



## CHEMISTRY

### BOOKS - G.R. BATHLA & SONS CHEMISTRY (HINGLISH)

#### HALOALKANES AND HALOARENES

#### Example

1. Write structural formula and give their IUPAC names:

(a) sec -Butyl chloride

(b) Isobutyl chloride

(c) tert -Butyl chloride

(d) Isopropyl bromide

(e) tert -Amyl iodide

(f) Isopentyl bromide

(g) Neopentyl chloride

(h) Neohexyl bromide

(i) Isopropylidene bromide

(j) Allyl iodide

(k) Crotyl bromide

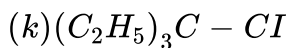
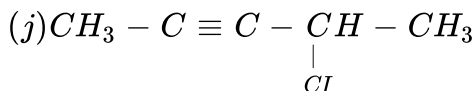
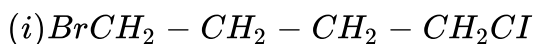
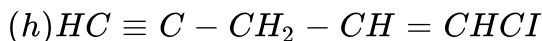
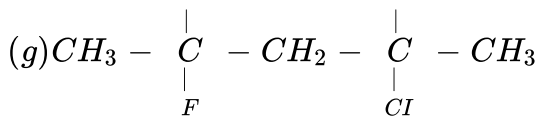
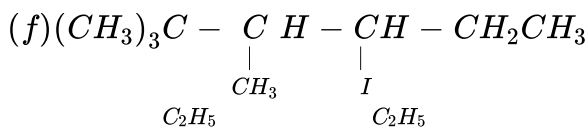
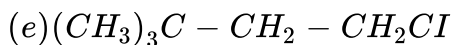
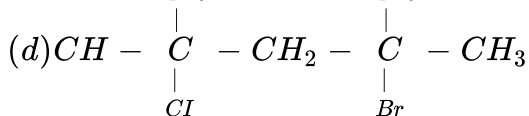
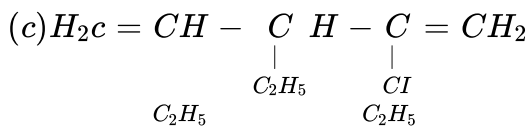
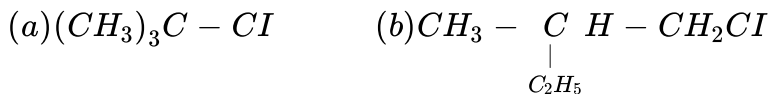
(l) Propargyl bromide

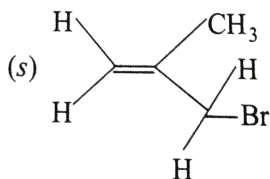
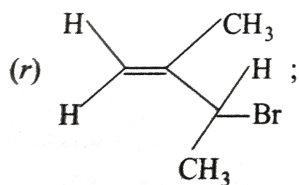
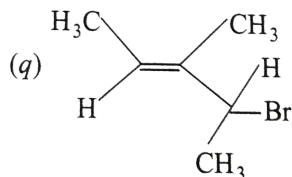
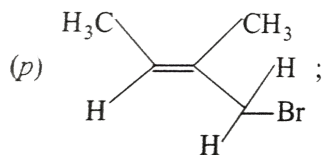
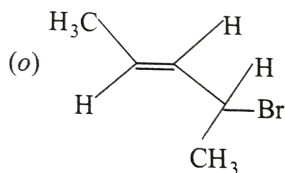
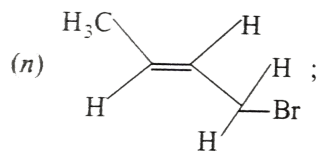
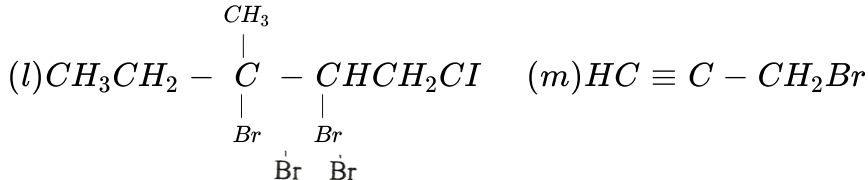
(m) 4-Chloro-2-pentene



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2. Give the IUPAC names of the following compounds:





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3. Draw the bond line structures of the following compound whose IUPAC names are given as under :

(a) 2-Bromobutane

(b) 1-Chloro -3- Methylbutane

(c) 2-Bromo-2-methylpropane ,

(d) 4-Chloro-4- methylpent -2- ene

(e) 3-Iodo-3-methylpentane

(f) 2,3-Dibromobutane

(g) 3-Iodopropene

(h) Bromoethene

(i) 1,4- Dibromobut -2-ene

(j) 4-tert-Butyl-3-iodoheptane

(k) 2-Chloro-3- methylpentane



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4. Write all the possible structures for the molecular formula  $C_5H_{11}Br$ .

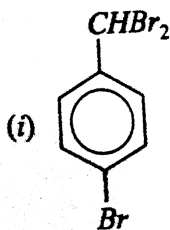
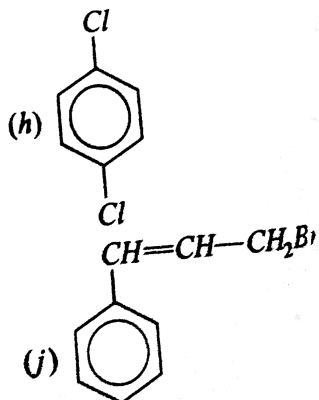
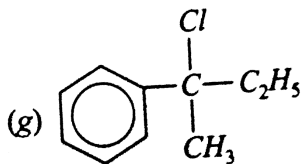
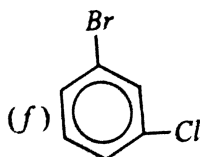
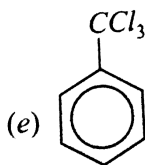
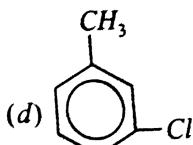
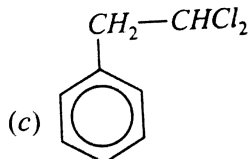
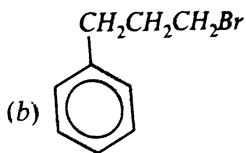
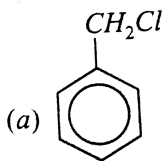
Give their IUPAC names. Which of these are optically active ?



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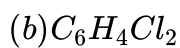
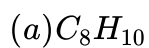
5. Give IUPAC names of the following compounds :

compounds :



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6. Write the possible isomers of aromatic compound having molecular of formulae :



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## illustrations of objective questions

1. On monochlorination of 2-methylbutane, the total number of chiral compound formed is :

A. 2

B. 4

C. 6

D. 8

Answer: D



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2. Which of the following will not give iodoform test ?

- A. Ethanol
- B. Isopropyl alcohol
- C. Ethanal
- D. Benzyl alcohol

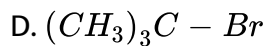
**Answer: D**



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3. which one of the following is excellent substrate for  $S_{N1}$  reaction ?

- A.  $(CH_3)_3C - Cl$
- B.  $(CH_3)_2CH - Cl$
- C.  $(CH_3)_2N - CH_2Cl$



**Answer: C**

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4. Which of the following compounds will have a mesoisomer also?

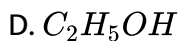
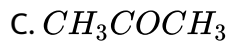
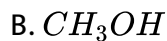
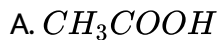
- A. 2-Chlorobutane
- B. 2,3-Dichlorobutane
- C. 2,3 -Dichloropentane
- D. 2-Hydroxy propanoic acid

**Answer: B**

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5. Phosgene is a poisonous gas obtained in chloroform bottles, substance used to make it non-poisonous is :



**Answer: D**



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6. Among the halogens the one which is oxidised by nitric acid is :

A. iodine

B. chlorine

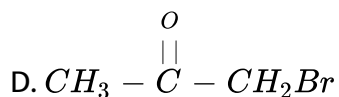
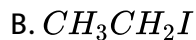
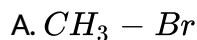
C. bromine

D. fluorine

**Answer: A**

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7. which one of the following is excellent substrate for  $S_N2$  reaction ?



**Answer: D**

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8. On treating a mixture of two alkyl halides with sodium metal in dry ether, 2-methylpropane was obtained. The alkyl halides are

A. 1-chloropropane and chloroethane

B. 2-chloropropane and chloroethane

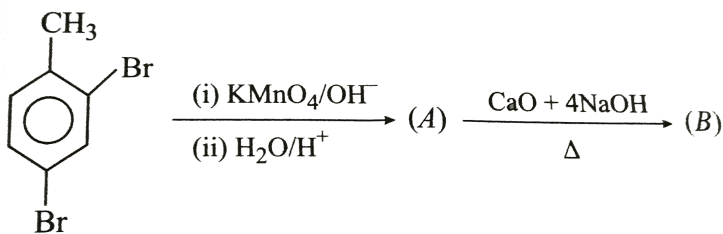
C. 2-chloropropane and chloromethane

D. 1-chloropropane and chloromethane

Answer: C

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9. What will be the end product (B) in the following sequence of reactions?



A. 1,2- Dibromobenzene

B. 1,3-Dibromobenzene

C. 1,4-Dibromobenzene

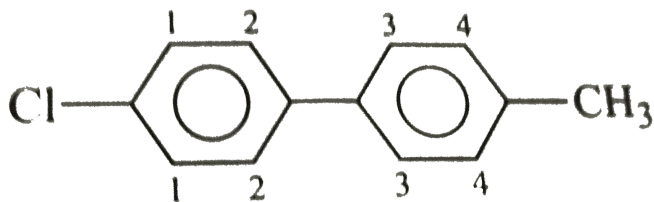
D. 1,2-Dibromobenzaldehyde

**Answer: B**

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10. Electrophilic substitution in the following compound will be fastest at position .....

fastest at position .....



A. 1

B. 2

C. 3

D. 4

**Answer: D**

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## Problem

1. How do alkyl, allyl and vinyl halides differ in structure ?

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2. Give the common and IUPAC names for  $C_4H_9Br$  isomers and classify them as to whether they are  $1^\circ$ ,  $2^\circ$  or  $3^\circ$

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3. (a) Give simple test to distinguish among hexane and  $CH_3 - CH = CHCl$ .

(b) Give simple test to distinguish among



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4. Give reasons for the following:

(a) Potassium cyanide reacts with R-X to give alkyl cyanide. While silver cyanide forms an isocyanide as a major product.

(b) Silver nitrite reacts R-X to give a mixture of nitroalkane and alkyl nitrite.

(c) R-OH does not react NaBr but on adding  $H_2SO_4$  . it forms R-Br.

(d) Alcohols do not undergo substitution in neutral or alkaline solution.

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5. A halide,  $C_5H_{11}X$ , on treating with alc. KOH gives only pent -2- ene.

What is halide ?

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6. A white precipitate was formed slowly when silver nitrate was added to compound (A) with molecular formula  $C_6H_{13}Cl$ . Compound (A) on treatment with hot alcoholic potassium hydroxide gave a mixture of two isomeric alkenes (B) and (C), having the formula  $C_6H_{12}$ . The mixture of (B) and (C), on ozonolysis, furnished four compounds.

i.  $CH_3CHO$ , ii  $C_2H_5CHO$

iii.  $CH_3COCH_3$ , (iv)  $CH_3 - \underset{\substack{| \\ CH_3}}{CH} - CHO$

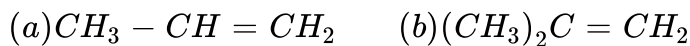
What are the structures of (A), (B) and (C) ?

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7. How many isomers are possible for  $C_4H_8F_2$  and give their IUPAC names:

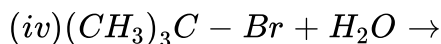
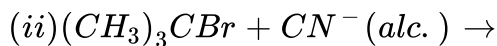
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8. Give the structures of two different alkyl bromides both of which yield the indicated alkene as the exclusive product of  $E_2$  elimination:

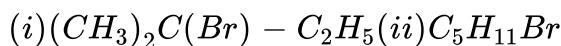


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9. (a) Indicate whether the following are  $S_{N1}$ ,  $S_{N2}$ ,  $E_1$  or  $E_2$  reactions.



(b) Give the decreasing order of reactivity of the alkaline hydrolysis of the following alkyl halides toward (A)  $S_{N1}$  (B)  $S_{N2}$  (C) in presence of  $AgNO_3$ .



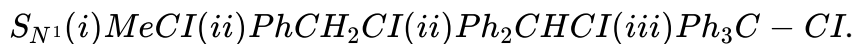
(c) Give the decreasing order reactivity of the alkaline hydrolysis of the



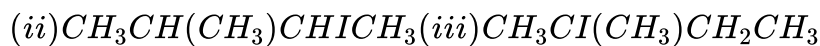
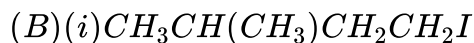
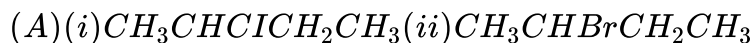
following

halides

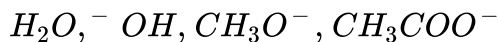
towards



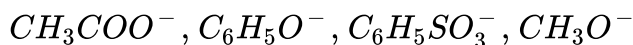
(d) Determine the relative  $S_{N2}$  reactivity with NaCl in aprotic DMSO of the following alkyl halides :



(e) Arrange the following in the order of decreasing nucleophilic character:

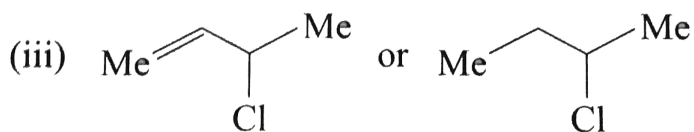
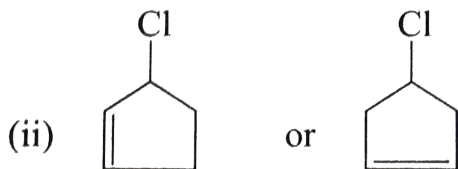
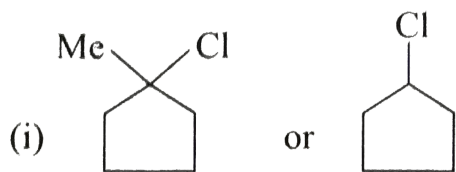


(f) Arrange the following in the decreasing order as leaving group in  $S_N$  reaction:

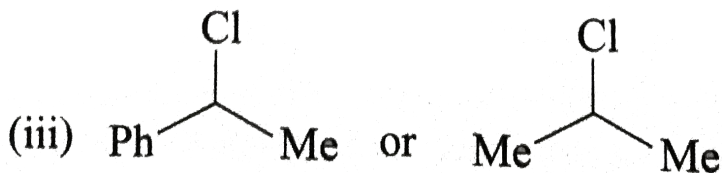
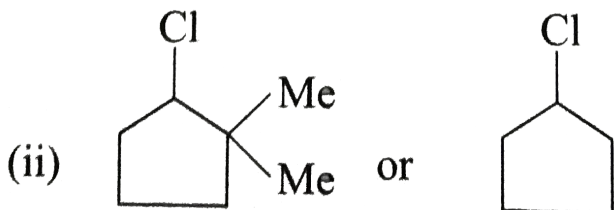
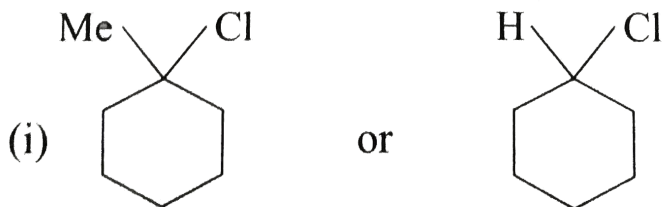


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10. (a) Which has faster rate of  $S_N1$ ?



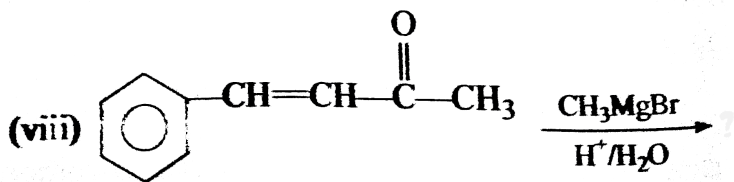
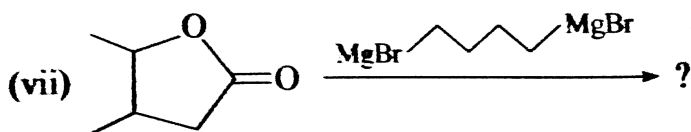
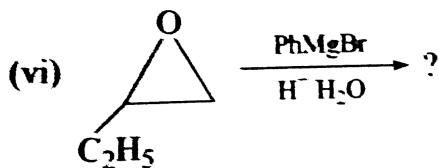
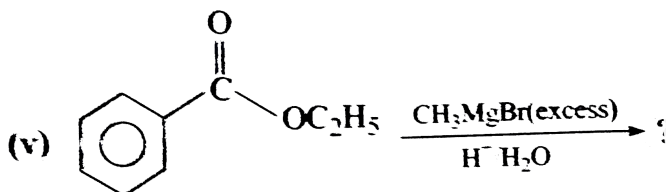
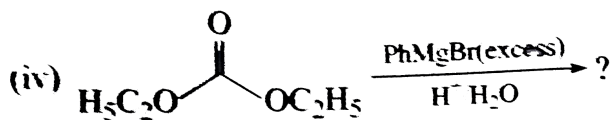
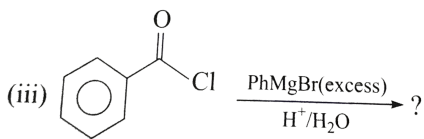
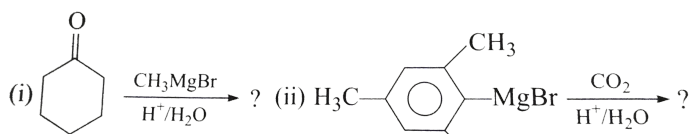
(b) Which has faster rate of  $S_N2$ ?





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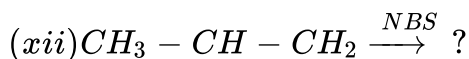
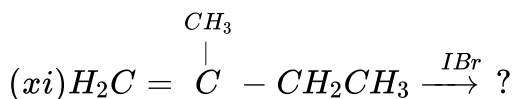
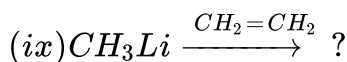
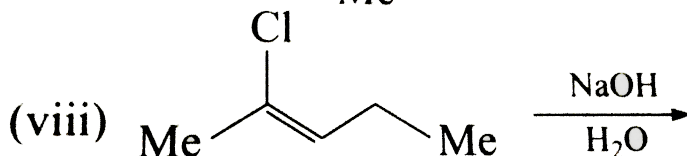
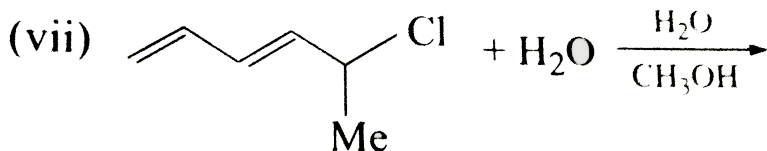
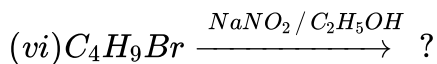
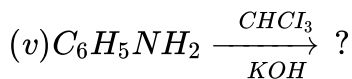
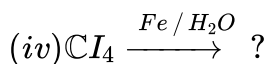
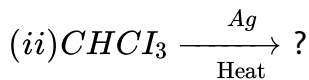
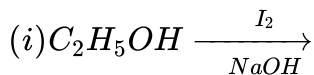
11. Draw the products of the following reaction with organometallic reagent.

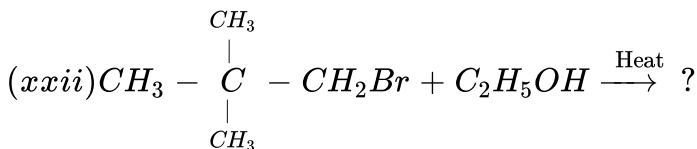
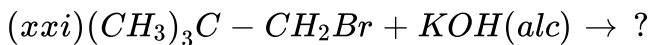
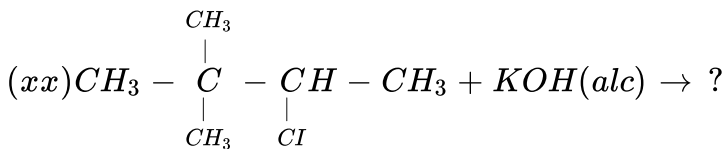
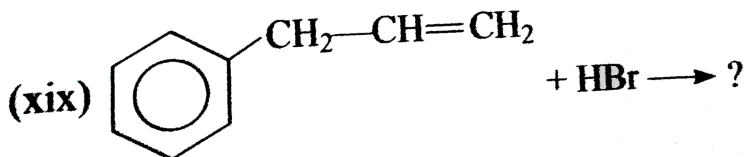
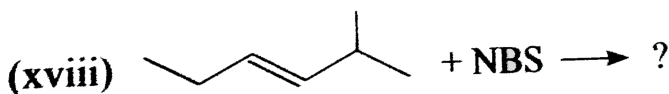
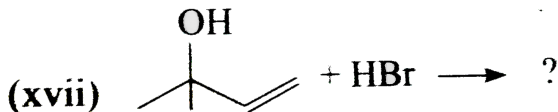
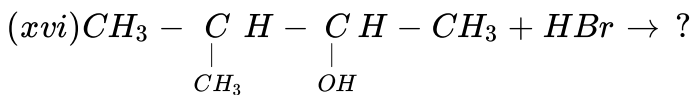
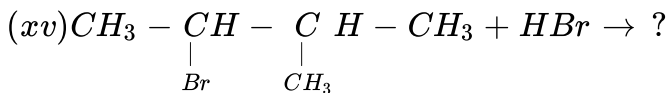
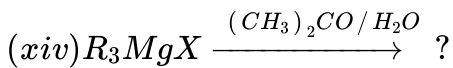
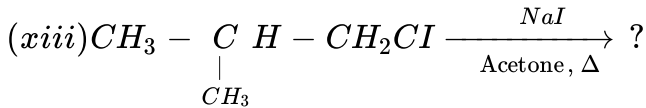


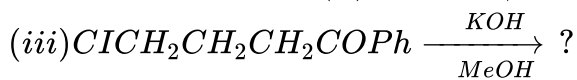
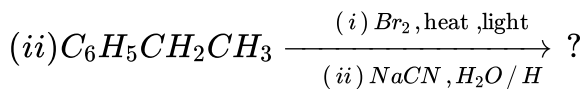
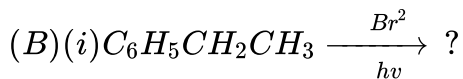
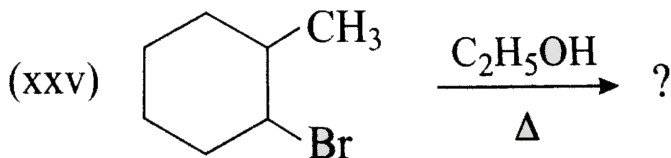
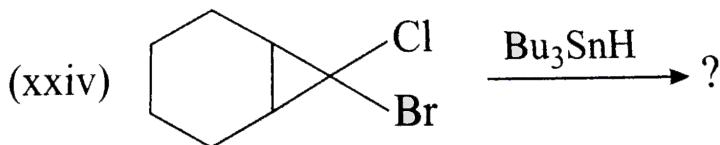
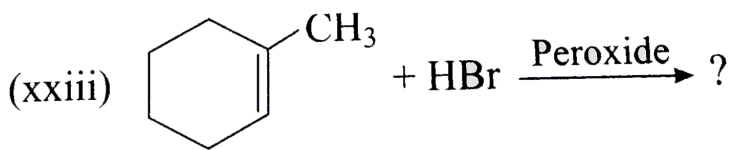
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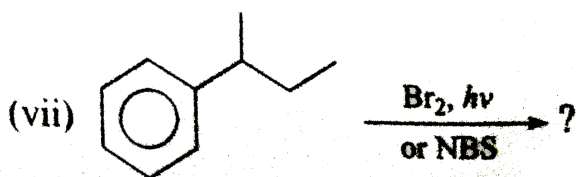
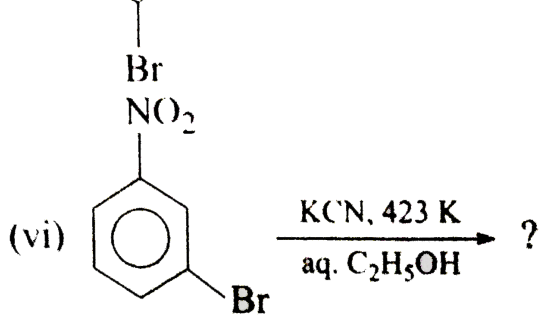
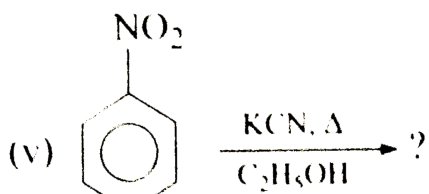
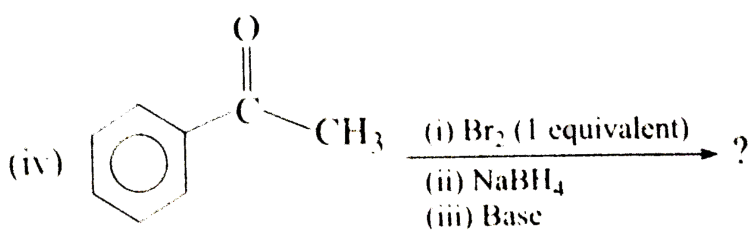
## Problem For Practice

1. (A) What is the final product in each reaction?

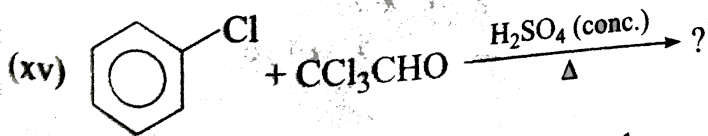
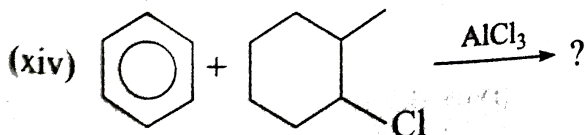
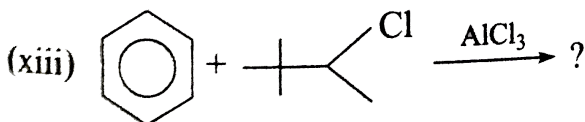
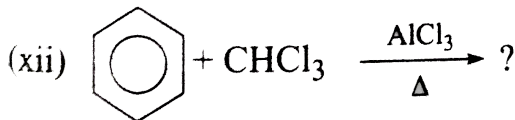
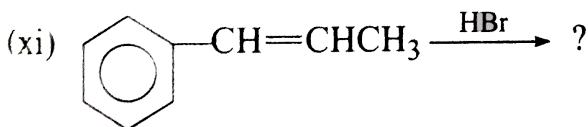
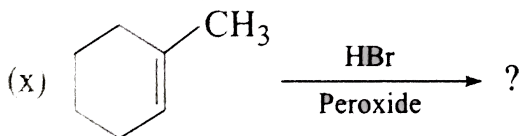
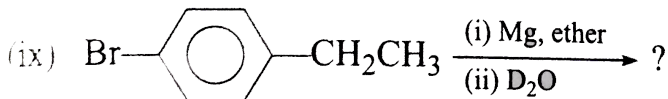
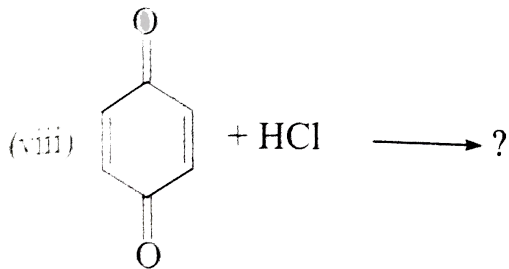












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2. What happens when ? Give equations only:

(i) chlorine reacts with  $CS_2$  in pressure of anhydrous aluminium chloride .

(ii) Chloride is heated with alcoholic KOH and aniline.

(iii) Ethyl alcohol is heated with ionic and sodium hydroxide.

(iv) Ethyl alcohol reacts with bleaching powder.

(v) Chloride is passed through ethyl alcohol.

(vi) Ethyl bromide reacts with sodium ethoxide.

(vii) Ethyl bromide reacts with silver cyanide.

(viii) Chloral is treated with aqueous sodium hydroxide.

(ix) Carbon tetrachloride is treated with hydrogen fluoride in pressure of antimony fluoride.

(x) Ethyl amine is heated with chloroform and alcoholic KOH.

(xi) Chloroform is boiled with aqueous potassium hydroxide.

(xii) Ethyl bromide is treated with alcoholic caustic soda.

(xiii) Ethyl bromine is heated with zinc.

(xiv) Methyl magnesium bromide is treated with formaldehyde followed by hydrolysis.

(xv) 2-Bromopentane is heated with alcoholic KOH.

(xvi) 2-Chloro-2-methylpropane is treated with potassium tert-butoxide in dimethyl sulphoxide.

(xvii) tertiary Butyl chloride reacts with ethylene in presence of  $AlCl_3$

(xviii) Benzene reacts with n-propyl chloride in presence of anhydrous  $AlCl_3$



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**3.** How will you synthesise ?

(a) Isopropyl bromide from n-propyl bromide.

(b) n-propyl bromide from isopropyl bromide.

(c) Propionic acid from ethyl bromide.

(d) 1-Bromopropane from 1-chloropropane.

(e) Ethylene glycol from ethyl chloride.

(f) Chloroform from ethyl alcohol.

(g) Iodoform from acetylene.

(h) vinyl bromide from ethyl alcohol.

(i) Allyl chloride from propane.

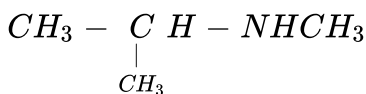
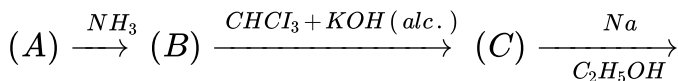
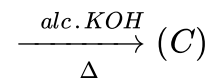
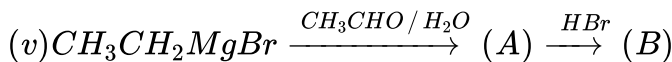
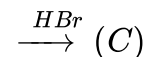
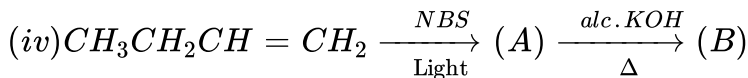
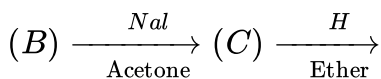
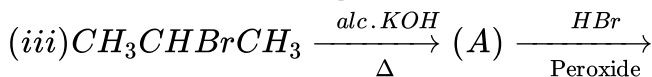
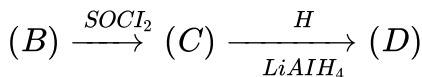
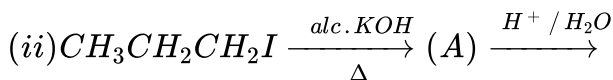
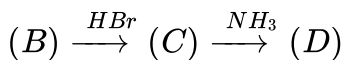
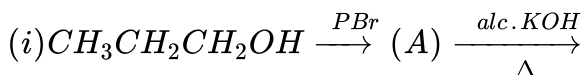
(j) Methyl iodide from methane.

