Draw the structure of 2-bromopentane.
    [CBSE 2014]

11. Write the IUPAC names of the following compounds:
    (A) $CH_2 = CHCH_2Br$

(B) $(CCl_3)_3CCl$

[CBSE 2014]

2. PREPARATION METHODS OF HALOALKANES & HALOARENES

Objective Qs [1 mark]

12. Major product obtained on reaction of 3-Phenyl propene with HBr in presence of organic peroxide is:

(a) 3 - phenyl -1- bromopropane

(b) 1 - phenyl-3- bromopropane

(c) 1 - phenyl-2-bromopropane

(d) 3 - phenyl -2- bromopropane

[CBSE SQP Term-1 2021]

13. o-Hydroxy benzyl alcohol when reacted with PCl_3 gives the product as (IUPAC name):

(a) o- hydroxy benzyl chloride

(b) 2-chloromethylphenol

(c) o-chloromethylchlorobenzene

(d) 4-hydroxymethylphenol

[CBSE SQP Term-1 2021]

14. The reaction of toluene with Cl_2 in presence of $FeCl_3$ gives ' X ' while the of toluene with Cl_2 in presence of light gives ' Y '. Thus ' X ' and ' Y ' are:

(a) $X =$ benzyl chloride $Y = 0$ and $p -$ chlorotoluene

(b) X $= m$ - chlorotoluene Y $=$ p $-$ chlorotoluene

(c) $X = 0$ and p-chlorotoluene $Y =$ trichloromethylbenzene

(d) $X =$ benzyl chloride, $Y = m$-chlorotoluene

[CBSE SQP Term-1 2021]

15. Which reagents are required for one step conversion of chlorobenzene to toluene?

(a) $CH_3Cl/AlCl_3$

(b) CH_3Cl, Na, Dry ether

(c) CH_3Cl/Fe dark

(d) $NaNO_2/HCl/0-5°C$

[CBSE SQP Term-1 2021]

Very Short & Short Qs [1 -3 marks]

16. How can you convert the following?

    But-1-ene to 1-iodobutane

    [CBSE 2020]

17. Give reason for the following:

    Thionyl chloride method is preferred for preparing alkyl chloride from alcohols.

    [CBSE 2019]

18. Write equation for preparation of 1-iodobutane from 1-chlorobutane.

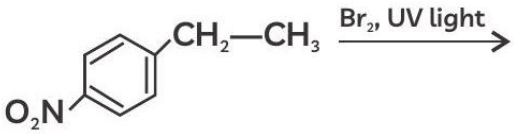
    [CBSE 2019]

19. How do you convert: Propene to 1-iodopropane.

    [CBSE 2016]

20. Write the major product in the following:

    [CBSE 2016]



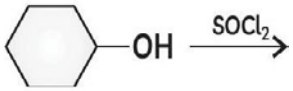
21. Write the structure of the major product in each of the following reactions:

$$CH_3CH=C(CH_3)_2+HBr\rightarrow$$

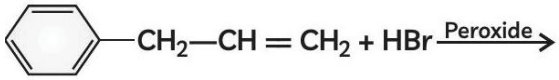
    [CBSE 2015]

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

    (A)



    (B)



[CBSE 2014]

23. Write the mechanism of the following reaction:

$$CH_3CH_2OH \xrightarrow{HBr} CH_2CH_2Br + H_2O$$

[CBSE 2014]

3. PHYSICAL AND CHEMICAL PROPERTIES OF HALOALKANES & HALOARENES

Objective Qs [1 mark]

24. Which of the following is not correct?

(a) In haloarenes, the electron pairs on halogen atom are in conjugation with π-electrons of the ring.

(b) The carbon-magnesium bond is covalent and non-polar in nature. (c) During S_N1 reaction, the carbocation formed in the slow step being sp^2 hybridised is planar.

(d) Out of $CH_2 = CH - Cl$ and $C_6H_5CH_2Cl$, $C_6H_5CH_2Cl$ is more reactive towards S_N1 reaction.

