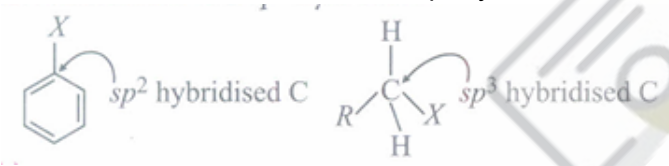
Haloalkanes and Haloarenes Important Questions With Answers

NEET Chemistry 2023

1. The main difference in C - X bond of a haloalkane and a haloarene is
   a) C - X bond in haloalkanes is shorter than haloarenes.
   b)
   in haloalkanes the C attached to halogen in C - X bond is Sp^3 hybridised while in haloarenes it is Sp^2 hybridised.
   c)
   C - X bond in haloarenes acquires a double bond character due to higher electronegativity of X than haloalkanes.
   d) haloalkanes are less reactive than haloarenes due to difficulty in C - X cleavage in halo alkanes.

   Solution : -
   In haloarenes, carbon of C - X is Sp^2 hybridised while in haloalkanes it is Sp^3 hybridised.



2. The (R) and (S) enantiomers of an optically active compound differ in :
   a) their solubility in a chiral solvent b) their reactivity with a chiral reagent
   c) their optical rotation of plane polarized light d) their melting points.

   Solution : -
   R and S forms of an optically active compound differ in their behavior towards the plane polarized light.
   When plane polarized light rotate towards right ⟶ R-form.
   When plane polarized light rotate towards left ⟶S-form

3. The most important chemical method to resolve a racemic mixture makes use of the formation of :
   a) a meso compound b) enantiomers **c) diastereomers** d) racemetes

   Solution : -
   To resolve racemic mixtures the formation of diastereomers is done as diastereomers have different physical properties such as melting point, boiling point, solubilities in a given solvent etc. Due to this they can be easily separated by fractional distillation.

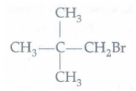
4. Choose the correct increasing order of density of the following compound
   a) $C_3H_7Cl < C_3H_7I < CH_2Cl_2 < CCl_4$ b) $C_3H_7I < C_3H_7Cl < CH_2Cl_2 < CCl_4$ c) $C_3H_7I < C_3H_7Cl < CCl_4 < CH_2Cl_2$
   d) $CCl_4 < CH_2Cl_2 < C_3H_7I < C_3H_7Cl$

   Solution : -
   As density increases with increase in number of carbon atoms, halogen atoms and atomic mass of the halogen atoms. Hence correct increasing order is $C_3H_7Cl < C_3H_7I < CH_2Cl_2 < CCl_4$

5. In a $^{S}N^{2}$ substitution reaction of the type

   R-Br + $Cl^{-} \xrightarrow{DMF}$ R-Cl + Br^{-}

   Which one of the following has the highest relative rate?

   a)  **b) CH_3CH_2Br** c) $CH_3CH_2CH_2Br$ d) CH_3-$\underset{CH_3}{\overset{CH}{|}}$-$CH_2Br$

   Solution : -

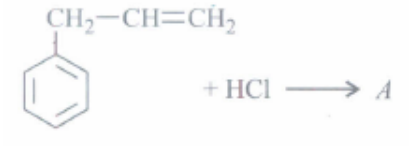
   In $^{S}N^{2}$ reaction primary is more reactive than secondary and tertiary alkyl halides.

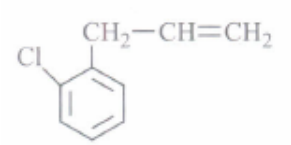
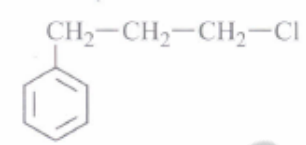
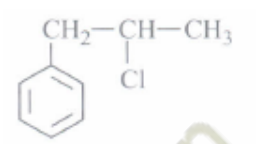
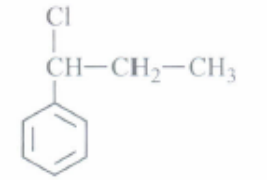
   Thus, order of $^{S}N^{2}$ is :

   CH_3-X > R-CH_2-X > R_2CH-X > R_3C-X

   S_N reaction is favoured by small groups on the carbon atoms attached to halogen.