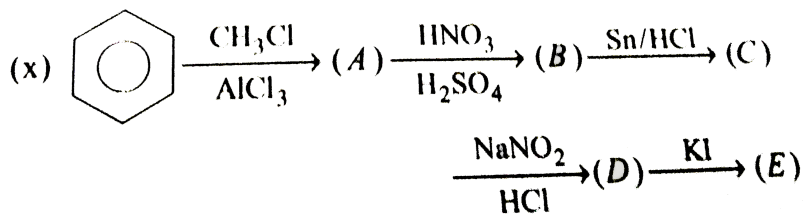
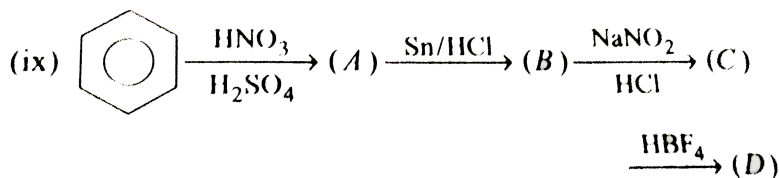
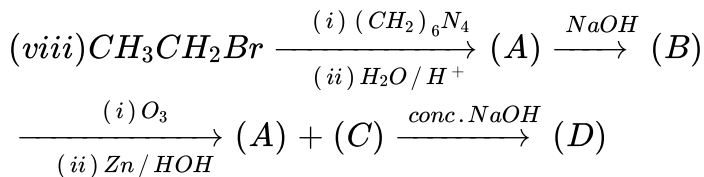
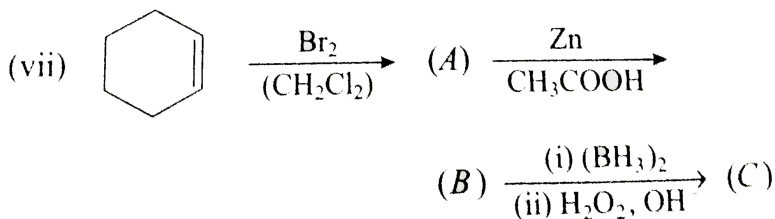
(k) o-Bromobenzoic acid from toluene.

(l) o-Chlorotoluene from toluene.

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4. Complete the following by providing (A),(B),(C) and (D) :



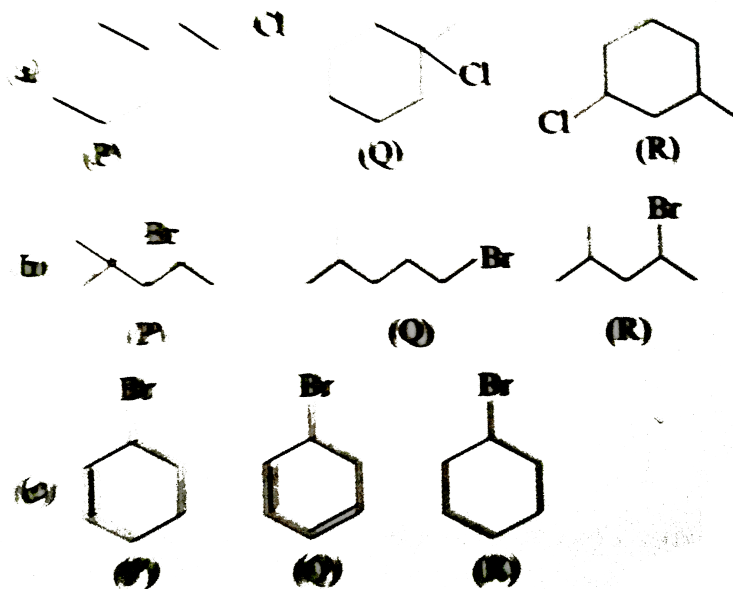


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5. Give structures and IUPAC names of the products expected from reaction between 1-chlorobutane and (a) KOH (alc) (b) NaOH(aq). (c)  $\text{NH}_3$ , (d)  $\text{H}_2\text{S}$ , (e)  $\text{C}_6\text{H}_6 + \text{AlCl}_3$ , (f)  $\text{C}_2\text{H}_5\text{ONa}$

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6. Rank the alkyl halides in order of increasing reactivity in  $E_2$  reaction.



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7. (a) Give the product of debromination with NaI in acetone solution of the following.

(i) Erythro or meso -2,3- dibromobutane

(ii) Threo or (±) - 2, 3 - dibromobutane.

(b) Write the structural formulae of the isomers of the alkyl halide ,



- (w) Which one undergoes  $E_1$  elimination at the fastest rate
- (x) Which one can give only a single alkene on  $E_2$  elimination ?
- (y) Which one gives the most complex mixture of alkenes on  $E_2$  elimination ?
- (z) Which one is incapable of reacting by the  $E_2$  elimination ?
- (c) A compound is formed by substitution of two chlorine atoms for two H-atoms in propane . What is the number of structural isomers possible ?



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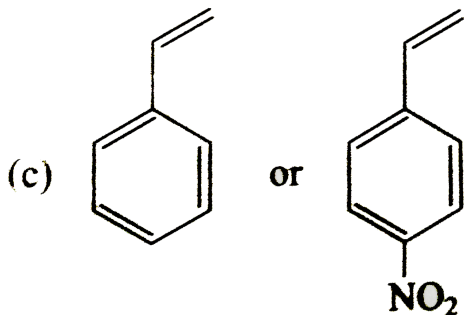
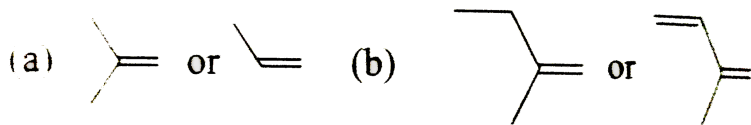
8. Write down the IUPAC names and structures of all the possible isomers having the molecular formula  $C_2H_4Cl_2$  .

How are these prepared and distinguished ?

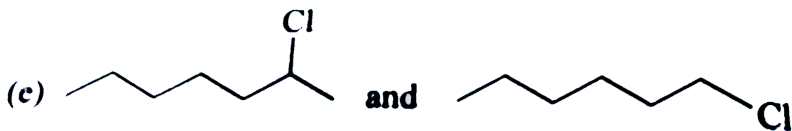
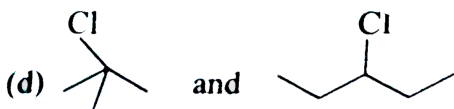


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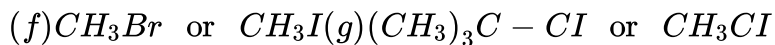
9. (i) State which compound has a faster rate of reaction with HCl.



(ii) In the following pairs of halogen compounds which compound undergoes faster  $S_N1$  reaction ?



(iii) In the following pairs of halogen compounds which compound undergoes faster  $S_N2$  reaction with  $OH^-$  ?





10. (a) Arrange alkyl halides water and alkane in order of decreasing density .

(b) Arrange chloromethanes and water in order of decreasing density.

(c) Arrange MeX in order of decreasing bond length.

(d) Arrange MeX in order of decreasing bond strength.

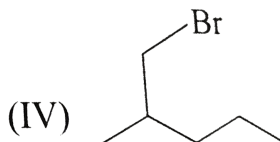
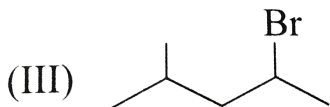
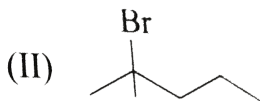
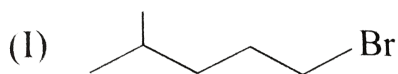
(e) Arrange MeX in order of activity.

(f) Arrange alkyl halides ( $1^\circ$ ,  $2^\circ$ ,  $3^\circ$ ) in order of decreasing  $S_N2$  reactivity.

(g) Arrange the order of reactivity of alcohols towards HX.

(h) Arrange the decreasing order of reactivity in haloforms.

(i) Arrange the following isomeric bromides in order of decreasing reactivity in  $S_N2$  displacement:



(b) 2-Bromo-2- methylbutane, 1 – Bromopentane,  
(I) (II)

2 – Bromopentane  
(III)

(C) 1 – Bromo-3-methylbutane, 2 – Bromo-2-methylbutane  
(I) (II)

2 – Bromo-3-methylbutane  
(III)

(d) 1 – Bromobutane, 1 – Bromo-2- methylbutane  
(I) (II)

1 – Bromo -3- methylbutane  
III

1 – Bromo-2,2-dimethylpropane  
(IV)

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11. Explain the following :

(a) Carbon tetrachloride is used as fire extinguisher.

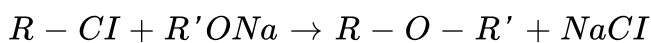
(b) Use of chloroform as anaesthetic is decreasing.

(c) Chloroform is kept with a little ethyl alcohol in a dark brown coloured bottle.

(d) Iodoform gives precipitate with  $AgNO_3$  on heating while chloroform does not.

(e) Alkyl iodides become darken on standing in presence of light.

(f) A small amount of NaI or KI catalyses the hydrolysis of R-Cl or the reaction,



(g) while preparing alkyl halides from alkanes ,dry gaseous hydrohalogen

acids are used instead of their aqueous solutions.

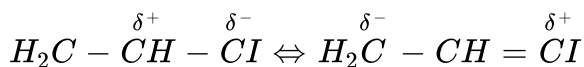
(h) Hydrogen atom of chloroform is definitely acidic in nature.

(i) Vinyl halide is less reactive while allyl halide is more reactive than alkyl halides. or

Vinyl chloride does not give  $S_N$  reaction but allyl chloride gives.

(j) Why is free radical halogenation of alkanes seldom used for laboratory preparation of alkyl halides? Under what conditions good yields of monosubstituted chloride can be obtained?

(k) What effect should the following resonance of vinyl chloride have on its dipole moment?




(l) 2-Chloro-3-methylbutane on treatment with alcoholic potash gives 2-methylbut-2-ene as the major product.

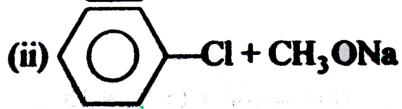
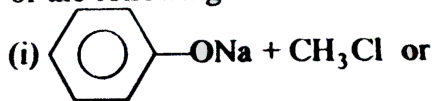
(m) Compare the rates of (i)  $S_{N1}$  and (iii)  $S_{N2}$  reactions of allyl chloride and n-propyl chloride.

(n) When  $CH_3CH = CHCH_2Cl$  reacts with alcoholic potassium cyanide, a mixture of isomeric products is obtained.

(o) the formation of the products giving the structures of the intermediates.

Anisole  can be prepared by either

of the following two reactions:



(q) Arrange

$\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{Cl}$ ,  $\text{C}_6\text{H}_5\text{CHClCH}_3$  and  $\text{C}_6\text{H}_5\text{CH}=\text{CHCl}$  in

the order of their decreasing activities with alcoholic silver nitrate.

(r) Arrange  $\text{CH}_3\text{CH}_2\text{Br}$ ,  $\text{C}_6\text{H}_5$  and  $\text{C}_6\text{H}_5\text{CH}_2\text{Br}$  in order of their decreasing activities with KCN.

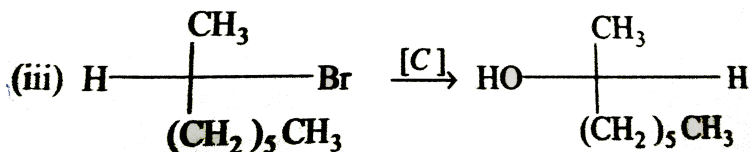
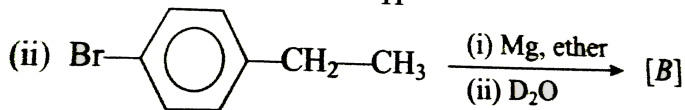
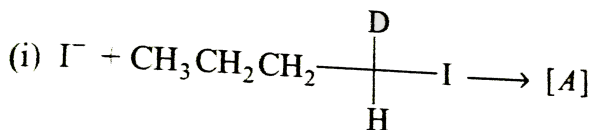
(s) Chlorobenzene is less reactive as compared to ethyl chloride.

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12. The number of isomers for the compound with molecular formula  $\text{C}_2\text{BrClFI}$  is

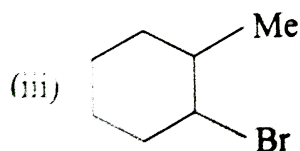
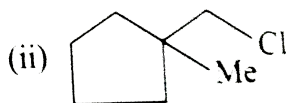
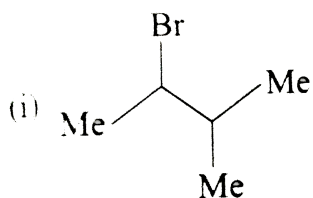
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13. Give structures/configurations of the products in the following reactions :



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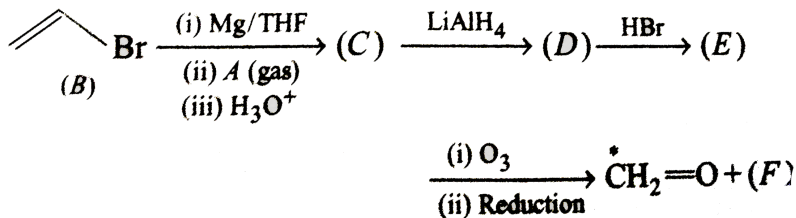
14. Give the major product when the following compounds are treated with sodium ethoxide.



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15. Identify (A) to (F) and mark the  $C^*$  carbon in the entire scheme :

[ $C^*$  denotes  $^{14}C$ ].



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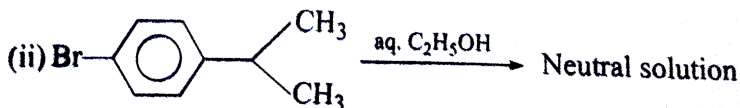
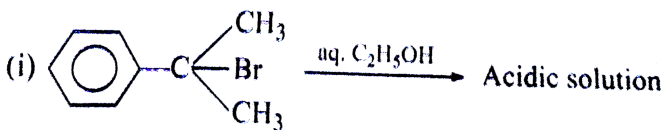
16. (a) Give the order of reactivity towards  $S_{N1}$  solvolysis of the following :

(i) Benzyl chloride (ii) p-chlorobenzyl chloride

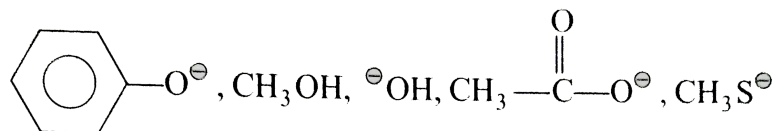
(iii) p-Methoxybenzyl chloride (iv) p-Methylbenzyl

Chloride (v) p-Nitrobenzyl chloride.

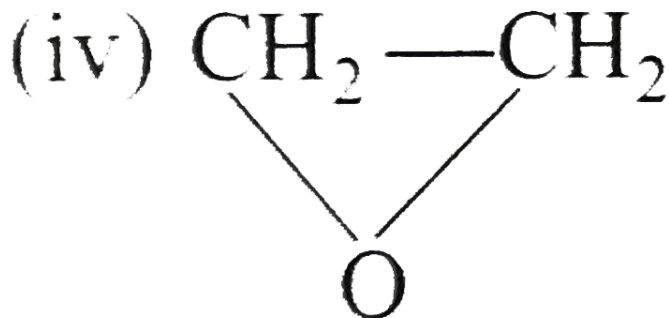
(b) Explain :



17. (a) List the following species in order of decreasing nucleophilicity in aqueous medium.



(b) Indicate which of the following solvent is protic or aprotic . ,

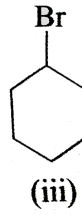
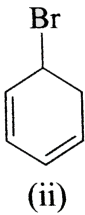
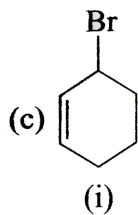
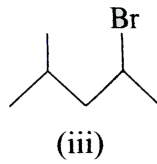
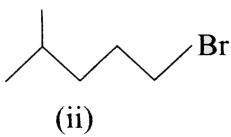
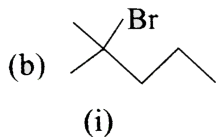
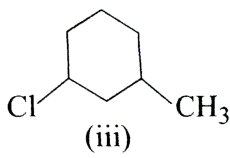
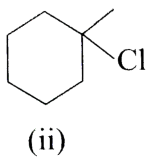
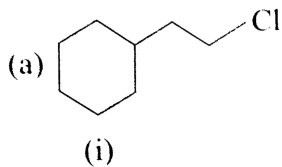


(c) Identify the strongest nucleophile in each pair of anions.

(i)  $\text{Br}^\ominus$  and  $\text{Cl}^\ominus$  in  $\text{H}_2\text{O}$  (ii)  $\text{}^\ominus\text{SH}$  and  $\text{F}^\ominus$  in  $\text{CH}_3\text{OH}$

(iii)  $\text{}^\ominus\text{OH}$  and  $\text{Cl}^\ominus$  in  $\text{DMF}$

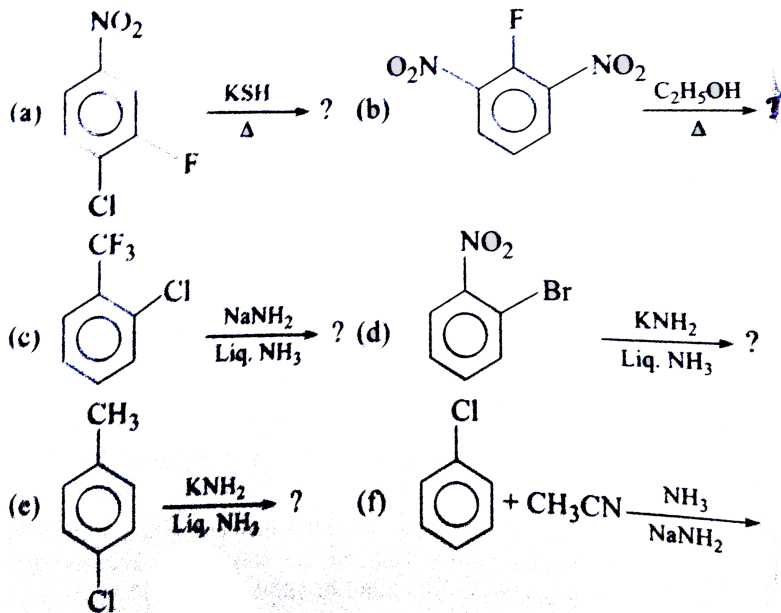
18. Rank the alkyl halides in order of increasing reactivity in  $E_2$  reaction .



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19. Find the major products of the following reactions :



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Matching type

1. Match the following :

- |                          |                     |
|--------------------------|---------------------|
| (A) carbon tetrachloride | 1. Antiseptic       |
| (B) Chloretone           | 2. Refrigerant      |
| (C) Westrosol            | 3. Chloroform       |
| (i) (D) Freon            | 4. Polymer          |
| (E) Iodoform             | 5. Hypnotic         |
| (F) Teflon               | 6. Pyrene           |
| (G) Carbylamine reaction | 7. Solvent          |
| (A) Acetone              | 1. Plastic          |
| (B) Chloropicrin         | 2. Gem-dihalide     |
| (C) PVC                  | 3. Vic-dihalide     |
| (ii) (D) $RCHCl_2$       | 4. Iodoform test    |
| (E) $CH_2Cl - CH_2Cl$    | 5. Grignard reagent |
| (F) $RMgX$               | 6. $CHCl_3 + HNO_3$ |

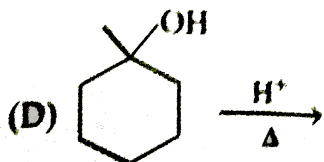
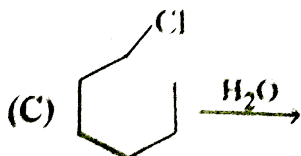
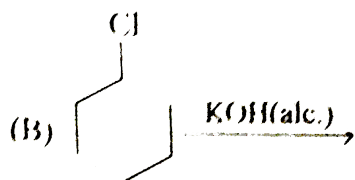
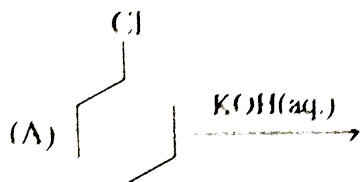


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2. Match the following column I and column II

**Column I**

(Reaction)



**Column II**

(Type of reaction)

(p)  $S_N1$

(q)  $S_N2$

(r)  $E_1$

(s)  $E_2$



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Problems based on structure and properties

1. An organic compound (A)  $C_7H_{15}Cl$  on treatment with alcoholic caustic potash gives a hydrocarbon (B)  $C_7H_{14}$  (B) on treatment with ozone and subsequent hydrolysis gives acetone and butyraldehyde. What are (A) and (B)?

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2. A Chloro compound (A) showed the following properties:

(a) decolourised bromine water (b) absorbed hydrogen catalytically (c) gives precipitate with cuprous chloride, (d) when vaporized 1.49 g of (A) gave 448 mL of vapours at STP. Identify (A) and write down the reactions involved.

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3. An alkyl halide (X) of the formula  $C_6H_{13}Cl$  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. Predict the structures of (X), (Y), and (Z)

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4. An organic compound (A)  $C_5H_9Br$  which readily decolourises bromine water and  $KMnO_4$  solution gives (B),  $C_5H_{11}Br$  on treatment with  $Sn/HCl$ . The reaction of (A) with  $NaNH_2$  produces (C) with evolution of ammonia (C) neither reacts with sodium nor forms any metal acetylide but reacts with Lindlar catalyst to give (D) and on reaction with  $Na/liq. NH_3$  produces (E). Both the compounds (D) and (E) are isomeric. Give structures of (A) to (E) with proper reasoning.

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5. An organic compound (A)  $C_4H_9Cl$  on reacting with aqueous KOH gives (B) and on reaction with alcoholic KOH gives (C), which is also formed on passing the vapours of (B) over the heated copper. The compound (C) readily decolourises bromine water. Ozonolysis of (C) gives two

compounds (D) and (E). Compound (D) reacts with  $NH_2OH$  to give (F) and compound (E) reacts with NaOH to have an alcohol (G) and sodium salt (H) of an acid. (D) can also be prepared from propyne on treatment with water in the presence of  $Hg^{2+}$  and  $H_2SO_4$ . Identify (A) to (H) with proper reasoning.

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6. A 10 g mixture of isobutane and isobutene requires 20 g of  $Br_2$  (in  $CCl_4$ ) for complete addition. If 10 g of the mixture is catalytically hydrogenated and the entire alkane is monobrominated in the presence of light at 393K which exclusive product and how much of it would be formed?

(Atomic weight of bromine =80)

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7. Compounds (A) and (B) on reaction in ether medium and subsequent acidification and oxidation give 2,5-dimethylhexan-3-one. What are (A) and

(B) ?

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8. (W) and (X) are optically active isomers of  $C_6H_9Cl$ . (w) on treatment with 1 mol of  $H_2$  is converted to an optically inactive compound (y) but (x) gives an optically active compound (Z) under the same conditions. Give structure of (Y) and configurations of (W) ,(X) nad (Z) in Fischer projections.

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9. On electrolysis an alcoholic solution of sodium chloride gives a sweet smelling liquid (A) which gives carbylamine reaction and condenses with acetone to form hypnotic . What is (A) ? Ginve reactions of its formation.

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10. RCl is treated with Li in ether to form R-Li R-Li reacts with water to form isopentane. R-Cl also reacts with sodium to form 2,7-dimethyloctane.

What is the structure of R-Cl ?

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11. Which hydrocarbon is consistent with the following formation ?

Molecular mass =72 gives a single monochloride and two dichlorides on photochlorination.

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12. With alkali  $C_3H_6Cl_2(A)$  gives  $CH_3H_6O(B)$  or  $C_3H_4(C)$ . (C) reacts with dilute  $H_2SO_4$  containing mercuric sulphate to give  $C_3H_6O(D)$  which gives iodoform test.

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13. A Grignard reagent (A) and a haloalkene (B) react together to give (C) . Compound (C) on heating with KOH yields a mixture of two geometrical isomers (D) and (E) of which (D) predominates . Compound (C) on reaction with HBr in presence of a peroxide gives 1-bromo-3- phenylpropane. Give the structures of (A), (B) and (C) and configurations of (D) and (E).

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14. Cyclopentane on heating with bromine gives compound (A) which on reaction with sodium ethoxide in ethanol, gives (B), Compound (B) on reaction with NBS in presence of peroxide gives (C) .Identify (A), (B) and (C) .

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15. Cyclobutyl bromide on treatment with magnesium in dry ether forms an organometallic compound (A). The organometallic compound (A) reacts with ethanal to give an alcohol (B) after mild acidification.

Prolonged treatment of alcohol (*B*) with an equivalent amount of  $HBr$  gives 1-bromo-1-methylcyclopentane (*C*) Write the structures of (*A*) and (*B*), and explain how (*C*) is obtained from (*B*).

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**16.** A hydrocarbon (*A*) with molecular formula  $C_8H_8$  gave the following reactions :

(i) On shaking with bromine a bromo derivative (*B*) with the composition  $C_8H_8Br_2$  was formed.

(ii) The rapid oxidation of hydrocarbon with alkaline  $KMnO_4$  gave a monobasic (*C*) .

(iii) The acid (*C*) on distillation with soda lime gave benzene.

Deduce the structures of (*A*), (*B*) and (*C*) and name the compound (*A*).

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**17.** When bromobenzene is monochlorinated two isomeric compounds (*A*) and (*B*) are obtained. Monobromination of (*A*) gives several isomeric

products of molecular formula  $C_6H_3ClBr_2$  while monobromination of (B) yields only two isomers (C) and (D). compound (C) is identical with one of the compounds obtained from the bromination of (A), however (D) is totally different from any of the isomeric compounds obtained from the bromination of (A). Give the structure of (A),(B),(C) and (D) and also structures of isomeric monobrominated products of(A). Support your answer with reasoning.



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**18.** A Grignard reagent (A) and a haloalkene (B) react together to give (C) . Compound (C) on heating with KOH yields a mixture of two geometrical isomers (D) and (E) of which (D) predominates . Compound (C) on reaction with HBr in presence of a peroxide gives 1-bromo-3-phenylpropane. Give the structures of (A), (B) and (C) and configurations of (D) and (E).



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1. The derivatives not found in nature are :

- A. alkanes
- B. carbohydrates
- C. fats
- D. alkyl halides

**Answer: D**



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2.  $C_2H_5Br$  can be obtained in the laboratory by the action of ethyl alcohol with :

- A.  $KBr$
- B.  $NH_4Br$

C.  $Br_2$

D.  $KBr$  and conc  $H_2SO_4$

**Answer: D**

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**3. The reaction**



is reversible . For the completion of the reaction ..... us used.

A. anhydrous zinc chloride.

B. concentrated  $H_2SO_4$

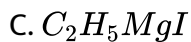
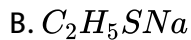
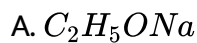
C. excess of water

D. calcium chloride

**Answer: A**

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4. Which one is an organometallic compound ?



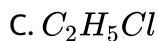
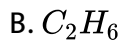
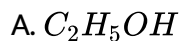
D. All of these

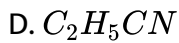
Answer: C



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5. A Grignard reagent is prepared by the action of magnesium in dry ether on:

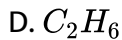
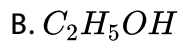
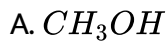




**Answer: C**

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6. Iodoform is formed on warming iodine and sodium hydroxide with :



**Answer: B**

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7.  $CCl_4$  and freons :

- A. are green compounds because they are green coloured
- B. depletes ozones concentration
- C. causes increase in ozone concentration
- D. have no effect on ozone concentration

**Answer: B**

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**8. Chloral is :**

- A.  $CCl_3CHO$
- B.  $CCl_3CH_3$
- C.  $CCl_3COCH_3$
- D.  $CCl_3CH_2OH$

**Answer: A**

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9. Chloroform reacts with oxygen in the presence of light to give:

- A. carbon tetrachloride
- B. carbonyl chloride
- C. methyl chloride
- D. methylenedichloride

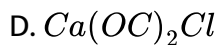
**Answer: B**



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10. Which is the correct formula of bleaching powder ?

- A.  $Ca(OCl)Cl$
- B.  $CaO(OCl)$
- C.  $Ca(OCl)_2$



**Answer: C**



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11. When chloroform is treated with aniline and potassium hydroxide we get:

- A. sweet odour
- B. bitter almond odour
- C. Very repulsive characteristic odour
- D. none of the above

**Answer: C**



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12. when (-)-2-methyl butan-1-ol is heated with conc. HCl (+)-1-chloro-2-methyl butane is obtained .The reaction is an example of :

- A. inversion
- B. resolution
- C. racemisation
- D. retention

**Answer: D**



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13. the bad smelling substance formed by the action of alcoholic caustic potash of chloroform and aniline is :

- A. phenyl isocyanide
- B. nitrobenzene
- C. chloropicrin

D. acetylene

**Answer: A**

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14. . . . . would be obtained by boiling  $CHCl_3$  with caustic soda.

A. Sodium acetate

B. Sodium formate

C. Sodium oxalate

D. Methyl alcohol

**Answer: B**

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15. Heating together of sodium ethoxide and ethyl iodide will give:

A. ethyl alcohol

B. acetaldehyde

C. diethyl ether

D. acetic acid

**Answer: C**

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**16. Chloropicrin is :**

A. picric derivative

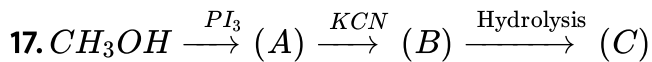
B. nitrochloroform

C. nitromethane

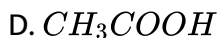
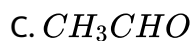
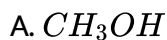
D. nitroethyl chloride

**Answer: B**

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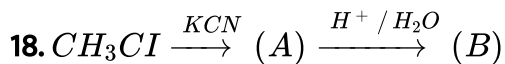
The compound (C) is:



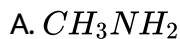
Answer: D

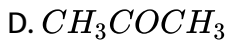
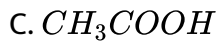


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The compound (B) in above reaction is :



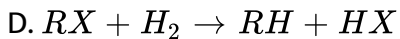
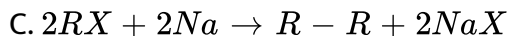
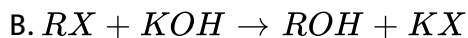
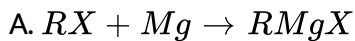


**Answer: C**



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19. Which of the following reactions is an example of nucleophilic substitution reaction?