[CBSE SQP 2023]

25. Retention of configuration is observed in:

(a) S_N1 reaction

(b) S_N2 reaction

(c) Neither S_N1 nor S_N2 reaction

(d) S_N2 reaction as well as S_N1 reaction

[CBSE 2023]

26. Which of the following reactions are feasible?

(a) $CH_3CH_2Br + Na^+O - C(CH_3)_3 \rightarrow CH_3CH_2O - C(CH_3)_3$

(b) $(CH_3)_3C - Cl + Na^+O - CH_2CH_3 \rightarrow CH_3CH_2 - O - C(CH_3)_3$

(c) Both (a) and (b)

(d) Neither (a) nor (b)

[CBSE 2023]

27. Which one of the following compounds is more reactive towards S_N1 reaction?

(a) $CH_2 = CHCH_2Br$

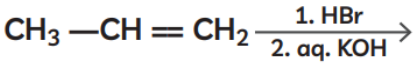
(b) $C_6H_5CH_2Br$

(c) $C_6H_5CH(C_6H_5)Br$

(d) $C_6H_5CH(CH_3)Br$

[CBSE SQP 2022]

28. Consider the following reaction



The major end product is:

(a) $CH_3 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_3$

(b) $CH_3 - \underset{\displaystyle Br}{\underset{|}{CH}} - CH_3$

(c) $CH_3 - CH_2 - CH_2 - OH$

(d) $CH_3 - CH_2 - CH_2 - Br$

[CBSE Term-1 2021]

29. Which of the following isomer has the highest melting point?

(a) 1,2-Dichlorobenzene

(b) 1,3 -Dichlorobenzene

(c) 1,4-Dichlorobenzene

(d) All isomers have same melting points

[CBSE SQP Term-1 2021]

30. Complete the following analogy:

Same molecular formula but different structures:

A:: Non superimposable mirror images: *B*

(a) A : Isomers B: Enantiomer

(b) A : Enantiomers B : Racemic mixture

(c) A : Stereoisomers B : Retention

(d) A : Isomers B : Stereoisomers

[CBSE SQP Term-1 2021]

31. Enantiomers differ only in:

(a) boiling point

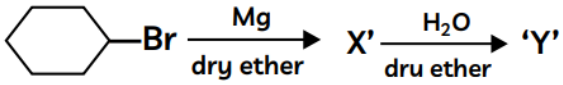
(b) rotation of polarised light

(c) melting point

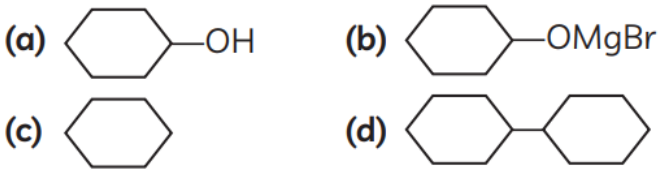
(d) solubility

[CBSE Term-1 2021]

32. In the reaction



compound ' Y ' is:



[CBSE Term-1 2021]

33. Which one of the following halides contains $C_{sp^2} - X$ bond?

(a) Allyl halide

(b) Alkyl halide

(c) Benzyl halide

(d) Vinyl halide

[CBSE Term-1 2021]

34. Which of the following is optically inactive?

(a) (+) - Butan-2-ol

(b) (-) - Butan-2-ol

(c) (\pm) - Butan-2-ol

(d) (+) - 2 - Bromobutane

[CBSE Term-1 2021]

35. Which of the following has highest boiling point?
(a) $C_2H_5 - F$
(b) $C_2H_5 - Cl$
(c) $C_2H_5 - Br$
(d) $C_2H_5 - I$

[CBSE Term-1 2021]

36. $CH_3CH_2CH_2Cl \xrightarrow{\text{alc. KOH}} B \xrightarrow{HBr} C \xrightarrow{Na/\text{ ether}} D$ in this reaction *D* is:

(a) Propanone

(b) Hexane

(c) 2,3-dimethylbutane

(d) Allylic bromide

[Delhi Gov. SQP Term-1 2021]

37. Which of the following is a correct statement for C_2H_5Br ?

(a) It reacts with metallic Na to give ethane.

