



# CHEMISTRY

## **BOOKS - MODERN PUBLISHERS CHEMISTRY (HINGLISH)**

## HALOALKANES AND HALOARENES

**Solved Examples** 

1. Write the IUPAC names of the following compounds:

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2. Write the IUPAC names of the following compounds:

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3. Write the structures of the following compounds :

(i) 2-Chloro-3-methylpentane (ii) 1-Chloro-4-ethylcyclohexane (iii) 4-tert-

Butyl-3-iodoheptane

(iv) 1-4-Dibromobut-2-ene (v) 1-Bromo-4-sec-butyl-2-methylbenzene

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**4.** Draw the structures of all the eight structural isomers that have the molecular formula  $C_5H_{11}$  Br. Name each isomer according to IUPAC system and classify them as primary, secondary or tertiary bromide.

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5. Write structural formulae and give IUPAC names of isomers of  $C_4H_8Cl_2$ 

**6.** Write the structure of the major product and IUPAC name in each of the following reactions :

$$\begin{array}{ll} \text{(i)} \ CH_3CH_2CH_2Cl + NaI \xrightarrow[\text{Heat}]{\text{Acetone}} \\ \text{(ii)} \ CH_3CH_2CH_2OH + SOCI_2 \rightarrow \\ \text{(iv)} \\ CH_3CH_2CH = CH_2 + HBr \xrightarrow[\text{Peroxide}]{\text{Peroxide}} \\ \text{(v)} \ CH_3CH_2C = CH_2 + HBr \xrightarrow[\text{No Peroxide}]{\text{No Peroxide}} \\ \text{(vi)} \\ CH_3CH_2CH_2Br + Hg_2F_2 \rightarrow \\ \text{(vii)} \\ CH_3CH_2C \equiv CH + HCl(1\text{-equiv}) \rightarrow \\ \end{array}$$

$$CH_3CH = CH_2 + Cl_2 \xrightarrow{773 - 873k}$$

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**7.** Draw the structures of major monohalo products in each of the following reactions :

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8. Identify all the possible monochloro structural isomers expected to be

formed on free radical monochlorination of  $(CH_3)_2CHCH_2CH_3$ .



9. Write the products of the following reactions :

(i)  $CH_3CH_2-CH=CH_2+HCl
ightarrow$ 

(ii)  $Me_2CHCH_2OH \xrightarrow{SOCl_2}$ 

(iii) 📄

(iv) 
$$Me_2C = CMe_2 \xrightarrow{Br_2}$$

(v) 📄

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**10.** Draw the structures of the major monohalo product in each of the

following:

**11.** Identify chiral and achiral molecules in each of the following pairs of compounds :



12. (a) Out of 📄 , which one is optically active and why?

(b) Which alkyl halide from the following pair undergoes faster  $S_N 2$  reaction with  $OH^{-}$ ?

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CH_3Br or CH_3I
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(c) Which one of the following reacts faster in an  $S_N 1$  reaction?

- (d) Out of  $S_N 1$  and  $S_N 2$  which occurs with
- (i) Inversion of configuration
- (ii) Racemisation
- (e) Write the structure of alkene formed by dehydrohalogenation of 1-

bromo-1-methylcyclohexane with alcoholic KOH.



13. Complete the following reactions (giving major products):

(a) 
$$CH_3CH_2COOAg \xrightarrow{Br_2} ? \xrightarrow{alc.KOH}$$
  
(b)  $? \xrightarrow{P, Br_2} CH_3CHCH_3 \xrightarrow{alc.KOH} ? \xrightarrow{HBr}$   
 $\downarrow \\ Br \\ Peroxide \\ Br \\ (c)  $CH_3CH_2CH_2Cl \xrightarrow{CH_3C \equiv CNa}$   
(d)  $\swarrow$   
(e)  $CH_3CHII \xrightarrow{Na}$   
 $\downarrow \\ CH_3 \\ HI \xrightarrow{Dry ether} ? \xrightarrow{aq.KOH} ?$   
(f)  $CH_3CH = CH_2 \xrightarrow{HBr} ? \xrightarrow{aq.KOH} ?$   
(g)  $CH_3CH_2Br + KOH(alc) \rightarrow$   
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14. Predict the order of reactivity of the following compounds in  $S_N 1$  and

 $S_N 2$  reactions:

(i) The four isomeric bromobutanes

(ii)

 $C_{6}H_{5}CH_{2}Br, C_{6}H_{5}CH(C_{6}H_{5})Br, C_{6}H_{5}CH(CH_{3})Br, C_{6}H_{5}C(CH_{3})(C_{6}H_{5}CH_{$ 



**16.** Which compound in each of the following paris will react faster in  $SN^2$  reaction with  $HO^{o-}$ ? a. CH (3)Br or CH (3)Ib. (CH (3)) (3)CCl or CH (3)Clc. CH (2) = CHBr or

CH\_(2) = CH - CH\_(2)Br`

**17.** Predict the order of reactivity of the following compounds in dehydrohalogenation:

(a)

 $CH_{3}CH_{2}CH_{2}CH_{2}Cl, (CH_{3})_{2}CHCH_{2}Cl, (CH_{3})_{2}CH - CH_{2}Br, CH_{3}CH$  (b)

 $CH_{3}CH(Br)CH_{3}, CH_{3}CH_{2}CH_{2}Br, (CH_{3})_{2}CHCH_{2}Br, (CH_{3})_{2}CCH_{2}Br$ 

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**18.** A chloro derivative (A) on treatment with zinc - copper couple gives a hydrocarbon with five C atoms. When 'A' is dissolved in ether and treated with sodium, 2,2,5,5-tetramethyl hexane is obtained. What is the original compound 'A' ?



**19.** What products would you expect from the elimination of the following alkyl halides, which product will be major in each case :

(i) 2-Bromo-2-methylbutane (ii) 3-Bromo-2,3,5-trimethylhexane (iii) 屍

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

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**21.** (a) Write the structure of the major product in each of the following:

 $ec{\wp}$  (b) Write the structure of the product formed when chlorobenzene is

treated with methyl chloride in the presence of sodium metal and dry ether.

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22. How will you bring about the following conversions in not more than

two steps ?

- (i) Toluene to Benzaldehyde
- (ii) Ethylcyanide to 1-Phenylpropanone.

23. Arrange the folliwing compounds in increasing order of  $SN^{-2}$  reactivity.

a. I.m  $ClCH_2CH = CHCH_2CH_3$ 

II.  $CH_3C(Cl) = CHCH_2CH_3$ 

III.  $CH_3CH = CHCH_2CH_2Cl$ 

IV.  $CH_3CH = CHCH_2(Cl)CH_3$ 

b. l.  $CH_3CH_2Br$ 

II.  $CH_2 = CHCH(Br)CH_3$ 

III.  $CH_2 = CHBr$ 

IV.  $CH_3CH(Br)CH_3$ 

C. I.  $(CH_3)_3\mathbb{C}l$ , II.  $C_6H_5C(CH_3)_2Cl$ 

III.  $(CH_3)_2 CHCl$ , IV.  $CH_3 CH_2 CH_2 Cl$ 

24. The following compounds ar given to you

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

(a) Write the compound which is most reactive towards  $S_N^2$  reaction.

(b) Write the compound which is optically active.

(c). Write the compound which is most reactive towards  $\beta$ -elimination reaction.

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- 25. Propose mechanism of the reaction taking place when
- (a) (-)-2-Bromooctane reacts with sodium hydroxide to form (+)-octane-2-

ol.

(b) 2-Bromopentane is heated with (alc.) KOH to form alkenes.

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**26.** How will you convert the following:

(i) Isopropyl chloride to n-propyl chloride (ii) Methyl bromide to

ethylamine

(iii) Chlorobenzene to benzoic acid (iv) Methyl bromide to acetic acid

(v) Propane to allyl chloride (vi) 1-Bromopropane to 2-bromopropane

(vii) Propene to propyne (viii) Ethanol to but-1-yne



**27.** How will you distinguish between the following (give one chemical test):

- (a) Chlorobenzene and chlorocyclohexane
- (b) Chlorobenzene and benzyl chloride
- (c) Ethyl chloride and vinyl chloride
- (d) Chlorobenzene and n-hexylchloride
- (e) Chloroethane and bromoethane
- (f) 3-Bromopropene and 1-bromopropane.

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**Practice Problems** 

1. Write the structural formula and IUPAC name of

- (i) Iso-butyl chloride
- (ii) Tert-amyl bromide
- (iii). Sec-butyl chloride
- (iv). Neo-pentyl chloride.

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2. Write the structures of the following compounds and identify them as

- $1^\circ$  ,  $2^\circ$  or  $3^\circ$  halides.
- (a) 1-Bromo-2-methylpropane (b) 2-Chloro-2-methylpropane (c) 2-Bromo-3-

methylbutane

(d) 3-Bromopentane (e) 2-Bromo-2-methylbutane (f) Neopentyl chloride.



3. Write the structures of the following dihaloalkanes and identify them

as gem or vicinal, if any:



5. Classify the following as alkyl, vinyl, allyl or aryl halides :

(i) 
$$H_2C = CHCHI_2$$
 (ii)  $CH_3CH = CFCH_2CH_3$  (iii)



(iv)  $(CH_3)_2 CClCH_2 CH_3$  (v)  $(CH_3)_2 C = CHCH_2 Br$  (vi)  $C_6 H_5 Br$ 

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6. Write IUPAC names of the following compounds :

 $(CH_3)_3CCH(Cl)CH(CHBrCH_3)CH_2CH_2CH(CH_3)_2$ 



7. Give the IUPAC names of the following compounds:

(i)

 $CH_{3}CH(Cl)CH(Br)CH_{3}(ii)CHF_{2}CBrClF(iii)ClCH_{2}C \equiv CCH_{2}Br$  $(iv)(CCl_{3})_{3}CCl(v)CH_{3}C(p - ClC_{6}H_{4})_{2}CH(Br)CH_{3}(vi)(CH_{3})_{3}CCH =$  Watch Video Solution8. Identify all the possible monochloro structural isomers expected to be formed on free radical monochlorination of  $(CH_{3})_{2}CHCH_{2}CH_{3}$ . Watch Video Solution

**9.** From each of the following pairs, predict which compound will have higher boiling point:

(i) isopropyl bromide and n-propyl bromide (ii) bromoethane and iodoethane

(iii) tert-butyl chloride and tert-butyl iodide (iv) iso-propyl bromide and n-

butyl bromide

**10.** Arrange the following in the increasing order of boiling point:

(i)  $(CH_3)_3CBr$  (ii)  $CHCHCH_2CH_3$  (iii)  $CH_3CH_2CH_2CH_2Br$  (iv)  $(CH_3)_3C-Cl$ 

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**11.** Which isomer of  $C_4H_9Cl$  will have the lowest boiling point?

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12. Which metal is used in the preparation of Grignard's reagent from

haloalkanes ?



13. Which of the following is most reactive alcohol for its reaction with

HCl?





14. Name the reagents which can convert

- (a). 1-Chloropropane into 1-Nitropropane (b) Bromoethane to But-1-yne
- (c). Bromoethane to Butane.

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**15.** Select the compound in each of the following pairs that can be converted to corresponding alkyl bromide more rapidly on being treated with hydrogen bromide :

l(i) 1-butanol or 2-butanol (ii) 2-methyl-1-butanol or 2-butanol

(iii) 2-methyl-2-butanol or 2-butanol

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**16.** What will be the main product when the following haloalkanes are treated with alcoholic KOH ? (i) 2-bromobutane (ii)  $CH_3CH_2C(CH_3)_2Cl$ 



**17.** Predict all the alkenes that would be formed by the dehydrohalogenation of the following halides with sodium ethoxide and identify the major alkene :

(i) 2-Chloro-2-methylbutane (ii) 2, 2, 3-trimethyl-3-bromopentane

(iii) Cyclohexylmethyl bromide (iv) 1-Bromo-1-methylcyclohexane

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18. Which out of o-chloronitrobenzene and 2, 4, 6-trinitrochlorobenzene is

more reactive towards nucleophilic substitution?



**22.** Write the possible isomers of the aromatic compound having molecular formula  $C_7H_7Cl$ . Which of these will have weakest C-Cl bond ?



23. Identify X, Y and Z in the following reactions :

(a)  $C_6H_5NH_2 \xrightarrow{NaNO_2} X \xrightarrow{CuBr} Y \xrightarrow{623 \text{ K, pressure}} Z$ (b)  $C_6H_6 \xrightarrow{Cl_2 \cdot FeCl_3} X \xrightarrow{CuCN} Y \xrightarrow{dil \cdot HCl} Z$ (c)  $C_6H_5N_2^+Cl^- \xrightarrow{KI} X \xrightarrow{Cu} Y$ 

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**24.** Give reagents, inorganic or organic compound needed to convert benzyl bromide into

(i) benzyl iodide

(ii) benzyl ethyl ether

(iii) benzyl alcohol

(iv) benzyl cyanide

(v) benzyl acetate
(vi) (nitromethyl) benzene
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25. How are nitrochlorobenzene and chlorobenzene sulphonic acid are
prepared from chlorobenzene?
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26. In each of the following pairs of compounds, which will give iodoform

test ?

(a) Sec-butyl alcohol and tert-butyl alcohol (b) Ethyl alcohol and isopropyl

alcohol

(c) Formaldehyde and acetaldehyde (d) Methylpropyl ketone and diethyl

ketone.

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#### 27. How will you distinguish between ethyl chloride and vinyl chloride?



**28.** Name the product obtained when chloroform reacts with (a) nitric acid (b) silver powder (C) aniline in the presence of alcoholic KOH (d) acetone.

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**29.** Write the IUPAC names of isomers of  $C_2H_4Cl_2$ . Give one test to distinguish these.

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**Conceptual Questions** 



more reactive towards  $S_N 1$  reaction and why?