**Answer: B**



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20. Chloroform can be obtained from

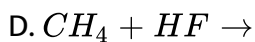
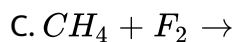
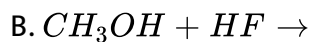
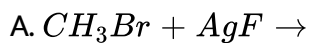
- A. methanol
- B. methanal
- C. propan-1-ol
- D. propan-2-ol

Answer: D



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21. Which of the following is the correct method of preparation of methyl fluoride ?

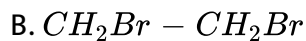




**Answer: A**

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**22.** which of the following is gem-dihalide ?



**Answer: A**

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**23.** Ethylene dichloride and ethyldene chloride are isomeric compound .

Identify the statement which is not applicable to both of them:

- A. They react with alcoholic KOH
- B. they are dihalides
- C. they react with aq. KOH and give the same product
- D. they respond to Beilstein's test

**Answer: C**

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**24.** A sample of chloroform before using as an anaesthetic is tested by :

- A. Fehling 's solution
- B. ammoniacal cuprous chloride
- C. silver nitrate solution
- D. silver nitrate solution after boiling with alcoholic KOH

**Answer: C**

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25. Ethyl alcohol is obtained when ethyl chloride is boiled with :

A. alcoholic KOH

B. aqueous KOH

C. water

D.  $H_2O_2$

**Answer: B**



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26. Which one of the following statements is wrong ?

A. Lower alkyl halides are either colourless gases or volatile liquids

B. Alkyl halides are very soluble in water

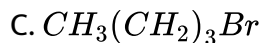
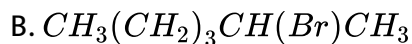
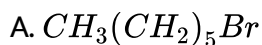
C. Alkyl halides burn easily with green edged flame

D. the higher alkyl halides are colourless solids

Answer: B

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27. An alkyl bromide reacts with  $Na$  metal to form 4, 5-diethyl octane. The bromide is



Answer: D

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28. A silver salt of fatty acid on heating with alkyl halide give ,

- A. ether
- B. alcohol
- C. ester
- D. aldehyde

**Answer: C**



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29. The product formed on reaction of ethyl alcohol with bleaching powder is .

- A. chloroform
- B. ethyl chloride
- C. acetaldehyde
- D. chloral

**Answer: A**

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**30.** Chlorination of  $CS_2$  gives,

- A. carbon tetrachloride
- B. chloroform
- C. both of these
- D. none of these

**Answer: A**

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**31.** Which will be obtained by boiling  $CH_2Cl_2$  with caustic soda?

- A. Sodium oxalate

B. Sodium acetate

C. Sodium formate

D. Ethyl alcohol

**Answer: C**

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**32.** When  $CCl_4$  is boiled with hot ethanolic KOH. The product formed is KCl and:

A. formic acid

B. methyl alcohol

C. formaldehyde

D. potassium carbonate

**Answer: D**

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33. Which one of the following statement is wrong ?

- A. Iodoform is used as an antiseptic
- B. Chloroform can be used as an insecticide
- C. Chloropicrin is used as an insecticide
- D. Chloretone is used as an antiseptic

Answer: D



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34. In the reaction ,  $HC \equiv CH + 2Cl_2 \rightarrow CHCl_2 - CHCl_2$  ,

The product is :

- A. called westrosol
- B. used as a solvent
- C. used as a fire-extinguisher



D. used as an anaesthetic

**Answer: B**

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35. The compound  $CCl_2 = CHCl$  is known as westrosol. Which one of the following statement is wrong regarding this compound ?

A. It is obtained by treating westron with  $Ca(OH)_2$

B. It is used as a solvent

C. It is used in refrigerators

D. It is used as a degreasing agent

**Answer: C**

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36. Alcoholic solution of KOH is used for ,

- A. dehalogenation
- B. dehydrohalogenation
- C. dehydration
- D. dehydrogenation

**Answer: B**



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37. The reaction ,

$R - Br + NaCN \rightarrow R - CN + NaBr$  is an example of ,

- A. elimination reaction
- B. nucleophilic substitution
- C. electrophilic substitution
- D. oxidation reduction

**Answer: B**

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**38.** An example of a sigma bonded organometallic compound is:

A. Grignards reagent

B. ferrocene

C. cobaltocene

D. ruthenocene

**Answer: A**

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**39.**  $AgNO_3$  does not give precipitate with  $CHCl_3$  because ,

A.  $AgNO_3$  is chemically inert

B.  $CHCl_3$  is chemically inert

C.  $CHCl_3$  does not ionise in water

D. none of the above

**Answer: C**

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**40.** Teflon is a polymer of ,

A. ethylene

B. vinyl chloride

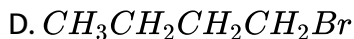
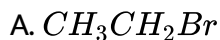
C. acetonitrile

D. tetrafluoroethene

**Answer: D**

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41. Which alkyl halide has maximum reactivity ?



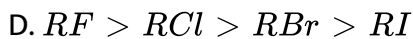
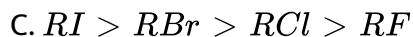
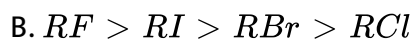
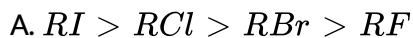
Answer: B



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42. Decreasing order of reactivity of alkyl halide for dehydrohalogenation

is :



**Answer: C**

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**43.** n-Propyl bromide on treatment with ethanolic potassium hydroxide produces .

A. propane

B. propene

C. propyne

D. propanol

**Answer: B**

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**44.** The bond angle in carbon tetrachloride is approximately :

A.  $180^\circ$

B.  $120^\circ$

C.  $109^\circ$

D.  $90^\circ$

**Answer: C**

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**45.** Ethylidene chloride on hydrolysis with aq. KOH gives ,

A.  $CH_3CHO$

B.  $CH_3COOH$

C.  $CHCl_3$

D.  $CH_3CH_2OH$

**Answer: A**

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46. Chloroform on reaction with acetone yields ,

- A. insecticide
- B. analgesic
- C. isocyanide
- D. hypnotic

**Answer: D**



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47. The chloro compound which is used as a fire extinguisher is

- A.  $CCl_4$
- B.  $CHCl_3$
- C.  $CH_3Cl$

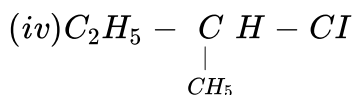
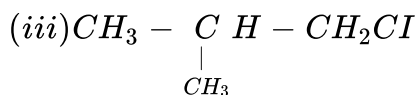
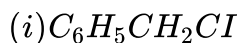


D.  $\text{COCl}_2$

Answer: A

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48. Which of the following compounds will undergo racemisation when solution of KOH hydrolysis ?



A. (i) and (ii)

B. (ii) and (iv)

C. (iii) and (iv)

D. (i) and (iv)

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49. which of the following is obtained when chloral is boiled with NaOH ?



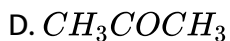
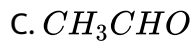
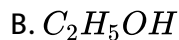
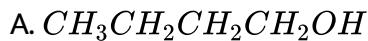
D. None of these

Answer: B



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50. Which of the following will not give iodoform test?



**Answer: A**

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**51.** Butanenitrile 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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**52.** A mixture of 1-chlorobutane and 2-chlorobutane when treated with alcoholic KOH gives:

- A. 1-butene
- B. 2-butene
- C. isobutylene
- D. a mixture of 1-butene and 2-butene

**Answer: D**

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**53.** The reagent used in the conversion of 1-butanol to 1-bromobutane is :

- A.  $CHBr_3$
- B.  $Br_2$
- C.  $CH_3Br$
- D.  $PBr_3$

**Answer: D**

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54. Which of the following reagents can be used to prepare an alkyl halide from an alcohol?

A.  $\text{NaCl}$

B.  $\text{PCl}_5$

C.  $\text{SOCl}_2$

D.  $\text{ZnCl}_2 + \text{HCl}$

**Answer: A**



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55. Ethyl bromide reacts with lead-sodium alloy to form

A. tetraethyl lead

B. tetraethyl lead bromide

C. both (a) and (b)

D. none of the above

**Answer: A**



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**56.** Freon -12 is manufactured from tetrachloromethane by ,

A. Wurtz reaction

B. Swarts reaction

C. Fitting reaction

D. Wurtz -Fitting reaction

**Answer: B**



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57. 2-Bromobutane reacts with  $\text{OH}^-$  in  $\text{H}_2\text{O}$  to give 2-butanol.

The reaction involves:

- A. retention involves
- B. racemization
- C. inversion in configuration
- D. mutarotation

**Answer: B**



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58. In preparation of  $\text{CHCl}_3$  from ethanol and bleaching powder the latter provides .

- A.  $\text{Cl}_2$
- B.  $\text{Ca}(\text{OH})_2$
- C. both (a) and (b)

D. none of these

**Answer: C**

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59. Which one of the following processes does not occur during formation of  $CHCl_3$  from  $C_2H_5OH$  and bleaching powder? .

A. Oxidation

B. Chlorination

C. Hydrolysis

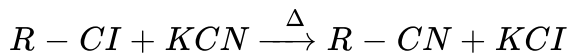
D. Reduction

**Answer: D**

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60. Following is the substitution reaction in which -CN replaces -Cl



To obtain propane nitrile R -Cl should be:

- A. chloroethane
- B. 1-chloropropane
- C. chloromethane
- D. 2-chloropropane

**Answer: A**



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61. Iodoform can be prepared from all except

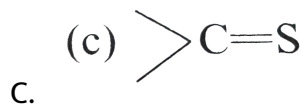
- A. isopropyl alcohol
- B. 3-methyl -2-butanone
- C. isobutyl alcohol

D. ethylmethylketone

Answer: C

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62. Grignard reagent adds to :

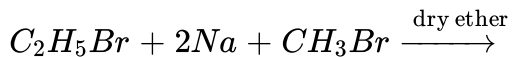


D. All of these

Answer: D

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63. The product /s of the following reaction is (are)



- A. Butane
- B. Ethane ,propane and butane
- C. Propane
- D. Ethane

**Answer: B**



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64. Which of the following alkyl halide is hydrolysed by  $S_N1$  mechanism ?

- A.  $(CH_3)_2CHX$
- B.  $(CH_3CH_2X$
- C.  $CH_3CH_2CH_2X$
- D.  $(CH_3)_3CX$

**Answer: D**

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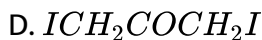
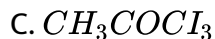
**65.** Which of the following organohalogen compound when heated with alcoholic KOH does not undergo dehydrohalogenation reaction :

- A. Isobutyl chloride
- B. Neopentyl chloride
- C. Sec-Butyl chloride
- D. tert-Butyl chloride

**Answer: B**

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**66.** Which of the following compounds is not formed in iodoform reaction of acetone?



**Answer: D**

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67. 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 :



The organic halide is :

A. 2-bromohexane

B. 3-bromo-2-methylpentane

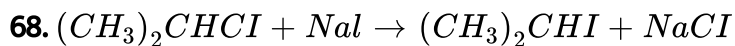
C. 1-bromo-2,2-dimethylhexane

D. none of the above

**Answer: B**



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The above reaction is known as :

A. Finkelstein reaction

B. Stephen's reaction

C. Kolbe's reaction

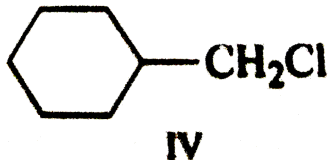
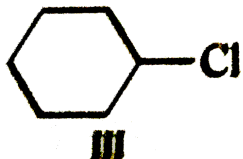
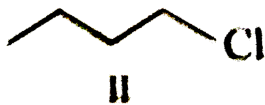
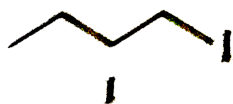
D. Wurtz reaction

**Answer: A**



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69. Which of the following haloalkanes would undergo  $S_N2$  reaction faster

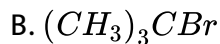
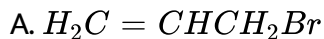


- A. I
- B. II
- C. III
- D. IV

Answer: A

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70. Which of the following alkyl halides is hydrolysis by  $S_N2$  mechanism?



D. None of these

**Answer: C**

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71. Ethene on treatment with bromine in presence of NaCl solution gives:

A. 1,2-dibromoethane

B. 1,2-dichloroethane

C. a mixture of 1,2-dibromo and 2-bromo-1-chloroethanes

D. No reaction occurs

**Answer: C**

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72. the non-reactivity of chlorine atom in  $H_2C = CH - Cl$  is due to :

- A. inductive effect
- B. resonance stabilization
- C. electromeric effect
- D. electronegativity

**Answer: B**



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73. Ethyl orthoformate is formed by heating ..... with sodium ethoxide.

- A.  $HCOOH$
- B.  $C_2H_5OH$
- C.  $CHCl_3$

D.  $CH_3CHO$

**Answer: C**

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74. What happens when  $CCl_4$  is treated with  $AgNO_3$  solution ?

- A.  $NO_2$  will be evolved
- B. A white ppt. will be formed
- C.  $CCl_4$  will dissolve in  $AgNO_3$  solution
- D. No reaction takes place

**Answer: D**

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75. If 1,3- dibromopropane reacts with zinc and NaI, the product obtained is :

- A. propene
- B. propane
- C. cyclopropane
- D. hexane

**Answer: C**



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76. Which one of the following does not give white precipitate with acidified silver nitrate solution?

- A.  $C_6H_5Cl$
- B.  $H_2C = CH - Cl$
- C.  $H_2C = CH - CH_2Cl$

D. Both (a) and (b)

**Answer: D**

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77. 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**

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78. Chloroform on reduction with zinc and water gives:

A. acetylene

B. ethylene

C. ethane

D. methane

**Answer: D**



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79. When carbon tetrachloride is reduced with Zn and  $H_2SO_4$  alcoholic solution it forms:

A.  $CH_3CI$

B.  $CHCl_3$

C.  $C_2H_5CI$

D.  $CI_2$

**Answer: B**

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**80.** Pure chloroform may be prepared by :

- A. chlorination of methane
- B. partial reduction of  $CCl_4$
- C. the action of bleaching powder and alkali on ethanol
- D. distilling chloral hydrate with conc. Aqueous alkali solution

**Answer: D**

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**81.** When pure chloroform is shaken with silver nitrate solution we get :

- A. a yellow ppt. of AgI

B. a white ppt. of AgCl

C. silver mirror

D. no precipitate

**Answer: A**

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**82.** When pure chloroform is shaken with silver nitrate solution we get :

A. No precipitate

B. a yellow ppt. of AgI

C. a white ppt. of AgCl

D. acetylene is liberated

**Answer: A**

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83. When alkyl halide is heated with an aqueous ethanolic solution of silver nitrite it gives:

- A. nitroalkane only
- B. alkyl nitrite only
- C. a mixture of nitroalkene and alkyl nitrite
- D. acetylene

**Answer: C**



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84. When ethyl chloride is heated with AgCN, the main product is :

- A. ethyl cyanide
- B. ethyl isocyanide
- C. ethyl amine
- D. ethyl nitrate



**Answer: B**

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**85.** When a solution of sodium chloride containing ethyl alcohol is electrolysed, it forms:

- A. ethyl chloride
- B. chloral
- C. chloroform
- D. acetaldehyde

**Answer: C**

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**86.** Ethyl alcohol on treatment with bleaching powder gives chloroform  
.Which of the following is / are the function of bleaching powder ?

A. as an oxidising agent

B. as a chlorinating agent

C. as a hydrolysing agent

D. as chlorinating oxidising and hydrolysing agent

**Answer: D**



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**87.** Which one of the following is not expected to undergo iodoform reaction ?

A. Propan-2-ol

B. Butan-2-ol

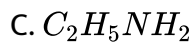
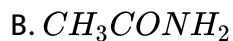
C. Ethanol

D. Diphenylmethanol

**Answer: D**

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88. which is detected by carbylamine test ?

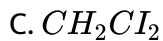


Answer: C

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89. In which of the following compounds, carbon exhibits a valency of four but oxidation state of -2 ?





**Answer: B**



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90. When an alkyl halide reacts with alcoholic potassium hydroxide to form an alkene the reaction is called as :

A. dehydrohalogenation reaction

B. elimination reaction

C. increase in unsaturation

D. all of the above

**Answer: D**



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91. Tertiary butyl chloride preferably undergo hydrolysis by:

- A.  $S_N2$  mechanism
- B.  $S_N1$  mechanism
- C. any of (a) and (b)
- D. none of these

**Answer: A**



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92. Alkyl halide reacts with alcoholic potassium hydrogen sulphide to form:

- A. alkanethiol
- B. thioether
- C. thioacid
- D. alkane

**Answer: A**

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**93.** Alkyl halide when heated with alcoholic solution of potassium sulphide, it forms:

- A. thioalcohol
- B. thioether
- C. thioacid
- D. alkene

**Answer: B**

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**94.** The aliphatic halide which is used for the preparation of synthetic rubber, plastics and resins is :

- A. chloroform
- B. carbon tetrachloride
- C. allyl iodide
- D. vinyl chloride

**Answer: D**

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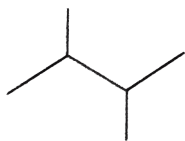
95. the antiseptic action of  $CHI_3$  is due to :

- A. iodoform itself
- B. liberation of free iodine
- C. partially due to iodine and partially due to  $CHI_3$  itself
- D. none of the above

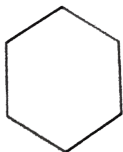
**Answer: B**

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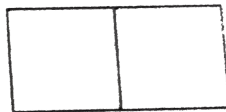
96. The numbers of monochloroderivatives obtained with  $Cl_2/h\nu$  from the following:



I



II



III

A. 1, 1, 1

B. 2, 1, 2

C. 1, 2, 1

D. 2, 2, 2

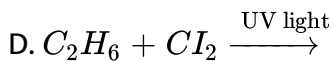
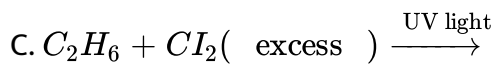
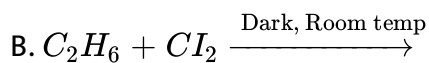
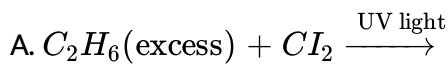
Answer: B



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97. The reaction conditions leading to the best yield of  $C_2H_5Cl$  are





**Answer: A**

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**98.** Which one of the following has antiseptic property ?

A. Dichloromethane

B. Triiodomethane

C. Trifluoromethane

D. Tetrachloromethane

**Answer: B**

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99. With conc. Nitric acid the chloroform forms a compound which is used as an :

- A. anaesthetic
- B. antiseptic
- C. insecticide
- D. antiknock compound

**Answer: C**



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100. the order of reactivity of alkyl halides depends upon:

- A. nature of alkyl group
- B. nature of halogen atom
- C. nature of both alkyl group and halogen atom

D. none of the above

**Answer: C**

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**101.** 1-Bromopropane and 2-bromopropane on treatment with sodium in presence of ether gives:

A. n-hexane

B. 2,3-dimethylbutane

C. 2-methylpentane

D. a mixture of all these different alkanes

**Answer: D**

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102. Compound  $C_4H_8Cl_2(A)$  on hydrolysis gives a compound  $C_4H_8O(B)$  which reacts with hydroxylamine and does not give any test with Tollens reagent . What are (A) and (B) ?

- A. 1,1-Dichlorobutane and butanal
- B. 2,2-Dichlorobutane and butanal
- C. 1,1-Dichlorobutane and butan-2-one
- D. 2,2-Dichlorobutane and butan-2-one

**Answer: D**



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103. Which of the following is not an allylic halide?

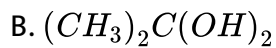
- A. 4-Bromopent-2-ene
- B. 3-Bromo-2-methylbut-1-ene
- C. 1-Bromobut-2-ene

D. 4-Bromobut-1-ene

Answer: D

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104. Which one of the following compounds is stable?



D. None of these

Answer: C

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105. Chloroform on treatment with phenol in presence of caustic alkalic forms salicylaldehyde. This reaction is known as :

- A. Carbylamine reaction
- B. Cannizzaro's reaction
- C. Wurtz-Fittig reaction
- D. Reimer-Tiemann reaction

**Answer: D**



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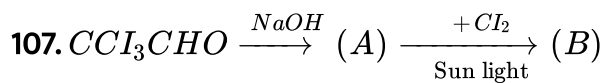
106. Which of the following compounds will give a yellow precipitate with  $I_2$  and alkali?

- A. Acetophenone
- B. Benzophenone
- C. Methyl acetate

## D. Propionaldehyde

Answer: A

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The product (B) can be used as a:

A. fire extinguisher

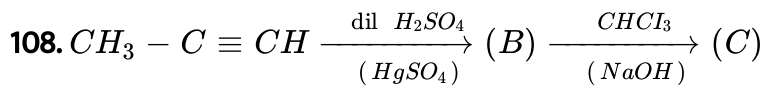
B. solvent

C. insecticide

D. all of these

Answer: D

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Compound (C) can be used as:

- A. an anaesthetic
- B. an insecticide
- C. a solvent
- D. a hypnotic

**Answer: D**



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109. Treatment of  $NH_3$  with excess of ethyl chloride gives:

- A. diethyl amine
- B. ethane
- C. tetraethylammonium chloride



D. methylamine

**Answer: C**

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**110.** Chloropicrin is obtained by the reaction of

A. steam on carbon tetrachloride

B. nitric acid on chlorobenzene

C. chlorine on picric acid

D. nitric acid on chloroform

**Answer: D**

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111. Isobutyl magnesium bromide with dry ether and absolute alcohol gives

- A.  $(CH_3)_2CHCH_2OH$  and  $CH_3CH_2MgBr$
- B.  $(CH_3)_2CHCH_2CH_2CH_3$  and  $Mg(OH)Br$
- C.  $(CH_3)_3CH$  and  $CH_3CH_2OMgBr$
- D.  $(CH_3)_3CH$ ,  $H_2C = CH_2$  and  $Mg(OH)Br$

Answer: C



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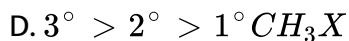
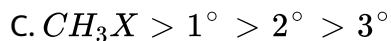
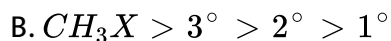
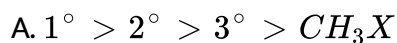
112. Which of the following is an organometallic compound?

- A. Lithium methoxide
- B. Lithium acetate
- C. Lithium dimethylamide
- D. Methyl lithium

**Answer: D**

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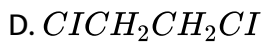
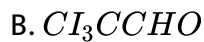
**113.** The order of rate of hydrolysis of alkyl halides  $1^\circ$ ,  $2^\circ$ ,  $3^\circ$  and  $CH_3X$  by the  $S_N2$  pathway is :



**Answer: C**

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**114.** Which of the following will react with water?



**Answer: B**

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115.  $CH_3 - CH_2 - \underset{\substack{| \\ Cl}}{CH} - CH_3$  obtained by chlorination of n- butane

will be :

A. meso form

B. racemic mixture

C. d-form

D. l-form

**Answer: B**



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116. Isopropyl chloride undergoes hydrolysis by :

- A.  $S_{N1}$  mechanism
- B.  $S_{N2}$  mechanism
- C.  $S_{N1}$  and  $S_{N2}$  mechanism
- D. Neither  $S_{N1}$  nor  $S_{N2}$  mechanism

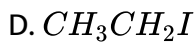
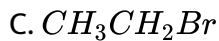
Answer: C



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117. Which will undergo  $S_{N2}$  reaction feates among the following halogen compounds ?

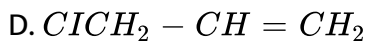
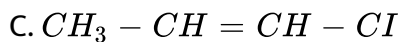
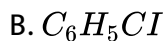
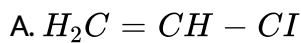
- A.  $CH_3CH_2F$
- B.  $CH_3CH_2Cl$



**Answer: D**

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**118.** Which one of the following is most reactive towards nucleophilic substitution reaction ?



**Answer: D**

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119. Match List I (compound) with List II (Use) and select the correct answer using the codes given below in the lists:

List I (compound)

List II (Use)

I. Acetyl salicylic acid

A. Insecticide

II. DDT

B. Drug

III. Naphthalene

C. Moth repellent

IV. Carbon tetrachloride

D. Fire extinguisher

E. Refrigerant

Codes :

A.  $I - B, II - A, III - C, IV - D$

B.  $I - E, II - C, III - D, IV - A$

C.  $I - B, II - C, III - D, IV - A$

D.  $I - E, II - A, III - C, IV - D$

Answer: A



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120. The correct decreasing order of reactivity for a given ( $R$ ) group in both  $S_{N1}$  and  $S_{N2}$  reaction mechanism is :

A.  $RF > RCl > RBr > RI$

B.  $RF > RBr > RCl > RI$

C.  $RCl > RBr > RF > RI$

D.  $RI > RBr > RCl > RF$

**Answer: D**

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**121.** How many chirality centres are present in 1-chloro-2-methylcyclohexane ?

A. 1

B. 2

C. 3

D. 4

**Answer: B**



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122. Among the choices of alkyl bromide, the least reactive bromide in a  $S_N2$  reaction is :

- A. 2-bromo-2-methylbutane
- B. 1-bromopentane
- C. 1-bromo-3-methylbutane
- D. 1-bromo-3-methylbutane

**Answer: A**

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123. 2-bromopentane is treated with alcoholic KOH solution the reaction respectively are :

- A. pent-1-ene,  $\beta$  – elimination

B. pent-2-ene  $\beta$  – elimination

C. pentan-2-ene, nucleophilic substitution

D. pent-2-ene , nucleophilic substitution

**Answer: B**

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**124.** which chlorine atom is more electronegative in the following ?

A.  $CH_3Cl$

B.  $CH_3CH_2Cl$

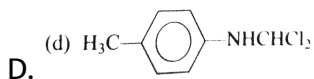
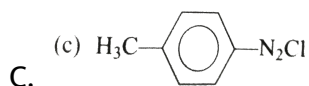
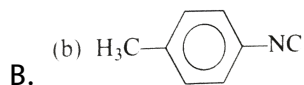
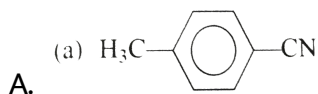
C.  $(CH_3)_2CHCl$

D.  $CH_3CH_2 - \underset{\underset{Cl}{|}}{C} - (CH_3)_2$

**Answer: D**

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125. The reaction of chloroform with alcoholic  $KOH$  and p-toluidine forms



**Answer: B**

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126. When alkyl halide is heated with dry  $Ag_2O$ . It produces :

A. ester

B. ether

C. ketone

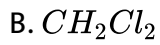
D. alcohol

**Answer: B**



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**127.** The formula of freon -12 is :



**Answer: C**



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128. Which one of the following halogen compounds is difficult to be hydrolysed by  $S_{N1}$  mechanism?

- A. ter-Butyl chloride
- B. Isopropyl chloride
- C. Benzyl chloride
- D. Chlorobenzene

Answer: D



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129. Among the following the most reactive towards alcoholic KOH is

- A.  $CH_3CH_2Br$
- B.  $(CH_3)_2CHBr$
- C.  $CH_3CH_2CH_2Br$
- D.  $CH_3COCH_2CH_2Br$

**Answer: D**



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**130.** Acetone is mixed with bleaching powder to give

- A. chloroform
- B. acetaldehyde
- C. ethanol
- D. phosgene

**Answer: A**



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**131.** Debromination of mesodibromobutane will give the product as :

- A. n-butane

B. 2-butyne

C. cis-2-butene

D. trans-2-butene

**Answer: C**

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**132.** At higher temperature, iodoform reaction is given by:

A.  $CH_3COOCH_3$

B.  $CH_3COOC_2H_5$

C.  $C_6H_5COOCH_3$

D.  $CH_3COOC_6H_5$

**Answer: B**

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133. Alkyl halides react with dialkyl copper reagents to give

- A. alkenes
- B. alkyl copper halides
- C. alkanes
- D. alkenyl halides

**Answer: C**



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134. tert-Alkyl halides are practically inert to substitution by  $S_N2$  mechanism because of:

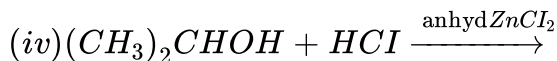
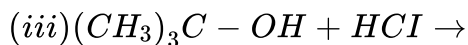
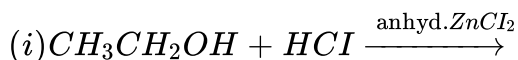
- A. insolubility
- B. instability
- C. inductive effect
- D. steric hindrance



Answer: D

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



A. (i) ,(iii) and (iv) only

B. (i) and (ii) only

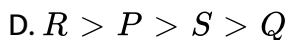
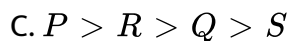
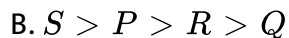
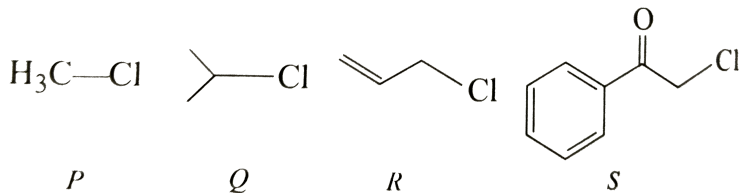
C. (iv) only

D. (iii) and (iv) only

Answer: A

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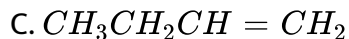
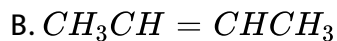
136. KI in acetone undergoes  $S_N2$  reaction with each of P, Q, R, S. The rates of the reaction vary as :



Answer: B

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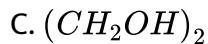
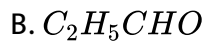
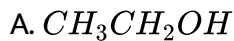
137. The major product obtained on treatment of  $\text{CH}_3\text{CH}_2\text{CH}(\text{F})\text{CH}_3$  with  $\text{CH}_3\text{O}^- / \text{CH}_3\text{OH}$  is :



**Answer: B**

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**138.** which of the following gives iodoform test ?



D. None of these

**Answer: A**

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139. Which among the following is a catalyst for the preparation of Grignard reagent ?

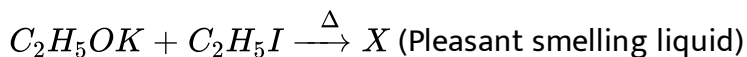
- A. Iodine powder
- B. Iron powder
- C. Activated charcoal
- D. Manganese dioxide

**Answer: A**



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140. Consider the following reaction :



Which of the following reagents converts ethyl bromide to X?