(b) It gives nitroethane on heating with aqueous solution of $AgNO_2$

(c) It gives C_2H_5OH on boiling with alcoholic potash.

(d) It forms diethylthioether on heating with alcoholic KSH.

[CBSE SQP Term-1 2021]

38. Alkyl halides which will undergo S_N1 reaction most readily is:
(a) $(CH_3)_3C - Cl$
(b) $(CH_3)_3 - C - Br$
(c) $(CH_3)_3C - F$
(d) $(CH_3)_3C - I$

[Delhi Gov. SQP Term-1 2021]

39. Which of the following isomer has the highest melting point:

(a) 1, 2-dichlorobenzene

(b) 1, 3-dichlorobenzene

(c) 1, 4-dichlorobenzene

(d) all isomers have same melting points.

[CBSE SQP Term-I-2021]

40. Racemisation occurs in:

(a) S_N2 reaction

(b) S_N1 reaction

(c) Neither S_N2 nor S_N1 reactions

(d) S_N2 reaction as well as S_N1 reaction.

[CBSE 2020]

41. The conversion of an alkyl halide into an alcohol by aqueous NaOH is classified as:

(a) A dehydrohalogenation reaction

(b) A substitution reaction

(c) An addition reaction

(d) A dehydration reaction

[CBSE 2020]

In the following questions (Q. No. 42-44) a statement of Assertion (A) followed by a statement of Reason (R) is given. Choose the correct answer out of the following choices.

(a) Both (A) and (R) are true and (R) is the correct explanation of (A).

(b) Both (A) and (R) are true but (R) is not the correct explanation of (A).

(c) (A) is true but (R) is false.

(d) (A) is false but (R) is true.

42. Assertion (A): Chlorobenzene is resistant to electrophilic substitution reaction.

Reason (R): $C-Cl$ bond in chlorobenzene acquires partial double bond characters due to resonance.

[CBSE 2023]

43. Assertion (A): Chlorobenzene is less reactive towards nucleophilic substitution reaction.

Reason (R): Nitro group in chlorobenzene increases its reactivity towards nucleophilic substitution reaction.

[CBSE Term-1 2021]

44. Assertion (A): Alkyl halides are insoluble in water.

Reason (R): Alkyl halides have halogen attached to sp^3 hybrid carbon.

[CBSE SQP Term-1 2021]

Very Short & Short Qs [1 -3 marks]

45. (A) Arrange the isomeric dichlorobenzene in the increasing order of their boiling point and melting points.

(B) Explain why the electrophilic substitution reactions in haloarenes occur slowly and require more drastic conditions as compared to those in benzene.

[CBSE SQP 2023]

46. Answer any 3 of the following:

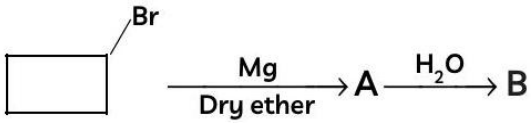
(A) Which isomer of C_5H_{10} gives a single monochloro compound C_5H_9Cl in bright sunlight?

(B) Arrange the following compounds in increasing order of reactivity towards S_N^2 reaction:

2-Bromopentane, 1-Bromopentane, 2-Bromo-2-methylbutane

(C) Why p-dichlorobenzene has higher melting point than those of ortho- and meta-isomers?

(D) Identify A and B in the following:



[CBSE 2023]

47. Give reason for the following:

(A) During the electrophilic substitution reaction of haloarenes, para substituted derivative is the major product.

(B) The product formed during S_N1 reaction is a racemic mixture.

[CBSE SQP 2022]

48. (A) Name the suitable alcohol and reagent, from which 2-chloro-2-methyl propane can be prepared.