**3.** Chloroform contains chlorine but gives no reaction with  $AgNO_3$  solution. Why?





8. Iodoform gives a precipitate with AgNO3 on heating but chloroform

does not because -

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9. A small amount of ethyl alcohol is usually added to chloroform bottles.

Why?

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**10.** Organic halogen compounds used in industry as solvents are chlorides rather than bromides and iodides. Explain.

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**11.** What effect should the following resonance of vinyl chloride have on its dipole moment?



15. Predict the order of reactivity of the following compounds in  $S_N 1$ 

reactions :



**16.** Allyl chloride is more reactive than n-propyl chloride towards unimolecular nucleophilic substitution reaction. Explain why ?

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**17.** Write the various possible isomers of  $C_7H_7Cl$  containing benzene ring. Which of these has weakest C-Cl bond.

**18.** An alkyl halide with molecular formula  $C_4H_5Br$  is optically active.

What is its structure ?

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**19.** Which out of the two : 2-cyclopentenol or 3-cyclopentenol has chiral centre.

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**20.** Allyl chloride is hydrolysed more readily than n-propyl chloride.



**21.** Write the structure of major monohalo product of the following reaction:



24. Primary alkyl halide  $C_4H_9Br$  (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an

isomer of (a). When (a) is reacted with sodium metal it gives compound (d),  $C_8H_{18}$  which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.



(i) 2-Chloro-3-methylpentane

- (ii) 1-Chloro-4-ethylcyclohexane
- (iii) 4-tert. Butyl-3-iodoheptane
- (iv) 1,4-Dibromobut-2-ene
- (v) 1-Bromo-4-sec. butyl-2-methylbenzene.

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<b>2.</b> Why is sulphuric acid not used during the reaction of alcohols with KI?
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<b>3.</b> Write structures of different dihalogen derivatives of propane.
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**4.** Among the isomeric alkanes of molecular formula  $C_5H_{12}$ , identify the one that on photochemical chlorination yields

(i) A single monochloride.



(iii) Four isomeric monochlorides.

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5. Arrange each set of compounds in order of increasing boiling points.

(i) Bromomethane, Bromoform, Chloromethane, Dibromomethane.

(ii) 1-Chloropropane, Isopropyl chloride, 1-Chlorobutane.

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6. Which alkyl halide from the following pairs would you expect to react more rapidly by an  $S_N 2$  mechanism? Explain your answer.

(i)  $CH_3CH_2CH_2CH_2Br$  or  $CH_3CH_2CHCH_3$  (ii)  $CH_3CH_2CHCH_3$  or

Br

Br

$$H_3C-egin{pmatrix} CH_3\ dot\ Br\ dot\ CH_3\ \end{pmatrix} =Br$$

011

7. In the following pairs of halogen compounds, which compound undergoes faster  $S_N 1$  reaction?



+ Mg Dry ether, \_\_\_\_\_MgBr HgO, \_\_\_\_ Mg(OH)Br

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**1.** Name the following halides according to IUPAC system and classify them asalkyl, allyl, benzyl (primary, secondary, tertiary), vinyl or aryl halides:

(i)  $(CH_3)_2CHCH(Cl)CH_3$ ,  $(ii)CH_3CH_2CH(CH_3)CH(C_2H_5)Cl$ (iii)  $CH_3CH_2C(CH_3)_2CH_2I$ ,  $(iv)(CH_3)_3CCH_2CH(Br)C_6H_5$ (v)  $CH_3CH(CH_3)CH(Br)CH_3$ ,  $(vi)CH_3C(C_2H_5)_2CH_2Br$   $(vii)CH_3C(Cl)(C_2H_5)CH_2CH_3$ ,  $(viii)CH_3CH = C(Cl)CH_2CH(CH_3)_2$ (ix)  $CH_3CH = CHC(Br)(CH_3)_2(x)p - ClC_6H_4CH_2CH(CH_3)_2$ (xi)

 $m-ClCH_2C_6H_4CH_2C(CH_3)_3, {
m (xii)}o-Br-C_6H_4CH(CH_3)CH_2CH_3$ 

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**Ncert Textbooks Exercise**
1. Give the IUPAC names of the following compounds (i)  $CH_3CH(Cl)CH(Br)CH_3$  (ii)  $CHF_2CBrClF$ (iii)  $ClCH_3C \equiv CCH_2Br$  (iv)  $(CCl_3)_3CCl$ (v)  $CH_3C(p - ClC_6H_4)_2CH(Br)CH_3$  (vi)  $(CH_3)_3CCH = C(Cl)C_6H_4I - p$ 

**2.** Write the structure of the following organle halogen compounds:

(i) 2-Chloro-3-methylpentane (ii) p-Bromochlorobenzene

- (iii) 1-Chloro-4-ethylecyclohexane (iv) 2-(2-Chlorophenyl)-1-iodooctane
- (v) Perfluorobenzene (vi) 4-tert-Butyl-3-iodoheptane
- (vii) 1-Bromor-4-sec-butyl-2-methylbenzene (viii) 1,4-Dibromobut-2-ene



3. Which one of the following has the highest dipole moment ?

**4.** A hydrocarbon  $C_5H_{10}$  does not react with chlorine in dark but gives a single monochloro compound  $C_5H_9Cl$  in bright sunlight. Identify the hydrocarbon.

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5. Write the isomers of the compound having formula  $C_4H_9Br$ .

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6. Write the equations for the preparation of 1-iodobutane from

(i) 1-butanol , (ii) 1-chlorobutane , (iii) but-1-ene.

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



reaction with .  $^- OH$  ?

(i)  $CH_3Br$  or  $CH_3I$ ,  $(ii)(CH_3)_3CCl$  or  $CH_3Cl$ 

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**9.** Predict all the alkenes that would be formed by dehydrohalogenation of the following halides with sodium ethoxide in ethanol and identify the major alkene:

- (i) 1-Bromo-1-methylcyclohexane , (ii) 2-Chloro-2-methylbutane
- (iii) 2,2,3-Trimethyl-3-bromopentane

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**10.** How will you bring the following conversions?

(a) Ethanol to but-1-yne (b) Ethane to bromoethene

- (c) Propene to 1-nitropropane (d) Toluene to benzyl alcohol
- (e) Propene to propyne (f) Ethanol to ethyl fluoride
- (g) Bromomethane to propanone
- (h) But-1-ene to but-2-ene
- (i) 1-Chlorobutane to n-octane (j) Benzene to biphenyl

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11. Explain why

(i) the dipole moment of chlorobenzene is lower than that of cyclohexyl

chloride?

- (ii) alkyl halides, though polar, are immiscible with water?
- (iii) Grignard reagents should be prepared under anhydrous conditions?



**12.** Give the uses of freon 12, DDT, carbon tetrachloride and iodoform.

**13.** Write the structure of the major organic product in each of the following reactions:

(i)  $CH_3CH_2CH_2Cl + NaI \xrightarrow{\text{acetone}}_{\text{heat}}$ (ii)  $(CH_3)_3CBr + KOH \xrightarrow{\text{ethanol}}_{\text{heat}}$ (iii)  $CH_3CH(Br)CH_2CH_3 + NaOH \xrightarrow{\text{water}}$ (iv)  $CH_3CH_2Br + KCN^{\text{aq. ethanol}}$ (v)  $C_6H_5ONa + C_2H_5Cl \rightarrow$ (vi)  $CH_3CH_2CH_2OH + SOCl_2 \rightarrow$ (vii)  $CH_3CH_2CH = CH_2 + HBr \xrightarrow{\text{peroxide}}$ (viii)  $CH_3CH = C(CH_3)2 + HBr \rightarrow$ 

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**14.** Explain the following reaction :

$$n-BuBr+KCN \xrightarrow{EtOH-H_2O} n-BuCN$$

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15. Arrange the compounds of each set in order of reactivity towards  $S_N 2$  displacement:

(i) 2-Bromo-2-methylbutane, 1-Bromopentane, 2-Bromopentane

(ii) 1-Bromo-3-methylbutane, 2-Bromo-2-methylbutane, 2-Bromo-3methylbutane

(iii) 1-Bromobutane, 1-Bromo-2,2-dimethylpropane, 1-Bromo-2methylbutane, 1-Bromo-3-methylbutane.

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16. Out of  $C_6H_5CH_2Cl$  and  $C_6H_5CHClC_6H_5$ , which is more easily

hydrolysed by aqueous KOH.

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17. The p-isomer of dichlorobenzene has higher melting point than o-and

m-isomer. Why?

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- 18. How the following conversions can be carried out?
- (i) Propene to propan-1-ol
- (ii) Ethanol to but-1-yne
- (iii) 1-Bromopropane to 2-bromopropane (iv) Toluene to benzyl alcohol
- (v) Benzene to 4-bromonitrobenzene
- (vi) Benzyl alcohol to 2-phenylethanoic acid
- (vii) Ethanol to propanenitrile
- (viii) Aniline to chlorobenzene
- (ix) 2-Chlorobutane to 3, 4-dimethylhexane
- (x) 2-Methyl-1-propene to 2-chloro-2-methylpropane
- (xi) Ethyl chloride to propanoic acid
- (xii) But-1-ene to n-butyliodide
- (xiii) 2-Chloropropane to 1-propanol
- (xiv) Isopropyl alcohol to iodoform
- (xv) Chlorobenzene to p-nitrophenol (xvi) 2-Bromopropane to 1-

bromopropane

(xvii) Chloroethane to butane

(xviii) Benzene to diphenyl

(xix) tert-Butyl bromide to isobutyl bromide

(xx) Aniline to phenylisocyanide



**19.** The treatment of alkyl chlorides with aqueous KOH leads to the formation of alcohols but in the presence of alcoholic KOH, alkenes are major products. Explain.

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**20.** Primary alkyl halide  $C_4H_9Br$  (a) reacted with alcoholic KOH to give compound (b). Compound (b) is reacted with HBr to give (c) which is an isomer of (a). When (a) is reacted with sodium metal it gives compound (d),  $C_8H_{18}$  which is different from the compound formed when n-butyl bromide is reacted with sodium. Give the structural formula of (a) and write the equations for all the reactions.

- 21. What happens when
- (i) n-butyl chloride is treated with alcoholic KOH,
- (ii) bromobenzene is treated with Mg in the presence of dry ether,
- (iii) chlorobenzene is subjected to hydrolysis,
- (iv) ethyl chloride is treated with aqueous KOH,
- (v) methyl bromide is treated with sodium in the presence of dry ether,
- (vi) methyl chloride is treated with KCN?

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Ncert Examplar Problems Multiple Choice Questions Type I

1. The order of reactivity of following alcohols with halogen acids is

 $CH_3CH_2 - CH_2 - OH$ 



#### Answer: B



**2.** Which of the following alcohols will yield the corresponding alkyl chloride on reaction with concentrated HCl at room temperature ?

A. 
$$CH_3CH_2-CH_2-OH$$

$$\mathsf{B}.\,CH_3CH_2-\mathop{C}_{|}_{CH_3}H-OH$$

C. 
$$CH_3CH_2- C H-CH_2OH$$

Answer: D

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3. Identify the compound Y in the following reaction.





# Answer: A

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4. Toluene react with a halogen in the presence of iron (III) chloride giving

ortho andpara halo compounds. The reactions is

A. Electrophilic elimination reaction

B. Electrophilic substitution reaction



D. Nucleophilic substitution reaction

#### Answer: B



### Answer: A

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6. Which reagent will you use for the following reaction ?

 $CH_3CH_2CH_2CH_3 \rightarrow CH_3CH_2CH_2CH_2Cl + CH_3CH_2CHClCH_3$ 

A.  $Cl_2 \,/\, UV$  light

B.  $NaCl + H_2SO_4$ 

C.  $Cl_2$  gas in dark

D.  $Cl_2$  gas in the presence of iron in dark

# Answer: A

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7. Arrange the following compounds in the increasing order of their densities





$$\begin{array}{l} \mathsf{A}.\,(i)<(ii)<(iii)<(iv)\\\\ \mathsf{B}.\,(i)<(iii)<(iv)<(ii)\\\\ \mathsf{C}.\,(iv)<(iii)<(ii)<(i)\\\\ \mathsf{D}.\,(ii)<(iv)<(iii)<(i) \end{array}$$

# Answer: A



**8.** Arrange the following compounds in increasing order of their boiling points.



 $(ii)CH_3CH_2CH_2CH_2Br$  $CH_3$  $H_3C - egin{array}{c} & | \ CH_3 \\ B_r & - CH_3 \\ C(ii) < (i) < (iii) \\ B. (i) < (i) < (iii) \\ C. (iii) < (i) < (iii) \\ C. (iii) < (i) < (ii) \\ D. (iii) < (ii) < (ii) < (ii) \end{cases}$ 

### Answer: C

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9. In which of the following molecules carbon atom marked with asterisk(\*) is asymmetric?



A. (i), (ii), (iii), (iv)

B. (i), (ii), (iii)

C. (ii), (iii), (iv)

D. (i), (iii), (iv)

#### Answer: B

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**10.** Which of the following structures is enantiomeric with the molecule

(A) given below?













# Answer: A

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**11.** Which of the following is an example of vic-dihalide?

A. Dichloromethane

B. 1,2-dichloroethane

C. Ethylidene chloride

D. Allyl chloride

Answer: B

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12. 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

Answer: A

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**13.** Cholorobenzene is formed by reaction of chlorine with benzene in the presence of  $AlCl_3$ . Which of the following species attacks the benzene ring in this reaction?

A.  $Cl^{-}$ 

B.  $Cl^+$ 

 $C. AlCl_3$ 

D.  $[AlCl_4]^-$ 

### Answer: B



14. Ethylidene chloride is a/an.....

A. vic-dihalide

B. gem-dihalide

C. allylic halide

D. vinylic halide

### Answer: B



# 15. What is 'A' in the following reaction?











# Answer: D

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16. A primary alkyl halide would prefer to undergo :-

A.  $S_N 1$  reaction

B.  $S_N 2$  reaction

C.  $\alpha$ -Elimination

D. Racemisation

Answer: B

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**17.** Which of the following alkyl halides will undergo  $S_N 1$  reaction most readily?