- A. Sodium

B. Dry silver oxide

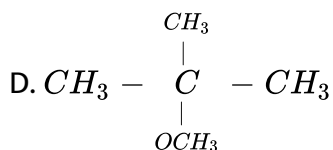
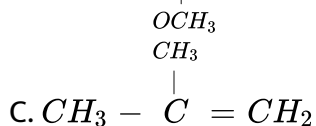
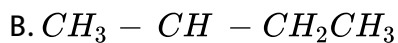
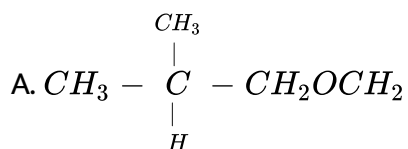
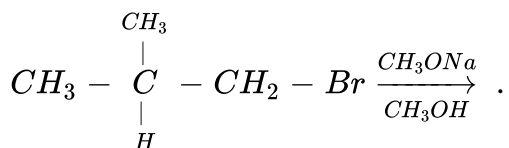
C. Ethyl chloride

D. Dry silver powder

**Answer: B**

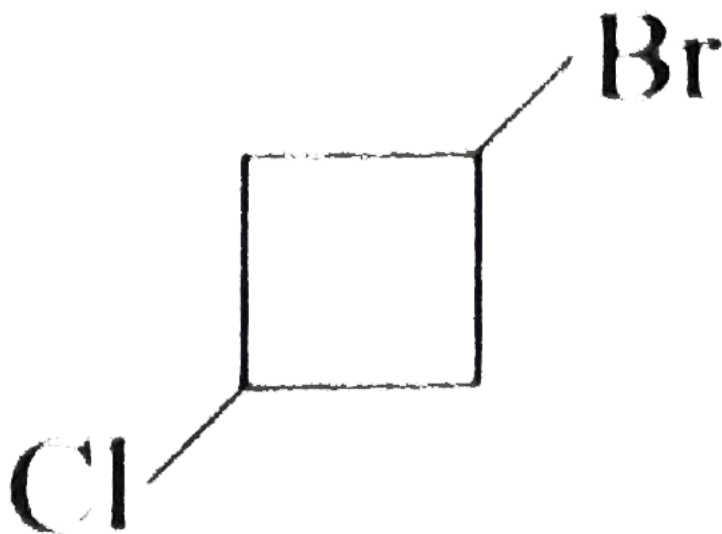
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**141.** The major product formed in the following reaction is



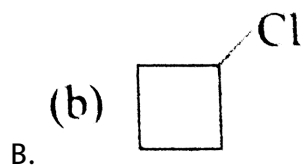
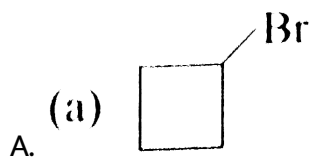
Answer: D

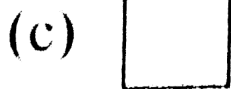
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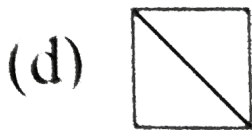
142. \_\_\_\_\_ when

treated with two equivalents of sodium in dry ether gives:





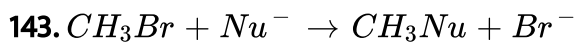
C.



D.

Answer: D

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The decreasing order of the rate of the above reaction with nucleophiles

( $Nu^-$ ) A to D is :



A.  $D > C > A > B$

B.  $D > C > B > A$

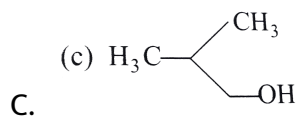
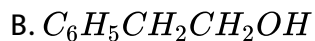
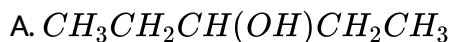
C.  $A > B > C > D$

D.  $B > D > C > A$

Answer: A

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144. Among the following the one that gives positive iodoform test upon reaction with  $I_2$  and  $NaOH$  is :

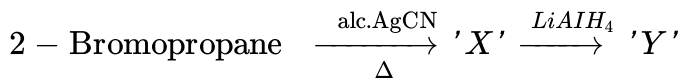


Answer: D

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145. In the given set of reactions :



The IUPAC name of product 'Y' is :

- A. N-isopropylmethanamine
- B. N-methylpropan-2-amine
- C. N-methylpropan-1-amine
- D. butan-2-amine

**Answer: B**



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146. The catalyst used in the preparation of an alkyl chloride by the action of dry HCl on an alcohol is

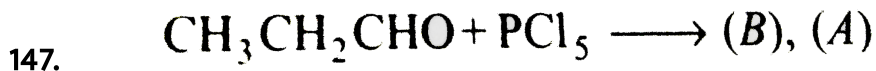
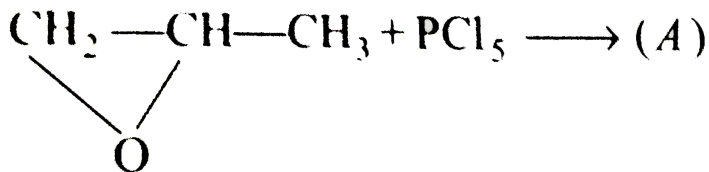
- A. anhyd.  $AlCl_3$
- B.  $FeCl_3$

C. anyl.  $ZnCl_2$

D.  $Cu$

**Answer: C**

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$\text{CH}_3\text{CH}_2\text{CHO} + \text{PCl}_5 \rightarrow (B), (A)$  and (B) are

A. gem dihalide

B. (A) gem dihalide (B) vic dihalide

C. vic dihalides

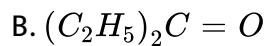
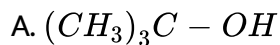
D. (A) vic dihalide (B) gem dihalide

**Answer: D**



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148. Which can undergo haloform reaction ?



C. Acetophenone

D. Benzophenone

Answer: C



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149. Which of the following is a primary halide ?

A. Isopropyl iodide

B. Secondary butyl iodide

C. Tertiary buty bromide

D. Neo hexyl chloride

**Answer: D**



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**150.** Among the halogens, the one which is oxidised by nitric acid is

A. fluorine

B. iodine

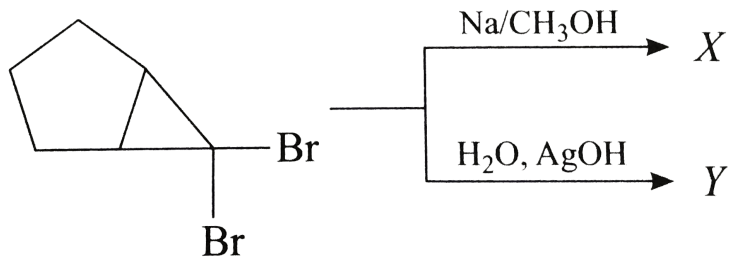
C. chlorine

D. bromine

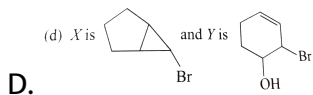
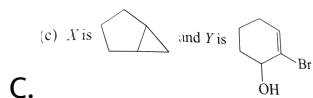
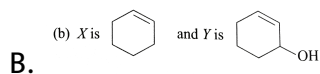
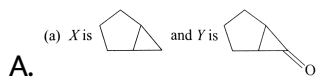
**Answer: B**



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151.



Answer: C

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152. Which of the following is formed when the product of oxidation of chloroform is treated with ethyl alcohol ?

- A. Ethyl chloride
- B. Ethyl carbonate
- C. Chloral hydrate
- D. Chloral

**Answer: B**

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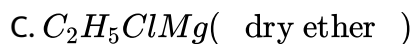
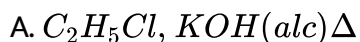
**153.** Which of the following is added to chloroform to slow down its aerial oxidation in presence of light ?

- A. Carbonyl chloride
- B. Ethyl alcohol
- C. Sodium hydroxide
- D. Nitric acid

**Answer: B**

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154. Ethyl chloride reacts with sodium ethoxide to form a compound 'A' which of the following reactions also yields 'A' ?

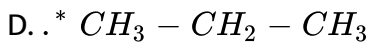
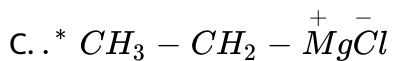
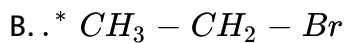


**Answer: B**

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155. In which of the following compounds the carbon marked with asterisk is expected to have highest positive charge ?

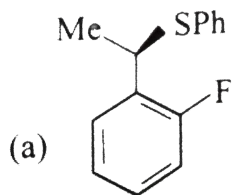
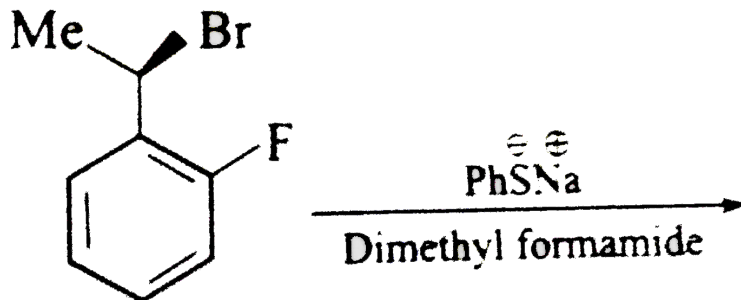




Answer: A

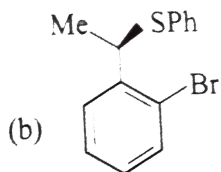
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156. The major product of the following reaction is :

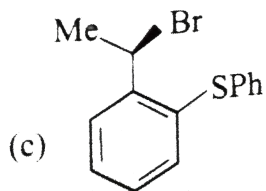


A.

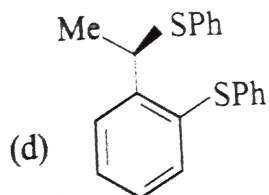




B.



C.

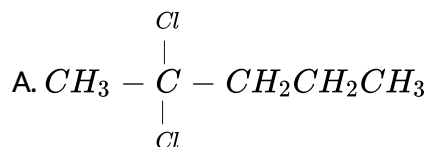


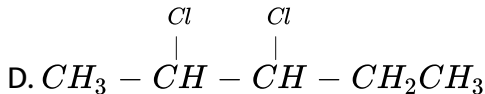
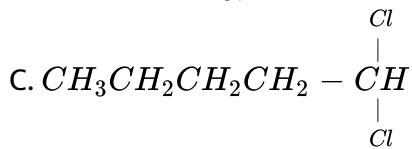
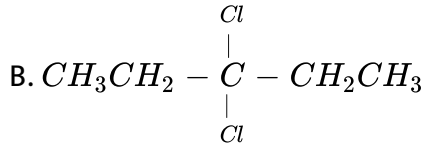
D.

Answer: A

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157. A compound (A)  $C_5H_{10}Cl_2$  on hydrolysis gives  $C_5H_{10}O$  which reacts with  $NH_2OH$ , forms iodoform but does not give Fehling test (A) is :





**Answer: A**

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**158.** Match List I with List II and pick the correct matching from the codes given below.

List I

(Haloalkane/arene)

A. Iodoform

B. BHC

C. Freon-14

D. Halothanes

E. p-Dichlorobenzene

List II

(Application)

1.  $\text{CF}_4$

2. Antiseptic

3. Moth repellent

Inhalative anaesthetic

5. Termite pesticide

A. A - 2, B - 4, C - 5, D - 3, E - 1

B. A - 2, B - 5, C - 1, D - 4, E - 3

C.  $A - 3, B - 4, C - 2, D - 1, E - 5$

D.  $A - 1, B - 3, C - 5, D - 2, E - 4$

**Answer: B**



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**159.** The correct order increasing reactivity of the following alkyl halides.

$CH_3CH_2CH(Br)CH_3$  (I),  $CH_3CH_2CH_2CH_2Br$  (II),

$(CH_3)_2CClCH_2CH_3$  (III) and  $CH_3CH_2CH_2Cl$  (IV)

towards  $S_N2$  displacement is :

A.  $I < II < III < IV$

B.  $III < I < II < IV$

C.  $III < I < IV < II$

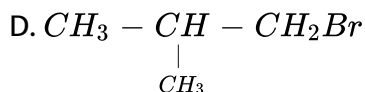
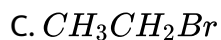
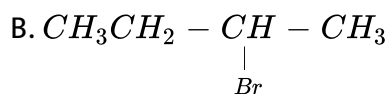
D.  $II < IV < I < III$

**Answer: C**



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160. An equimolar mixture of alkylbromide (A) and ammonia gives (B) which on treatment with  $NaNO_2$  and  $HCl$  gives (C). Compound (C) on oxidation followed by decarboxylation gives . What (A) ?



Answer: B



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161. Which of the following haloalkanes is most reactive?



B. 1-Bromopropane

C. 2-Chloropropane

D. 2-Bromopropane

**Answer: D**

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**162.** In the chemical reaction ,



The compounds (A) and (B) are respectively:

A.  $C_2H_5NC$  and  $3KCl$

B.  $C_2H_5CN$  and  $3KCl$

C.  $CH_3CH_2CONH_2$  and  $3KCl$

D.  $C_2H_5NC$  and  $K_2CO_3$

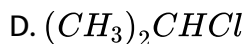
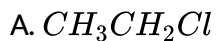
**Answer: A**



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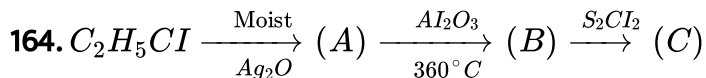
What is (X) ?



Answer: B



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In the above sequence of reactions identify (C)

A. chloretone

B. chloropicrin

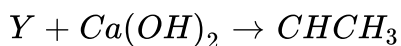
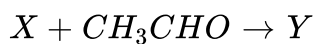
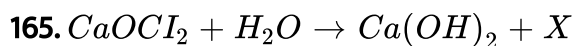
C. mustard gas

D. lewisite gas

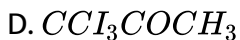
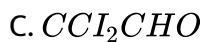
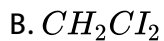
**Answer: C**



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what is 'Y' ?



**Answer: C**



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**166.** The products expected to be formed in the Wurtz reaction of a mixture of neopentyl bromide and isobutyl bromide are :

- (i) 2,2,4-trimethylpentane
- (ii) 2,2,5,5-tetramethylhexane
- (iii) 2,2,4,4- tetramethylhexane
- (iv) 2,5-dimethylhexane
- (v) 2,2,5-trimethylhexane

A. (ii) , (iii) and (v)

B. (ii) ,(iv) and (v)

C. (i) , (iv) and (v)

D. (i) ,(iii) and (v)

**Answer: B**







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167. Chloroform gives a trichloro derivative of an alcohol on reaction with :

A. conc.  $HNO_3$

B. aq.alkali

C. acetone and alkali

D. sodium ethoxide

Answer: C

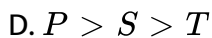
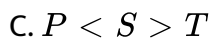


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168. In a group of isomeric alkyl halides the order of boiling point is :

A.  $P < S < T$

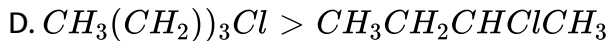
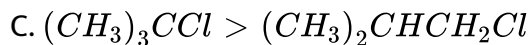
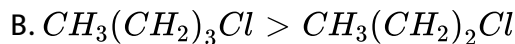
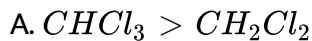
B.  $p > S < T$



**Answer: D**

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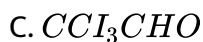
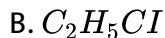
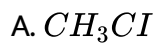
**169.** Which one of the following is not the correct order of boiling points of alkyl / aryl halides ?



**Answer: C**

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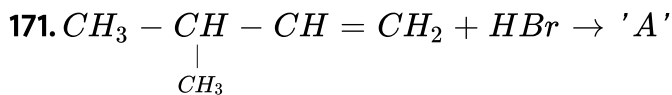
170. What is the product obtained when chloride reacts with ethyl alcohol in the presence of NaOH ?



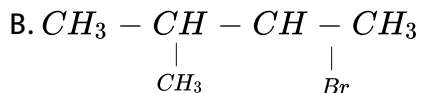
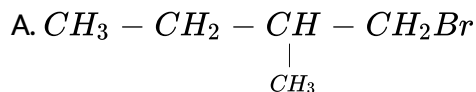
Answer: D

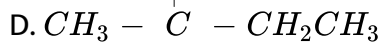
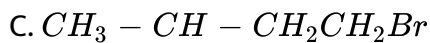


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'A' (predominantly) is:





**Answer: D**

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172. A dihalogen derivative '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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173. The IUPAC name of Westron is :

- A. 1,1,2,2-tetrachloroethane
- B. 1,1,2,2-tetrachloroethene
- C. 1,2-dichloroethyne
- D. 1,3,3,3- tetrachloroprop-1-yne

**Answer: A**



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174.  $CCl_4$  is a well known fire extinguisher. However after using it to extinguish fire the room should be well ventilated. This is because:

- A. it is inflammable at higher temperature
- B. it is toxic

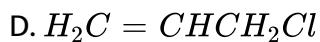
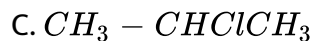
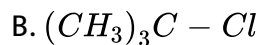
C. it produces phosgene by reaction with water vapours at higher temperatures

D. it is corrosive

**Answer: C**

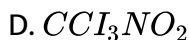
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175. Which of the following will be least reactive in nucleophilic substitution?



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176. The chemical formula of test gas is :

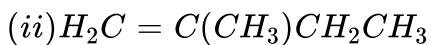
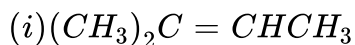


Answer: D



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177. When 2-chloro-2-methylbutane is heated with alcoholic KOH the possible products /s is /are?



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

B. (i) and (ii)

C. (ii) and (iii)

D. (i) only

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178. The best method for the conversion of an alcohol into an alkyl chloride is by treating the alcohol with :

A.  $PCl_5$

B.  $SOCl_2$  in presence of pyridine

C.  $PCl_3$

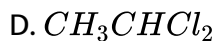
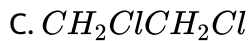
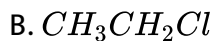
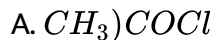
D. dry HCl in presence of anhydrous  $ZnCl_2$

**Answer: B**

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179. which of the following on heating with aqueous KOH produces acetaldehyde?



Answer: D



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180. It gives propionic acid on hydrolysis

A. it has an ester function

B. It has a nitrogen linked to ethyl carbon

C. It has a cyanide group

D.

**Answer: C**

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**181.** An organic compound on heating with  $CuO$  produces  $CO_2$  but no water . The organic compound may be

- A. chloroform
- B. ethyl chloride
- C. methane
- D. carbon tetrachloride

**Answer: D**

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**182.** Which one of the following does not undergo iodoform reaction ?

A. Secondary butyl alcohol

B. Iso propyl alcohol

C. Diethyl ketone

D. Ethyl alcohol

**Answer: C**

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**183.** An ethereal solution of alkyl halide is heated with sodium metal. The reaction is known as :

A. Frankland's reaction

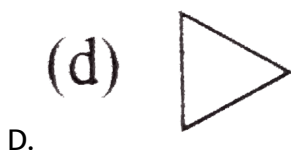
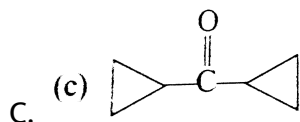
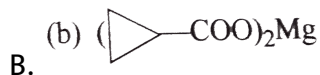
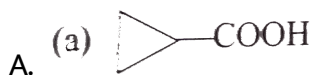
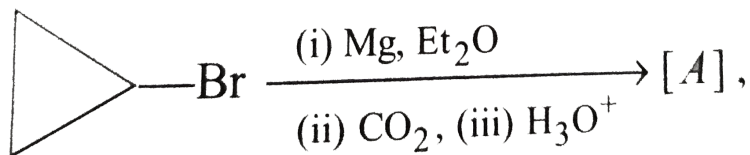
B. Sandmeyer's reaction

C. Wurtz-Fittig reaction

D. Wurtz reaction

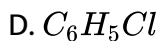
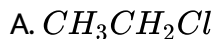
**Answer: D**

184. For the following reaction,



Answer: A

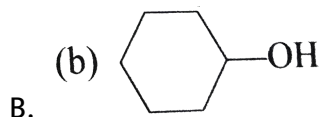
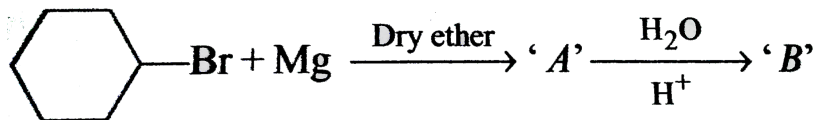
185. Which of the following is the least reactive towards nucleophile?



Answer: D

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186. Complete the following reaction

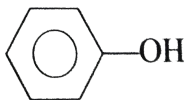


(c)



C.

(d)



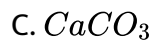
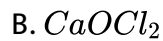
D.

**Answer: C**



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**187.** Chemical formula of phosgene is :

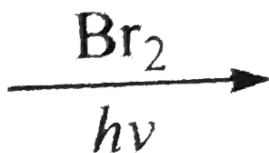
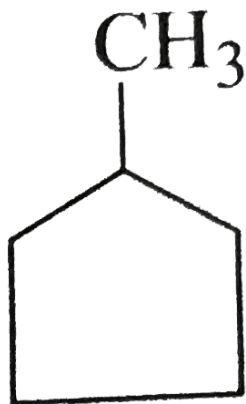


**Answer: A**

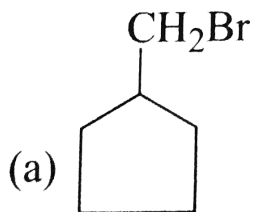


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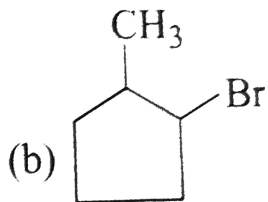
188. In the following reaction



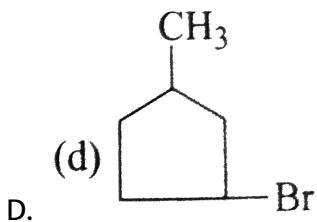
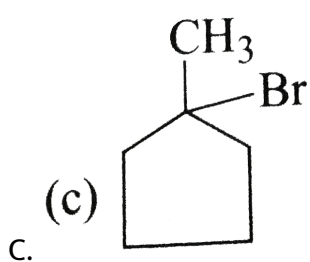
The major product obtained is :



A.



B.



**Answer: C**

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**189.** Chronic chloroform exposure may cause damage to liver and kidney due to the formation of :

- A. phosgene
- B. methylene chloride
- C. methyl chloride
- D. carbon tetrachloride



**Answer: A**

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**190.** The correct order of reactivity of the halides ethyl chloride (I) isopropyl chloride (II) and benzyl chloride (III) in  $S_N1$  reaction is :

A.  $III > II > I$

B.  $I > II > III$

C.  $II > I > III$

D.  $I > III > II$

**Answer: A**

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**191.** In Raschig's process for the preparation of chlorobenzene the reactant are :

A.  $C_6H_6$  and  $Cl_2$

B.  $C_6H_5OH$  and  $PCl_5$

C.  $C_6H_6 + HCl + O_2$

D.  $C_6H_6OH$  and  $HCl$

**Answer: C**

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**192.** Chlorobenzene when condensed with chloral in the presence of conc.

$H_2SO_4$  yields :

A. Gammexane

B. DDT

C. TNB

D.  $C_6Cl_6$

**Answer: B**

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193. the chemical name of DDT is :

- A. dichloro dinitrotoluene
- B. dichloro dimethyltoluene
- C. p-p'-dichloro diphenyl trichloroethane
- D. none of the above

Answer: C

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194. Chlorobenzene can be prepared by reacting aniline with

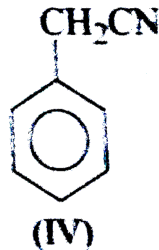
- A.  $HCl$  and  $Cu_2Cl_2$
- B. chlorine in presence of U.V. light
- C. chlorine in presence of anhydrous  $AlCl_3$

D. nitrous acid followed by heating with  $Cu_2Cl_2$

Answer: D

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195. The order of decreasing reactivity towards nitration in the following compound is :



A.  $II > IV > III > I$

B.  $II > I > III > IV$

C.  $III > II > I > IV$

D.  $I > IV > III > II$

Answer: D

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196. When benzene diazonium chloride is treated with cuprous chloride in HCl. Chlorobenzene is formed . This reaction is called :

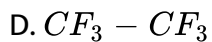
- A. Perkin's reaction
- B. Etard's reaction
- C. Gattermann reaction
- D. Sandmeyer's reaction

**Answer: D**

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197. Which of the following is an insecticide?

- A. DDT
- B.  $CHCl_3$

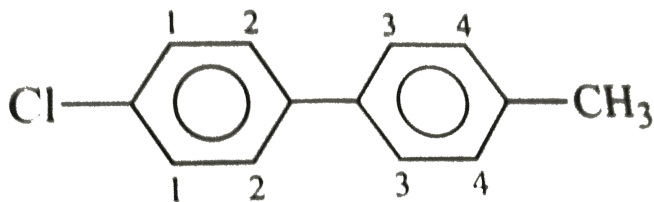


Answer: A

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198. Electrophilic substitution in the following compound will be fastest at position .....

fastest at position .....



A. 1

B. 2

C. 3

D. 4

**Answer: D**

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**199.** When phenyl magnesium bromide reacts with *t* – *bu tanol* the product would be :

- A. t-butylbenzene
- B. phenol
- C. benzene
- D. t-butyl phenyl ether

**Answer: C**

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**200.** Which one of the following compounds forms benzoic acid on oxidation ?

- A. Chlorophenol
- B. Benzyl chloride
- C. Chlorobenzene
- D. Chlorotoluene

**Answer: B**

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**201.** Which of the following methods give rise to 1-bromo-2-phenylethane?

- A. Propene + HBr followed by reaction with benzene in the presence of  $AlCl_3$
- B. Styrene +  $H_3O^+$  + followed by reaction with  $P/Br_2$
- C. Benzene + Oxirane +  $H^+$  followed by reaction with  $P/Br_2$
- D. Benzene + Oxirane +  $H^+$  followed towards reaction with HBr



**Answer: C**

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**202.** Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to

- A. the formation of less stable carbocation
- B. resonance stabilization
- C. longer carbon-halogen bond
- D. inductive effect

**Answer: B**

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**203.** Chlorination of toluene in the presence of light and heat followed by treatment with aqueous  $NaOH$  gives

A. o-cresol

B. p-cresol

C. 2:4 dihydroxy toluene

D. benzoic acid

**Answer: D**

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**204.** Which one is most reactive towards  $S_N1$  reaction?

A.  $C_6H_5CH_2Br$

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

C.  $C_6H_5CH(CH_3)Br$

D.  $C_6H_5CH(C_6H_5)Br$

**Answer: B**

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205. Which of the following statements are correct with respect to the effect of trifluoromethyl group ( $-CF_3$ ) on an electrophilic aromatic substitution ?

- (1) the  $CF_3$  group will deactivate the ring
- (2) The  $CF_3$  group will activate the ring
- (3) The  $CF_3$  group will be an o- and p- director
- (4) the  $CF_3$  group will be a meta-director

A. (1) and (2)

B. (1) and (4)

C. (1) and (3)

D. (2) and (3)

**Answer: B**



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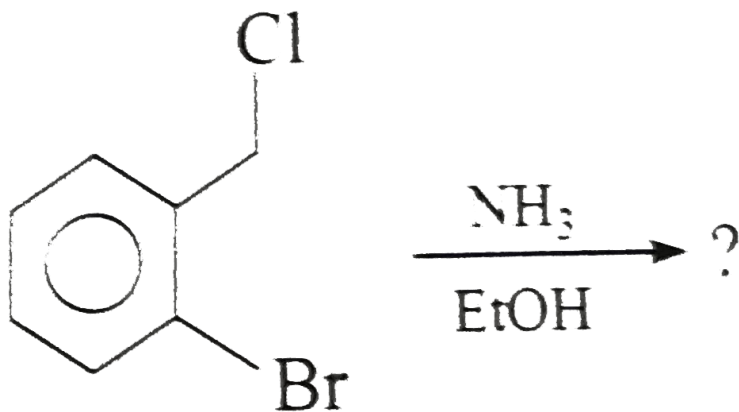
206. The position least nitrated when m-bromochlorobenzene is nitrated is :

- A. position ortho to bromine
- B. position ortho to chlorine
- C. position ortho to bromine and chlorine
- D. position meta to chlorine

**Answer: D**

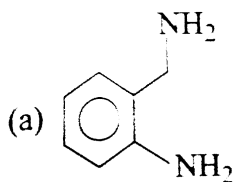


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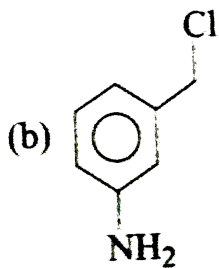


207.

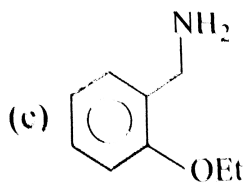
The product of the above reaction is :



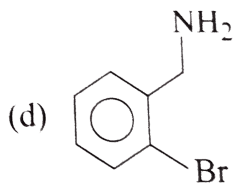
A.



B.



C.

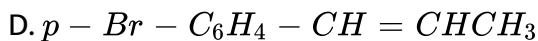
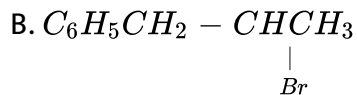
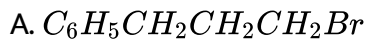


D.

Answer: D

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



Answer: C

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209. Ulmann reaction is used for the preparation of :

- A. diphenyl
- B. toluene
- C. iodobenzene
- D. naphthalene

**Answer: A**



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210. Which of the following is not formed when a mixture of methyl bromine and bromobenzene is heated with sodium metal in the presence of dry ether?

- A. Ethane
- B. Propane
- C. Toluene

D. Diphenyl

Answer: C

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211. An equimolar mixture of toluene and chlorobenzene is treated with a mixture of conc.  $H_2SO_4$  and conc.  $HNO_3$ . Indicate the correct statement from the following :

- A. p-nitrotoluene is formed in excess
- B. equimolar amounts of p-nitrotoluene and p-nitro-chlorobenzene are formed
- C. p-nitrochlorobenzene is formed in excess
- D. m-nitrochlorobenzene is formed in excess

Answer: A

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212. In the reaction of p-chlorotoluene with  $KNH_2$  in liquid  $NH_3$  the major product is .

- A. o-toluidine
- B. m-toluidine
- C. p-toluidine
- D. p-chloroaniline

**Answer: B**



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213. The set of compounds in which the reactivity of halogen atom in the ascending order is .