6. What is 'A' in the following reaction?

   a)  b)  **c)**  d) 

7. Which one of the following pairs represents stereoisomerism

   a) Chain isomerism and rotational isomerism b) Structural isomerism and geometrical isomerism

   c) Linkage isomerism and geometrical isomerism **d) Optical isomerism and geometrical isomerism**

   Solution : -

   Pair of optical isomerism and geometrical isomerism are able to exhibit the phenomenon of stereoisomerism because both type of isomers differ only in their orientation in space.

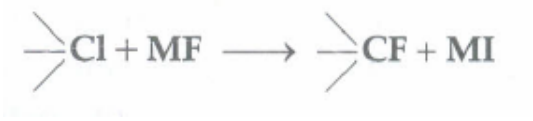
8. Molecules whose mirror image is nonsuperimposable over them are known as chiral. Which of the following molecules is chiral in nature?

   a) 2-Bromobutane b) 1-Bromobutane c) 1-Bromobutane d) 2-Bromopropan-2-ol

   Solution : -

   $CH_3CH_2 - CH(Br) - \overset{*}{C}H_3$ $2 - Bromobutane$

9. In the replacement reaction

   The reaction will be most favorable if M happens to be :

   a) Na b) K **c) Rb** d) Li

   Solution : -

   Tertiary alkyl halides shows S_N1 mechanism to the greater extent. In the given reaction negative ion will attack on carbocation. Thus, greater the tendency of ionization (greater ionic character in M-F bond) more favourable will be reaction. In the given options Rb-F is most ionic and hence it will be most favourable for S_N1 mechanism.

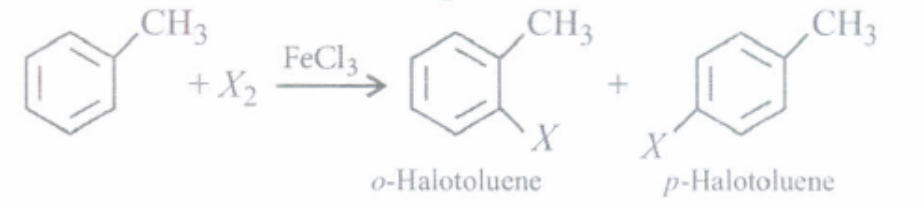
10. Toluene reacts with a halogen in the presence of iron (III) chloride giving ortho and para halo compounds. The reaction is

    a) electrophilic elimination reaction **b) electrophilic substitution reaction** c) free radical addition reaction

    d) nucleophilic substitution reaction.

Solution : -

The reaction is electrophilic substitution reaction.



11. Consider the reactions,

(i) $(CH_3)_2CH\text{-}CH_2Br \xrightarrow{C_2H_5OH} (CH_3)_2CH\text{-}CH_2OC_2H_5 + HBr$

(ii) $(CH_3)_2CH\text{-}CH_2Br \xrightarrow{C_2H_5O-} (CH_3)_2CH\text{-}CH_2OC_2H_5 + Br^-$

The mechanisms of reactions (i) and (ii) are respectively:

a) $^SN^1$ and $^SN^2$ b) $^SN^1$ and $^SN^1$ **c) $^SN^2$ and $^SN^2$** d) $^SN^2$ and $^SN^1$

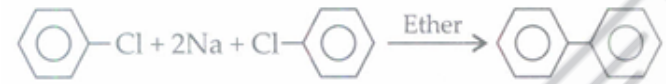
Solution : -

These reactions are purely $^SN^1$ reactions as in reaction (i) and (ii) there is no rearrangement takes place (rearrangement occurs in $^SN^1$ mechanism). Simple substitution of nucleophile takes place.

12. Chlorobenzene on treatment with sodium in dry ether gives diphenyl. The name of the reaction is

a) Fittig reaction b) Wurtz- Fittig reaction c) Sandmeyer reaction d) Gattermann reaction

Solution : -



13. **Assertion:** Melting points of isomeric dihalobenzenes are nearly the same.

Reason : Isomeric dihalobenzenes have different molecular masses

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false. **d) If both assertion and reason are false**

Solution : -

The para-isomers are high melting as compared to their ortho- and meta- isomers. This is due to symmetry of para-isomers that they fit in crystal lattice better as compared to ortho- and meta-isomers.