(B) Out of the chloromethane and fluoromethane, which one is has higher dipole moment and why?

[CBSE SQP 2022]

49. Write the mechanism of the following S_N1 reaction.

$$(CH_3)_3C-Br \xrightarrow{Aq\cdot NaOH} (CH_3)_3COH + NaBr$$

[CBSE 2020]

50. "Melting point of a structure depends on the lattice structure of the compound. And the molecules having efficient packaging have high melting points as it requires larger force of attraction to break the structure."

Give reason for the following: *p*-dichlorobenzene has higher melting point than that of ortho or meta isomer.

[CBSE 2019]

51. Out of chlorobenzene and benzyl chloride, which one gets easily hydrolysed by aqueous NaOH and why?

[CBSE 2018]

52. Explain the following:

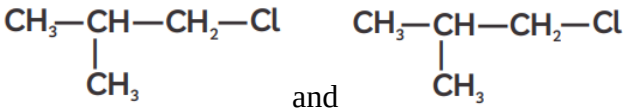
Alkyl halides, though polar, are immiscible with water.

[CBSE 2017, 15]

53. Explain why the dipole moment of chlorobenzene is lower than that of cyclohexyl chloride.

[CBSE 2016]

54. Out of the following



Which is more reactive towards S_N1 reaction and why?

[CBSE 2016]

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

[CBSE 2016]

56. Give reasons:

(A) $C-Cl$ bond length in chlorobenzene is shorter than $C-Cl$ bond length in CH_3-Cl.

(B) S_N1 reactions are accompanied by racemisation in optically active alkyl halides.

[CBSE 2016]

57. How do you convert:

(A) chlorobenzene to biphenyl

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

[CBSE 2016]

58. (A) $2CH_3 - \underset{Cl}{CH} - CH_3 \xrightarrow[\text{dry ether}]{Na} \longrightarrow ?$

(B) $CH_3 - CH_2 - Br \overset{AgCN}{\longrightarrow} ?$

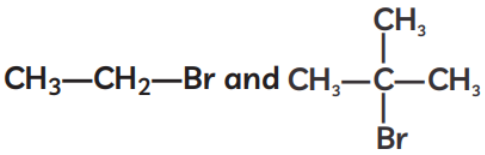
[CBSE 2016]

59. Give reason

n-Butyl bromide has higher boiling point than *t*-butyl bromide.

[CBSE 2015]

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



[CBSE 2015]

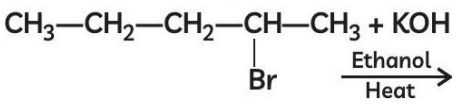
61. Which would undergo S_N2 reaction faster in the following pair and why?

$CH_3 - CH_2 - Br$ and $CH_3 - CH_2 - I$

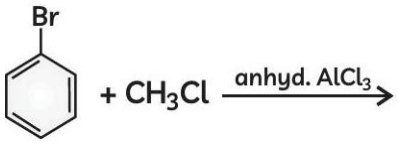
[CBSE 2015]

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

(A)



(B)



[CBSE 2015]

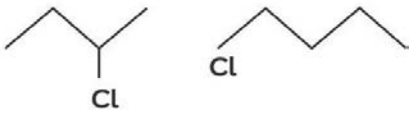
63. (A) Why is butan-1-ol optically inactive but butane-2-ol is optically active?

(B) Although chlorine is an electron withdrawing group, yet it is ortho-, para-directing in electrophilic aromatic substitution reaction. Why?

[CBSE 2015]

64. Identify the chiral molecule in the following pair:

[CBSE 2014]



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

[CBSE 2014]

66. Write chemical equations when:

(A) Methyl chloride is treated with $AgNO_2$.

(B) Bromobenzene is treated with CH_3Cl in the presence of anhydrous $AlCl_3$.

[CBSE 2014]

67. Write chemical equation when:

(A) ethyl chloride is treated with aqueous KOH

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

[CBSE 2014]