- A. Chlorobenzene vinylchloride , chloroethane
- B. chloroethane , chlorobenzene , vinylchloride

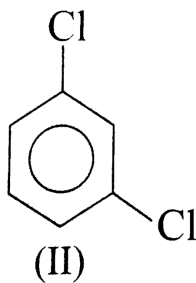
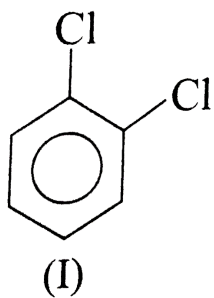
C. vinylchloride , chlorobenzene, chloroethene

D. vinylchloride , chloroethane , chlorobenzene

**Answer: A**

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**214.** Which among the following has higher melting point



A. I and II

B. III

C. II and III

D. I

**Answer: B**

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**215.** The bad smelling substance formed by the action of alcoholic potash on chloroform and aniline is :

- A. phenylcyanate
- B. phenyl cyanide
- C. phenyl isonitrile
- D. phenyl isocyanate

**Answer: C**

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**216.** Fluorobenzene ( $C_6H_5F$ ) can be synthesized in the laboratory ,

A. by heating phenol with HF and KF

B. from aniline by diazotisation followed by heating the diazonium salt with  $HF_4$

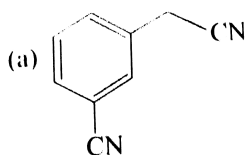
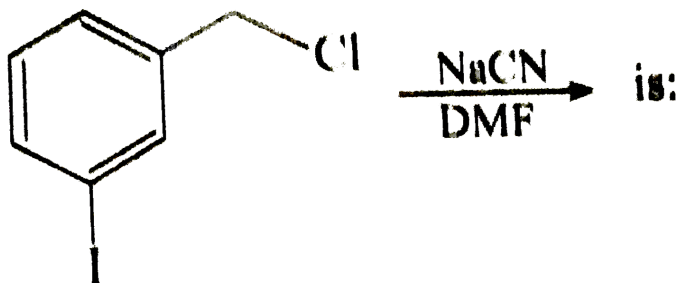
C. by direct fluorination of benzene with  $F_2$  gas

D. by reacting bromobenzene with NaF solution

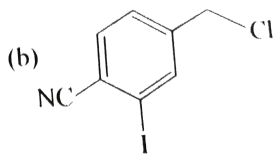
Answer: B

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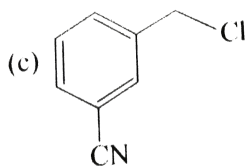
217. the structure of the major product formed in the following reaction :



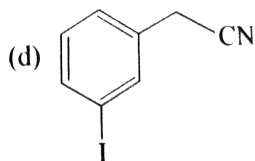
A.



B.



C.



D.

**Answer: D**



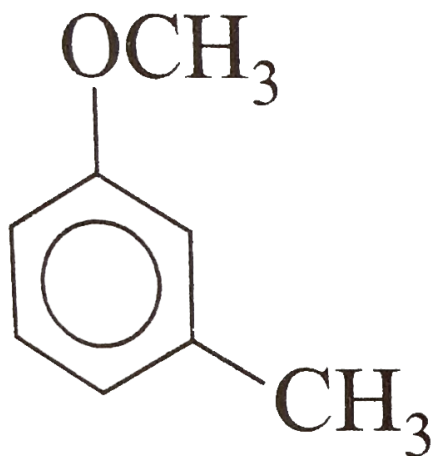
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**218.** Phenyl magnesium bromide reacts with methanol to give:

- A. a mixture of anisole and  $Mg(OH)Br$
- B. a mixture of benzene and  $Mg(OMe)Br$
- C. a mixture of toluene and  $Mg(OH)Br$
- D. a mixture of phenol and  $Mg(Me)Br$

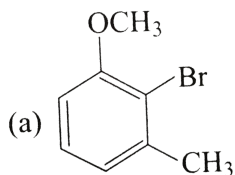
Answer: B

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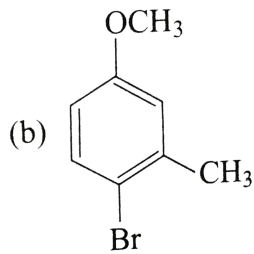


219.

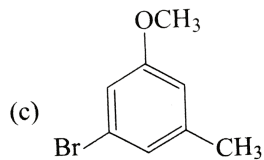
The major product formed on monobromination  $\left(\frac{Br_2}{FeBr_3}\right)$  of the following compound. Is



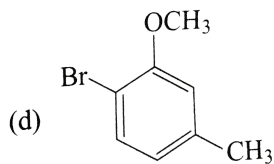
A.



B.



C.



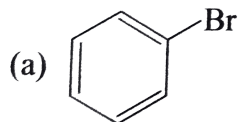
D.

**Answer: B**

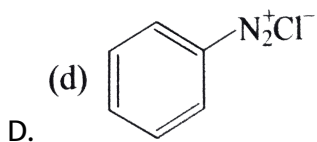
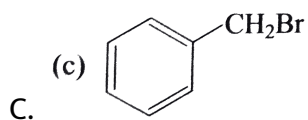
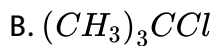
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220.  $X \xrightarrow[\text{HNO}_3]{\text{AgNO}_3}$  Yellow or white ppt

which of the following cannot be X



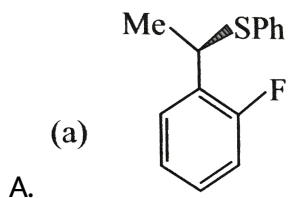
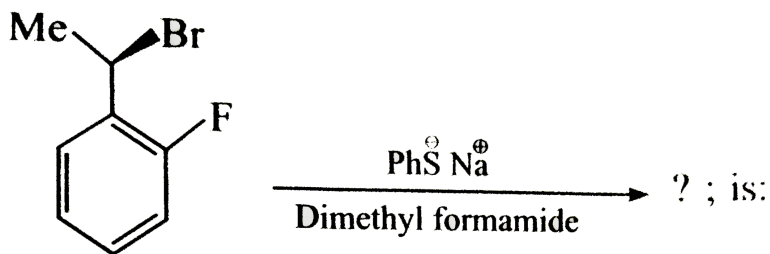
A.



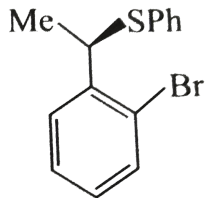
Answer: A

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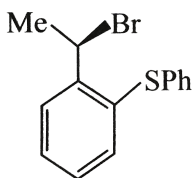
221. the major product of the following reaction



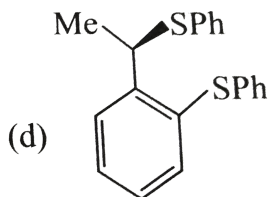




B.



C.



D.

**Answer: A**

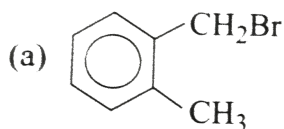
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**222.** In gattermann reaction a diazonium group is replaced by X using Y.

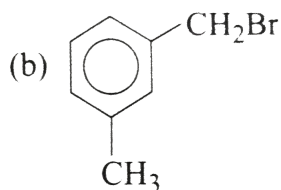
What are X and Y?

- | <i>X</i>   | <i>Y</i>       |
|------------|----------------|
| (a) $Cl^-$ | $Cu / HCl$     |
| (b) $Cl^+$ | $CuCl_2 / HCl$ |
| (c) $Cl^-$ | $CuCl_2 / HCl$ |
| (d) $Cl_2$ | $Cu_2O / HCl$  |

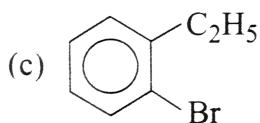
223. Compound (A),  $C_8H_9Br$  gives a white precipitate when warmed with alcoholic  $AgNO_3$ . Oxidation of (A) gives an acid (B)  $C_8H_6O_4$ . (B) easily forms anhydride on heating. Identify the compound (A)



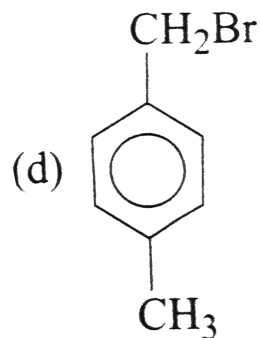
A.



B.



C.

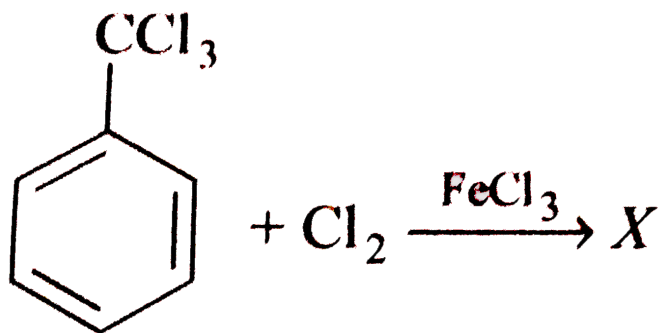


D.

Answer: A

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224. Complete the following reaction



- A. ortho chlorobenzotrichloride
- B. para chlorobenzotrichloride
- C. meta chlorobenzotrichloride
- D. none of the above

Answer: C

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225. the incorrect statement with respect to  $S_{N1}$  and  $S_{N2}$  mechanisms for alkyl halide is :

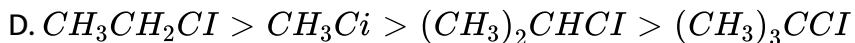
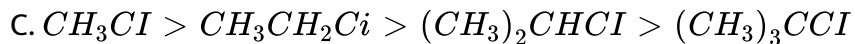
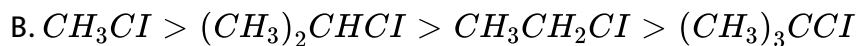
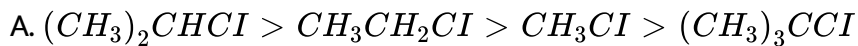
- A. a strong nucleophilic in an aprotic solvent increases the rate or favours  $S_{N2}$  reaction
- B. a weak nucleophilic and a protic solvent increases the rate or favours  $S_{N1}$  reaction
- C. competing reaction for an  $S_{N2}$  reaction rearrangement
- D.  $S_{N1}$  reaction can be catalysed by some Lewis acids

Answer: C

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226. In  $S_{N2}$  reactions, the correct order of reactivity for the following compounds:

$CH_3Cl$ ,  $CH_3CH_2Cl$ ,  $(CH_3)_2CHCl$  and  $(CH_3)_2CCl$  is:



Answer: C

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

A. Finkelstein reaction

B. Swarts reaction

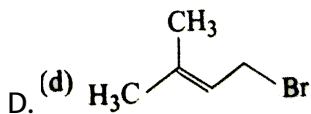
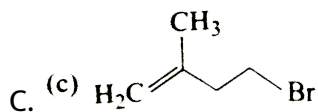
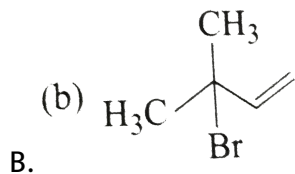
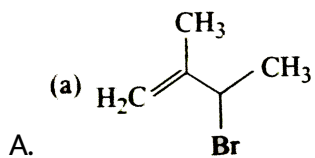
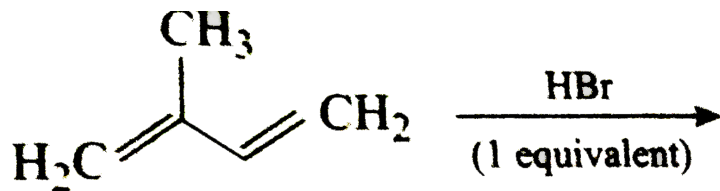
C. Sandmeyer's reaction

D. Free radical fluorination

Answer: B

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228. In the following reaction the major product is :



Answer: D

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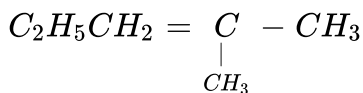
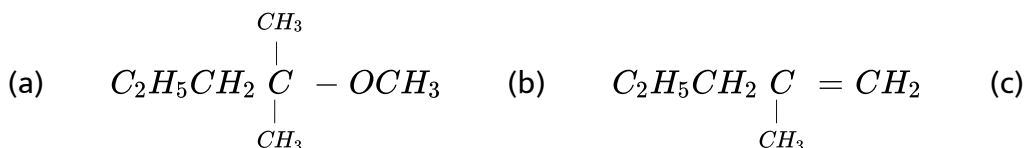
229. Replacement of *Cl* of chlorobenzene to give phenol require drastic conditions but chlorine of 2,4-dinitrochlorobenzene is readily replaced because .

- A.  $-NO_2$  withdraws electrons from o-and p-positions
- B.  $-NO_2$  withdraws electrons from m-position
- C.  $-NO_2$  donates electrons at m-position
- D.  $-NO_2$  makes the ring electron rich at o-and p-positions

**Answer: A**

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230. 2-chloro-2-methylpentane on reaction with sodium methoxide in methanol yields:



A. both (i) and (iii)

B. only (iii)

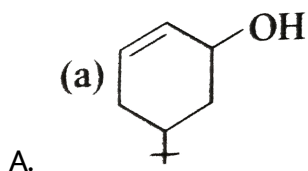
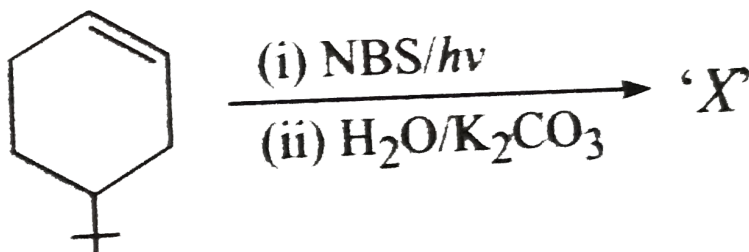
C. both (i) and (ii)

D. all of these

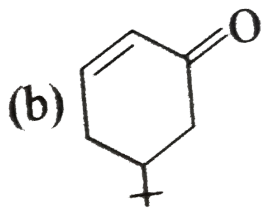
Answer: D

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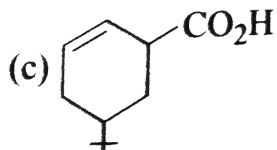
231. The product of the reaction given below is :



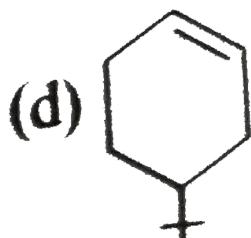




B.



C.



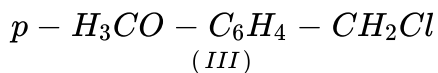
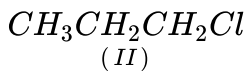
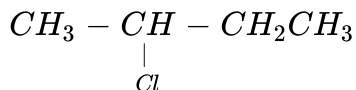
D.

**Answer: A**



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**232.** The increasing order of reactivity of the following halides for the  $S_N1$  reaction is :



A.  $\text{III} < \text{II} < \text{I}$

B.  $\text{II} < \text{I} < \text{III}$

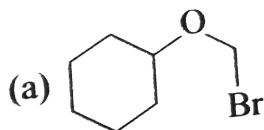
C.  $\text{I} < \text{III} < \text{II}$

D.  $\text{II} < \text{III} > \text{I}$

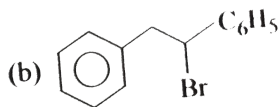
Answer: B

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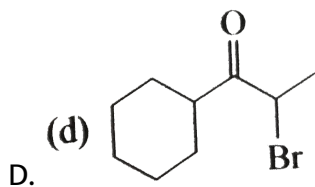
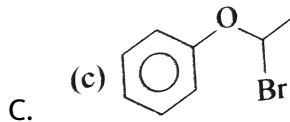
233. Which of the following, upon treatment with tert-BuONa followed by addition of bromine water, fails to decolourise the colour of bromine ?



A.



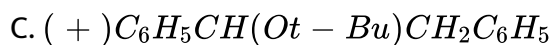
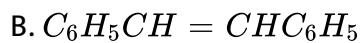
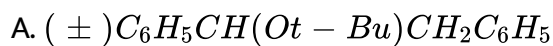
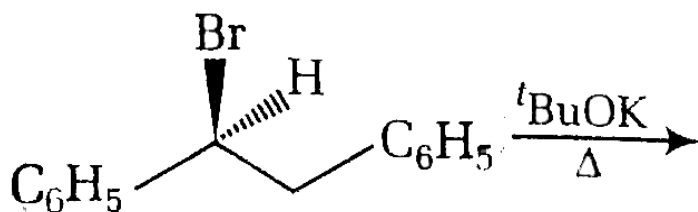
B.

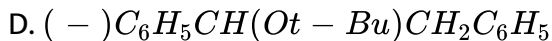


Answer: A

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234. The major product obtained in the following reaction is



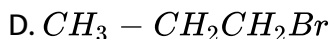


Answer: B

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### Objective Questions Level -B

1. An alkyl bromine (A) on treatment with Na and ether gives a hydrocarbon (B). (B) on treatment with HBr and peroxide gives  $\text{Br} - (\text{CH}_2)_6 - \text{Br}$  compound (A) is :



Answer: B

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2. The number of monochloro product obtained during the reaction of 2,3-dimethyl butane with  $Cl_2$  in presence of sunlight is : (do not consider optical isomers)

A. 2

B. 3

C. 4

D. 5

**Answer: A**



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3. In which of the following pairs, the bromination of first member is easier than the second member ?

A. Isobutane n-Butane

B. n-Butane isobutane

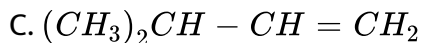
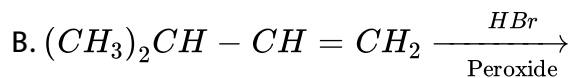
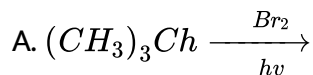
C. Methane, ethane

D. None of these

**Answer: A**

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4. ter-Alkyl halide is obtained as major product in :

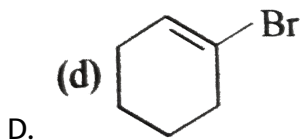
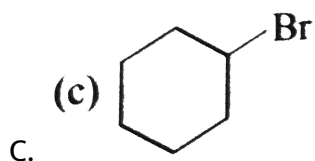
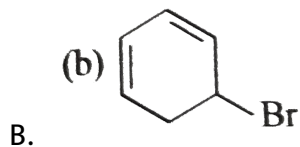
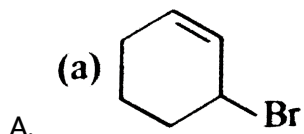


D. both (a) and (C)

**Answer: D**

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5. Which of the following is fast de-brominated ?

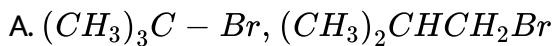


Answer: B

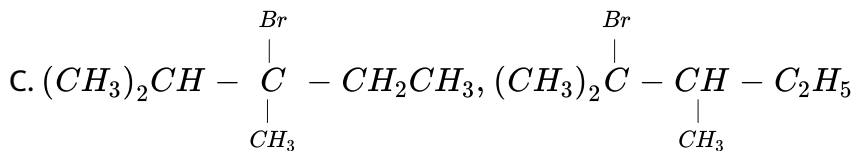


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6. In which of the following pairs both members on heating with alc. KOH result in the formation of same alkene as major product?



B. n-Propyl iodide, isopropyl iodide

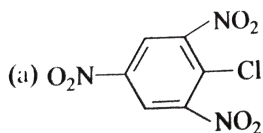


D. All of above

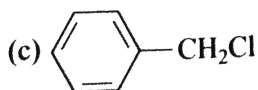
**Answer: D**

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7. Detection of chlorine is possible without preparing sodium extract in :



A.



C.

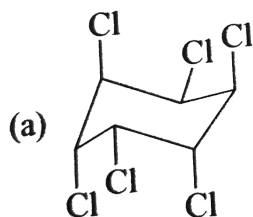




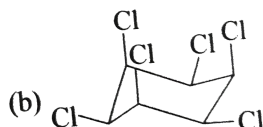
Answer: A

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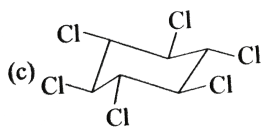
8. Dehydrohalogenation by strong base is slowest in :



A.



B.



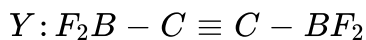
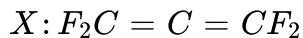
C.

D. 

Answer: C

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9. consider the structures of the following two molecules :



In which of these two it is impossible for all the four F-atoms to lie in the same plane ?

A. X

B. Y

C. Both X and Y

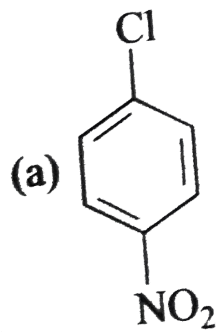
D. None of these

**Answer: A**

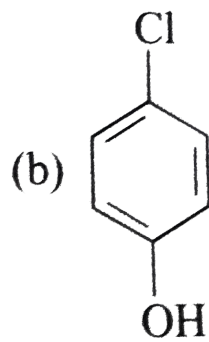


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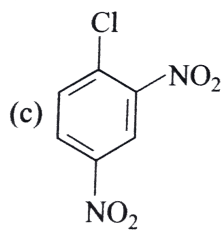
10. Which of the following is least reactive towards nucleophilic substitution with aqueous KOH



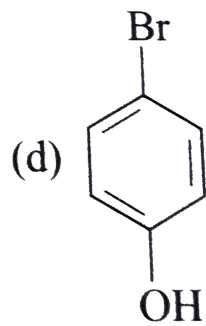
A.



B.



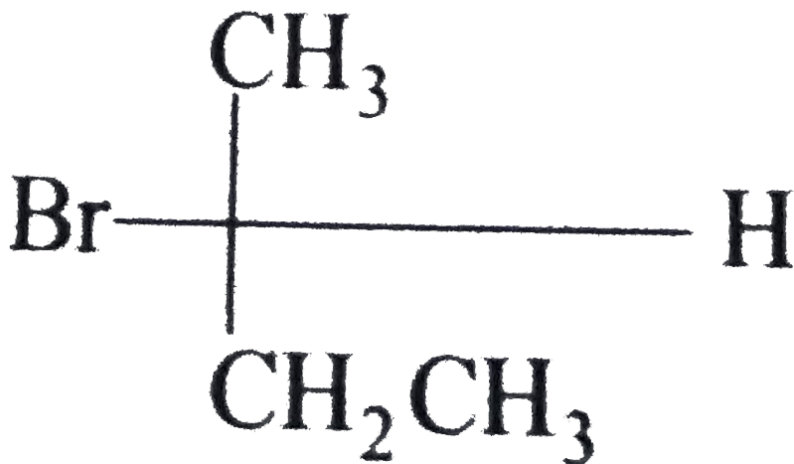
C.



D.

Answer: B

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water (through  $S_N2$  reaction mechanism) then stereochemistry of product so formed will be:

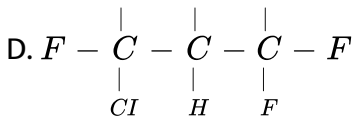
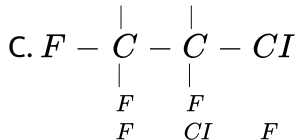
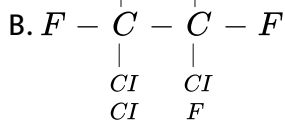
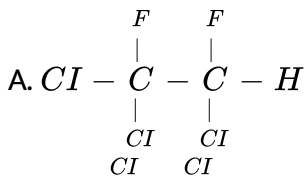
- A. R
- B. S
- C. mixture of R and S
- D. Partial S+ racemic mixture

Answer: B



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12. Which of the following is known as freon which is used as a refrigerant ? .

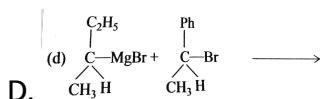
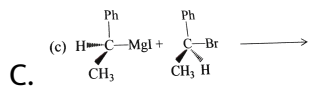
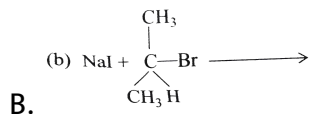
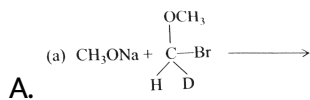


Answer: C



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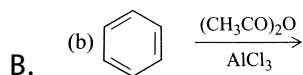
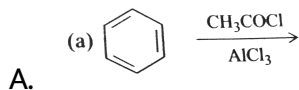
13. In which of the following reactions an optically active single product is formed ?

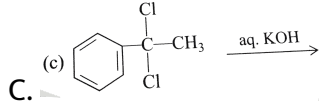


Answer: D

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14. Which of the following will give acetophenone as a product ?



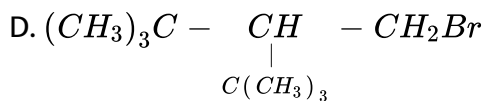
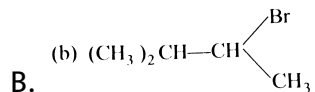
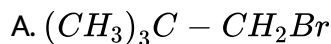


D. All of the above

Answer: D

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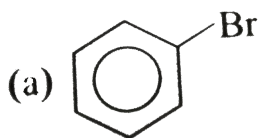
15. Most reactive alkyl halide towards  $E2$  mechanism is :



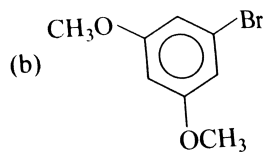
Answer: B

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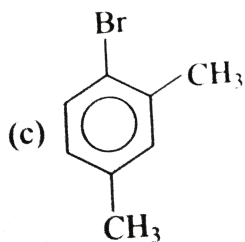
16. Which of the following compounds is the most likely to undergo a bimolecular nucleophilic substitution reaction with aqueous NaOH?



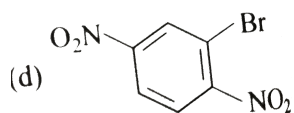
A.



B.



C.



D.

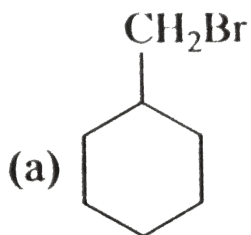
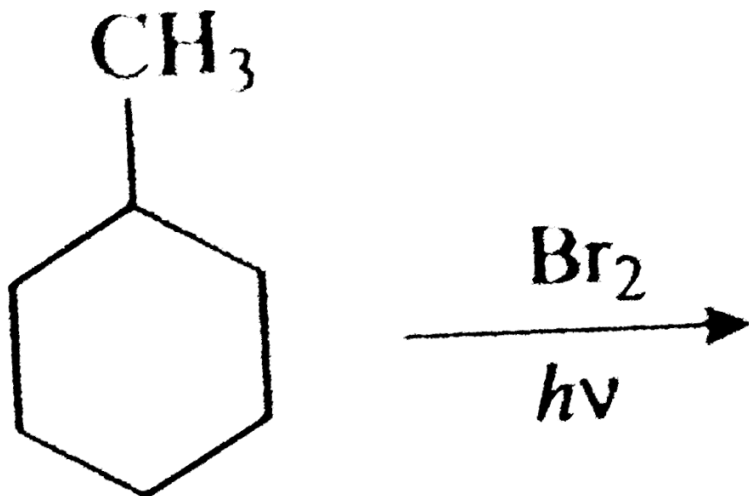
Answer: D



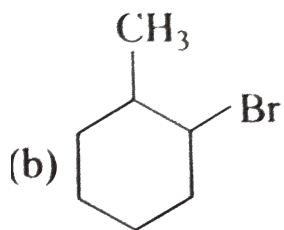
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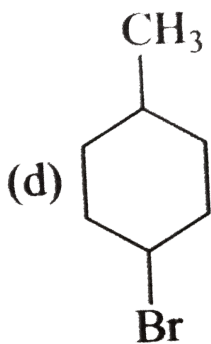
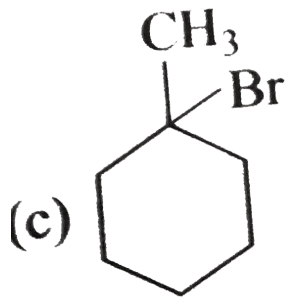
17. The major product obtained in the reaction



A.



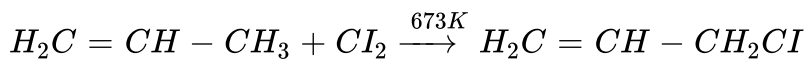
B.



Answer: C

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18. The reaction



proceeds through the intermediate formation of a :

A. carbene

B. carbocation

C. free radical

D. carbanion

**Answer: C**



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**19. Iodoform is used as an:**

A. anaesthetic

B. analgesic

C. antiseptic

D. antifebrile

**Answer: C**



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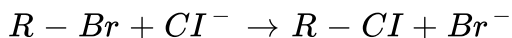
20. The trade name of trichloroethylene is :

- A. freon
- B. westron
- C. westrosol
- D. DDT

**Answer: C**

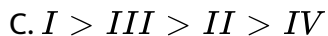
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21. In the reaction :



The rates of reaction of ethyl bromide (I) n-propyl bromide (II) isobutyl bromide (III) and neopentyl bromide (IV) follow the order:

- A.  $IV > III > II > I$
- B.  $I > II > III > IV$

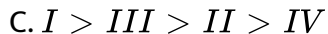
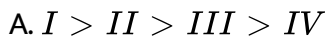
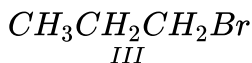
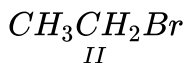
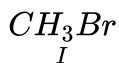


Answer: B



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22. Arrange the following compounds in the decreasing order of the boiling point:

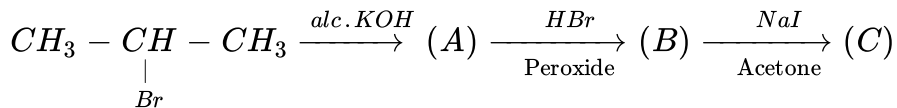


Answer: B

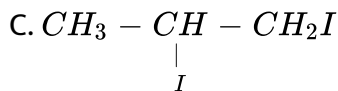
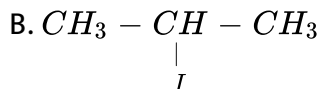
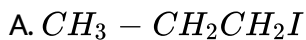


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23. In the reaction ,



The compound (C) is :



Answer: A



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24.  $CCl_4$  is used as fire extinguisher because :

A. of its covalent bond

B. of its low b.pt.

C. of its high m.pt.

D. it gives incombustible vapours

**Answer: D**

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25. The correct of reactivity of alkyl halides for  $S_{N1}$  reaction is :

A.  $RI > RBr > RCl > RF$

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

C.  $3^\circ < 2^\circ < 1^\circ$

D.  $RF < RCl > RBr > RI$

**Answer: B**

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26. Match List I with List II and select the correct answer using the codes

given below the lists :

List I

List II

Compound

Use

(A) Chloretone

(i) Monomer

(B) Chloropicrin

(ii) In war and as insecticide

(C) Lindane

(iii) Insecticide

(D) Teflon

(iv) Hypnotic

Codes :

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

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

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

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

**Answer: C**



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27. Match List I with list II and select the correct answer using the codes given below the lists:

List I	List II
Compound	Action
(A) Teflon	(i) Ozone layer depletion
(B) Pyrene	(ii) Non-biodegradable insecticide
(C) DDT	(iii) Non-stick cookwares and insulator
(D) Freon	(iv) Fire extinguisher

Codes

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

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

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

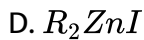
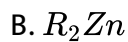
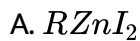
D. (ii),(i),(iv),(iii)

**Answer: C**



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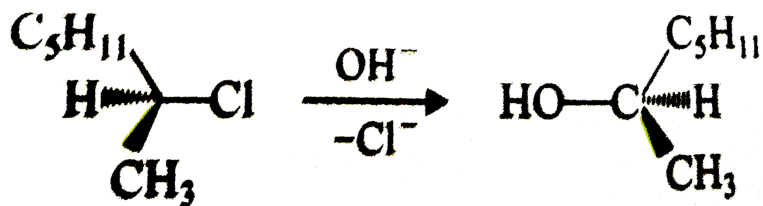
28. the intermediate compound formed in Frankland's reaction is



Answer: C

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29. The reaction given



is :

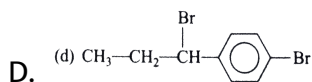
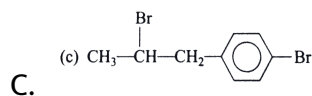
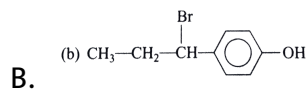
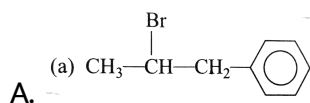
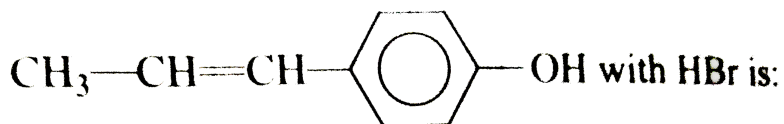


D.  $E_2$

Answer: A

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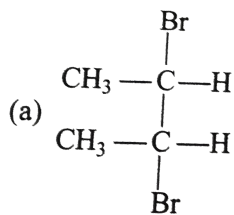
30. The major product of the reaction



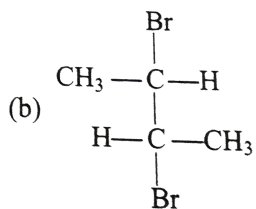
Answer: B

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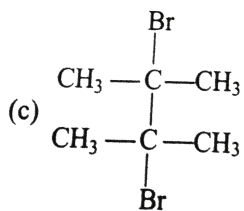
31. Which among the following on dehalogenation will give trans-alkene?