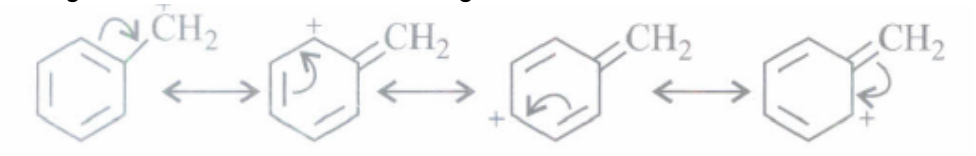
14. Reaction of $C_6H_5CH_2Br$ with aqueous sodium hydroxide follows _____

a) S_N1 mechanism b) S_N2 mechanism

c) Any of the above two depending upon the temperature of reaction d) Saytzeff rule

Solution : -

Benzylic halides show high reactivity towards the S_N1 reaction.The carbocation thus formed gets stabilised through resonance as shown in the figure.



15. Which of the following is not correctly matched with its IUPAC name?

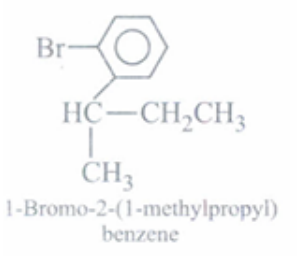
a) $CHF_2CBrClF$: I-Brorno-Lchloro-1, 2, 2 -trifluoroethane

b) $(CCl_2)_3CCl$: 2-(Trichloromethyl)-1, 1, 1, 2, 3, 3, 3 -heptachloropropane

c) $CH_3C(p\text{-}ClC_6H_4)_2CH(Br)CH_3$: 2- Bromo-3,3-bis(4-chlorophenyl) butane

d) $o\text{-}BrC_6H_4CH(CH_3)CH_2CH_3$: 2- Bromo-1-methylpropylbenzene

Solution : -



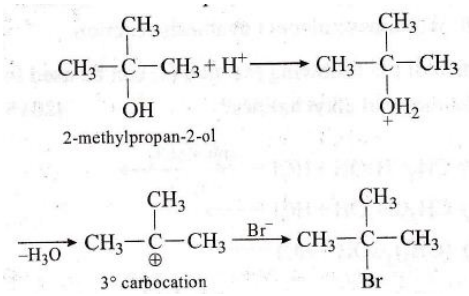
1-Bromo-2-(1-methylpropyl) benzene

16. HBr reacts fastest with _____ .

a) 2 -methyl propan-1-ol **b) 2 -methyl propan-2-ol** c) propan-2-o1 d) propan-1-ol

Solution : -

2-methylpropan-2-ol gives 3° carbocation, so it reacts with HBr at faster speed.



17. The ease of dehydrohalogenation of alkyl halide with alcoholic KOH is

a) 3°<2°<1° **b) 3°>2°>1°** c) 3°<2°>1° d) 3°>2°<1°

18. Which of the following alkyl halides will undergo S_N1 reaction most readily?

a) $(CH_3)_3C$-F b) $(CH_3)_3C$-Cl c) $(CH_3)_3C$-Br **d) $(CH_3)_3C$-I**

Solution : -

As C-I bond is weakest, $(CH_3)C$-I will undergo S_N1 reaction most readily.

19. The compound which reacts fastest with Lucas reagent is (at room temperature)

a) butan-1-ol b) butan-2-ol c) 2-methyl propan-1-ol **d) 2-methyl propan-2-ol**

Solution : -

In Lucas test, when Lucas reagent is treated with $1^\circ, 2^\circ$ and 3° alcohols, then turbidity appears, if turbidity is appeared immediately, then alcohol is tertiary, 2-methyl propan-2-ol is a tertiary alcohol Hence, it reacts fastest with Lucas reagent

20. Which is the correct increasing order of boiling points of the following compounds?

1-Bromoethane, 1-Brornopropane, 1-Brornobutane, Bromobenzene

a) Bromobenzene < 1-Bromobutane < 1-Bromopropane < 1-Bromoethane

b) Bromobenzene < 1-Bromoethane < 1-Bromopropane < 1-Bromobutane

c) 1-Bromopropane < 1-Bromobutane < 1-Bromoethane < Bromobenzene

d) 1-Brornoethane < 1-Bromopropane < 1-Bromobutane < Bromobenzene

Solution : -

For the same halogen, boiling point increases as the size of the hydrocarbon part increases.