- A.  $(CH_3)_3 C F$
- $\mathsf{B.} (CH_3)_3 C Cl$
- $C. (CH_3)_3 C Br$
- D.  $(CH_3)_3C I$

#### Answer: D

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18. Which is the correct IUPAC name for  $CH_3 - \operatorname{CH}_3 - CH_2 - Br?$ 

A. 1-Bromo-2-ethylpropane

- B. 1-Bromo-2-ethyl-2-methylethane
- C. 1-Bromo-2-methylbutane

D. 2-Methyl-1-bromobutane

# Answer: C



19. What should be the correct IUPAC name for diethylbromomethane?

A. 1-Bromo-1, 1-diethylmethane

B. 3-Bromopentane

C. 1-Bromo-1-ethylpropane

D. 1-Bromopantane

#### Answer: B



**20.** The reaction of toluene with chlorine in the presence of iron and in the absence of light yields ......





D. Mixture of (ii) and (iii)

# Answer: D



21. Chloromethane on treatment with excess of ammonia yields mainly



A. N, N-Dimethylmethanamine

B. N-methylmethanamine  $(CH_3 - NH - CH_3)$ 

C. Methanamine  $(CH_3NH_2)$ 

D. Mixture containing all these in equal proportion

### Answer: C

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**22.** Molecules whose mirror image is non-superimposable over them are known as chiral. Which of the following molecules is chiral in nature?

A. 2-Bromobutane

B. 1-Bromobutane

C. 2-Bromopropane

D. 2-Bromopropan-2-ol

# Answer: A

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23. Reactions of  $C_6H_5CH_2Br$  with aqueous sodium hydroxide follows......

A.  $S_N 1$  mechanism

B.  $S_N 2$  mechanism

C. Any of the above two depending upon the temperature of reaction

D. Saytzeff rule

Answer: A

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24. Which of the carbon atoms present in the molecule given below are

asymmetric?



A. a, b, c, d

B.b,c

C. a, d

D. a, b, c

Answer: B

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**25.** Which of the following compounds will give racemic mixture on nucleophilic substitution by  $OH^{-}$  ion?

(I) 
$$CH_3- \mathop{C}\limits_{|}_{C_2H_5}H-Br$$

(II)  $CH_3 - \bigcup_{\substack{I \\ C_2H_5}}^{Br} - CH_3$ (III)  $CH_3 - \bigcup_{\substack{I \\ C_2H_5}}^{C} H - CH_2Br$ A. (i) B. (i), (ii), (iii) C. (ii), (iii)

D. (i), (iii)

Answer: A

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26.

A. (i) < (ii) < (iii)

B. 
$$(iii) < (ii) < (i)$$
  
C.  $(i) < (iii) < (ii)$   
D.  $(iii) < (i) < (ii)$ 

# Answer: C





- A. (i) < (ii) < (iii)B. (i) < (iii) < (ii)C. (iii) < (ii) < (i)
- $\mathsf{D}.\,(ii)<(iii)<(i)$

#### Answer: D





- A. (iii) < (ii) < (i)
- $\mathsf{B.}\,(ii)<(iii)<(i)$
- $\mathsf{C}.\,(i)<(iii)<(ii)$
- $\mathsf{D}.\left(i
  ight)<\left(ii
  ight)<\left(iii
  ight)$

### Answer: D

**D** View Text Solution



A. (i) < (ii) < (iii)B. (ii) < (i) < (iii)C. (iii) < (ii) < (i)D. (i) < (iii) < (ii)

### Answer: C

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**30.** Which of the correct increasing order of boiling points of the following compounds?

1-lodobutane,1-Bromobutane,1-Chlorobutane, Butane

 ${\tt A. Butane} < 1 \text{-} {\tt Chlorobutane} < 1 \text{-} {\tt Bromobutane} < 1 \text{-} {\tt Iodobutane}$ 

B. 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane < Butane

 ${\tt C. Butane} < 1 \text{-} {\tt Iodobutane} < 1 \text{-} {\tt Bromobutane} < 1 \text{-} {\tt Chlorobutane}$ 

 ${\tt D. Butane} < 1 \text{-} {\tt Chlorobutane} < 1 \text{-} {\tt Iodobutane} < 1 \text{-} {\tt Bromobutane}$ 

#### Answer: A

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

1-Bromoethane, 1-Bromopropane, 1-Bromobutane, Bromobenzene

A.

Bromobenzene < 1-Bromobutane < 1-Bromopropane < 1-Bromoeth

Β.

Bromobenzene < 1-Bromoethane < 1-Bromopropane < 1-Bromobut

C.

1-Bromopropane < 1-Bromobutane < 1-Bromoethane < Bromobenz

D.

1-Bromoethane < 1-Bromopropane < 1-Bromobutane < Bromobenz

Answer: D

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Ncert Examplar Problems Multiple Choice Questions Type Ii

1. Which of the statements are correct about above reaction?

A. (i) and (v) both are nucleophiles.

B. In (iii) carbon atom is  $sp^3$  hybridised.

C. In (iii) carbon atom is  $sp^2$  hybridised.

D. (i) and (v) both are electrophiles.

# Answer: A::C



2. Which of the following statements are correct about this reaction ?

A. The given reaction follows  $S_N 2$  mechanism.

B. (ii) and (iv) have opposite configuration.

C. (ii) and (iv) have same configuration.

D. The given reaction follows  $S_N 2$  mechanism.

#### Answer: A::B

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**3.** Which of the following statements are correct about the reaction intermediate ?
A. Intermediate (iii) is unstable because in this carbon is attached to 5

atoms.

- B. Intermediate (iii) is unstable because carbon atom is  $sp^2$  hybridised.
- C. Intermediate (iii) is stable because carbon atom is  $sp^2$  hybridised.
- D. Intermediate (iii) is less stable than the reactant (ii).

Answer: A::D

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**4.** Which of the following statements are correct about the mechanism of this reaction ?

- A. A carbocation will be formed as an intermediate in the reaction.
- B.  $OH^{-}$  will attach the substrate (ii) from one side and  $CI^{-}$  will

leave it simultaneously from other side.

C. An unstable intermediate will be formed in which  $OH^{\,-}$  and  $Cl^{\,-}$ 

will be attached by weak bonds.

D. Reaction proceeds through  $S_N 1$  mechanism.

Answer: A::D

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**5.** Which of the following statements are correct about the kinetics of this reaction ?

A. The rate of reaction depends on the concentration of only (ii).

B. The rate of reaction depends on concentration of both (i) and (ii).

C. Molecularity of reaction is one.

D. Molecularity of reaction is two.

## Answer: A::C

**6.** Haloalkanes contain halogen atom (s) attached to the  $sp^3$  hybridised carbon atom of an alkyl group. Identify haloalkane from the following compounds.

A. 2-Bromopentane

B. Vinyl chloride (chloroethene)

C. 2-chloroacetophenone

D. Trichloromethane

## Answer: A::D

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**7.** Ethylene chloride and ethylidene chloride are isomers. Identify the correct statements.

A. Both the compounds form same product on treatment with

alcoholic KOH.

- B. Both the compounds form same product on treatment with aq.
- C. Both the compounds form same product on reduction.
- D. Both the compounds are optically active.

# Answer: A::C

- 8. Which of the following compounds are gem-dihalides?
  - A. Ethylidene chloride
  - B. Ethylene dichloride
  - C. Methylene chloride
  - D. Benzyl chloride

# Answer: A::C



9. Which of the following are secondary bromides ?

A.  $(CH_3)_2 CHBr$ 

 $B.(CH_3)_3CCH_2Br$ 

 $\mathsf{C.}\,CH_3CH(Br)CH_2CH_3$ 

D.  $(CH_3)_2 CBrCH_2 CH_3$ 

#### Answer: A::C

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10. Which of the following compounds can beclassified as aryl halides ?

A.  $p - ClC_6H_4CH_2CH(CH_3)_2$ 

B.  $p - CH_3CHCl(C_6H_4)CH_2CH_3$ 

 $\mathsf{C.}\,o-BrH_2C-C_6H_4CH(CH_3)CH_2CH_3$ 

D.  $C_6H_5 - Cl$ 

#### Answer: A::D

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11. Alkyl halides are prepared from alcohols by treating with

A.  $HCl + ZnCl_2$ 

 $\mathsf{B.Red}P+Br_2$ 

 $\mathsf{C}.\,H_2SO_4+KI$ 

D. All of the above

Answer: A::B

12. Alkyl fluorides are synthesised by alkyl chloride/bromide in presence

of...... .

A.  $CaF_2$ 

 $\mathsf{B.}\, CoF_2$ 

 $\mathsf{C}.\,Hg_2F_2$ 

D. NaF

Answer: B::C

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Ncert Examplar Problems Short Answer Type Questions

**1.** Aryl chlorides and bromides can be easily prepared by electrophilic substitution of arenas with chlorine and bromine respectively in the presence of Lewis acid catalyst. But why does preparation of aryl iodides requires presence of an oxidising agent? **2.** Out of o- and p-dibromobenzene which one has higher melting point and why?

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3. Which of the compounds will react faster in  $S_N 1$  reaction with  ${}^-OH$ 

ion?

 $CH_3 - CH_2 - Cl$  or  $C_6H_5 - CH_2 - Cl$ 

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4. Why iodoform has appreciable antiseptic property?



## 5. Haloarenas are less reactive than haloalkanes and haloalkenes. Explain.



(ii)

8. Allyl chlo	ride is hydro	lysed more	e readily than	n-propyl	chloride.	Why?
			· · • • · · · · · · · · · · · · · · · ·			

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<b>9.</b> Why is it necessary to avoid even traces of moisture during the use of a
Grignard reagent?
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**10.** How do polar solvents help in the first step in  $S_N 1$  mechanism ?

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**11.** Write a test to detect the presence of double bond in a molecule.

12. Diphenyls are potential threat to the envioronment. How are these

produced from aryl halides?

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**13.** What are the IUPAC names of the insecticide DDT and benzene hexachloride? Why is their use banned in India and other countries?

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**14.** Elimination reaction (especially  $\beta$  - elimination) are as common as the nucleophilic substitution reaction in case of alkyl halides. Specify the reagents used in both cases.

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15. How will you obtain monobromobenzene from aniline ?



**16.** Aryl halides are extremely less reactive towards nucleophilie substitution. Predict and explain the order of reactivity of the following compounds towards nucleophilic substitution:



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17. tert-Butylbromide reacts with aq. NaOH by  $S_N \mathbf{1}$  mechanism while n

butylbromide reacts by  $S_N 2$  mechanism. Why?

18. Predict the major product formed when HCl is added to isobutylene,

Explain the mechanism involved.



as a strong nucleophile in aqueous medium? Give reason for your answer.

# Ncert Examplar Problems Matching Type Questions

## 1. Match the compounds given in Column I with the effects given in

Column II.

Column I	Column II	
(a) Chloramphenicol	(i) Malaria	
(b) Thyroxine	(ii) Anaesthetic	
(c) Chloroquine	(iii) Typhoid fever	
(d) Chloroform	(iv) Goiter	
	(v) Blood substituent	

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# 2. Match the items of Column I and Column II.

Column I	Column II		
(a) S <sub>N</sub> 1 reaction	(i) vic-dibromides		
(b) Chemicals in fire extinguisher	(ii) gem-dihalides		
(c) Bromination of alkenes	(iii) Racemisation		
(d) Alkylidene halides	(iv) Saytzeff rule		
(e) Elimination of HX from alkylhalide	(v) Chlorobromocarbons		

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3. Match the structures of compounds given in Column I with the classes

of compounds given in Column II.





4. Match the reactions given in Column I with the types of reactions given

in Column II.



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## 5. Match the structures given in Column I with the names in Column II.



6. Match the reactions given in Column I with the names given in Column

II.



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# Ncert Examplar Problems Assertion And Reason Type Questions

 Assertion (A) Phosphorus chlorides (tri and penta) are preferred over thionyl chloride for the preparation of alkyl chlorides from alcohols.
Reason (R) Phosphorus chlorides give pure alkyl halides.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

#### Answer: B

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2. Assertion( A) The boiling points of alkyl halides decrease in the order RI > RBr > RCl > RF

Reason (R) The boiling points of alkyl chlorides, bromides and iodides are considerably higher than that of the hydrocarbon of comparable molecular mass.

- A. Assertion and reason both are correct and reason is correct explanation of assertion.
- B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion and reason both are correct statements but reason is not

correct explanation of assertion

Answer: D

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**3.** Assertion: KCN reacts with methyl chloride to give methyl isocyanide

Reason:  $CN^{-}$  is an ambident nucleophile.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

## Answer: D

**4.** Assertion: tert-butyl bromide undergoes Wurtz reaction to give 2,2,3,3-tetramethylbutane.

Reason: In wurtz reaction, alkyl halides react with sodium in dry ether to give hydrocarbon containing double the number of carbon atoms present in the halide.

- A. Assertion and reason both are correct and reason is correct explanation of assertion.
- B. Assertion and reason are both are wrong statements
- C. Assertion is correct but reason is wrong
- D. Assertion is wrong but reason is correct statement.

#### Answer: D



**5.** Assertion: Presence of a nitro group at ortho or para position increases the reactivity of haloarenes towards nucleophilic substitution. Reason: Nitro group, being an electron withdrawing group decreases the

electron density over the benzene ring.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

## Answer: A



6. Assertion: In monohaloarenes, further electrophilic substitution occurs

at ortho and para position

Reason: Halogen atom is a ring deactivator

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion and reason both are correct statements but reason is not

correct explanation of assertion

### Answer: D

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**7.** Assertion: Aryl iodides can be prepared by reaction of arenes with iodine in the presence of an oxidising agent.