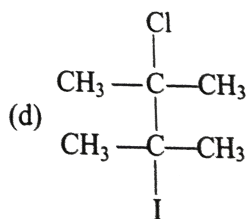
A.



B.



C.



D.

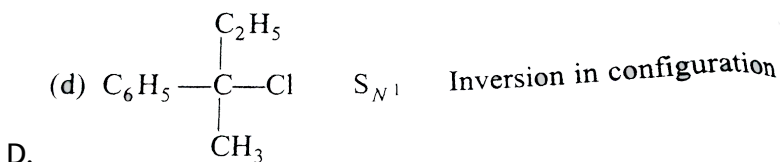
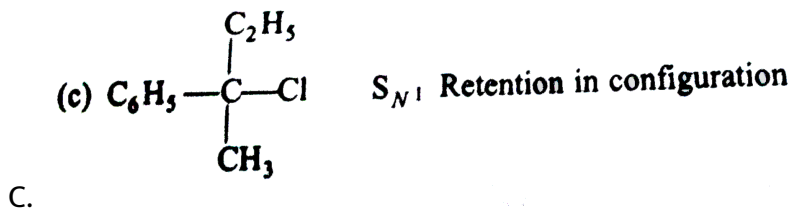
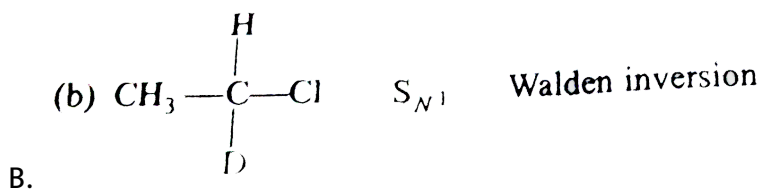
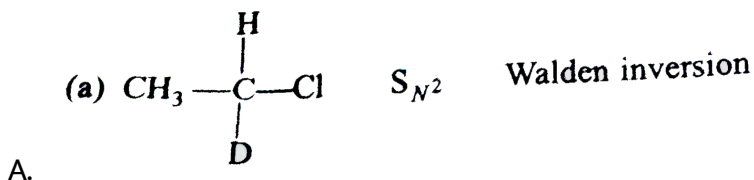
Answer: A

32. Which of the following combinations is correctly matched ?

compound

Reaction

Stereochemistry

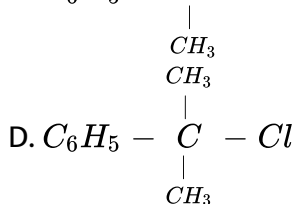
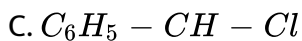
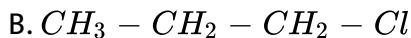
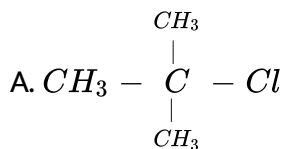


Answer: A

33. for the given reaction



Which of the following alkyl halides will give the maximum yield ?

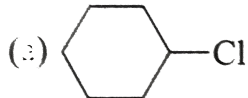


Answer: B

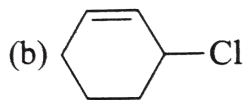


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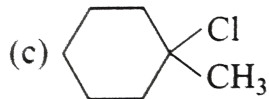
34. Which among the following compounds will be most reactive for  $S_{N1}$  reaction ?



A.



B.



C.

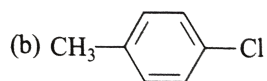


D.

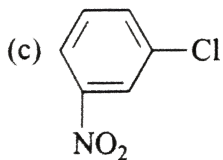
**Answer: D**

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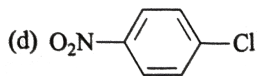
**35.** Ullmann reaction is given by :



B.



C.

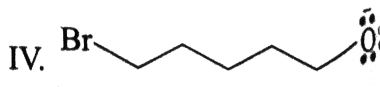
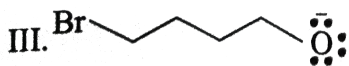
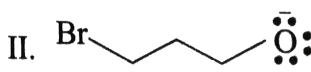
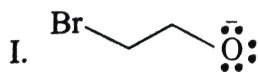


D.

**Answer: D**

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36. In the following compounds nucleophile and the leaving groups are in the same molecule :



these dual nature species can undergo intramolecular and intermolecular nucleophilic substitution. Intramolecular substitution reaction is possible in :

A. I, II



B. II, III

C. III, IV

D. IV

Answer: C

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37.

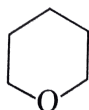
Compound



undergoes intramolecular nucleophilic substitution of the type ..... giving

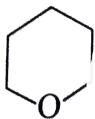
.....

(a)  $S_N1$ ;



A.

(b)  $S_N2$ ;



B.

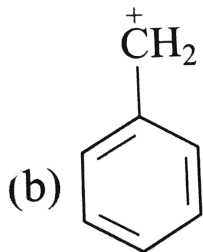
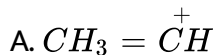
C. both of the above are correct

D. intramolecular reaction is not possible

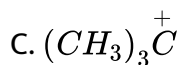
**Answer: B**

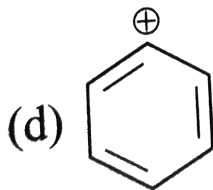
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38. which is the most stable carbocation formed as intermediate in nucleophilic substitution reaction ?



B.





D.

**Answer: B**

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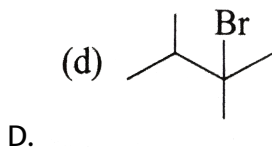
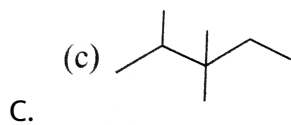
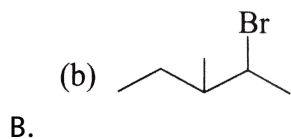
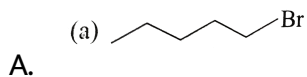
39. Transition state is accompanied by the formation of which of the following species in  $S_N2$  reaction ?

- A. Carbocation
- B. Carbanion
- C. Free radical
- D. A dianion

**Answer: A**

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40. Only one of the following alkyl halides can be prepared as the major product of the addition of HBr to an alkene:



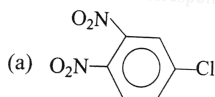
Answer: D



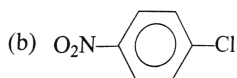
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41. which chloro derivative of benzene among the following would undergo hydrolysis most readily with aqueous NaOH to furnish the corresponding hydroxy compound?

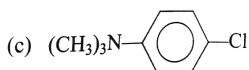
OR ANSWER the corresponding



A.



B.



C.



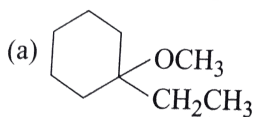
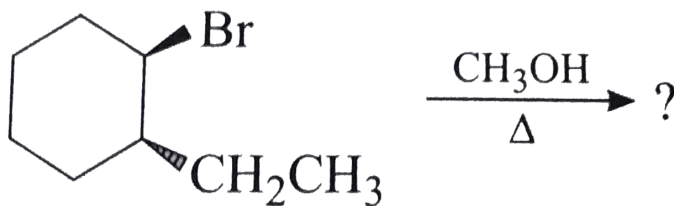
D.

**Answer: A**

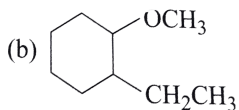


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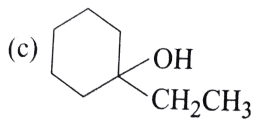
42. What will be the major product of the following reaction



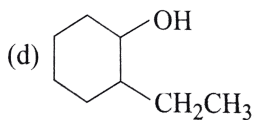
A.



B.



C.



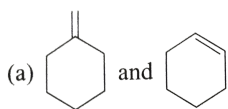
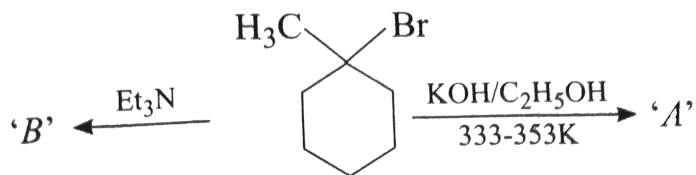
D.

**Answer: A**

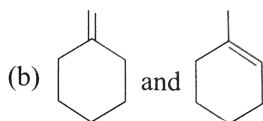


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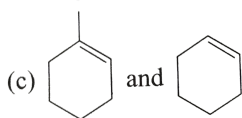
43. The major organic products 'A' and 'B' in the given reactions are respective :



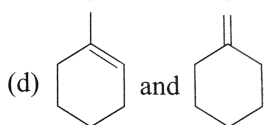
A.



B.



C.



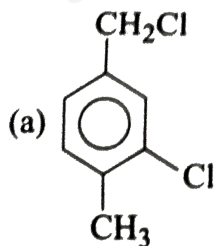
D.

Answer: D



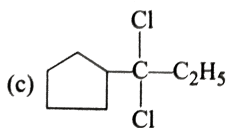
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44. Structure of  $C_8H_8Cl_2$ . Which on aqueous alkali hydrolysis gives a product which does not give positive iodoform test but gives silver mirror test is:

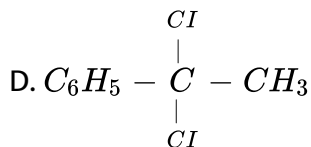


A.

B.  $C_6H_5CH_2CHCl_2$



C.

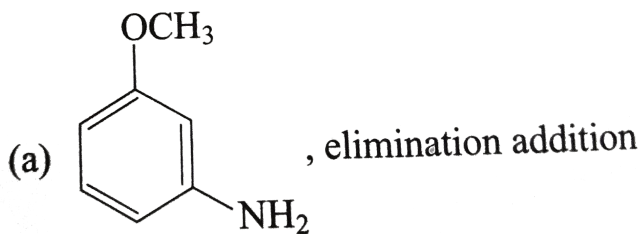
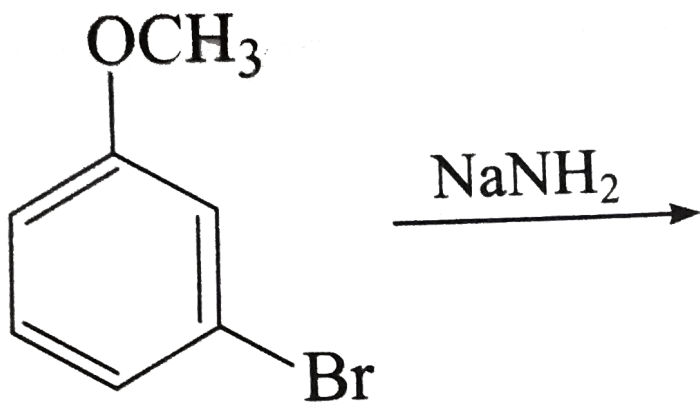


Answer: B

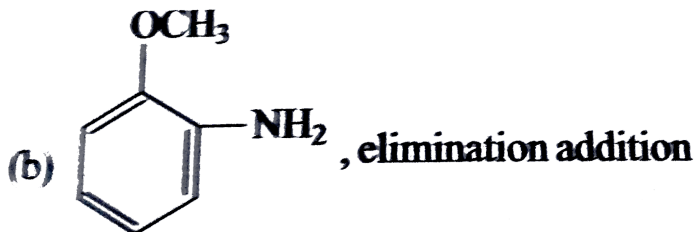
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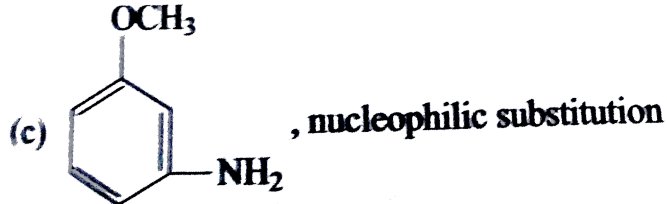
45. Complete the following reaction



A.



B.



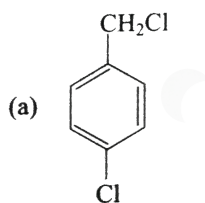
C.

D. none of the above

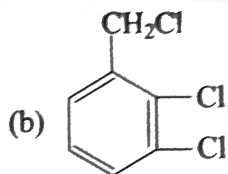
Answer: C

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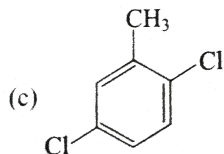
46. An aromatic compound  $C_7H_6Cl_2$  (A), gives AgCl on boiling with alcoholic  $AgNO_2$  solution and yields  $C_7H_7OCl$  on treatment with sodium hydroxide (A) on oxidation gives monochlorobenzoic acid. The compound (A) is



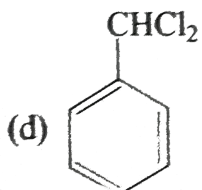
A.



B.



C.

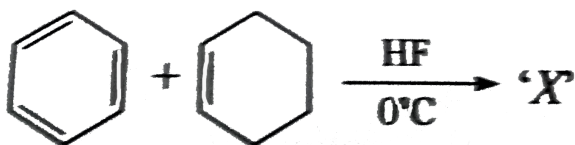


D.

Answer: A

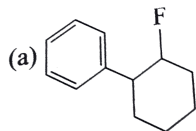
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47. In the given reaction

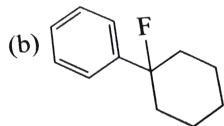


The product 'X' is :

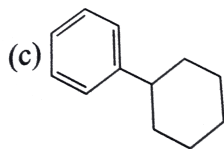
Organic Chemistry



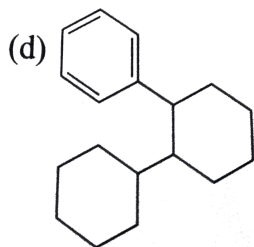
A.



B.



C.



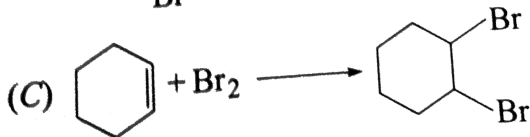
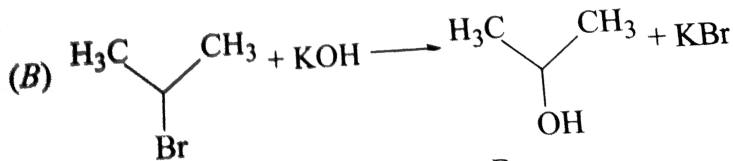
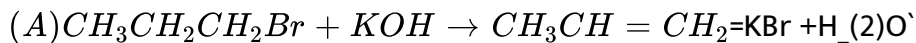
D.

Answer: C



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48. For the following reaction :



which of the following statement is correct ?

A. (A) is elimination (B) and (C) are substitution reaction

B. (A) is substitution (B) and (C) are addition reaction

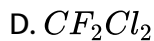
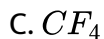
C. (A) and (B) are elimination reaction and (C) is addition reaction

D. (A) is elimination (B) is substitution and (C) is addition reaction

Answer: D

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1. The compound(s) used as refrigerant are

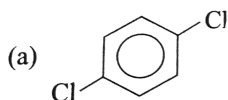


Answer: A:D

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2. Which of the following chemicals are used as moth repellents ?

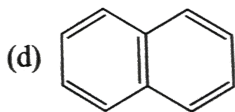
Which of the following is



A.

B. Perchloroethane

C.  $CHCl_3$

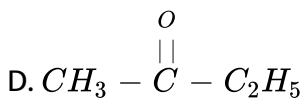
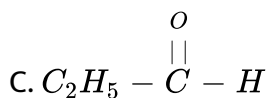
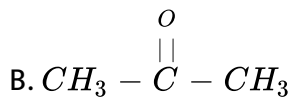
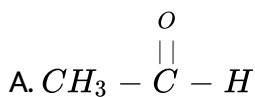


D. *(faint text)*

**Answer: A::B::D**

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3. Which of the following compounds will give iodoform test with  $I_2/NaOH$

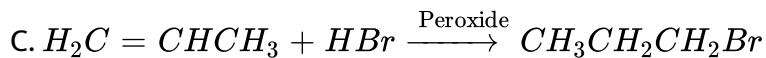
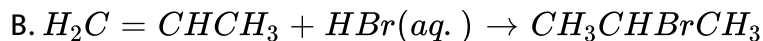
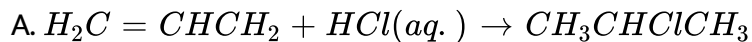


**Answer: A::B::D**



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4. Select the correct addition products among the following :



Answer: A::B::C::D



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5. What are the intermediate products involved in the following reaction

?





B.  $CCl_2$

C.  $CH(OH)_3$

D.  $COCl_2$

**Answer: A::B**

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6. Ethyl alcohol on treatment with bleaching powder gives chloroform  
.Which of the following is /are the function of bleaching powder ?

A. Chlorinating agent

B. Oxidising agent

C. Hydrolysing agent

D. None of these

**Answer: A::B::C**

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7. Select the correct statement among the following ?

- A.  $S_{N1}$  reactions involve two steps
- B.  $S_{N2}$  reactions involve single step
- C.  $S_{N1}$  reaction involves transition state intermediate
- D.  $S_{N2}$  reaction involves carbonium ion intermediate

Answer: A:B

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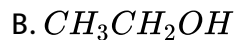
8. Which of the following reaction products are correct

- A.  $CH_3 - Cl + Ag - CN \rightarrow CH_3 - CN + AgCl$
- B.  $CH_3 - Cl + Na^+ CN^- \rightarrow CH_3 - NC + NaCl$
- C.  $CH_3 - Cl + Ag - NO_2 \rightarrow CH_3 - NO_2 + AgCl$
- D.  $CH_3 - Cl + NaNO_2 \rightarrow CH_3 - O - N = O + NaCl$

Answer: C::D

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9. Which of the following can give iodoform test ?`



D. both (a) and (c)

Answer: A::B

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10. which compounds among the following gives a positive iodoform test

?

A. Ethanol

B. Ethanal

C. 1-Butanol

D. 2-Butanol

**Answer: A::B::D**

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**11.** Which of the following compounds will give a yellow precipitate with iodine alkali?

A. Acetophenone

B. Methyl acetate

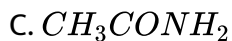
C. Acetamide

D. 2-Hydroxypropane

**Answer: A::D**

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12. Which of the following will give a yellow precipitate with  $I_2 / NaOH$

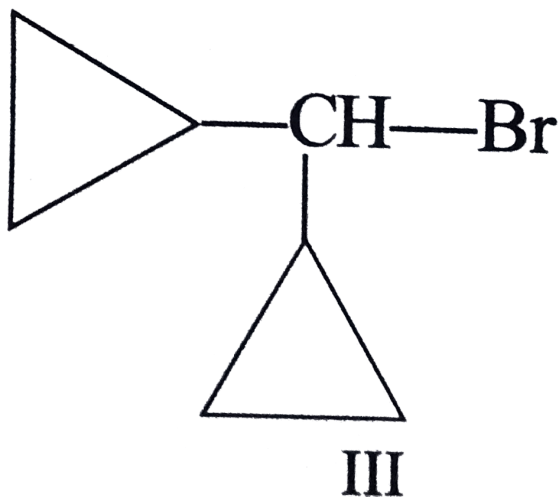


Answer: A::D

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13. Which of the following statements regarding the given compounds are true ?

I



A. Reactivity for  $S_N1$  is  $III > II > I$

B. Reactivity for  $S_N1$  is  $I > III > II$

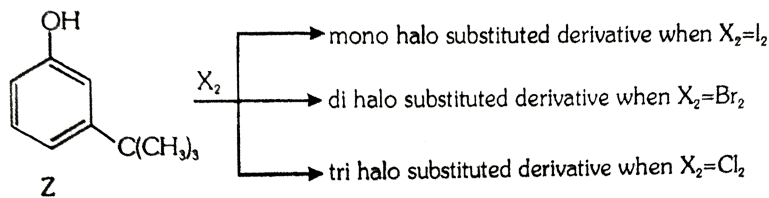
C. Reactivity for  $S_N2$  is  $II > III > I$

D. Reactivity for  $S_N2$  is  $II > I > III$

Answer: B::C

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14. The reactivity of compound  $Z$  with different halogens under appropriate conditions is given below-



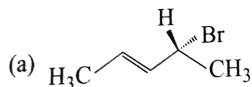
The observed pattern of electrophilic substitution can be explained by-

- A. the steric effect of the halogen
- B. the steric effect of the ter-butyl group
- C. the electronic effect of the phenolic group
- D. the electronic effect of the ter-butyl group

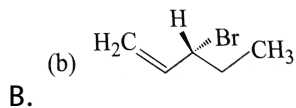
**Answer: A::B::C**

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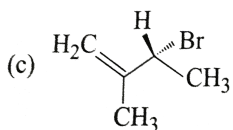
15. Compound (S) that on hydrogenation product (S) optically inactive compound (s) is/are



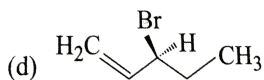
A.



B.



C.

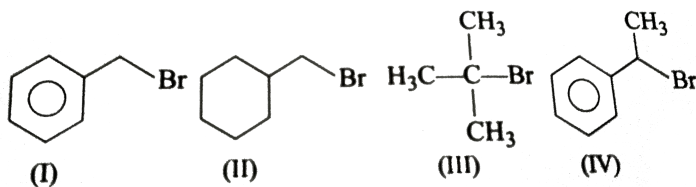


D.

Answer: B::D

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16. For the following compounds the correct statement(s) with respect of nucleophilic substitution reactions is (are) :



A. (i) and (ii) follow  $S_N2$  mechanism



B. the order of reactivity for (i) , (iii) and (iv) is :  $(IV) > I > III$

C. iv and iii follow  $S_{N1}$  mechanism

D. compound IV undergoes inversion of configuration

**Answer: A::C::D**



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### Assertion -Reason Type Questions

1. (A) The dipole moment of  $CH_3F$  is greater than  $CH_3Cl$ .

(R) C-F bond is more polar than C-Cl bond.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: D**

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2. (A) the dipole moment of  $CH_3Cl$  is greater than  $CH_3F$ .

(R) Bond length C-Cl bond is greater than C-F bond.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: A**

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3. (A)  $S_N2$  reaction takes place in single step.

(R)  $S_N2$  reaction involves the reactivity order of alkyl halides as  $1^\circ > 2^\circ > 3^\circ$  halides.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: A**



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4. (A) Nucleophilic substitution of iodoform is easier than chloroethane.

(R) bond energy of C-I bond is less than that of C-Cl bond.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: A**

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5. (A) Optically active 2-iodobutane on treatment with NaI in acetone undergoes racemization.
- (R) Reaction involves multiple Walden inversion and the product contains mixture of dextro and laevo isomer.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)

- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: A**

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6. (A) Nucleophilic substitution reaction on an optically active halide gives a mixture of enantiomers.

(R) Reaction should be in accordance with  $S_{N1}$  mechanism.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: A**

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7. (A) Ethyl chloride is more reactive than vinyl chloride towards nucleophilic substitution reaction .

(R) In vinyl chloride the -Cl is bonded to sp-hybridized carbon of an alkene.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

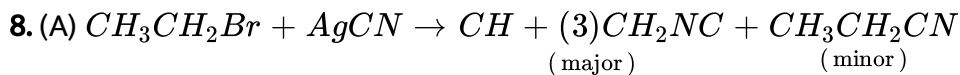
C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: C**



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(R)  $\cdot^- \text{CN}$  is an ambident nucleophilic therefore reaction gives both cyanide and isocyanide.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

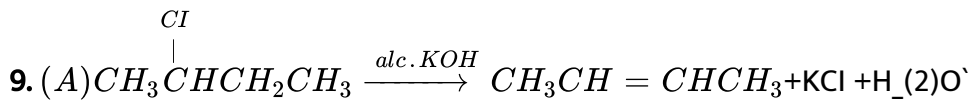
C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

Answer: A



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Dehydrohalogenation reaction of 2-chlorobutane gives 2-butene.

(R) Elimination reaction takes place according to Saytzeff's rule.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: A**

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10. (A) Addition of HBr to alkene in presence of peroxide gives anti-Markownikoff product.



(R) This addition follows ionic mechanism .

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: C**



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11. (A) 2- Bromobutane on reaction with sodium ethoxide in ethanol gives 1-butene as a major product.

(R) 1-Butene is less stable than 2-butene.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: D**



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12. (A) Isobutanal does not give iodoform test.

(R) It does not have  $\alpha$ -hydrogen.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)

- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: C**

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13. (A) Styrene on reaction with HBr gives 2-bromo-2-phenyl ethane.  
(R) Benzyl radical is more stable than alkyl radical .

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.

D. If both (A) and (R) are incorrect.

**Answer: E**

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14. Assertion. *t*-Butyl Methyl ether is not prepared by the reaction of *t* – butyl bromide with sodium methoxide.

Reason: Sodium methoxide is a strong nucleophile.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: B**



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15. A) Addition of HBr on 2-butene gives two isomeric products.

R) Addition of HBr on 2-butene follows Markownikoff's rule.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If both (A) and (R) are incorrect.

**Answer: D**



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16. Assertion: Aryl halides undergo nucleophilic substitution reactions with ease.

Reason: The carbon halogen bond in aryl halides has partial double bond character.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: D**



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17. (A) Benzyl bromide when kept in acetone water it produces benzyl alcohol.

(R) The reaction follows  $S_N2$  mechanism.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: C**

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**18.** (A) 4-Nitrochlorobenzene undergoes nucleophilic substitution more readily than chlorobenzene.

(R) Chlorobenzene undergoes nucleophilic while 4-nitro chlorobenzene undergoes nucleophilic substitution by addition elimination mechanism.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)

- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)
- C. If (A) is correct but (R) is incorrect.
- D. If (A) is incorrect but (R) is correct.

**Answer: B**

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19. (A) Greater the stability of carbanion, greater is its ease of formation and hence, more reactive is aryl halide.

(R) Chlorobenzene is less reactive than p-chloroanisole towards nucleophilic substitution reactions.

- A. If both (A) and (R) are correct and (R) is the correct explanation of (A)
- B. If both (A) and (R) are correct but (R) is not the correct explanation of (A)



C. If (A) is correct but (R) is incorrect.

D. If both (A) and (R) are incorrect.

**Answer: E**

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20. (A) Vinyl chloride undergoes  $S_{N1}$  and  $S_{N2}$  reactions.

(R) Allyl carbocations is stabilised due to resonance.

A. If both (A) and (R) are correct and (R) is the correct explanation of

(A)

B. If both (A) and (R) are correct but (R) is not the correct explanation

of (A)

C. If (A) is correct but (R) is incorrect.

D. If (A) is incorrect but (R) is correct.

**Answer: D**

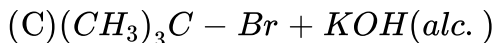
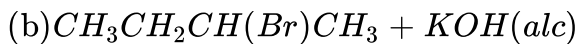
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## Matrix -Match Type Questions

### 1. Match the following

Column I

(Reactants)



Column II

(Products)

(p) Butan-2-ol

(q) But-2-ene(trans)

(r) But-1-ene

(s) 2-Methylprop-1-ene

(t)  $\alpha, \beta$  - elimination

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### 2. Match the following :

Column I

(a) Compounds which give three dichloro derivatives

(b) Ethanol

(c) Acetone

(d) Give propene on treatment with alcoholic KOH

column II

(p) Chlorocyclohexane

(q) Give chloroform

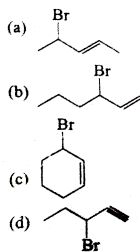
(r) 2-chloropropane

(s) 1-chloropropane

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### 3. Match the following :

Column I



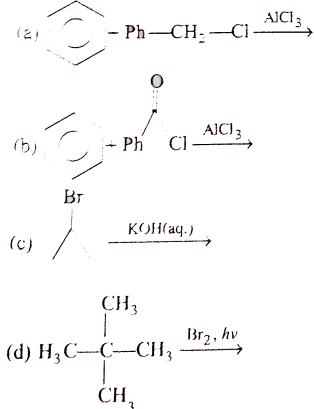
Column II

- (p) Can show geometrical isomerism
- (q) Can show optical isomerism
- (r) If  $\text{C}^+$  is formed it will be resonance stabilized
- (s) On heating with alc. KOH gives penta-1,3-diene

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### 4. Match the following :

Column I



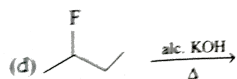
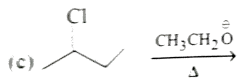
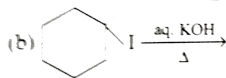
Column II

- (p) Nucleophilic substitution
- (q) Electrophilic substitution
- (r) Cation intermediate
- (s) Free radical substitution

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## 5. Match the following :

### Column I



### Column II

- (p) Carbanion  
 (q) Two step process  
 (r) Carbocation  
 (s) Transition state

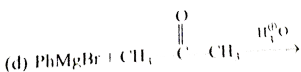
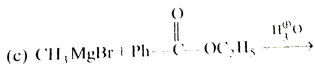
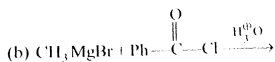
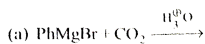
### Column II

6. Match the following


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## 6. Match the following :

### Column I

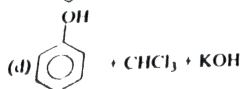
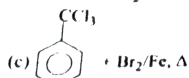
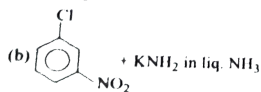
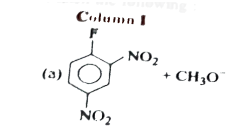


### Column II

- (p) Nucleophilic addition reaction  
 (q) Nucleophilic addition elimination reaction  
 (r)   
 (s) PhCOOH

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## 7. Match the following :



### Column II

(p) Electrophilic aromatic substitution

(q) Reimer-Tiemann reaction

(r) Nucleophilic aromatic substitution

(s) Coupling reaction

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## 8. Match the following :

### Column I

(a) Sandmeyer reaction

(b) Gattermann reaction

(c) Rasching method

(d) Chlorination of toluene

### Column II

(p) Chlorobenzene

(q) Bromobenzene

(r) Benzyl chloride

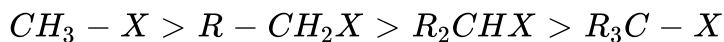
(s) Iodobenzene

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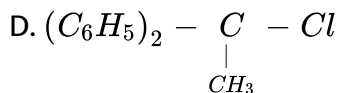
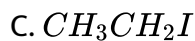
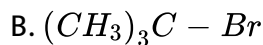
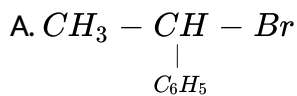
1. The high reactivity of alkyl halides can be explained in terms of nature of C-X bond which is highly polarised covalent bond due to large difference in the electronegativities of carbon and halogen atom. This polarity is responsible for the nucleophilic substitution reaction of alkyl halides which mostly occur by  $S_{N1}$  and  $S_{N2}$  mechanisms.  $S_{N1}$  reaction is a two step process and in the first step R-X ionises to give carbocation (slow process). In the second step the nucleophile attacks the carbocation from either side to form the product (fast process). In  $S_{N1}$  reaction there can be racemization and inversion.  $S_{N1}$  reaction is favoured by heavy (bulky) groups on the carbon atom attached to halogens.

i.e.,  $R_3C - X > R_2CH - X > RCH_2X > CH_3X$ . In  $S_{N2}$  reaction the strong nucleophile  $OH^-$  attacks from the opposite side of the chlorine atom to give an intermediate (transition state).

which breaks to yield the product (alcohol) and leaving ( $X^-$ ) group. The alcohol has a configuration opposite to that of the bromide and is said to proceed with inversion of configuration.  $S_{N2}$  reaction is favoured by small groups on the carbon atom attached to halogen i.e.,



Which among the following will not give  $S_{N1}$  reaction?