21. Identify the products X and Y in the given reaction,

$$CH_3 - \underset{Br}{CH} - CH_3 + Mg \xrightarrow{Dry\ ether} X \xrightarrow{D_2o} Y$$

$X = CH_3 - \underset{Br}{CH} - CH_2Mg,$ $X = CH_3 - \underset{MgBr}{C\ H} - CH_3$

a) $Y = CH_3 - CH_2CH_2CH_2OH$ **b)** $Y = CH_3 - \underset{D}{CH} - CH_3$

$X = CH_3 - \underset{MgBr}{C\ H} - CH_3$ $X = CH_3 - \underset{Br}{CH} - CH_2Mg$

c) $Y = CH_3 - \underset{OD}{C\,H} - CH_3$ d) $Y = CH_3 - \underset{OH}{C\,H} - CH_3$

Solution : -

$$CH_3 - \underset{Br}{CH} - CH_3 + Mg \xrightarrow{dry\ ether} CH_3 - \underset{\underset{(X)}{MgBr}}{C\ H} - CH_3 \xrightarrow{D_2O} CH_3 - \underset{\underset{(Y)}{D}}{CH} - CH_3$$

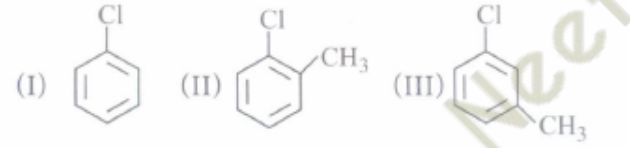
22. **Assertion:** The boiling point of the compounds increases in the order: Isopropylchloride < 1-Chloropropane < 1-Chlorobutane.
Reason: Boiling point depends upon the molecular mass and surface area.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false d) If both assertion and reason are false.

23. Which of the following is the most reactive towards nucleophilic substitution reaction?
a) $ClCH_2$ - CH = CH_2 b) CH_2 = CH - Cl c) CH_3CH=CH-Cl d) C_6H_5Cl

Solution : -
Order of reactivity of different halo compounds towards nucleophilic substitution reactions are: allyl chloride> vinyl chloride> chlorobenzene.

24. The position of - Br in the compound in CH_3CH=CHC(Br)$(CH_3)_2$ can be classified as_____
a) allyl b) aryl c) vinyl d) secondary

25. Arrange the compounds in increasing order of rate of reaction towards nucleophilic substitution

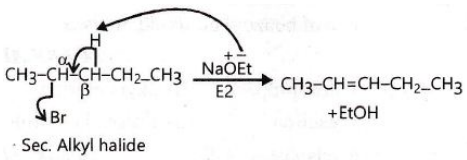


a) (I) < (II) < (III) b) (I) < (III) < (II) c) (III) < (II) < (I) **d) (II) < (III) < (I)**

Solution : -
Presence of electron donating group (-CH_3) decreases the reactivity towards nucleophilic substitution and the effect at a-position is greater than at m-position.

26. Elimination reaction of 2-Bromo-pentane to form pent-2-ene is:
(I) p-Elimination reaction
(2) Follow Zaitsev rule
(3) Dehydrohalogenation reaction
(4) Dehydration reaction
a) (I),(2),(3) b) (1),(2),(3) **c) (I),(3),(4)** d) (2),(3),(4)

Solution : -



Sec. Alkyl halide

(i) This reaction is an example of β-elimination.

(ii) Hydrogen is removed from β-carbon and halgoen from α-carbon, hence, dehydrohalgoenation reaction.

(iii) Generally in E_2 reaction Zaitsev alkene is formed as major product (more stable alkene).

27. Which of the following compounds will have highest melting point?

a) Chlorobenzene b) a-Dichlorobenzene c) m- Dichlorobenzene **d) p- Dichlorobenzene**

Solution : -

p-isomer is symmetrical hence closely packed due to which it shows higher melting point than o- and m- isomers.