Reason: Oxidising agent oxidises  $I_2$  into HI.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

## Answer: C

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**8.** Assertion: It is difficult to replace chlorine by -OH in chlorobenzene in comparison to that in chloroethane Reason: Chlorine-carbon (C-Cl) bond in chlorobenzene has a partial

double bond character due to resonance.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

# Answer: A



**9.** Assertion: Hydrolysis of (-)-2- bromooctane proceeds with inversion of configuration.

Reason: This reaction prioceeds through the formation of a carbocation.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

Answer: C

**10.** Assertion (A) Nitration of chlorobenzene leads to the formation of mnitrochlorobenzene.

Reason (R)  $-NO_2$  group is a m-directing group.

A. Assertion and reason both are correct and reason is correct

explanation of assertion.

B. Assertion and reason are both are wrong statements

C. Assertion is correct but reason is wrong

D. Assertion is wrong but reason is correct statement.

## Answer: D

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Memory Test A Say True Or False

**1.** The dipole moment of  $CH_3F$  is greater than that of  $CH_3Cl$ .





nucleophillic substituion reaction

**6.** Give True or False. 2, 3, 4- Trichloropentane has three asymmetric carbon atoms.

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7. Chlorobenzene and benzyl chloride can be distinguished by boiling with aqueous KOH followed by acidification with dil  $HNO_3$  and subsequent treatment with  $AgNO_3$  solution.

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8. Addition of  $BrCCI_3$  to propene in the presence of peroxides gives 3-

bromo-1, 1, 1-trichloro-2-methylpropane.

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9. Iodide is a better nucleophile than bromide.Explain



10. Chlorobenzene gives a white precipitate with alcoholic silver nitrate

solution. True or False?

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**11.** 3, 3-Dimethylbut-1-ene reacts with HI to form 3-iodo-2, 2dimethylbutane and 2-iodo-2, 3-dimethylbutane.

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12. Bromoethane reacts with silver nitrite to form ethyl nitrite. TRUE or

False

13. 1, 1-Dichloroethane reacts with aqueous KOH to give ethanal. TRUE or

## FALSE?



**1.** Isobutyl bromide is an example of .....alkyl halide.

A. tertiary

B. secondary

C. primary

D. none of these

## Answer:

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2. Nitroalkanes are formed when alkyl alides react with\_\_\_\_while alkyl

nitrites are formed when alkyl halides are treated with\_\_\_\_\_.

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3. Hydrolysis of 2-brmo-3-methylbutane yields only\_\_\_\_\_.





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<b>9.</b> With potassium cyanide, alkyl halides givewhile with silver					
cyanideare the major products.					
Watch Video Solution					
<b>10.</b> Alkyl halides are insoluble in water because they donot form					
Watch Video Solution					

11. BHC is commercially called ............

**1.** Reaction of alkyl halide with potassium sulphide gives thioethers/thioalcohols.

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**2.** Boiling point of tert-butyl bromide is less/more than that of n-butylbromide.

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**3.** Aryl bromides can be prepared by reacting silver salt of aromatic acids with  $Br_2$  in  $CCI_4$ . This reaction is called Hunsdiecker reaction/Balz-Schiemann reaction.

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**6.** CHBrCIF has chiral/achiral carbon atom.

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7.  $S_N 2$  reaction occurs with inversion of configuration/racemisation.



10.  $C_6H_5Cl$  is less/more reactive than  $C_6H_{11}Cl$ .

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11.  $\ensuremath{\operatorname{Tetrachloromethane}}\xspace/triiodomethane$  has been used as antiseptic.



**Revision Exercise Objective Questions Multiple Choice Questions** 

**1.** The IUPAC name of  $(CH_3)_3 CCl$  is

A. 1-chloro-1, 1, 1-trichloromethane

B. 2-chloro-2-methylpropane

C. 2-chlorobutane

D. Trimethylchloromethane

#### Answer: B

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2. Which of the following is not a chiral ?

A. 3-Methylhexane
- B. 2, 3-Dihydroxypropanoic acid
- C. 2, 3-Dibromobutane
- D. Butan-2-ol

## Answer: C

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3. The reaction :

 $RX+2Na+RX \xrightarrow{ ext{Dry ether}} R-R+2NaX$  is called :

A. Sandmeyer's reaction

**B.** Fittig reaction

C. Wurtz reaction

D. Williamson's synthesis.

## Answer: C

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**4.** In  $S_N 1$  reaction, the order of reactivity of halides is

A.  $3^\circ > 2^\circ > 1^\circ > ext{methyl}$ 

B. methyl  $> 1^\circ > 2^\circ > 3^\circ$ 

 $\mathsf{C.3}^\circ > 2^\circ = 1^\circ > \mathrm{methyl}$ 

D.  $2^\circ > 1^\circ > ext{methyl} > 3^\circ$ 

## Answer: A

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5. C-X bond is strongest in :

A.  $CH_3Cl$ 

 $\mathsf{B.}\,CH_3Br$ 

 $\mathsf{C}. CH_3F$ 

D.  $CH_3I$ 

## Answer: C



6. Reactivity order of halides of dehydrohalogenation is

A. 
$$R-F>R-Cl>R-Br>R-I$$

B. 
$$R-I>R-Br>R-Cl>R-F$$

 $\mathsf{C}.\,R-I > R-Cl > R-Br > R-F$ 

D. 
$$R-F>R-I>R-Br>R-Cl$$

#### **Answer: B**

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7. Which one of the following gives only one monochloro derivative?

A. n-hexane

B. 2-methylpentane

C. 2,3-dimethylpentane

D. neo-pentane

Answer: D

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8. D.D.T. is prepared by heating chlorobenzene with:

A. chloroform

B. chloral

C. aniline

D. chloropicrin.

Answer: B

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**9.**  $C_2H_5Cl$  on heating with alcoholic KOH will produce

A.  $C_2H_5OH$ 

 $\mathsf{B.}\, C_2 H_4$ 

 $\mathsf{C.}\, C_2 H_2$ 

D.  $C_2H_6$ 

### Answer: B

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10. Alkyl halides are less soluble in water because

A. Low melting point

B. Do not form H-bond with  $H_2O$ 

C. Viscous in nature

D. Have very strong C-X bond

## Answer: B

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11. Among the following, which one is chlorine containing insecticide?

A. D.D.T.

B. Freon

C. Phosgene

D. lodoform

Answer: A

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12. The boiling points of haloalkanes follow the order:

A. RI > RBr > RCI

 $\mathsf{B}.\,RCI > RBr > RI$ 

C.RI > RCI > RBr

D. RBr > Rl > RCI

#### Answer: A

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13. Which of the following has highest dipole moment in the following ?

A.  $CH_3F$ 

 $\mathsf{B.}\, CH_3 Cl$ 

 $C. CCl_4$ 

D.  $CH_3I$ 

Answer: B

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14. Which of the following is not a polyhalogen compound?

A. Chloroform

B. Freon

C. Carbon tetrachloride

D. Chlorobenzene

## Answer: D

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15. The ease of dehydrohalogenation of alkyl halide with alcoholic KOH is-

A. 
$$3^\circ\,<2^\circ\,<1^\circ$$

 $\mathsf{B.3}^\circ > 2^\circ > 1^\circ$ 

 $\mathsf{C.3}^\circ\,<2^\circ\,>1^\circ$ 

D. None of these

## Answer: B



**16.** Alkyl halides are prepared from alcohol by treating with:

A.  $HCl + ZnCl_2$ 

 $\mathsf{B.}\,H_2SO_4+KI$ 

 $C. NaCl + H_2SO_4$ 

D. None of these

#### Answer: A

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17. Organic compound which shows complete stereochemical inversion during  $S_N 2$  reaction is:

A.  $CH_3Cl$ 

- $\mathsf{B}.\,(CH_3)_2CH-Cl$
- $C. (CH_3)_3 C Cl$
- D. None of these

#### Answer: A



18. Which of the following reaction is most suitable for the preparation of

n-propylbenzene?

- A. Friedel-Crafts alkylation
- **B.** Wurtz reaction
- C. Wurtz-Fitting reaction
- D. Grignard reaction

Answer: A





The reaction is:

A. Stephen

B. Sandmeyer's

C. Fittig

D. Wurtz-Fitting

Answer: D

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20. In the given alkyl halides which one has minimum boiling point?

A.  $C_2H_5F$ 

 $\mathsf{B.}\, C_2 H_5 I$ 

 $\mathsf{C.}\,C_2H_5Cl$ 

D.  $C_2H_5Br$ 

Answer: A

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**21.**  $S_N 2$  reaction will be fastest in:

A.  $CH_3Br$ 

 $\mathsf{B.}\, CH_3 Cl$ 

 $\mathsf{C.}\,CH_3CH_2Cl$ 

 $D.(CH_3)_2 CHCl$ 

Answer: A

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which of the

following is the correct order of C-halogen bond length?



# Answer: A

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**23.** Which of the following organic compounds are formed by Wurtz reaction?

A. Alcohols

B. Hydrocarbons

C. Haloalkanes

D. Haloarenes

## Answer: B

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24. In the preparation of alkyl halide from alcohol which of the following

reagent is preferred?

A.  $HX + ZnCl_2$ 

 $\mathsf{B}.\, PX_3$ 

 $C. PCl_5$ 

D.  $SOCl_2$ 

# Answer: D





Answer: B

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### 26. Select the correct answer



A. (i)-(C), (ii)-(A)

B. (i)-(B), (ii)-(A)

C. (i)-(C), (ii)-(B)

D. (i)-(D), (ii)-(A)

## Answer: D



# 27. Select the correct answer

Reaction	Name	
(i) 2	(A) Wurtz Fittig reaction	
( <i>ii</i> ) $C_{g}H_{g}Cl + 2Na + CH_{g}Cl \xrightarrow{\text{Bther}} C_{g}H_{g}CH_{g}$ ( <i>iii</i> ) $2C H Cl \xrightarrow{Na} C H - C H$	<ul><li>(B) Wurtz reaction</li><li>(C) Ullmann reaction</li><li>(D) Fittig reaction</li></ul>	

A. (i)-(C), (ii)-(A), (iii)-(D)

B. (i)-(D), (ii)-(A), (iii)-(C)

C. (i)-(B), (ii)-(A), (iii)-(D)

D. (i)-(C), (ii)-(D), (iii)-(A)

# Answer: A



# 28. Select the correct answer

Reaction	Main product
( <i>i</i> ) CH <sub>3</sub> CH <sub>2</sub> Br + AgNO <sub>2</sub> → ( <i>ii</i> ) CH <sub>3</sub> CH <sub>2</sub> Br $\xrightarrow{\text{alc.KOH}}$	<ul> <li>(A) CH<sub>3</sub>CH<sub>2</sub>NO<sub>2</sub></li> <li>(B) CH<sub>3</sub>CH<sub>2</sub>ONO</li> </ul>
	(C) CH <sub>3</sub> CH <sub>2</sub> OH (D) CH <sub>2</sub> =CH <sub>2</sub>

A. (i)-(A), (ii)-(B)

B. (i)-(B), (ii)-(C)

C. (i)-(B), (ii)-(D)

D. (i)-(A), (ii)-(C)

Answer: A

## 29. Select the correct answer

.

	Reaction	Example
( <i>i</i> )	Raschig reaction	(A) $CH_{3}Br + AgF \rightarrow CH_{3}F + AgBr$
( <i>ii</i> )	Finkelstein reaction	(B) $C_6H_5N_2^+Cl^- \xrightarrow{Cu,Cl_2} C_6H_5Cl$
(iii)	Sandmeyer's reaction	(C) $CH_3CH_2Cl + NaI \xrightarrow{acetone} CH_3CH_2I + NaCl$
( <i>iv</i> )	Swarts reaction	(D) $2C_6H_6 + 2HCl + O_2 \xrightarrow{CuCl_2}{\Delta} \rightarrow 2C_6H_5Cl + 2H_2O$

A. (i)-(D), (ii)-(A), (iii)-(B), (iv)-(C)

B. (i)-(D), (ii)-(B), (iii)-(C), (iv)-(A)

C. (i)-(D), (ii)-(C), (iii)-(B), (iv)-(A)

D. (i)-(D), (ii)-(B), (iii)-(A), (iv)-(C)

## Answer: C

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30. Select the correct answer

Reaction	Product (major)
$(i) (CH_3)_2 CHCH(Br)CH_3 \xrightarrow{aq.KOH} (ii) CH_3(CH_2)_2 CH(Br)CH_3 \xrightarrow{abc. KOH} (ii) CH_3(CH_2) CH(Br)CH_3 (ii) CH_3 (ii) CH_3(CH_2) CH(Br)CH_3 (ii) CH_3 $	<ul> <li>(A) 3-Methylbutan-2-ol</li> <li>(B) 2-Methylbutan-2-ol</li> <li>(C) Pent-2-ene</li> <li>(D) Pent-1-ene</li> </ul>

A. (i)-(C), (ii)-(B)

B. (i)-(B), (ii)-(C)

C. (i)-(A), (ii)-(D)

D. (i)-(A), (ii)-(C)

#### Answer: B

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Revision Exercise Objective Questions Passage Based Questions

**1.** Alkylhalides have polar C-X bond and undergo nucleophilic substitution reactions. These give a variety of products with nucleophiles such as -OH, -OR,  $-NH_2$ , -CN, -NC,  $-NO_2$ , -ONO,  $RCOO^-$ , etc. They undergo mainly two types of nucleophilic substitution reactions,  $S_N 1$  and  $S_N 2$ .  $S_N 1$  reactions are two steps reactions which proceed through the formation of carbocations while  $S_N 2$  reactions are one step reaction which proceeds through the formation state. The stability of carbocation and transition state determine the reactivity of alkyl halides.