**Answer: C**

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2. The high reactivity of alkyl halides can be explained in terms of nature of C-X bond which is highly polarised covalent bond due to large difference in the electronegativities of carbon and halogen atom. This polarity is responsible for the nucleophilic substitution reaction of alkyl halides which mostly occur by  $S_{N1}$  and  $S_{N2}$  mechanisms.  $S_{N1}$  reaction is a two step process and in the first step R-X ionises to give carbocation (slow process). In the second step the nucleophile attacks the carbocation from either side to form the product (fast process). In  $S_{N1}$  reaction there can be racemization and inversion.  $S_{N1}$  reaction is favoured by heavy

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which breaks to yield the product (alcohol) and leaving ( $X^-$ ) group. The alcohol has a configuration opposite to that of the bromide and is said to proceed with inversion of configuration.  $S_N2$  reaction is favoured by small groups on the carbon atom attached to halogen i.e.,  $CH_3 - X > R - CH_2X > R_2CHX > R_3C - X$

$S_N1$  reaction of optically active alkyl halide leads to :

- A. retention of configuration
- B. racemisation
- C. inversion of configuration
- D. none of these

**Answer: B**



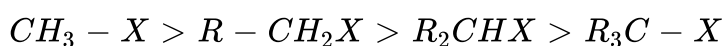
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which breaks to yield the product (alcohol) and leaving ( $X^-$ ) group. The alcohol has a configuration opposite to that of the bromide and is said to proceed with inversion of configuration.  $S_{N2}$  reaction is favoured by small groups on the carbon atom attached to halogen i.e.,



An  $S_{N2}$  reaction at an asymmetric carbon of a compound always gives:

- A. an enantiomer of the substrate
- B. a product with opposite optical rotation
- C. a mixture of diastereomers
- D. a single stereoisomer

**Answer: D**

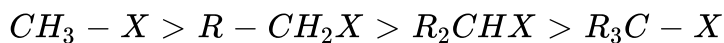
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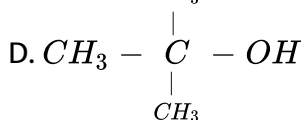
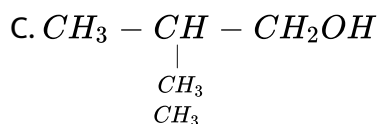
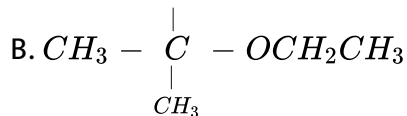
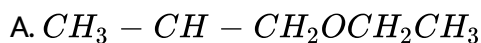
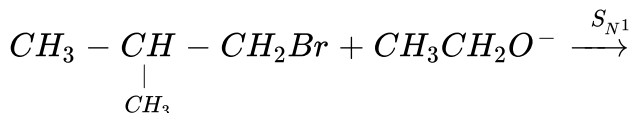
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The main product formed in the following reaction is



**Answer: B**

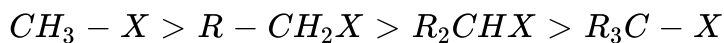
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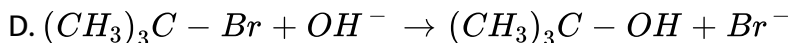
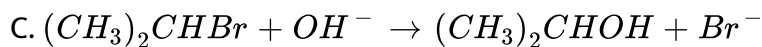
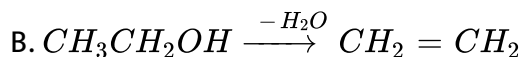
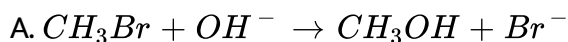
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proceed with inversion of configuration.  $S_N2$  reaction is favoured by small groups on the carbon atom attached to halogen i.e.,



Which of the following is an example of  $S_N2$  reaction ?

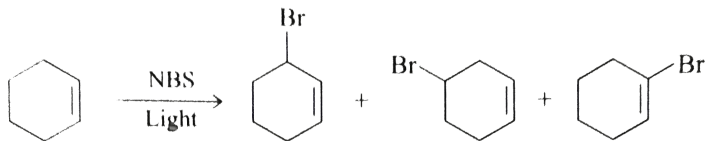


**Answer: A**

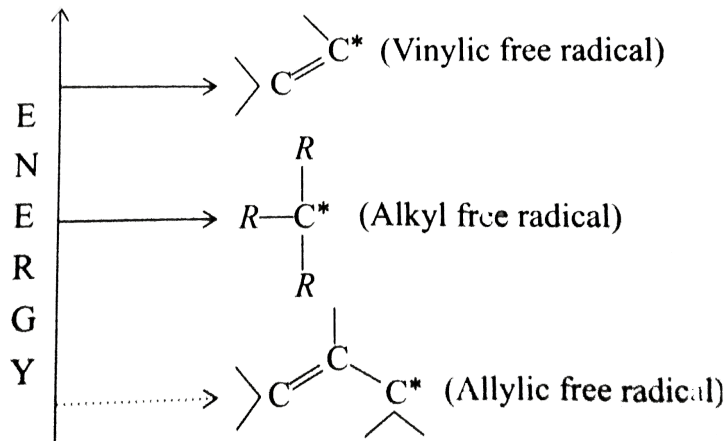
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6. Karl Ziegler reported that alkenes react with N-bromosuccinimide (NBS) in presence of light to give products resulting from substitution of hydrogen by bromine at the allylic position i.e., the position next to the double bond.

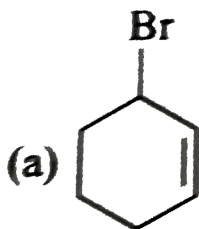
Let us consider the halogenation of cyclohexane.



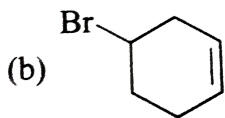
Energy level diagram for allylic, vinylic and alkyl free radicals is given below:



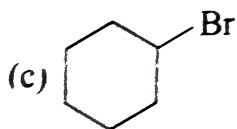
Select the correct statement(s) among the following :



A.



B.



C.

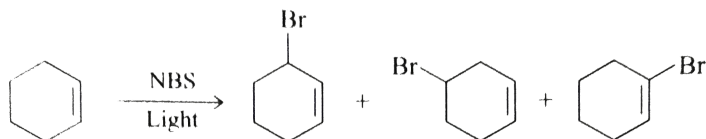
D. Cannot be predicted

**Answer: C**

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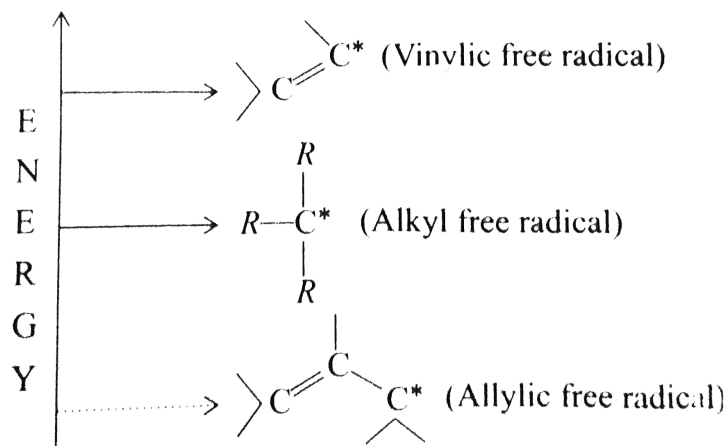
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Let us consider the halogenation of cyclohexene.

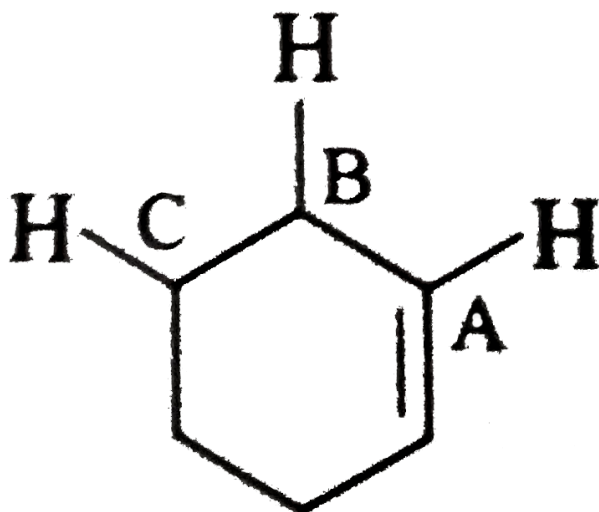


Energy level diagram for allylic vinylic and alkyl free radicals is given

below:



Consider the three types of C-H bonds in cyclohexene.



Which of the following *is/are* correctly matched?



A. A-Vinylic C-H bond

B. B-Allylic C-H bond

C. C-Alkyl C-H bond

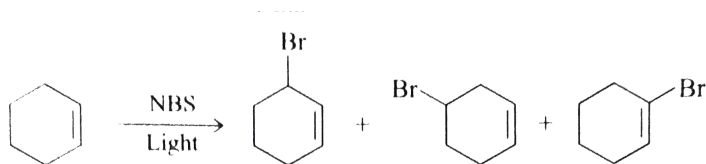
D. All of these

**Answer: D**

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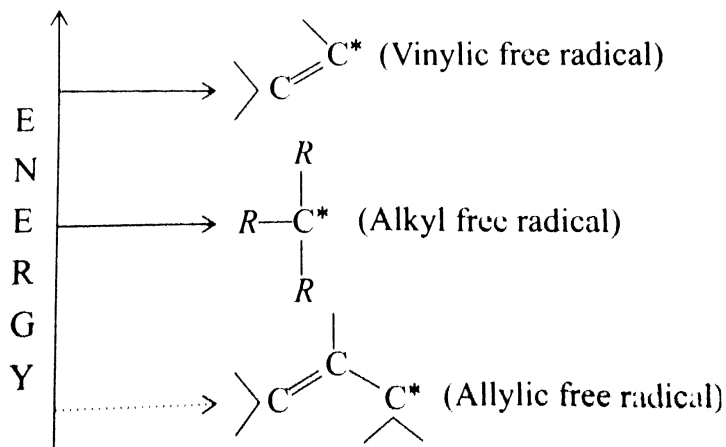
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Let us consider the halogenation of cyclohexene.



Energy level diagram for allylic vinylic and alkyl free radicals is given

below:



Which of the following sequences is correct about C-H bond energy ?

- A. (C-H)Vinylic > (C-H) Alkylic > (C-H) Allylic
- B. (C-H) Vinuylic < (C-H) Alkylic < (C-H) Allkylic
- C. (C-H) Alkylic < (C-H)Vinylic < (C-H) Allylic
- D. (C-H) Vinylic =(C-H) Alkylic =(C-H)Allylic

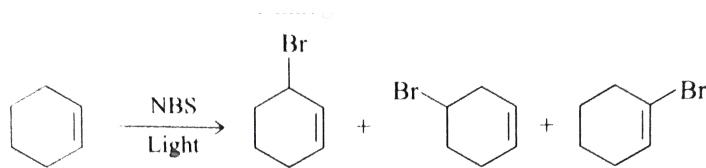
**Answer: A**



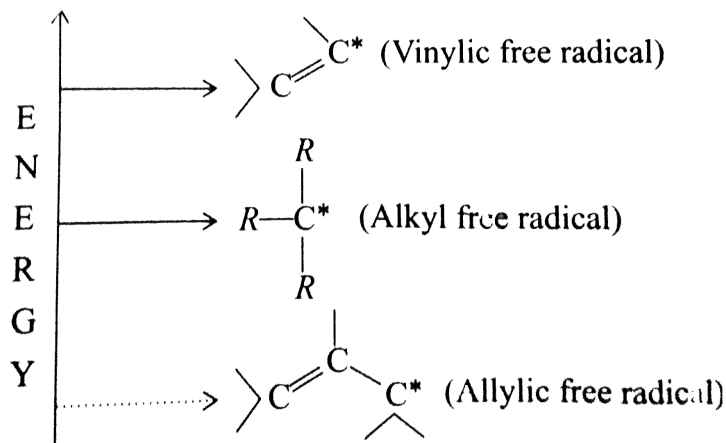
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9. Karl Ziegler reported that alkenes react with N-bromosuccinimide (NBS) in presence of light to give products resulting from substitution of hydrogen by bromine at the allylic position i.e., the position next to the double bond.

Let us consider the halogenation of cyclohexene.



Energy level diagram for allylic vinylic and alkyl free radicals is given below:



Select the correct statement(s) among the following :

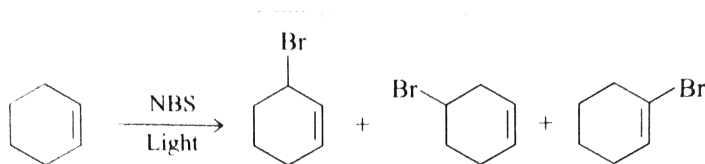
- A. allylic free radical is stabilised by delocalisation
- B. Vinylic free radical is stabilised by hyperconjugation
- C. Alkyl free radicals are stabilised by hyperconjugation
- D. Alkyl free radical is stabilised by hyperconjugation

**Answer: A:C**

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**10.** Karl Ziegler reported that alkenes react with N-bromosuccinimide (NBS) in presence of light to give products resulting from substitution of hydrogen by bromine at the allylic position i.e., the position next to the double bond.

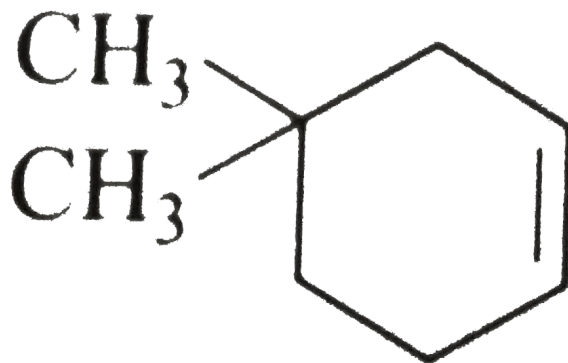
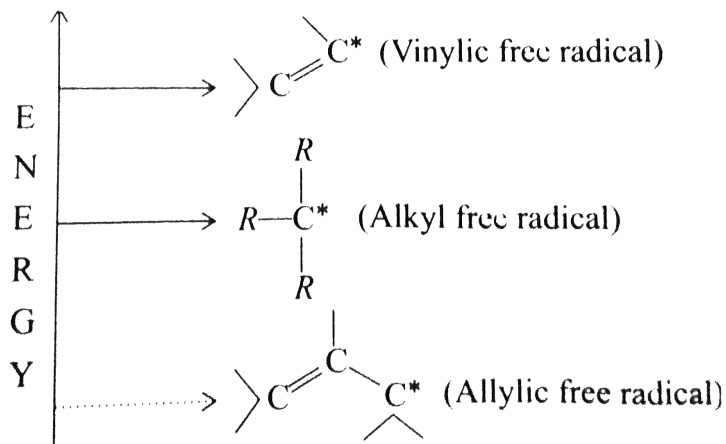
Let us consider the halogenation of cyclohexene.



Energy level diagram for allylic vinylic and alkyl free radicals is given

below:

AS IS GIVEN BELOW.



(4,4-Dimethyl cyclohexene)

Above compound on treatment with NBS gives allylic bromides . How many product (s) will be obtained in this reaction?

A. One

B. Two

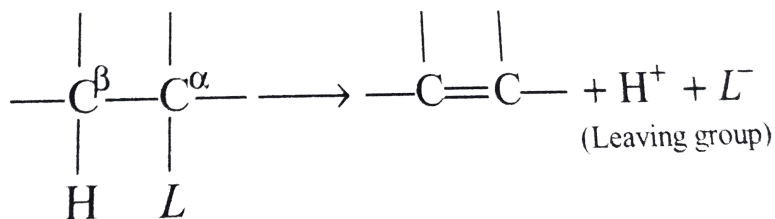
C. Three

D. Four

**Answer: C**

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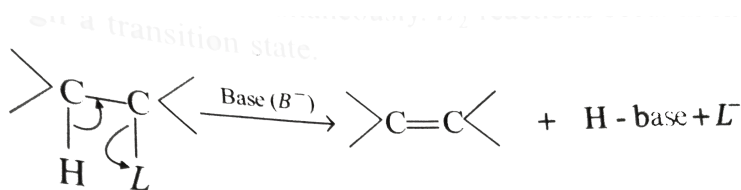
11. The removal of two atoms or groups one generally hydrogen ( $H^+$ ) and the other a leaving group ( $L^-$ ) resulting in the formation of unsaturated compound is known as elimination reaction.



In  $E_1$  (elimination) reactions the C-L bond is broken heterolytically (in step 1) to form a carbocation (as in  $S_{N1}$  reaction) in which ( $L^-$ ) is lost (rate determining step). The carbocation (in step 2) loses a proton from the  $\beta$  - carbon atom by a base (nucleophile) to form an alkene.  $E_1$  reaction is favoured in compounds in which the leaving group is at

secondary ( $2^\circ$ ) or tertiary ( $3^\circ$ ) Position.

In  $E_2$  (elimination) reactions two sigma bonds are broken and a  $\pi$  bond is formed simultaneously.  $E_2$  reactions occur in one step through a transition state.



$E_2$  reactions are most common in haloalkanes (particularly  $1^\circ$ ) and better the leaving group higher is the  $E_2$  reaction. In  $E_2$  reactions, both the leaving groups should be antiplaner.

$E_1cb$  (Elimination unimolecular conjugate base) reaction involves the removal of proton by a conjugate base (step 1) to produce carbanion which loses a leaving group to form an alkene (step 2) and is a slow step

Isopropyl chloride on heating with concentrated solution of ethanolic KOH gives mainly:

A. propan-1-ol

B. propan-2-ol

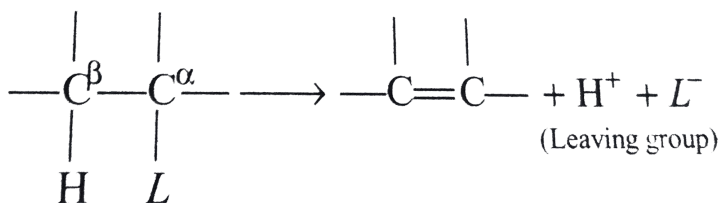
C. propene

D. isopropyl ethyl ether

Answer: C

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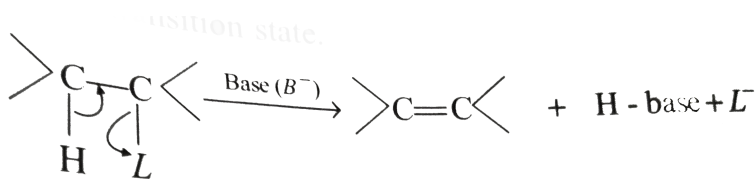
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2-Bromobutane on heating with concentrated solution of alcoholic KOH gives major product as :

A. but -1-ene

B. but-2-ene

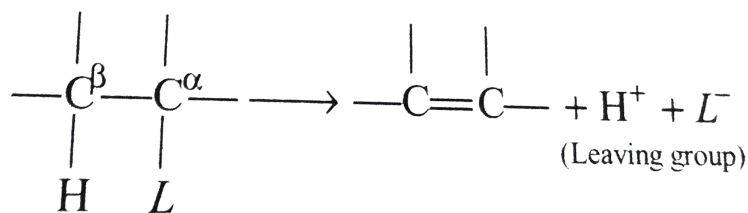
C. butan-2-ol

D. 2-methylpropene

Answer: B

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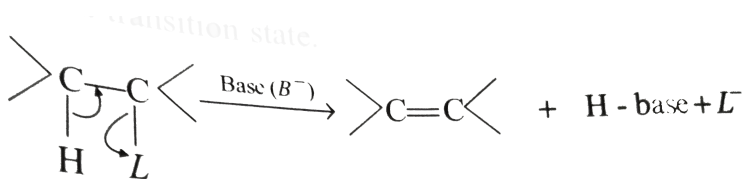
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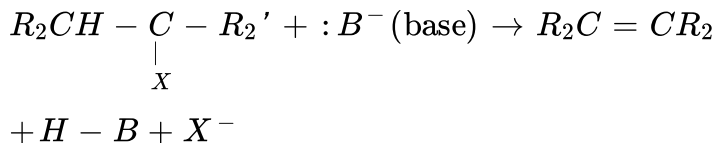
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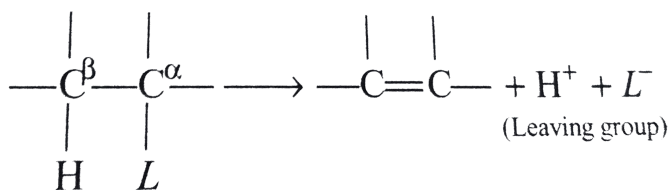
this reaction is an example of:

- A.  $E_1$  reaction
- B.  $E_2$  reaction
- C.  $E_1$  cb reaction
- D. first order reaction

Answer: B

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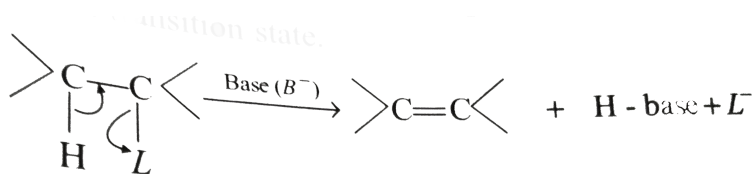
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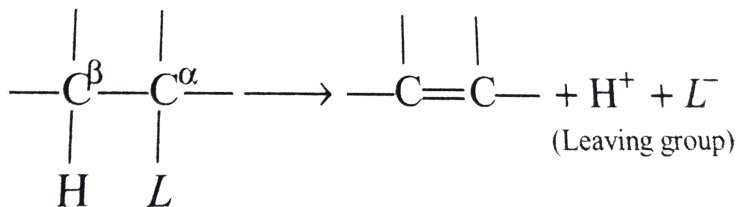


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$E_1cb$  (Elimination unimolecular conjugate base) reaction involves the removal of proton by a conjugate base (step 1) to produce carbanion which loses a leaving group to form an alkene (step 2) and is a slow step 2-Bromopentane is heated with potassium ethoxide in ethanol. The major product obtained is :

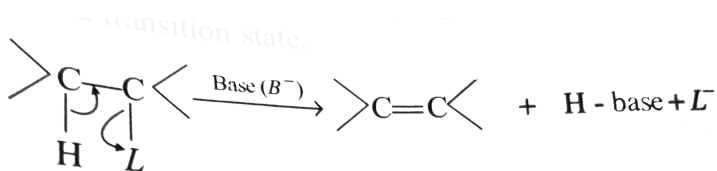
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15. The removal of two atoms or groups one generally hydrogen ( $H^+$ ) and the other a leaving group ( $L^-$ ) resulting in the formation of unsaturated compound is known as elimination reaction.



In  $E_1$  (elimination) reactions the C-L bond is broken heterolytically (in step 1) to form a carbocation (as in  $S_N1$  reaction) in which ( $L^-$ ) is lost (rate determining step). The carbocation (in step 2) loses a proton from the  $\beta$  - carbon atom by a base (nucleophile) to form an alkene.  $E_1$  reaction is favoured in compounds in which the leaving group is at secondary ( $2^\circ$ ) or tertiary ( $3^\circ$ ) Position.

In  $E_2$  (elimination) reactions two sigma bonds are broken and a  $\pi$  - bond is formed simultaneously.  $E_2$  reactions occur in one step through a transition state.



$E_2$  reactions are most common in haloalkanes (particularly  $1^\circ$ ) and better the leaving group higher is the  $E_2$  reaction. In  $E_2$  reactions, both the leaving groups should be antiplaner.

$E_1cb$  (Elimination unimolecular conjugate base) reaction involves the

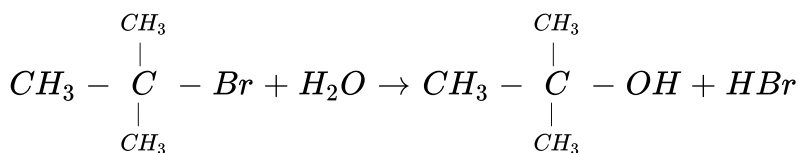
removal of proton by a conjugate base (step 1) to produce carbanion which loses a leaving group to form an alkene (step 2) and is a slow step Neopentyl bromide undergoes dehydrohalogenation to give alkene even though it has no  $\beta$  – hydrogen. This is due to :

- A.  $E_2$  mechanism
- B.  $E_1$  mechanism
- C. due to rearrangement of carbocation by  $E_1$  mechanism
- D.  $E_1$  cb mechanism

**Answer: C**

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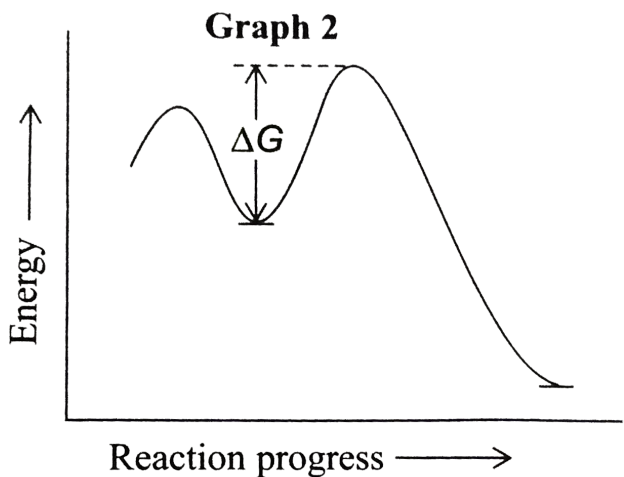
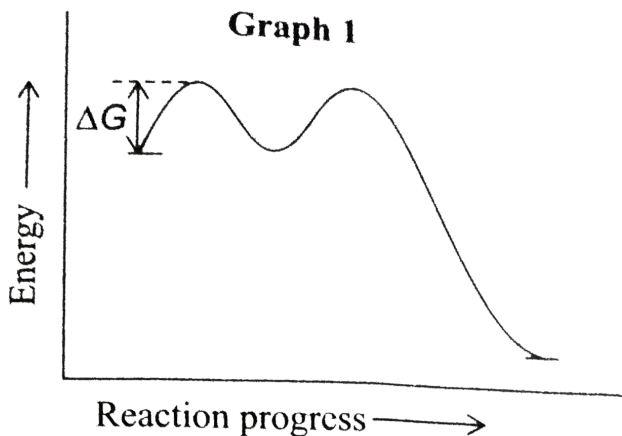
16.  $S_N1$  reaction is a first order nucleophilic substitution e.g.



The concentration of nucleophile does not appear in the rate law expression.

Reaction rate  $k[\text{RX}]$

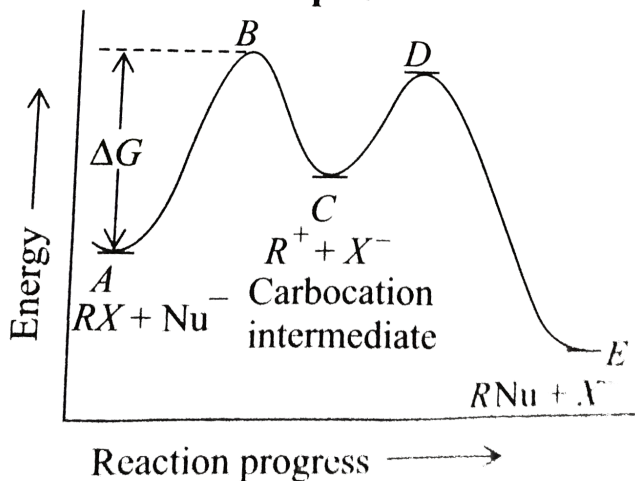
In a multistep organic reaction, the rate-limiting step is the slowest step. Rate determining step is represented by the following energy level diagram:



A reaction energy level diagram for an  $S_{\text{N}}1$  reaction. The rate limiting step is spontaneous dissociation of an alkyl halide to give a carbocation intermediate:



Graph 3



In  $S_N1$  reaction the hybridization changes in rate determination step.