28. Which of the following reactions does not take place?

a) $C_2H_5Br + KNO_2 \longrightarrow C_2H_5 - O - N = O + KBr$

b) 

c) $C_2H_5Br + AgCN \longrightarrow C_2H_5NC + AgBr$

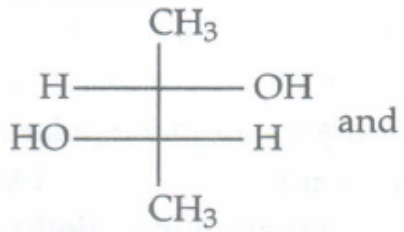
d) $C_2H_5Br + KCN \longrightarrow C_2H_5NC + KBr$

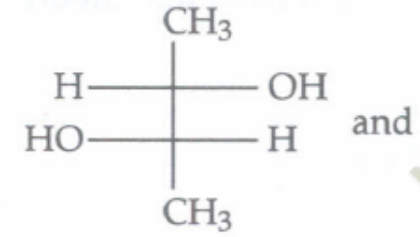
Solution : -

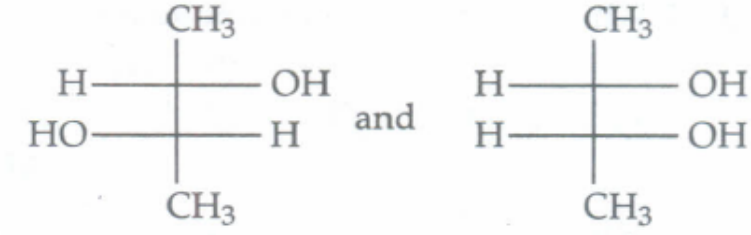
$C_2H_5Br + KCN \longrightarrow C_2H_5NC + KBr$

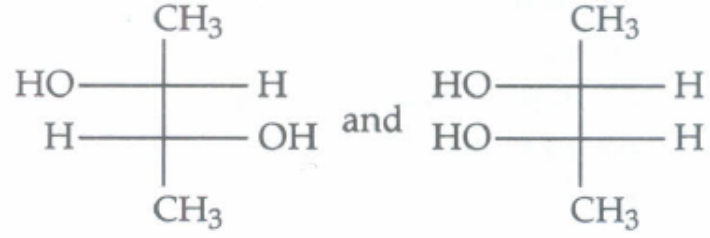
Due to ionic nature, the attack by CN^- occurs through C atom and alkyl cyanide is formed.

29. Which of the following pairs of compounds are enantiomers ?

a) 

b) 

c) 

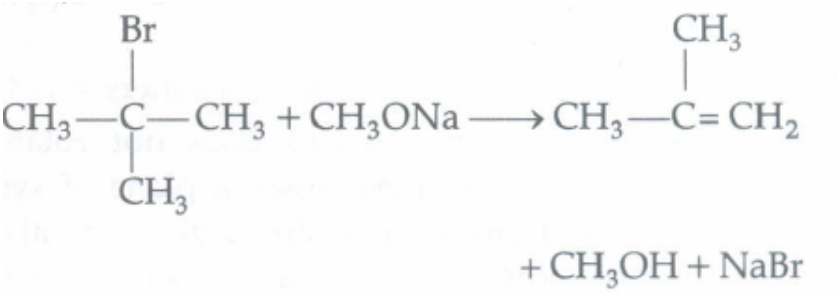
d) 

Solution : -

Option (a) are the two non-superimposable mirror images of each other so they are enantiomers.

30. Reaction of t-butyl bromide with sodium methoxide produces:
a) sodium t-butaoxide b) t-butyl methyl ether c) isobutane **d) isobutylene**

Solution : -
Isobutylene is obtained here



31. Grignard reagent, a very useful starting compound for a number of organic reactions can be prepared by
a) reaction of alkyl halides with a solution of magnesium hydroxide

b) reaction of alkyl halides with dry magnesium powder in presence of dry ether

c) reaction of $MgCl_2$ with ether and alcohol

d) reaction of alkyl halide with magnesium in presence of alcohol.