Write the main products A and B in the following reaction.

$$A \stackrel{KNO_2}{\longleftarrow} CH_3 CH_2 Br \stackrel{AgNO_2}{\longrightarrow} B.$$

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**2.** Alkylhalides have polar C-X bond and undergo nucleophilic substitution reactions. These give a variety of products with nucleophiles such as -OH, -OR,  $-NH_2$ , -CN, -NC,  $-NO_2$ , -ONO,  $RCOO^-$ , etc. They undergo mainly two types of nucleophilic substitution reactions,

 $S_N 1$  and  $S_N 2$ .  $S_N 1$  reactions are two steps reactions which proceed through the formation of carbocations while  $S_N 2$  reactions are one step reaction which proceeds through the formation of transition state. The stability of carbocation and transition state determine the reactivity of alkyl halides.

Complete the reaction:

 $CH_3CH_2Br \xrightarrow[Heat]{Ag_2O}$ 

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**3.** Alkylhalides have polar C-X bond and undergo nucleophilic substitution reactions. These give a variety of products with nucleophiles such as -OH, -OR,  $-NH_2$ , -CN, -NC,  $-NO_2$ , -ONO,  $RCOO^-$ , etc. They undergo mainly two types of nucleophilic substitution reactions,  $S_N1$  and  $S_N2$ .  $S_N1$  reactions are two steps reactions which proceed through the formation of carbocations while  $S_N2$  reactions are one step reaction which proceeds through the formation state. The stability of carbocation and transition state determine the reactivity of alkyl halides.

Arrange the following in the increasing order of reactivity towards  $S_N 2$ reaction:



**4.** Alkylhalides have polar C-X bond and undergo nucleophilic substitution reactions. These give a variety of products with nucleophiles such as -OH, -OR,  $-NH_2$ , -CN, -NC,  $-NO_2$ , -ONO,  $RCOO^-$ , etc. They undergo mainly two types of nucleophilic substitution reactions,  $S_N 1$  and  $S_N 2$ .  $S_N 1$  reactions are two steps reactions which proceed through the formation of carbocations while  $S_N 2$  reactions are one step reaction which proceeds through the formation and transition state determine the reactivity of alkyl halides.

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



**5.** Alkylhalides have polar C-X bond and undergo nucleophilic substitution reactions. These give a variety of products with nucleophiles such as -OH, -OR,  $-NH_2$ , -CN, -NC,  $-NO_2$ , -ONO,  $RCOO^-$ , etc. They undergo mainly two types of nucleophilic substitution reactions,  $S_N 1$  and  $S_N 2$ .  $S_N 1$  reactions are two steps reactions which proceed through the formation of carbocations while  $S_N 2$  reactions are one step reaction which proceeds through the formation state. The stability of carbocation and transition state determine the reactivity of alkyl halides.

Which out of  $S_N 1$  or  $S_N 2$  results into inversion of configuration?

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**6.** Ethyl bromide reacts with alcoholic solution of KCN and AgCN to give different products having same molecular formula. These further react with other reagents to form different products.

Name the different products formed by reaction of ethyl bromide with KCN and AgCN.

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**7.** Ethyl bromide reacts with alcoholic solution of KCN and AgCN to give different products having same molecular formula. These further react with other reagents to form different products.

How are these two compounds related?

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**8.** Ethyl bromide reacts with alcoholic solution of KCN and AgCN to give different products having same molecular formula. These further react with other reagents to form different products.

Complete the reaction:

$$CH_3CH_2Br \stackrel{alc\,.\,KCN}{\longrightarrow} A \stackrel{Na\,,C_2H_5OH}{\longrightarrow} B$$

**9.** Ethyl bromide reacts with alcoholic solution of KCN and AgCN to give different products having same molecular formula. These further react with other reagents to form different products.

How will you convert ethyl bromide into N-methyl aminoethane? Give reaction.



**10.** Ethyl bromide reacts with alcoholic solution of KCN and AgCN to give different products having same molecular formula. These further react with other reagents to form different products.

How will you convert ethyl bromide into ethanamide? Give reaction.



**Revision Exercise Objective Questions Assertion Reason Questions** 

**1.** Assertion: Addition of  $Br_2$  to 1-butane gives two optical isomers.

Reason: The product contains one asymmetric carbon atoms.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

#### Answer: A

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**2.** Assertion:  $S_N 2$  reactions proceed with inversion of configuration

Reason:  $S_N 2$  reactions occur in one step .

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

### Answer: B

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**3.** Assertion: Addition of  $Br_2$  to trans but-2-ene yields meso- 2,3dibromobutane.

Reason : Bromine addition to an alkene is an electrophilic addition reaction.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

#### Answer: B

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**4.** Assertion: Benzyl bromide when kept in acetone-water, it produces benzyl alcohol.

Reason The reaction follows  $S_N 2$  mechanism.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

## Answer: C



**5.** Assertion: The nucleophilic substitution of vinyl chloride is difficult than ethyl chloride.

Reason : Vinyl group is electron donating group.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

#### Answer: C



**6.** Assertion: tert-butylbromide undergoes  $S_N 1$  nucleophilic substitution readily than n-butyl bromide.

Reason: It proceeds by the formation of stable carbocation.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

#### Answer: A

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**7.** Assertion : Treatment of chloroethane with a saturated solution of AgCN gives ethyl isocyanide as the major product.

Reason : Cyanide  $(CN^{-})$  is an ambident nucelophile

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

#### Answer: B



**8.** Assertion: Alkyl iodide can be prepared by treating alkyl chloride/bromide with Nal in acetone.

Reason : NaCl and NaBr are soluble in acetone but Nal is not.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

#### Answer: C

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**Revision Exercise Very Short Answer Questions** 

1. how will you prepare 1-bromopropane from propene?

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# 2. Write the structure of 2-chloro-3-methylpentane.



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Complete the reaction.





# 7. Write the IUPAC name of CH2Cl



8. Out of o-dichlorobenzene and p-dichlorobenzene, which has higher

melting point and why?






16. 
$$H_3C-Br+AgF
ightarrow H_3C-F+AgBr.$$

Name the reaction.

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17. Write the IUPAC name of the following compound :

 $(CH_3)_3 CCH_2 Br$ 

**18.** Write the IUPAC name of the following compound:

$$CH_{2} = C CH_{2}Br$$

$$CH_{3}$$
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19. Draw the structure of DDT.
  
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20. What happens when  $CH_{3} - Br$  is treated with KCN?
  
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21. Write the IUPAC name of  $CH_{3}CH = CH - CH_{3}$ .
  
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**24.** Arrange the following halides in order of increasing  $S_N 2$  reactivity:

 $(CH_3)_3CCl, CH_3Cl, CH_3Br, CH_3CH_2Cl, (CH_3)_2CHCI$ 

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**25.** Which would undergo  $S_{N^2}$  reaction faster in the following pair and why?

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26. Out  $CH_3-CH-CH_2-Cl$  and  $CH_3-CH_2-CH-Cl$  , which  $ert_{CH_3}$ 

is more reactive towards  $S_N 1$  reaction and why?

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**27.** What product is obtained when toluene is treated with Cl in the presence of light.

# 28. Write the structure of 1-Bromo-4-chlorobut-2-ene

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29. Write the structure of 3-Bromo-2-methylprop-1-ene

**30.** Write IUPAC name of the given compound:



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**31.** Write one stereochemical difference between  $S_N 1$  and  $S_N 2$  reactions.





Revision Exercise Very Short Answer Questions Cbse Qs

**1.** Give the IUPAC name of the following compound:



2. Write IUPAC name of the following :



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3. Write the ItJP AC name of the following compound :

4. Write the IUPAC name of the following compound:

$$CH_3-CH-CH_2-CH-CH_3 \ ert \ Br \ Cl$$

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5. Write IUPAC name of the following compound:







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# 7. Which of the following two reactions is $S_N 2$ and why?





**Revision Exercise Short Answer Questions** 

- 1. Write the following reactions:
- (i) Swarts reaction
- (ii) Sandmeyer reaction
- (iii) Wurtz-Fitting reaction

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2. Explain as to why haloarenes are much less reactive than halo-alkanes

towards nucleophilic substitution reactions.

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**3.** Which compound in each of the following pairs will react faster in  $S_N 2$ 

reaction with .  $^{-}$  OH ?

(i)  $CH_3Br$  or  $CH_3I$ ,  $(ii)(CH_3)_3CCl$  or  $CH_3Cl$ 

**4.** Write the equations for the steps in  $S_N 1$  mechanism of the conversion

of tert-Butyl bromide into tert-Butyl alcohol.

(a) Explain Fitting reaction.

(b) Name the reagent used in the dehydrohalogenation of haloalkanes.

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5. (i)State one use each of DDT and iodoform.

(ii) Which compound in the folloeing couples will react faster in `S\_(N)2

displacement and why?

(a)1-Bromopentane or2-bromopentane

(b) 1-Bromo -2 methylbutane or 2-bromo-2-methylbutane.

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6. Answer the following:

(i) Haloalkanes easily dissolve in organic solvents, why?

(ii) What is known as a racemic mixture ? Give an example.

(iii) Of the two bromoderivatives,  $C_6H_5CH(CH_3)Br$  and  $C_6H_5CH(C_6H_5)Br$ , which one is more reactive in  $S_{n^1}$  substitution reaction and why?

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

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**8.** (a) Explain why thionyl chloride  $(SOCI_2)$  method is preferred for preparing alkylchlorides from alcohols.

(b) For isomerichaloalkanes, the boiling point decreases with branching of chain. Why?

9. How will you convert the following (any two)? Give chemical equations

only:

(i) Ethane to bromoethane

(ii) Benzene to biphenyl

(iii) Aniline to chlorobenzene.

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10. Explain  $S_N 2$  reaction mechanism of haloalkane. Arrange the reactivity

of  $1^{\circ}, 2^{\circ} \; ext{ and } \; 3^{\circ}$  haloalkane towards  $S_N 2$  reaction.

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**11.** (a) Explain why haloarenes undergoes electrophilic substitution reactions at ortho and para positions only

(b) The p-isomer of dichloro benzene has higher melting point than its

ortho and meta-isomers. Explain.

**12.** (a). Complete the reaction:

 $CH_3CH_2Br + KOH(alc.)$ 

(b). Explain why the use of chloroform as Anaesthetic is decreasing

(c). What happens when bromobenzene is treated with magnesium is the

presence of dry ether?

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**13.** Explain why :

(i) Sulphuric acid is not used during the reaction of alcohols with KI?

(ii) Allyl chloride is more reactive than n-propyl chloride towards

nucleophilic substitution reactions?



14. Following compounds are given to you :

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

(i) Write the compound which is most reactive towards  $S_N 2$  reaction

(ii) Write the compound which is optically active

(iii) Write the compound which is most reactive towards  $\beta$ -elimination reaction

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15. (a) Alkyl halides react with  $AgNO_2$  and  $KNO_2$  to give  $R - NO_2$  and

**R-ONO respectively. Why?** 

(b) Haloarenes are insoluble in water but are soluble in benzene. Why?



**16.** (a) Haloalkanes react with potassium cyanide (KCN) to give alkyl cyanide but gives alkyl isocyanide with silver cyanide (AgCN).

(b) Why are haloarenes more stable than haloalkanes?

17. Give reasons:

- (a) n-Butyl bromide has higher boiling point than t-butyl bromide.
- (b) Racemic mixture is optically inactive.
- (c) The presence of nitro group (  $-NO_2$ ) at o & p positions increases the

reactivity of haloarenes towards nucleophilic substitution reactions.

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**18.** Explain  $S_N 2$  reaction mechanism of haloalkanes.



19. Give reasons:

(i). C-Cl bond length in chlorobenzene is shorter than C-Cl bond

length in  $CH_3 - Cl$ 

(ii). The dipole moment of chlorobenzene is less than of cyclohexyl

chloride.

(c).  $S_{N^1}$  reactions are are accompanied by racemisation is optically active alkyl halides.



**20.** (a) Complete the reaction:

(i)  $CH_3CH_2Br \stackrel{AgCN}{\longrightarrow}$ 

(ii)  $CH_3CH_2Br \xrightarrow[]{Na}{} Dry ether$ 

(b) During the B-elimination reaction of 2-bromopentane in an alcoholic

solution of KOH results pent-2-ene as major product and pent-1-ene as

minor product. State the rule to explain the reaction.

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**21.** (i) Out of  $(CH_3)_3$ , C-Br and  $(CH_3)_3$  C-I, which one is more reactive towards  $S_N 1$  and why?

(ii) Write the product formed when P-nitrochlorobenzene is heated with

aqueous NaOH at 443K followed by acidification.

(iii) Why dextro and laevo-rotatory isomers of Butan-2-ol are difficult to

separate by fractional distillation?



**Revision Exercise Short Answer Questions Cbse Qs** 

1. How would you differentiate between  $S_N 1$  and  $S_N 2$  mechanisms of

substitution reactions? Give one example of each.

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2. Out of chlorobenzene and benzyl chloride, which one gets easily

hydrolysed by aqueous NaOH and why?

- 1. Write short notes on the following:
- (a) Finkelstein réaction
- (b) Markovnikov's rule
- (c) Hunsdiecker reaction

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**2.** (a) How will you differentiate between  $S_N 1$  and  $S_N 2$  reactions?

(b) Why does the treatment of alkyl chloride with silver nitrate form

nitroalkane and with potassium nitrite form alkyl nitrite?



Higher Order Thinking Skills

1. Why alkyl halides are generally not prepared in the laboratory by free

radical halogenation of alkanes?



**2.** Propose reaction for the preparation of: (i) allyl iodide and (ii) allyl fluoride from prop-1-ene.

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**3.** (R)-2-Bromooctane reacts with hydrogen sulphide ( $HS^{-}$ ) ion and gives

(S)-2-octanethiol with inversion of configuration at the stereocentre. Can

we plan to get (R)-2-octanethiol from (R)-2-bromooctane?



**4.** RCI is hydrolysed to ROH slowly but the reaction is rapid if a catalytic amount of KI is added to the reaction mixture. Explain.

<b>D</b> Watch Video Solution
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**5.** Optically active (S)-2-iodooctane with Nal in acetone gives a product which does not show optical activity. Explain.