Solution : -

$$RX + Mg \overset{dry}{\longrightarrow} \overset{ether}{R - \underset{grignard}{Mg} \underset{reagent}{} - X}$$

32. The order of reactivity of following alcohols with halogen acids is_____
(I) CH_3CH_2-CH_2-OH
(II) $CH_3CH_2 - \underset{CH_3}{\overset{}{\underset{|}{C}}} H - OH$
(III) $CH_3CH_2 - \underset{CH_3}{\overset{CH_3}{\underset{|}{\overset{|}{C}}}} - OH$
a) (I) > (II) > (III) **b) (III) > (II) > (I)** **c) (II) > (I) > (III)** d) (I) > (III) > (II)

Solution : -
The reactivity of alcohols towards halogen acids decreases in the order: 3° > 2° > 1.

33. Propene, $CH_3 - CH = CH_2$ can be converted into 1-propanol by oxidation. Indicate which set of reagents amongst the following is ideal to affect the above conversion?
a) $KMnO_4(alkaline)$ b) Osmium tetroxide (OsO_4/CH_2Cl_2) **c)** B_2H_6 and alk H_2O_2 d) O_3/Zn

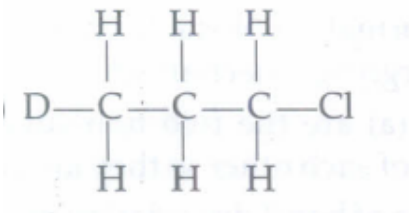
Solution : -

$$3CH_3CH = CH_2 \xrightarrow{B_2H_6} (CH_3 - CH_2 - CH_2)_3\,B \xrightarrow{H_2O_2/OH^-} \underset{\text{Propan-l-ol}}{CH_3 - CH_2 - CH_2 - OH}$$

Here, half mol of (B_2H_6) diborane react with propane by Markownikoffs addition it gives tripropyl borane called hydroboration. In presence of H_2O_2, in basic medium tripropyl borane gives alcohol. Remember that product is Anti-Markownrkoff's rule that is 1-propanol. Reaction is called hydroboration oxidation.

34. Which of the following compounds is not chiral?
a) CH_3CHDCH_2Cl b) CH_3CH_2CHDCl **c) $DCH_2CH_2CH_2Cl$** d) $CH_3CHClCH_2D$

Solution : -



This compound has no chiral C-atom.

35. 0.0852 g of an organic halide (A) when dissolved in 2.0 g of camphor, the melting point of the mixture was found to be 167°C. Compound (A) when heated with sodium gives a gas (B). 280 mL of gas (B) at STP weighs 0.375 g. What would be 'A' in the whole process? Kj for camphor = 40, m.pt. of camphor = 179°C.

a) C_2H_5Br **b) CH_3I** c) $(CH_3)_2CHI$ d) C_3H_5Br

Solution : -

$\triangle$T= 179-167= 12, w=0.0852g, W=2g,K_j=40, molecular weight of (A)

$$= \frac{1000 \times K_f \times w}{\triangle T \times W} = \frac{1000 \times 40 \times 0.0852}{12 \times 2} = 142$$

(A) undergoes Wurtz reaction to form (B) i.e.

(A) $\xrightarrow{Na}$ B) + NaX

(B) is an alkane say C_nH_{2n+2}

$\because$ 280 mL of (B) weighs 0.375 g at NTP

$\therefore$ 22400 mL of (B) weighs = $\frac{0.375 \times 22400}{280}$

= 30 g at NTP

$\therefore$ M.wt. of (B) = 30, 12n + Zn + 2 = 30, n = 2

Thus (B) is ethane and therefore (A) is CH_3X.

The m.wt. of CH_3X = 142

At. wt. of X = 127 :. X is iodine

Therefore alkyl halide is CH_3I. This reaction is

$$\underset{(A)}{2CH_3} \xrightarrow[either]{Na} \underset{(B)}{C_2H_6}$$

36. Which is the correct increasing order of boiling points of the following compounds?

1-Iodobutane, 1-Bromobutane, 1-Chlorobutane, Butane

a) Butane < 1-Chlorobutane < 1-Bromobutane < 1-Iodobutane

b) 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < Butane

c) Butane < 1-Iodobutane <1-Bromobutane < 1-Chlorobutane

d) Butane < 1-Chlorobutane < 1-Iodobutane < 1-Bromobutane

Solution : -

For the same alkyl halide, boiling point increases as the mass of halogen increases.