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**6.** An alkyl halide (X) of the folmula  $C_6H_{13}Cl$  on treatment with potassium tertiary butoxide gives two isomeric alkenes (Y) and  $(Z)(C_6H_{12})$ . Both the alkenes on hydrogenation give 2, 3 – dimethyl butane. Perdict the structures of (X), (Y), and (Z)

**7.** A dihalogen derivative (A) of a hydrocarbon having two carbon atoms reacts with alcoholic potash and forms another hydrocarbon which gives a red precipitate with ammoniacal cuprous chloride. Compound A gives an aldehyde when treated with aqueous KOH. Write down the name and formula for the organic compound.

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8. An organic compound  $C_8H_{18}$  on monochlorination gives a single monochloride. Write the structure of the hydrocarbon.

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**9.** If relative rates of substitution of  $1^{\circ}$  and  $2^{\circ}$  H are in the ratio 1 : 3.8, show that in the presence of light at 298 K, the chlorination of n-butane gives a mixture of 72% 2-chlorobutane and 28% 1-chlorobutane.

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10. The following reaction gives two products. Write the structures of the

products.

 $C_6H_5CH_2CHClC_6H_5 \xrightarrow{alc.KOH}_{\text{Heat}}$ 

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**11.** Which  $S_N 1$  reaction would you expect to take place more rapidly ? (a) (i)  $(CH_3)_2CCl + H_2O \rightarrow (CH_3)_2COH + HCl$ Or (ii)  $(CH_3)_3CBr + H_2O \rightarrow (CH_3)_3COH + HBr$ (b) (i)  $(CH_3)_3CCl + H_2O \rightarrow (CH_3)_3COH + HCl$ Or (ii)  $C_5H_5Cl + H_2O \rightarrow C_5H_5OH + HCl$ (c) (i)  $(CH_3)_3CCl + H_2O \rightarrow (CH_3)_3COH + HCl$ Or (ii)  $(CH_3)_3CCl + CH_3OH \rightarrow (CH_3)_3COCH_3 + HCl$ (d)

 $(CH_3)_3CCl(1.0M) + CH_3CH_2O^-(1.0M) \xrightarrow{C_2H_2OH} (CH_3)_3COCH_2CH_3 +$ 

(i)

Or

(ii)

# $(CH_3)_3 CCl(1.0M) + CH_3 CH_2 O^-(2.0M) \xrightarrow{C_2 H_2 OH} (CH_3)_3 COCH_2 CH_3 +$



12. Hydrolysis of 2-bromo-3-methylbutane (2 $^{\circ}$ ) gives only 2-methyl-2butanol (3 $^{\circ}$ ). Explain.

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**13.** Haloalkanes undergo nucleophilic substitution reactions while haloarenes undergo electrophilic substitution reactions. Explain.

A Multiple Choice Questions With Only One Correct Answer

1. The IUPAC name of  $CH_3 - CH = CHCH_2Br$  is :

A. 1-Bromobut-2-ene

B. 1-Bromobut-3-ene

C. 2-Butene-1-bromide

D. 4-Bromobut-2-ene.

#### Answer: A

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2. In the reaction :

 $CH_3CHCl_2 \xrightarrow{ ext{aq. KOH}} ext{Intermediate} o X$ , X is :

A.  $CH_3CHO$ 

 $\mathsf{B.} (CH_3)_2 CO$ 

 $\mathsf{C.}\,CH_3CH_2OH$ 

D. 
$$\begin{array}{c} C \ H_2 - \begin{array}{c} C \ H_2 \\ | \\ OH \end{array} \begin{array}{c} OH \end{array} \begin{array}{c} H_2 \end{array}$$

# Answer: A



3. Identify Z, in the following reaction.

 $C_2H_5l \xrightarrow{ ext{alc. KOH}} X \xrightarrow{Br_2} Y \xrightarrow{ ext{KCN}} Z$ 

A.  $CH_3CH_2CN$ 

 $\mathsf{B.}\, CNCH_2CH_2CN$ 

 $\mathsf{C}.\,BrCH_2CH_2CN$ 

D. Br CH = CHCN.

Answer: B

4. In the reaction ,

$$CH_3 - CH - CH_3 \xrightarrow[Br]{alc.KOH} (A) \xrightarrow[Peroxide]{HBr} (B) \xrightarrow[Acetone]{NaI} (C)$$

The compound (C) is :

A.  $CH_3CH_2CH_2I$ B.  $CH_3CH - CH_3$   $\downarrow$  IC.  $CH_3 = CHI$   $\downarrow$  ID.  $CH_3CHCH_2I$   $\downarrow$ I

Answer: A

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5. The reagents for the following conversions  $\, is/are:$ 

A. alcoholic KOH

B.  $Zn \mid CH_3OH$ 

C. aq. KOH followed by  $NaNH_2$ 

D. alcoholic KOH followed by  $NaNH_2$ .

### Answer: D

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6. In the following reaction:

The major product obtained is



## Answer: A



7. In the adddition of HBr to propene in the absence of peroxides, the first step involves the addition of-s

A.  $H^{\bullet}$ 

 $\mathsf{B.}\,Br^{\,\bullet}$ 

 $\mathsf{C.}\,H^{\,+}$ 

D.  $Br^{\,-}$ 

# Answer: C

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8. The major product in the reaction is

$$CH_3 - \mathop{C}\limits_{\substack{|\ CH_3}} H - CH_2 Br \mathop{
ightarrow}_{CH_3OH}^{CH_3O^-}$$

A. 
$$CH_3 - \mathop{C}\limits_{\substack{\mid\\OCH_3}} H - CH_2CH_3$$

#### Answer: B



9. In the reaction:

 $\stackrel{A}{\underset{(\mathrm{Major})}{\leftarrow}} \stackrel{C_{2}H_{5}OH}{\xleftarrow} (CH_{3})_{3}CBr \xrightarrow[C_{2}H_{5}O^{-}Na^{+}]{} \stackrel{B}{\underset{C_{2}H_{5}OH}{\longrightarrow}} B$ 

A and B are respectively:

A. A is  $(CH_3)_2 C = CH_2$  and B is  $(CH_3)_3 COC_2 H_5$ 

B. A is  $(CH_3)_3 COC_2 H_5$  and B is  $(CH_3)_2 C = CH_2$ 

C. Both A and B are  $(CH_3)_2C = CH_2$ 

D. Both A and B are  $(CH_3)_3COC_2H_5$ .

## Answer: B



**10.** The product of the reaction of alcoholic silver nitrite with ethyl bromide is:

A. Ethylene

B. Ethyl nitrite

C. Nitroethane

D. Ethyl alcohol.

Answer: C



**11.** When ethyl iodide and n-propyl iodide are allowed to react with sodium in the presence of dry ether, the number of alkanes that would be

produced is

A. only one

B. two alkanes

C. three alkanes

D. four alkanes

# Answer: C

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12. 1,3-Dibromopropane reacts with metallic zinc to form

A. Propene

**B.** Propane

C. Cyclopropane

D. Hexane

Answer: C

**13.** Identify the set of reagents/reaction conditions 'X' and 'Y' in the following set of transformation :

$$CH_3-CH_2-CH_2Br \stackrel{X}{\longrightarrow} ext{Product} \stackrel{Y}{\longrightarrow} CH_3- \stackrel{CH}{\underset{Br}{\longrightarrow}} -CH_3$$

A. X = dilute aqueous solution,  $20^{\circ}C$ ,

 $Y=\mathrm{HBr}\,/\,\mathrm{acetic}\,\mathrm{acid}$  at  $20^{\,\circ}\,C$ 

B. X = dilute aqueous NaOH,  $20^{\circ}C$ ,

 $Y=\mathrm{HBr}\,/\,\mathrm{acetic}\,\mathrm{acid}$  at  $20^{\,\circ}\,C$ 

C. X = dilute aqueous NaOH,  $20^{\circ}C$ ,

 $Y = Br/CHCl_3, 0^{\circ}C$ 

D. X = concentrated alcoholic NaOH,  $80^{\circ}C$ ,

 $Y=Br/CHCl_3,0^\circ C$ 

#### Answer: B

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14. Butane nitrile may be prepared by heating

A. propyl alcohol with KCN

B. butyl alcohol with KCN

C. butyl chloride with KCN

D. propyl chloride with KCN.

#### Answer: D

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**15.** Which of the following will be least reactive in nucleophilic substitution ?

A.  $CH_3CH_2CH_2Cl$ 

 $\mathsf{B.}\left(CH_3\right)_3 CCl$ 

 $\mathsf{C}.\,CH_2=CHCH_2Cl$ 

 $\mathsf{D}.\, CH_2 = CHCl$ 

Answer: D



16. The most reactive nucleophile among the following is

A.  $CH_3O^{-}$ 

B.  $C_6H_5O^-$ 

 $C. (CH_3)_2 CHO^-$ 

D.  $(CH_3)_3CO^-$ 

Answer: A



# 17. In the reaction, the major product 'X' is



## Answer: A



**19.** Which of the following is most reactive toward nucleophilic substitution reaction ?

A.  $C_6H_5Cl$ 

 $\mathsf{B.}\, CH_2 = CHCl$ 

 $\mathsf{C}.\, ClCH_2CH=CH_2$ 

 $\mathsf{D}.\,CH_3CH=CHCl$ 

Answer: C



20. The reaction fo toluenec with  $Cl_2$  in presence of  $FeCl_3$  gives

prediominantly

A. Benzoyl chloride

B. m-chloro toluene

C. Benzyl chloride

D. o- and p-chlorotoluene.

#### Answer: D

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21. During the conversion :

 $C_{6}H_{5}CH_{2}CH_{3} \xrightarrow{(a)} X \xrightarrow{(b)} C_{6}H_{5}CH = CH_{2}$ 

the reagents (a) and (b) are respectively

A.  $SOCl_2$ , alc. KOH

 $\mathsf{B.}\,Cl_2\,/\,hv,\,H_2O$ 

С.  $SO_2Cl_2$ , аq. КОН

D.  $SO_2Cl_2$ , alc. KOH

### Answer: D



22. The increasing order of hydrolysis of the following compounds is

A. A < D < B < CB. A < B < D < CC. D < C < B < AD. A < B < C < D

#### Answer: D



**23.** Arrange the following compounds in order of increasing dipole moment, Ethylbenzene (I), m-dichlorobenzene (II), o-dichlorobenzene (III),

A. I < IV < II < III

 $\mathsf{B}.\,IV < I < II < III$ 

 $\mathsf{C}.\,IV < I < III < II$ 

 $\mathsf{D}.\,IV < II < I < III$ 

#### Answer: B

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24. In the following sequence of reactions, B is

$$C_6H_6 \xrightarrow[FeCl_3]{Cl_2} A \xrightarrow{Na} B$$

A. chlorobenzene

B. benzyl chloride

## C. diphenyl

D. chlorophenylmethane

# Answer: C



25. 2-Phenyl-2-chloropropane on treatment with alc. KOH gives mainly

A. 2-Phenylpropene

B. 3-Phenylpropene

C. 1-Phenylpropan-2-ol

D. 1-Phenylpropan-3-ol

#### Answer: A

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26. The major product (Z) in the following reaction is :



A. Benzamide

B. Benzoic acid

C. 2-Phenylethanoic acid

D. Xylene

Answer: C

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**27.** Fluorobenzene is prepared by treating benzene diazonium chloride with fluoroboric acid and heating the product obtained. This reaction is known as:

A. Schiemann reaction

B. Sandmeyer reaction

C. Gattermann reaction

D. Ullmann reaction.

## Answer: A

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28. Chlorobenzene is commercially prepared by :

A. Etard reaction

B. Wurtz Fittig reaction

C. Raschig reaction

D. Grignard reaction.

#### Answer: C

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29. Chlorobenzene when heated with aqueous ammonia in the presence

of  $Cu_2O$  under pressure gives :

A. Aniline

B. Diphenyl

C. Diphenylamine

D. Phenyl isocyanide

Answer: A

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# **30.** The structure of the major product formed in the reaction is



**31.** Which of the following will give yellow precipitateon shaking with an aqueous solution of NaOH followed by acidification with dil.  $HNO_3$  and addition of  $AgNO_3$  solution?



Answer: C



32. Freon-12 is commonly used as

A. an insecticide

B. a refrigerant

C. a solvent

D. fire extinguisher.

### Answer: B

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**33.** Which of the following is the correct structure of D.D.T.?





## Answer: C



34. Benzene hexachloride (BHC) is used as :

A. Dye

B. Antimalarial drug

C. Antibiotic

D. Insecticide.

### Answer: D



**35.** When chloroform is exposed to light and damp air, it gives among other products

A. Carbon tetrachloride

B. Carbonyl chloride

C. Mustard gas

D. Carbon monoxide.

#### Answer: B

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**B** Multiple Choice Questions From Competitive Examinations

1. In a  $S_N 2$  substitution reaction of the type  $R - Br + Cl^- \xrightarrow{DMF} R - Cl + Br^-$ , which of the following has the highest reactivity rate?

A. 
$$CH_3- \displaystyle \underset{CH_3}{C} H-CH_2Br$$
  
B.  $CH_3-\displaystyle \underset{CH_3}{\overset{|}{C}} -CH_2Br$ 

 $\mathsf{C.}\,CH_3CH_2Br$ 

D. 
$$CH_3-CH_2-CH_2Br$$

Answer: C

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2. 
$$H_3C- \mathop{C}_{ert_{H_3}} = CH_2 + HBr o A$$

A (predominantly) is:

$$egin{aligned} & Br & \ ert & CH_3 & - egin{aligned} Br & \ ert & CH_2 & -CH_2 & CH_3 \ ert & ert &$$

D. 
$$CH_3 - \mathop{C}\limits_{\substack{\mid \ CH_3}} H - CH_2 - CH_2Br$$

### Answer: A



3. The hydrolysis of 2-bromo-3-methylbutane by  $S_{N^1}$  mechanism gives mainly:

A. 3-methyl-2-butanol

B. 2-methyl-2-butanol

C. 2,2-dimethyl-2-propanol

D. 2-methyl-1-butanol

Answer: B

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**4.** A dihalogen dervative 'X' of a hydrocarbon with three carbon atoms reacts with alcoholic KOH and produces another hydrocarbon which forms a red precipitate with ammoniacal  $Cu_2Cl_2$ . 'X' gives an aldehyde on reaction with aqueous KOH. The compound 'X' is :

A. 1,3-Dichloropropane

B. 1,2-Dichloropropane

C. 2,2-Dichloropropane

D. 1,1-Dichloropropane

### Answer: D

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5. When neopentyl bromide is subjected to Wurtz reaction, the product

formed is:

A. 2, 2, 4, 4-tetramethylhexane

- B. 2,2, 4, 4-tetramethylpentane
- C. 2, 2, 5, 5-tetramethylhexane
- D. 2, 2, 3, 3-tetramethylhexane

# Answer: C

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**6.** Which one is most reactive towards  $S_N 1$  reaction ?

A.  $C_6H_5C(CH_3)(C_6H_5)Br$ 

 $\mathsf{B.}\, C_6H_5CH_2Br$ 

 $\mathsf{C.}\, C_6H_5CH(C_6H_5)Br$ 

D.  $C_6H_5CH(CH_3)Br$ .

#### Answer: A

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**7.** The correct order of increasing reactivity of C-X bond towards nucleophile in the following compounds is :

A. IV < III < I < II

 $\mathsf{B}.\,III < II < I < IV$ 

 $\mathsf{C}.\, I < II < IV < III$ 

 $\mathsf{D}.\,II < III < I < IV$ 

Answer: C

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

A. X = benzyl chloride, Y = m-chlorotoluene

B. X = benzal chloride, Y = o-chlorotoluene

C. X = m-chlorotoluene, Y = p-chlorotoluene

D. X = o- and p-chlorotoluene, Y = trichloromethyl benzene

Answer: D



9. Arrange the following:

 $CH_{3}CH_{2}CH_{2}Cl$  (I),  $CH_{3}CH_{2}-CHCI-CH_{3}$  (II),  $(CH_{3})_{2}CHCH_{2}CI$ 

(III) and  $(CH_3)_3C - CI$  (IV) in order of decreasing tendency towards  $S_N2$  reactions

A. I > III > II > IV

 $\mathsf{B}.\,III > IV > II > I$ 

 $\mathsf{C}.\,II > I > III > IV$ 

 $\mathsf{D}.\,IV > III > II > I$ 

Answer: A





**10.** An organic halide with formula  $C_6H_{13}Br$  on heating with alc. KOH gives two isomeric alkene (A) and (B) with formula  $C_6H_{12}$ . On reductive ozonolysis of mixture (A) and (B) ,the following compounds are obtained :  $CH_3COCH_3, CH_3CHO, CH_3CH_2CHO$  and  $(CH_3)_2CHCHO$  The organic halide is :

A. 2-bromohexane

B. 2,2-dimethyl-1-bromobutane

C. 4-bromo-2-methylpentane

D. 3-bromo-2-methylpentane

### Answer: D



11. The compound that does not undergo hydrolysis by  $S_N 1$  mechanism is

A.  $CH_2 = CHCH_2Cl$ 

B.  $C_6H_5Cl$ 

 $\mathsf{C.}\, C_6H_5CH_2Cl$ 

 $\mathsf{D}.\, C_6H_5CH(CH_3)Cl$ 

Answer: B

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**12.** The major product formed when 2-bromo-2-methylbutane is refluxed with ethanolic KOH is

A. 2-methylbut-2-ene

B. 2-methylbutan-1-ol

C. 3-methylbutan-2-ol

D. 2-methylbutan-2-ol

Answer: A

**13.** Which of the following compounds will undergo racemisa- tion when solution of KOH hydrolyses ?

A. (i) and (ii)

B. (ii) and (iv)

C. (iii) and (iv)

D. (iv)

#### Answer: D

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**14.** In the reaction with HCl, an alkene reacts in accordance with the Markovnikov's rule, to give a product 1-chloro-1- methylcyclohexane. The possible alkene is:

A. 📄

в. 📄

C. (A) and (B)

D. 📄

Answer: C

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15. In an  $S_N$ 1 reaction on chiral centres, there is

A. 100% retention

B. 100% inversion

C. 100% racemization

D. inversion more than retention leading to partial recemization.

Answer: D

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**16.** Which of the following reaction(s) can be used for the preparation of alkyl halides?

 $\begin{array}{l} \text{(I) } CH_3CH_2OH + HCl \xrightarrow{\text{anhyd.}ZnCl_2} \\ \\ \text{(II) } CH_3CH_2OH + HCl \rightarrow \\ \\ \text{(III) } (CH_3)_3COH + HCl \rightarrow \\ \\ \\ \text{(IV) } (CH_3)_2CHOH + HCl \xrightarrow{\text{anhyd.}ZnCl_2} \\ \end{array}$ 

A. (IV) only

B. (III) and (IV) only

C. (I), (III) and (IV) only

D. (I) and (II) only

#### Answer: C

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17. Which of the following is the most correct electron displacement for a

nucleophilic reaction to take place?



### Answer: A

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18. The reaction of  $C_6H_5CH=CHCH_3$  with HBr produces :

A.  $C_6H_5CH_2CH_2CH_2Br$ 

В. 📄

C. 
$$C_6H_5CHCH_2CH_3$$



## Answer: C



**19.** In which of the following compounds, the C-Cl bond ionisation shall give most stable carbonium ion?



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20. The total number of optical isomers possible for 2, 3-dibromobutane

is					
	A. 2				
	B. 4				
	C. 0				
	D. 3				

### Answer: D

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**21.** Which of the following organohalogen compound when heated with

alcoholic KOH does not undergo dehydrohalogenation reaction :

A. Secondary butyl chloride

B. Isopropyl chloride

C. Neopentyl chloride

D. Isobutyl chloride

### Answer: C



**22.** Consider the reaction :

# $CH_3CH_2CH_2Br + NaCN ightarrow CH_3CH_2CH_2CN + NaBr$

This reaction will be the fastest in :

A. ethanol

B. methanol

C. N, N' -dimethylformamide (DMF)

D. water.

### Answer: C

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23. Which of the following biphenyl is optically active?



## Answer: D



**25.** Hydrocarbon(A) reacts with bromine by substitution to form an alkyl bromide which by Wurtz reaction is converted to gaseous hydrocarbon containing less than four carbon atoms (A) is

- A.  $CH \equiv CH$
- $\mathsf{B.}\, CH_2=CH_2$
- $C. CH_3 CH_3$
- D.  $CH_4$

### Answer: C

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**26.** The compound  $C_7H_8$  undergoes the following reactions :

 $C_7 H_8 \stackrel{3Cl_2 \, / \, \Delta}{\longrightarrow} A \stackrel{Br_2 \, / \, Fe}{\longrightarrow} B \stackrel{Zn \, / \, HCl}{\longrightarrow} C$ 

The product 'C' is

A. m-bromotoluene

B. o-bromotoluene

C. 3-bromo-2,4,6-trichlorotoluene

D. p-bromotoluene

Answer: A

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**27.** Among the following, the reaction that proceeds through an electrophilic substitution is

A. 📄

в. 📄

C. 📄			
D. 📝			
Answer: C			
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**28.** Consider the following bromides:

The correct order of  $S_N 1$  reactivity is:

A. C > B > A

 $\mathsf{B}.\, A > B > C$ 

 $\mathsf{C}.\,B>C>A$ 

 $\mathsf{D}.\,B > A > C$ 

Answer: C

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29. The alkene that will give the same product with HBr in the presence as

well as in the presence of peroxide is

A. 2-butene

B. 1-butene

C. propene

D. 1-hexene

Answer: A

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30. When 3-phenylpropene reacts with HBr in the presence of peroxide,

the major product formula is:

A. 2-bromo-1-phenylpropane

B. 1,2-dibromo-3-phenylpropane

- C. 3-(o-bromophenyl)propene
- D. 1-bromo-3-phenylpropane

Answer: D

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**31.** By passing excess of  $Cl_2(g)$  in boiling toluene, which one of the following compounds is exclusively formed?




# Answer: D

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**32.** How many chiral compounds are possible on monochlorination of 2methyl butane

A. 2

B. 4

C. 6

D. 8

Answer: A

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33. A solution of (-I)- chloro -1 phenyletane in toluene recemises slowly in

the presence of a small amunt of  $SbCI_5$  due to the formation of .

A. free radical

B. carbanion

C. carbene

D. carbocation

Answer: D

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**34.** An alkyl bromide (X) reacts with Na to form 4,5-diethyloctane. Compound X is:

A.  $CH_3(CH_2)_3Br$ 

B.  $CH_3(CH_2)_5Br$ 

 $\mathsf{C.}\,CH_2(CH_2)_3CH(Br)CH_3$ 

D.  $CH_3 - (CH_2)_2 - CH(Br) - CH_2 - CH_3$ 

#### Answer: D

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**35.** In  $S_N 2$  reaction, the correct order of reactivity for following compounds

 $CH_3Cl, CH_3CH_2Cl, (CH_3)_2CHCl, (CH_3)_3C - Cl$  is

A.  $(CH_3)_2 CHCl > CH_3 CH_2 Cl > CH_3 Cl > (CH_3)_3 CCl$ 

 ${\sf B}. \, CH_3Cl > (CH_3)_2CHCl > CH_3CH_2Cl > (CH_3)_3CCl$ 

 $\mathsf{C.}\,CH_3Cl>CH_3CH_2Cl>(CH_3)_2CHCl>(CH_3)_3CCl$ 

 $\mathsf{D}.\,CH_3CH_2Cl > CH_3Cl > (CH_3)_2CHCl > (CH_3)_3CCl$ 

Answer: C

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<b>36.</b> In the reaction
The product (E) is
A. 🔀
В. 📄
C. 🛃
D. 📄
Answer: A

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37. The synthesis of alkyl fluoride is best accomplished by:

A. Finkelstein reaction

B. Swart's reaction

C. Free radical fluorination

D. Sandmeyer's reaction.

Answer: B

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38. The hydrolysis of optically active 2-bromobutane with aqueous NaOH

result in the formation of :

A. (-)-butan-2-ol

B. (  $\pm$  )-butan-2-ol

C. (+)-butan-2-ol

D. (  $\pm$  )-butan-1-ol

# Answer: B



**40.** The absolute configuration of  $\triangleright$  is

A. (2R, 3S)

B. (2S, 3R)

C. (2S, 3S)

D. (2R, 3R)

### Answer: B

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**41.** 2-chloro-2-methylpentane on reaction with sodium methoxide in methonel violds:

(a) 
$$C_2H_5CH_2 \overset{|}{\underset{CH_3}{\overset{|}{C}}} - OCH_3$$
 (b)  $C_2H_5CH_2 \overset{|}{\underset{CH_3}{\overset{|}{C}}} = CH_2$  (c)  
 $C_2H_5CH_2 = \overset{|}{\underset{CH_3}{\overset{|}{C}}} - CH_3$ 

A. all of these

B. (I) and (III)

C. III only

D. I and II

Answer: A

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**42.** The major product obtained by the addition reaction of HBr to 4methylpent-1-ene in the presence of peroxide is:

A. 1-bromo-4-methylpentane

B. 4-bromo-2-methylpentane

C. 2-bromo-4-methylpentane

D. 3-bromo-2-methylpentane

Answer: A



44. The increasing order of reactivity of the following halides for the  $S_N 1$ 

reaction is

 $I.CH_3CH(CI)CH_2CH_3$ 

 $II.\ CH_3CH_2CH_2Cl$ 

III. p.  $-H_3CO-C_6H_4-CH_2Cl$ 

A. 
$$(III) < (II) < (I)$$
  
B.  $(II) < (I) < (III)$   
C.  $(I) < (III) < (II)$   
D.  $(II) < (III) < (I)$ 

#### Answer: B



**45.** 3-menthyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is

A. Six

B. Zero

C. Two

D. Four

# Answer: D



**46.** The major product obtained in the following reaction is:

A. 
$$(\pm)C_6H_5CHig(O^tBuig)CH_2C_6H_5$$

$$\mathsf{B.}\, C_6H_5CH=CHC_6H_5$$

$$\mathsf{C}.\,(\,+\,)C_6H_5CH\big(O^tBu\big)CH_2C_6H_5$$

D. 
$$(-)C_{6}H_{5}CHig(O^{t}Buig)CH_{2}C_{6}H_{5}$$

#### Answer: B



47. The major product of the following reaction is :



A.	
В.	
C.	
D.	

### Answer: B

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**48.** Tertiary alkyl halides are practically inert to substitution by  $S_N^2$  mechanism because of –

A. insolubility

B. instability

C. inductive effect

D. steric hindrance.

Answer: D

**49.** The number of possible organobromine compounds which can be obtained in the allylic bromination of 1 - butene with N - bromosuccinimide is

A. 1 B. 2 C. 3 D. 4

# Answer: D



50. Which of the following halides undergoes hydrolysis on warming with

water/aqueous NaOH?