37. **Assertion:** Aryl halides are highly reactive towards nucleophilic substitution reactions.

Reason : In case of haloarenes, halogen atom is attached to sp hybridised carbon atom.

a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false d) If both assertion and reason are false.

Solution : -

Aryl halides are less reactive towards nucleophilic substitution reactions as C-X bond aquires a partial double bond character due to resonance. Also halogen atom is attached to Sp^2 hybridised carbonatom.

38. Among the choices of alkyl bromide, the least reactive bromide in S_N2 reaction is
a) l-bromopentane **b) 2-bromo-2-methylbutane** **c) l-bromo-3-methylbutan** d) l-bromo-z-rnethylbutane.

Solution : -
The reactivity of different alkyl halides towards S_N2 reaction decreases in the order: methyl halides> 1° halides> 2° halides> 3° halides. Since, 2-bromo-2-methylbutane is a tertiary bromide hence it is least reactive among the given.

39. Which of the following reactions is an example of nucleophilic substitution reaction?
a) 2RX + 2Na ⟶ R-R + 2NaX b) RX+ H_2⟶RH + HX c) RX+ Mg⟶RMgX **d) RX+ KOH⟶ROH + KX**

Solution : -
RX + KOH ⟶ ROH + KX is an example of nucleophilic substitution reaction .
Here $^-$OH nucleophile substitute X^-.

40. Which of the following molecules has highest dipole moment?
a) CH_3Cl b) CH_2Cl_2 c) $CHCl_3$ d) CCl_4

Solution : -
Order of dipole moment is : $CH_3Cl > CH_2Cl_2 > CHCl_3 > CCl_4$

41. Bottles containing C_6H_5I and $C_6H_5CH_2I$ lost their original labels. They were labelled A and B for testing. A and B were separately taken in test tubes and boiled with NaOH solution. The end solution in each tube was made acidic with dilute HNO_3 and some $AgNO_3$ solution added. Solution B gave a yellow precipitate. Which one of the following statements is true for the experiment?
a) Addition of HNO_3 was unnecessary **b) A was C_6H_5I** c) A was $C_6H_5CH_2I$ d) B was C_6H_sI

Solution : -
Since B gives yellow ppt. with $AgNO_3/HNO_3$, B must be $C_6H_5CH_2I$ and hence A is C_6H_5I.

42. Match the column I with column II and mark the appropriate choice.

	Column I		**Column II**
(A)	$CH_3(CH_2)_3OH \xrightarrow[H_2SO_4,\Delta]{NaBr}$	(i)	$CH_3CH(Br)(CH_2)_2CH_3$
(B)	$(CH_3)_3COH \xrightarrow[room\ temp]{Conc.HCl}$	(ii)	$CH_3CH_2CH_2Cl$
(C)	$CH_3CH(OH)(CH_2)_2CH_3 \xrightarrow{PBr_3}$	(iii)	$(CH_3)CCl$
(D)	$CH_3CH_2CH_2OH \xrightarrow{SOCl_2}$	(iv)	$CH_3(CH_z)_3Br$

a) (A)→ (iv), (B)→ (iii), (C)→ (i), (D) → (ii) b) (A) → (iv), (B) → (iii), (C)→ (ii), (D) → (i)
c) (A) → (iii), (B) → (iv), (C) → (i), (D) → (ii) d) (A) → (iii), (B) → (iv), (C) → (ii), (D) → (i)

43. **Assertion:** Replacement of -Cl group by -OH in chlorobenzene is easier if nitro group is present in the ring.
Reason: Nitro group leads to strengthening of the C-Cl bond in chlorobenzene.
a) If both assertion and reason are true and reason is the correct explanation of assertion
b) If both assertion and reason are true but reason is not the correct explanation of assertion
c) If assertion is true but reason is false. d) If both assertion and reason are false

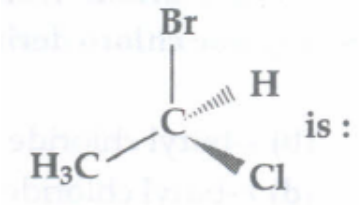
Solution : -
Nitro group is an electron withdrawing group which leads to weakening of C-Cl bond, hence making it easier to replace the -Cl group.