A.	
В.	
C.	
D.	

# Answer: D

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# 51. The compound having longest C-Cl bond is





# Answer: B

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52. The alkyl halides require to prepare 📄 by Wurtz reaction are

A. 📄	
В. 📄	
C. 📄	
D. 📄	

# Answer: C

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53. The neopentyl halide in ethanol yields alkenes by  $E_1$  mechanism due

# to

A. low concentration of solvent

B. absence of base

C. it is a primary halide

D. steric factor which prevents  $E_2$  mechanism

### Answer: D



55. Increasing order of reactivity of the following compounds for  $S_N \mathbf{1}$  substitution is :



$$\begin{array}{l} \mathsf{A.}\,(B) < (C) < (D) < (A) \\ \\ \mathsf{B.}\,(A) < (B) < (D) < (C) \\ \\ \mathsf{C.}\,(B) < (A) < (D) < (C) \\ \\ \\ \mathsf{D.}\,(B) < (C) < (A) < (D) \end{array}$$

#### Answer: C



**56.** Heating of 2-chloro-I-phenylbutane with EtOK/EtOH gives X as the major product. Reaction of X with  $Hg(OAc)_2/H_2O$  followed by  $NaBH_4$  gives Y as the major product. Y is :

A. 📄

в. 📄

C. 📄

D. 📄

Answer: D
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<b>57.</b> The major product of the following reaction is :
A. 📄
В. 📄
C. 📄
D. 📄
Answer: D
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**58.** The correct IUPAC name of the following compound is:



- A. 5-chloro-4-methyl-1-nitrobenzene
- B. 2-methyl-5-nitro-l-chlorobenzene
- C. 3-chloro-4-methyl-1-nitrobenzene
- D. 2-chloro-1-methyl-4-nitrobenzene

#### Answer: D

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59. The major product 'Y' in the following reaction is :



Answer: C



A. The compound is optically active



C. The compound possesses plane of symmetry

D. The compound possesses axis of symmetry

#### Answer: A

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**62.** KI in acetone, undergoes  $S_N 2$  reaction with each of P, Q, R and S. The

rates of the reaction vary as

A. P > Q > R > S

 $\mathsf{B}.\,S>P>R>Q$ 

 $\mathsf{C}.P > R > Q > S$ 

 $\mathsf{D}.\, R > P > S > Q$ 

#### Answer: B





C Multiple Choice Questions With More Than One Correct Answers

1. Dipole moment is shown by

A. Benzoyl chloride

B. cis-1, 2-dichloroethene

C. trans-1, 2-dichloroethene

D. trans -1, 2-dichloropent-2-ene

Answer: A::B::D

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**2.**  $A \xrightarrow{I_2/NaOH}$  lodoform + Sod. Succinate In the above sequence A can be

A. Pentane -2-one

B. Acetophenone

C. Hexane-2,5-dione

D. 4-keto pentanoic acid

Answer: C::D

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**3.** Benzylchloride  $(C_6H_5CH_2Cl)$  can be prepared from toluene by chlorination with :

A.  $SO_2Cl_2$ 

 $\mathsf{B.} SOCl_2$ 

C.  $Cl_2$ , hv

D. NaOCl.

Answer: A::C

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**4.** A new carbon-carbon bond formation is possible in the following reaction/reactions:

A. 
$$C_6H_6+CH_3Cl \xrightarrow{AlCl_3}$$

 ${\rm B.}\, CH_3 CH_2 Br + CH_3 CH_2 NH_2 \rightarrow$ 

C.  $CH_3CH_2Br + Na^{+-}OCH_3 
ightarrow$ 

D.  $CH_3CH_2Br+KCN(alc.\ )
ightarrow$ 

Answer: A::D

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5. Which of the following statements are correct ?

A. Benzyl halides are more reactive than vinyl and aryl halides

B. Vinyl halides are more reactive than alkyl halides

C. Aryl halides are less reactive than alkyl halides

D. Aryl halides are more reactive than benzyl halides

Answer: B::C

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**6.** Which of the following contain  $sp^2$  hybridised carbon bonded to X?



#### Answer: B::D

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**7.** Compound(s) that on hydrogenation produce(s) optically inactive compound(s) is(are)

A. 📄

в. 📄

С. 📄

D. 📄

# Answer: B::D



### Answer: A::B



9. For the following compounds, the correct statement(s) with respect to

nucleophilic substitution reactions is (are)



A. I and II follow  $S_N 2$  mechanism

B. compound IV undergoes inversion of configuration

C. the order of reactivity for I, III, and IV is : IV > I > III

D. I and III follow  $S_N 1$  mechanism.

### Answer: A::B::D

**D** View Text Solution

**10.** Choose the correct option(s) that give(s) an aromatic compound as the major product.





# D Multiple Choice Questions Based On The Given Passage Comprehension

**1.** Alkyl halides undergo nucleophilic substitution reactions in which halogen atom is replaced by other atom.

RX + Nu :  $^- 
ightarrow Nu - R + X^-$ 

These reactions follow  $S_N 1$  and  $S_N 2$  type mechanism, in which  $S_N 1$  takes place in two steps while  $S_N 2$  takes place in single step. Due to their tendency to undergo substitution by a large number of nucleophiles, they form a variety of products.

In which of the following pairs, the first nucleophile is stronger?

A. 
$$Cl^-, I^-$$

B.  $CH_3OH$ ,  $CH_3S^-$ 

 $C. (CH_3CH_2)_2NH, (CH_3CH_2)_3N$ 

D.  $(CH_3)_2 O, (CH_3)_3 N$ 

#### Answer: C

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**2.** Alkyl halides undergo nucleophilic substitution reactions in which halogen atom is replaced by other atom.

RX + Nu :  $^- 
ightarrow Nu - R + X^-$ 

These reactions follow  $S_N 1$  and  $S_N 2$  type mechanism, in which  $S_N 1$  takes place in two steps while  $S_N 2$  takes place in single step. Due to their tendency to undergo substitution by a large number of nucleophiles, they form a variety of products.

Which of the following is least reactive towards  $S_N 2$  mechanism ?

A.  $(CH_3)_2 CHCH_2 Br$ 

 $B.(CH_3)_3CCH_2Br$ 

 $C. CH_3 CH_2 Br$ 

D.  $(CH_3)_2 CHBr$ 

Answer: B

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**3.** Alkyl halides undergo nucleophilic substitution reactions in which halogen atom is replaced by other atom.

RX + Nu :  $^- 
ightarrow Nu - R + X^-$ 

These reactions follow  $S_N 1$  and  $S_N 2$  type mechanism, in which  $S_N 1$  takes place in two steps while  $S_N 2$  takes place in single step. Due to their tendency to undergo substitution by a large number of nucleophiles, they form a variety of products.

In which of the following pairs, the first compound is better  $S_N 2$  substrate ?

A. 1-bromo-1-methyl cyclohexane, cyclohexyl bromide

B. 1-iodo-2, 2-dimethyl propane, isopropyl iodide

C. 2, 2,-dimethyl-1-chlorobutane, 2-chloro butane

D. isopropyl bromide, 2-bromobutane

Answer: D

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**4.** Alkyl halides undergo nucleophilic substitution reactions in which halogen atom is replaced by other atom.

RX + Nu :  $^- 
ightarrow Nu - R + X^-$ 

These reactions follow  $S_N 1$  and  $S_N 2$  type mechanism, in which  $S_N 1$  takes place in two steps while  $S_N 2$  takes place in single step. Due to their tendency to undergo substitution by a large number of nucleophiles, they form a variety of products.

In which of the following nucleophilic substitution reaction, the product formed is racemic mixture ?

A.  $(CH_3)_3 CBr$ 

 $\mathsf{B.}\, CH_3 CH_2 Br$ 

 $C. (CH_3CH_2)_2CHBr$ 

 $\mathsf{D.}\, C_6H_5CH_2Br$ 

Answer: A

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**5.** Alkyl halides undergo nucleophilic substitution reactions in which halogen atom is replaced by other atom.

RX + Nu :  $^- 
ightarrow Nu - R + X^-$ 

These reactions follow  $S_N 1$  and  $S_N 2$  type mechanism, in which  $S_N 1$  takes place in two steps while  $S_N 2$  takes place in single step. Due to their tendency to undergo substitution by a large number of nucleophiles, they form a variety of products.

Which of the following has highest nucleophilicity?

A.  $SH^{-}$ 

 $B. H_2O$ 

 $\mathsf{C}.OH^-$ 

Answer: A



**6.** A chlorocompound (A) on reduction with Zn-Cu and ethanol gives the hydrocarbon (B) with five carbon atoms. When (A) is dissolved in dry ether and treated with sodium metal it gave 2,2,5,5,-tetramethylhexane. The treatment of A as

$$A \xrightarrow{alc \, . \, KCN} C$$

The compound A is

A. 1-chloro-2, 2-dimethyl propane

B. 1-chloro-2, 2-dimethyl butane

C. 1-chloro-2-methyl butane

D. 2-chloro-2-methyl butane

Answer: A

**7.** A chlorocompound (A) on reduction with Zn-Cu and ethanol gives the hydrocarbon (B) with five carbon atoms. When (A) is dissolved in dry ether and treated with sodium metal it gave 2,2,5,5,-tetramethylhexane. The treatment of A as

 $A \xrightarrow{\mathit{alc.KCN}} C$ 

The reaction of C with Na,  $C_2H_5OH$  gives

A.  $(CH_3)_3CCH_2CONH_2$ 

 $\mathsf{B.} (CH_3)_3 CNH_2$ 

 $\mathsf{C.}\left(CH_3\right)_3CCH_2NH_2$ 

 $\mathsf{D}.\,(CH_3)_2 CHCH_2 NH_2$ 

Answer: C

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**8.** A chlorocompound (A) on reduction with Zn-Cu and ethanol gives the hydrocarbon (B) with five carbon atoms. When (A) is dissolved in dry ether and treated with sodium metal it gave 2,2,5,5,-tetramethylhexane. The treatment of A as

 $A \xrightarrow{alc\,.\, \mathit{KCN}} C$ 

The reaction of C with Na,  $C_2H_5OH$  is called

A. Gilman reaction

**B.** Mendius reaction

C. Grooves process

D. Swart's reaction

Answer: B

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9. A chlorocompound (A) on reduction with Zn-Cu and ethanol gives the

hydrocarbon (B) with five carbon atoms. When (A) is dissolved in dry ether

and treated with sodium metal it gave 2,2,5,5,-tetramethylhexane. The treatment of A as

 $A \xrightarrow{\mathit{alc.KCN}} C$ 

The reation of A with aq. KOH will preferably favour

A.  $S_N 1$  mechanism

B.  $S_N 2$  mechanism

C.  $E_1$  mechanism

D.  $E_2$  mechanism

# Answer: A

**D** View Text Solution

**Integer Type Questions** 

1. The number of compounds showing enantiomers among the following

compounds is

Butan-2-ol, 2-Hydroxypropanoic acid, 2-Methylhexane, 2-Chlorobutane, 2-

Bromo-2-chlorobutane,

2-Methylbutanoic acid, isopropyl chloride

**D** View Text Solution

2. The number of reactions proceeding through free radical mechanism are (i)  $C_2H_5Br + Na^{+-}OCH_3$ 

(ii)  $C_2H_5Br + AgCN$ 

(iii)  $C_6H_5CH_3+Cl_2(hv)$ 

(iv)  $CH_3CH = CH_2 + HBr$  (peroxides)

(v)  $C_2H_5Br+alc.~KOH$ 

(vi)  $CH_3CH = CH_2 + HCl$ (peroxide)

(vii)  $C_2H_5Br+H_2(Ni\mathrm{or}Pd)$ 

(viii)  $C_2 H_6 + C l_2 (hv)$ 

(ix)  $C_2H_5Br+NaSH$ 

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**4.** The number of constitutional isomers of the formula  $C_5H_{11}$  Br is

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5. The total number of alkenes possible by dehydrobromination of 3-

bromo-3-cyclopentylhexane using alcoholic KOH is

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6. In the following monobromination reaction, the number of possible

chiral products is



Unit Practice Test

**1.** The hydrolysis of 2-bromo-3-methylbutane by  $S_{N^1}$  mechanism gives mainly:

A. 2-Methylbutan-1-ol

B. 2-Methylbutan-2-ol

C. 2, 2-Dimethylpropan-2-ol

D. Pentan-1-ol

Answer: B

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2. Butane nitrile can be prepared by heating

A. propyl chloride with alc. KCN

B. butyl chloride with alc. KCN

C. propyl chloride with alc. AgCN

D. butyl chloride with alc. AgCN

## Answer: C

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3. The correct order of boiling points is

A.  $CH_3F < CH_3Cl < CH_3Br < CH_3I$ 

 $\mathsf{B.}\,CH_3F < CH_3I < CH_3Br < CH_3Cl$ 

 $\mathsf{C.}\,CH_3I < CH_3Br < CH_3Cl < CH_3F$ 

D.  $CH_3F < CH_3Br < CH_3Cl < CH_3I$ 

## Answer: D



**4.** Assertion: The nucleophilic substitution of vinyl chloride is difficult than ethyl chloride.

Reason: Vinyl chloride undergoes only addition reactions.

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion.

- C. Assertion is correct statement but reason is wrong statement.
- D. Assertion is wrong statement but reason is correct statement.

### Answer: A



**5.** Assertion: In the reaction of tert-butyl bromide with aq. KOH, rate becomes double by increasing the concentration of both aq. KOH and tert-butyl bromide

Reason: Rate of reaction is, rate = kítert butyl bromide)  $[OH^{-}]$ .

A. Assertion and reason both are correct statements and reason is

correct explanation for assertion.

B. Assertion and reason both are correct statements but reason is not

correct explanation for assertion.

C. Assertion is correct statement but reason is wrong statement.

D. Assertion is wrong statement but reason is correct statement.

### Answer: B





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**9.** Which compound in each of the following pairs will react faster in  $S_N 2$ 

reaction with .  $^- OH$  ?

(i)  $CH_3Br$  or  $CH_3I$ ,  $(ii)(CH_3)_3CCl$  or  $CH_3Cl$ 



10. How do the products differ when ethyl bromide react with KCN and

AgCN? Give reasons.

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11. How will you convert:

(a) Ethyl chloride to propanoic acid.

(b) 1-Bromopropane to 2-bromopropane

(c) tert-butyl bromide to isobutyl bromide

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**12.** (a) Why are haloarenes less reactive than haloalkanes? Explain.

(b) Predict the alkenes that would be formed by dehydrohalogenation of

the following halides with sodium ethoxide in ethanol and predict the

major alkene:

- (i) 2-Chloro-2-methylbutane
- (ii) 3-bromo-2, 2, 3-trimethylpentane
- (c) How is chlorobenzene prepared from benzenediazonium chloride?

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