44. Which of the following statements is not correct about S_N2 reactions of alkyl halides?
a) Nucleophile attacks the carbon from the side opposite to where the leaving group is attached.
b) The bond formation and bond breaking take place in one step

c) The rate of reaction depends upon the concentration of nucleophile

d) S_N2 mechanism is predominant in tertiary alkyl halides

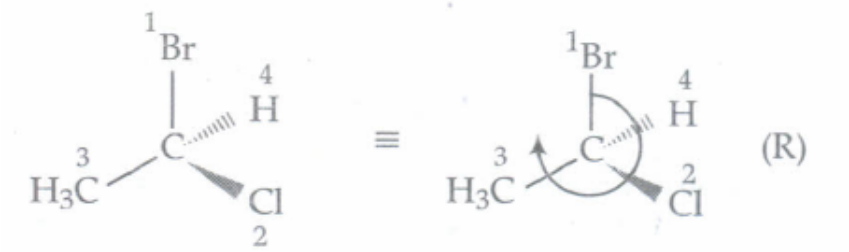
45. The chirality of the compound:



is

a) R b) S c) Z d) E

Solution : -



46. Arrange the following compounds in decreasing order of their boiling points.

(i) CH_3Br

(ii) CH_3CH_2Br

(iii) $CH_3CH_2CH_2Br$

(iv) $CH_3CH_2CH_2CH_2Br$

a) (i) > (ii) > (iii) > (iv) **b) (iv) > (lii) > (ii) > (i)** c) (i) > (iii) > (ii) > (iv) d) (iii) > (iv) > (i) > (ii)

47. **Assertion:** S_N2 reaction proceeds with racemisation while S_N1 reaction proceeds with complete stereochemical inversion.

Reason: S_N2 is two steps reaction while S_N is one step reaction.

a) If both assertion and reason are true and reason is the correct explanation of assertion

b) If both assertion and reason are true but reason is not the correct explanation of assertion

c) If assertion is true but reason is false **d) If both assertion and reason are false**

48. Arrange the following alkyl halides in order of dehydrohalogenation; C_2H_5I, C_2H_5Cl, C_2H_5Br, C_2H_5F

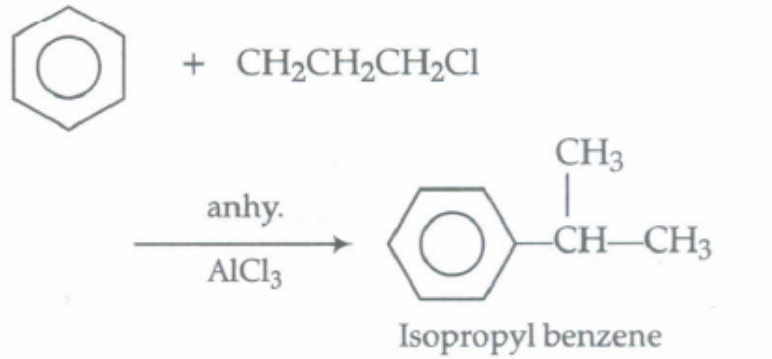
a) C_2H_5:F > C_2H_5Cl > C_2H_5Br > C_2H_5I **b) C_2H_5I > C_2H_5Br > C_2H_5Cl > C_2H_5F**

c) C_2H_5I> C_2H_5Cl > C_2H_5Br > C_2H_SF d) C_2H_5F> C_2H_5I > C_2H_5Br > C_2H_5Cl

49. Benzene reacts with n-propyl chloride in the presence of anhydrous $AlCl_3$ to give:

a) 3-propyl-I-chlorobenzene b) n-propyl benzene c) no reaction **d) isopropyl benzene.**

Solution : -



Isopropyl benzene

50. When chlorine is passed through propene at 400°C, which of the following is formed?

a) PVC **b) Allyl chloride** c) Nickel chloride d) 1,2-dichloro ethane

Solution : -

When chlorine gas is reacted with propene at high temperature $(400^{\circ}\mathrm{C})$, then substitution occurs in place of addition reaction. Hence, allyl chloride is formed.