Select the correct change among the following:

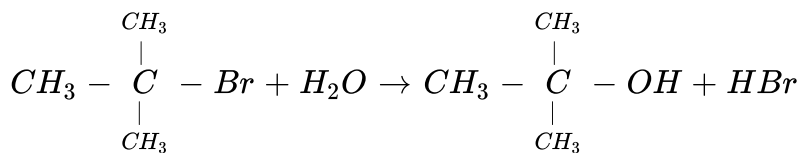
- A. from  $sp^3$  to  $sp^2$
- B. from  $sp^2$  to  $sp^3$
- C. from  $sp^2$  to  $sp$
- D. from  $sp$  to  $sp^2$

Answer: A



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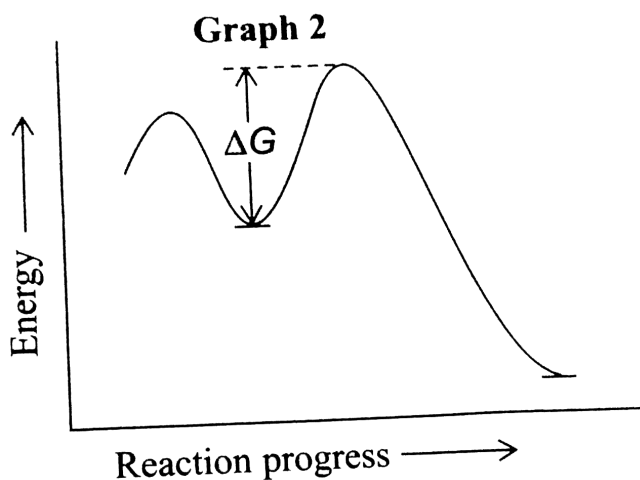
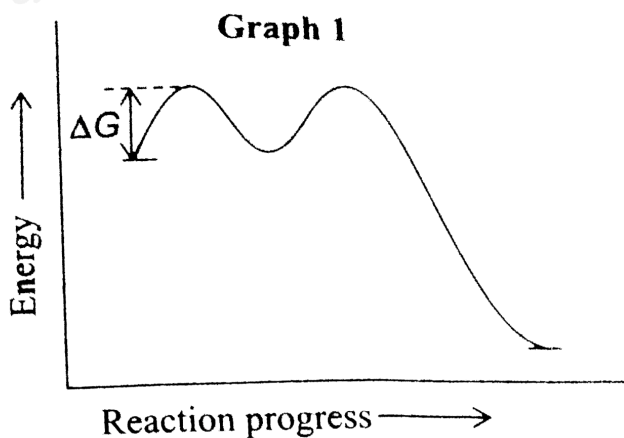
17.  $S_{N1}$  reaction is a first order nucleophilic substitution e.g.



The concentration of nucleophile does not appear in the rate law expression.

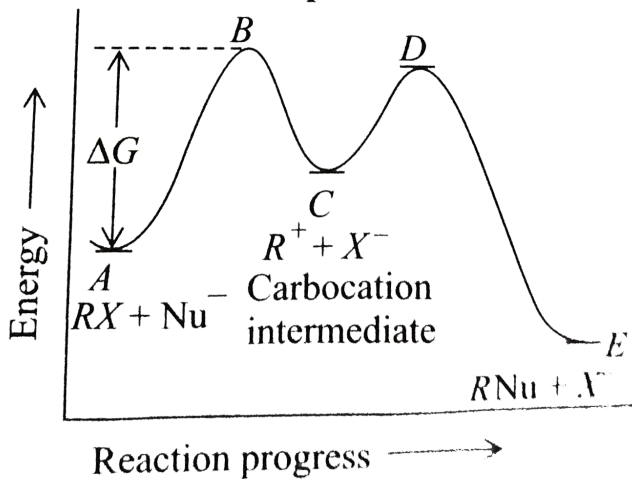
Reaction rate  $k[\text{RX}]$

In a multistep organic reaction, the rate-limiting step is the slowest step. Rate determining step is represented by the following energy level diagram:



A reaction energy level diagram for an  $S_N1$  reaction. The rate limiting step is spontaneous dissociation of an alkyl halide to give a carbocation intermediate:

**Graph 3**



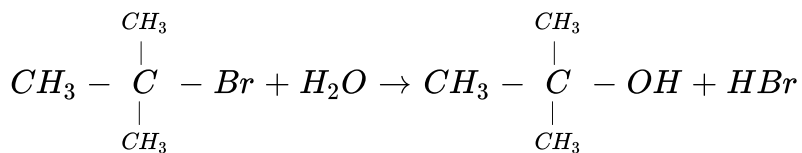
Select the correct statement (s) about the graph 1:

- A. first step is rate determining and it is endothermic
- B. first step is rate determining and it is exothermic
- C. second step is rate determining and it is exothermic
- D. second step is rate determining and it is endothermic

**Answer: A**

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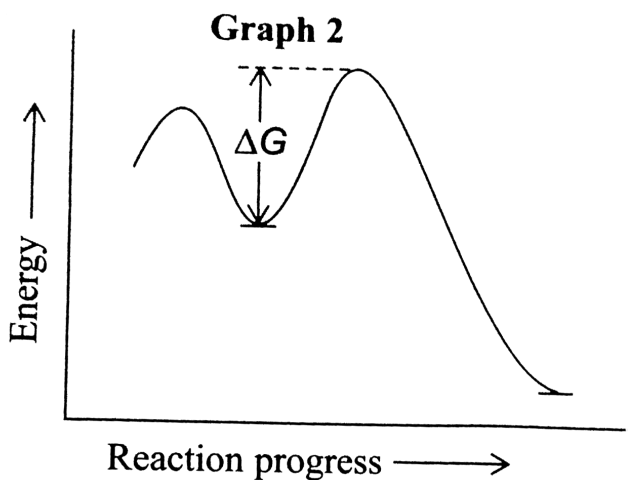
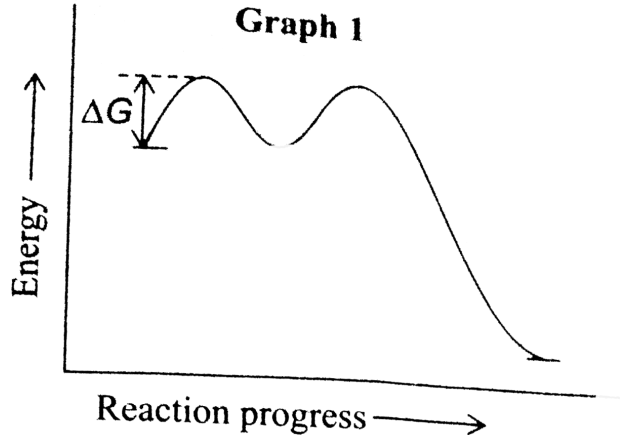
18.  $S_{N1}$  reaction is a first order nucleophilic substitution e.g.



The concentration of nucleophile does not appear in the rate law expression.

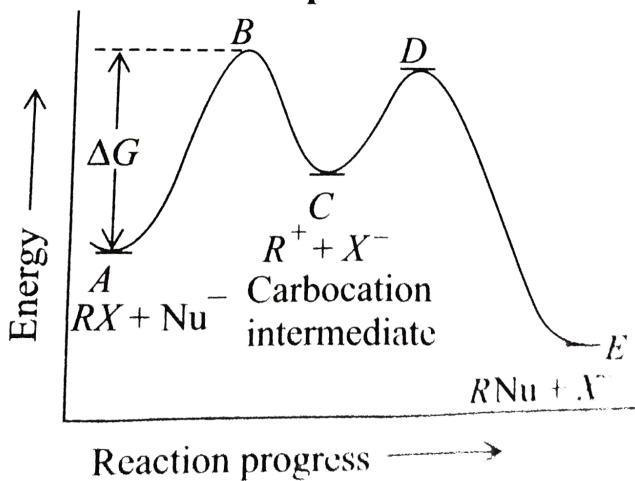
Reaction rate  $k[\text{RX}]$

In a multistep organic reaction, the rate-limiting step is the slowest step. Rate determining step is represented by the following energy level diagram:



A reaction energy level diagram for an  $S_N1$  reaction. The rate limiting step is spontaneous dissociation of an alkyl halide to give a carbocation intermediate:

**Graph 3**



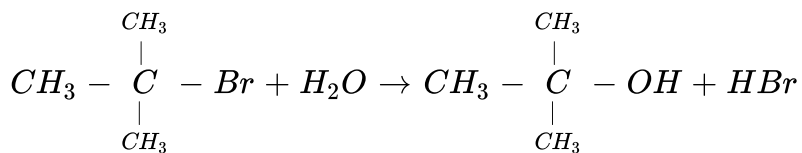
Select the correct statement(s) about the graph 2:

- A. first step is rate determining and it is endothermic
- B. first step is rate determining and it is exothermic
- C. second step is rate determining and it is exothermic
- D. second step is rate determining and it is endothermic

**Answer: C**

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19.  $S_{N1}$  reaction is a first order nucleophilic substitution e.g.

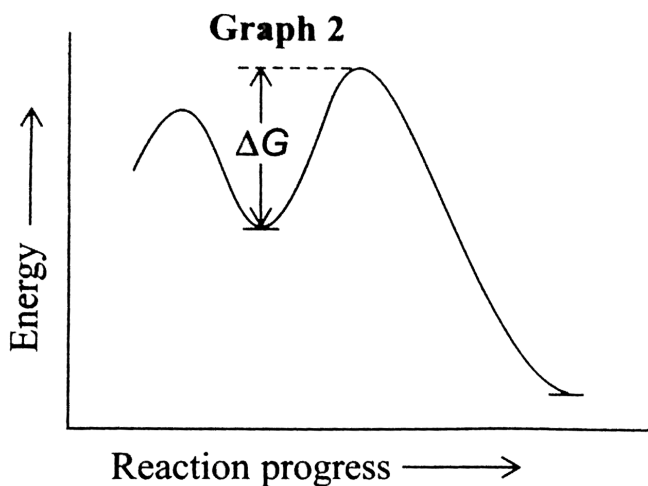
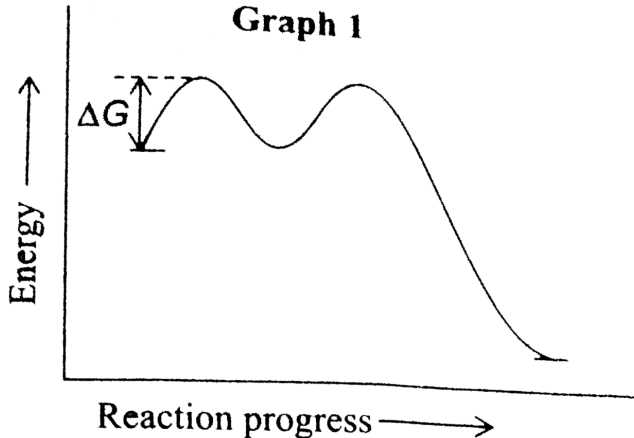


The concentration of nucleophile does not appear in the rate law expression.

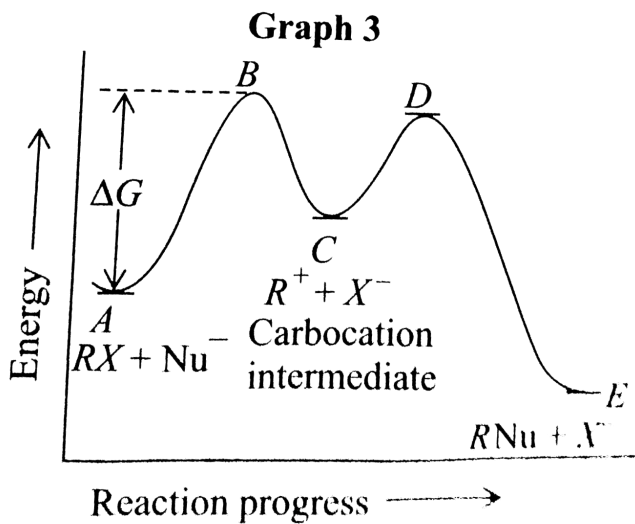
Reaction rate  $k[\text{RX}]$

In a multistep organic reaction, the rate-limiting step is the slowest step. Rate determining step is represented by the following energy level diagram:





A reaction energy level diagram for an  $S_N1$  reaction. The rate limiting step is spontaneous dissociation of an alkyl halide to give a carbocation intermediate:



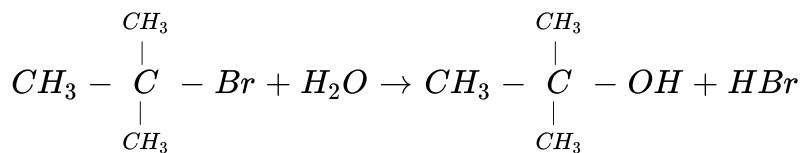
In the graph 3 for  $S_{N1}$  reaction the rate limiting step is the spontaneous dissociation of alkyl halide and is given by

- A. AB
- B. AC
- C. AD
- D. DE

**Answer: A**

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20.  $S_{N1}$  reaction is a first order nucleophilic substitution e.g.

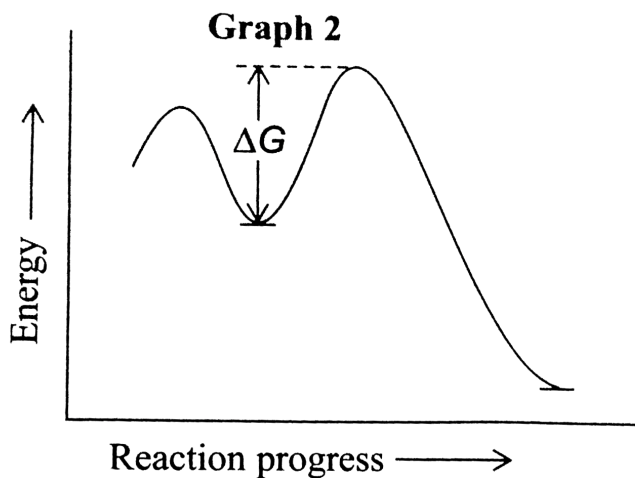
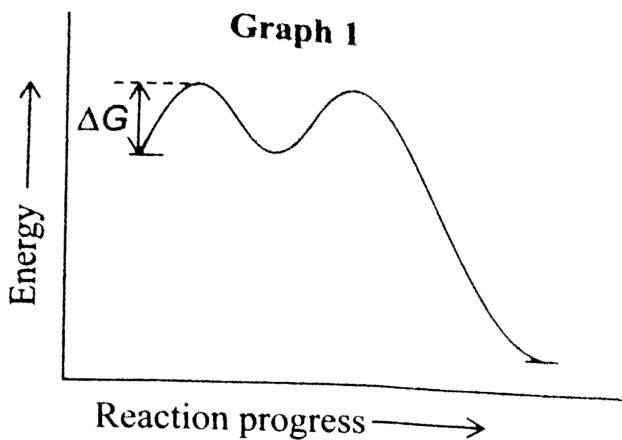


The concentration of nucleophile does not appear in the rate law expression.

Reaction rate  $k[\text{RX}]$

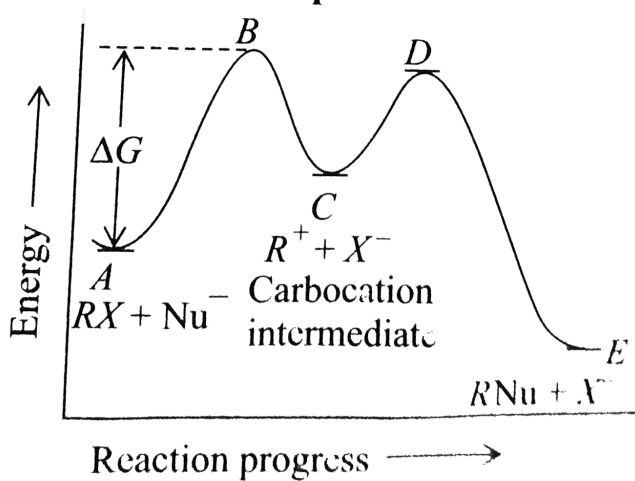
In a multistep organic reaction, the rate-limiting step is the slowest step. Rate determining step is represented by the following energy level diagram:

ig energy level diagram: is represented



A reaction energy level diagram for an  $S_N1$  reaction. The rate limiting step is spontaneous dissociation of an alkyl halide to give a carbocation intermediate:

**Graph 3**



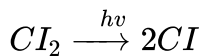
$S_N1$  reaction is :

- A. single step reaction
- B. two step reaction
- C. a reaction involving free radical intermediate
- D. a reaction involving carbocation intermediate

**Answer: D**

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**21.** Free radical halogenation takes place in the presence of light or at high temperature (above 773K.) Formation of halogen free radical intermediate takes place in first step called chain initiation step.



This reaction is mainly given by those compound which have at least one hydrogen atom present at  $sp^3$  – hybrid carbon.

Reactivity of  $sp^3$  – hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is :

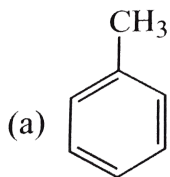
Tertiary > secondary > Primary  
 (5)                      (3.8)                      (1)

$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

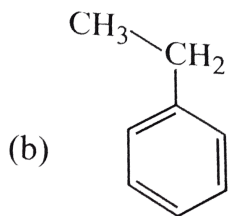
Relative amount = Number of hydrogen atoms on the respective carbon  
 × relative reactivity.

NBS (N-bromo succinimide) is used for bromination at allylic and benzylic carbon, whereas  $Br_2/h\nu$  gives bromination at benzylic allylic and alkyl carbon.

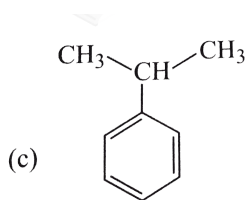
Select most reactive compound for chlorination in presence of light :



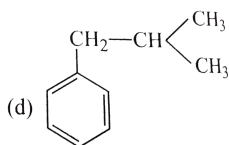
A.



B.



C.



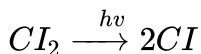
D.

Answer: C



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**22.** Free radical halogenation takes place in the presence of light or at high temperature (above 773K.) Formation of halogen free radical intermediate takes place in first step called chain initiation step.



This reaction is mainly given by those compound which have at least one hydrogen atom present at  $sp^3$  – hybrid carbon.

Reactivity of  $sp^3$  – hybrid carbon depends on the reactivity of reaction intermediate.

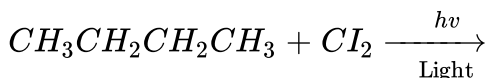
The relative rate of formation of alkyl radicals by a chlorine radical is :

Tertiary > secondary > Primary  
 (5)                      (3.8)                      (1)

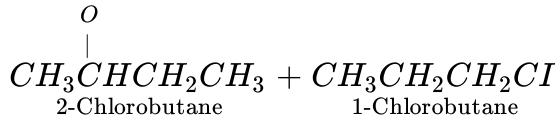
$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon  
 × relative reactivity.

NBS (N-bromo succinimide) is used for bromination at allylic and benzylic carbon, whereas  $Br_2/h\nu$  gives bromination at benzylic allylic and alkyl carbon.







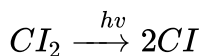
Percentage yield of 2-chlorobutane will be:

- A.  $\frac{15}{21} \times 100$
- B.  $\frac{21}{21} \times 100$
- C.  $\frac{6}{21} \times 100$
- D.  $\frac{3}{21} \times 100$

**Answer: A**

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**23.** Free radical halogenation takes place in the presence of light or at high temperature (above 773K.) Formation of halogen free radical intermediate takes place in first step called chain initiation step.



This reaction is mainly given by those compound which have at least one hydrogen atom present at  $sp^3$  – hybrid carbon.

Reactivity of  $sp^3$  – hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is :

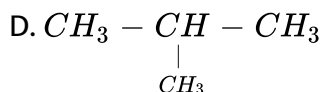
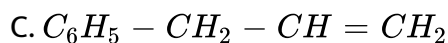
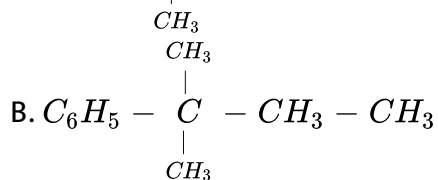
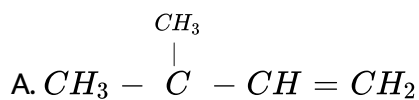
Tertiary > secondary > Primary  
(5)                      (3.8)                      (1)

$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon  
× relative reactivity.

NBS (N-bromo succinimide) is used for bromination at allylic and benzylic carbon, whereas  $Br_2/h\nu$  gives bromination at benzylic allylic and alkyl carbon.

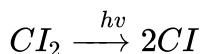
which one of the following compounds will react with NBS?



**Answer: C**



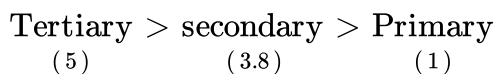
**24.** Free radical halogenation takes place in the presence of light or at high temperature (above 773K.) Formation of halogen free radical intermediate takes place in first step called chain initiation step.



This reaction is mainly given by those compound which have at least one hydrogen atom present at  $sp^3$  – hybrid carbon.

Reactivity of  $sp^3$  – hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is :

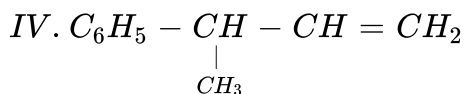
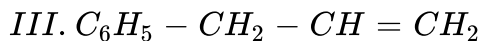
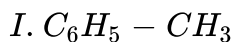


$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon  
× relative reactivity.

NBS (N-bromo succinimide) is used for bromination at allylic and benzylic carbon, whereas  $Br_2/h\nu$  gives bromination at benzylic allylic and alkyl carbon.

Arrange decreasing order of reactivity of given compounds with NBS :(N-bromo succinimide)



Select the correct answer from the codes given below

Codes:

A. IV, III, I, II

B. IV, III, II, I

C. I, II, III, IV

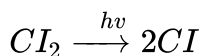
D. I, III, II, IV

**Answer: B**



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25. Free radical halogenation takes place in the presence of light or at high temperature (above 773K.) Formation of halogen free radical intermediate takes place in first step called chain initiation step.



This reaction is mainly given by those compound which have at least one hydrogen atom present at  $sp^3$  – hybrid carbon.

Reactivity of  $sp^3$  – hybrid carbon depends on the reactivity of reaction intermediate.

The relative rate of formation of alkyl radicals by a chlorine radical is :

Tertiary > secondary > Primary  
(5)                      (3.8)                      (1)

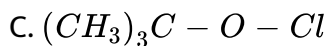
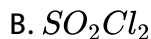
$$\text{Percentage yield of the product} = \frac{\text{Relative amount} \times 100}{\text{Sum of relative amounts}}$$

Relative amount = Number of hydrogen atoms on the respective carbon  
× relative reactivity.

NBS (N-bromo succinimide) is used for bromination at allylic and benzylic carbon, whereas  $Br_2/h\nu$  gives bromination at benzylic allylic and alkyl carbon.

Chlorinating agent for free radical chlorination may be taken as :

A.  $Cl_2$

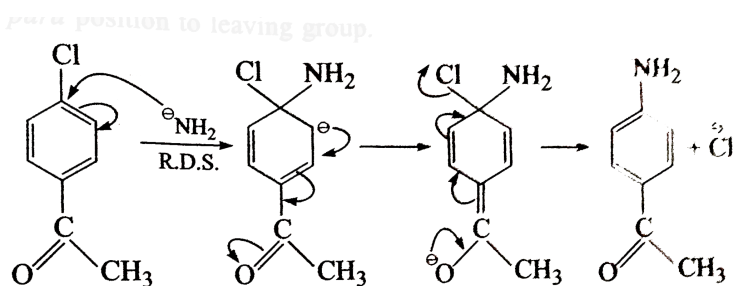


Answer: A::B::C

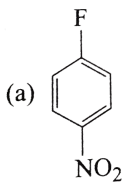
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26. For a typical nucleophilic aromatic substitution reaction to take place .

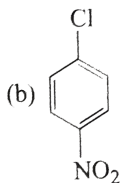
1. Nucleophilic atom should be of oxygen nitrogen or sulphur.
2. Leaving groups should be halide.
3. There should be strong electron withdrawing at ortho and para position to leaving group.



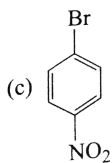
Fastest nucleophilic aromatic substitution reaction take place in :



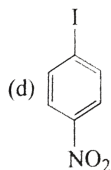
A.



B.



C.



D.

**Answer: A**

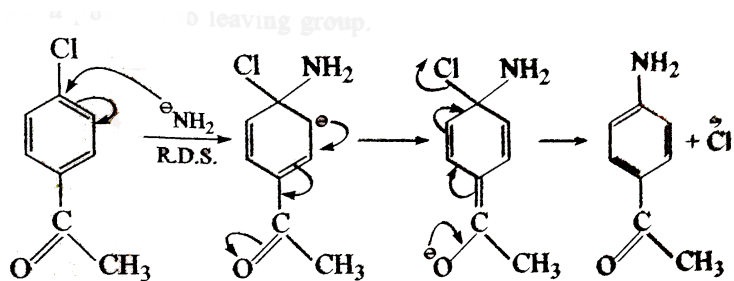
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27. For a typical nucleophilic aromatic substitution reaction to take place .

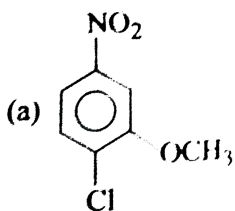
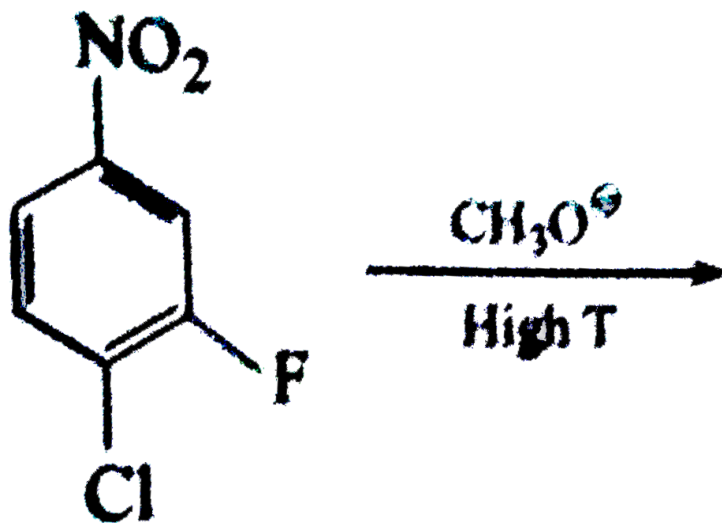
1. Nucleophilic atom should be of oxygen nitrogen or sulphur.

2. Leaving groups should be halide.

3. There should be strong electron withdrawing at ortho and para position to leaving group.

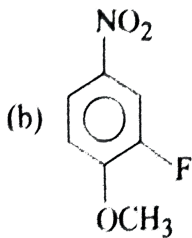


Find out correct product of following reaction

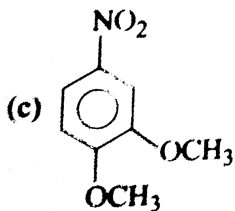


A.

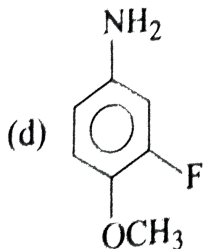




B.



C.



D.

**Answer: B**

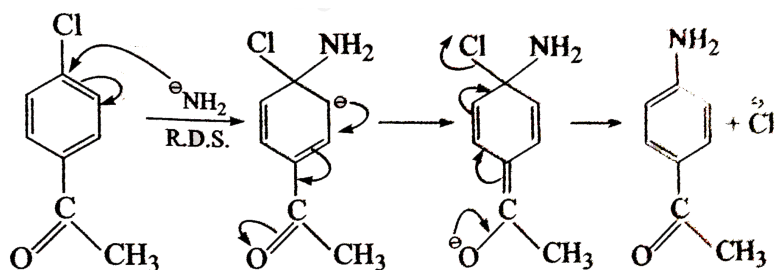
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28. For a typical nucleophilic aromatic substitution reaction to take place .

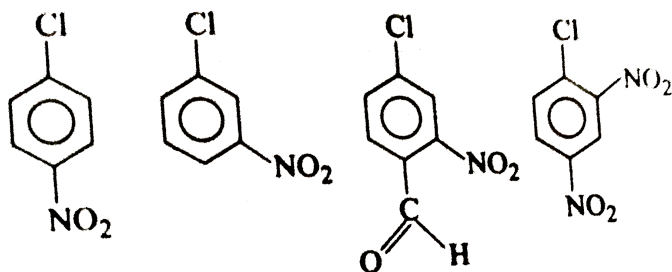
1. Nucleophilic atom should be of oxygen nitrogen or sulphur.

2. Leaving groups should be halide.

3. There should be strong electron withdrawing at ortho and para position to leaving group.



Compare rate of nucleophilic aromatic substitution reaction in following reactants:



A.  $S > Q > P > R$

B.  $R > S > P > Q$

C.  $S > R > P > Q$

D.  $P > S > R > Q$

**Answer: C**

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## Single Integer answer type questions

1. How many monochloro derivatives are possible when 3-methylheptane is subjected to free radical chlorination ?

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2. The total number of isomers including stereoisomers that could be obtained by replacing two hydrogen atoms of propane by two chlorine atoms are :

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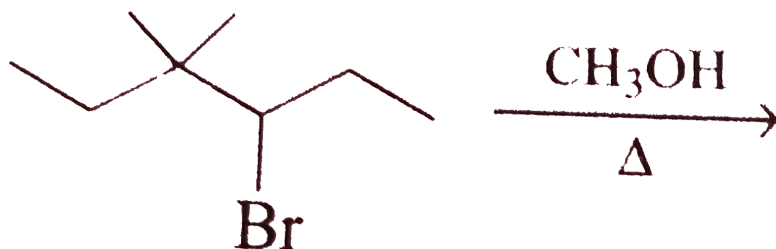
3. If 3-chloromethylhexane is treated with  $C_2H_5O^-Na^+ / C_2H_5OH$ ,  $E_2$  elimination reaction takes place predominantly. How many different alkenes would be formed ?

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4. Total number of compound among the following have zero dipole moment is/are  $CCl_4$ ,  $CHCl_3$ ,  $CH_2Cl_2$ ,  $CH_3Cl$ , *o*-m- and *p*-dichlorobenzene benzyl chloride benzal chloride and benzotrichloride.

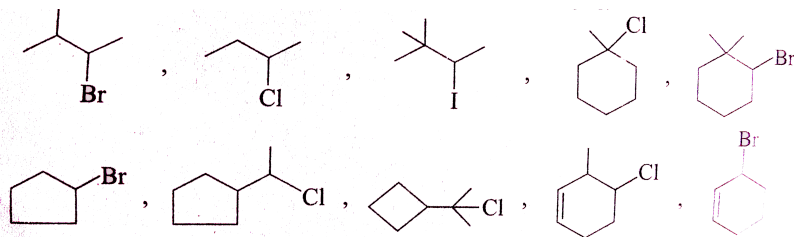
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5. Find out numbers of possible  $E_1$  products from following reaction .



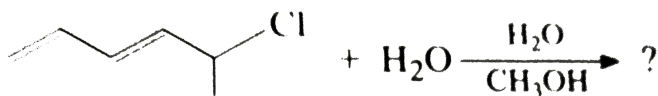
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6. How many substrates will show rearrangement during  $S_N1$  reaction?



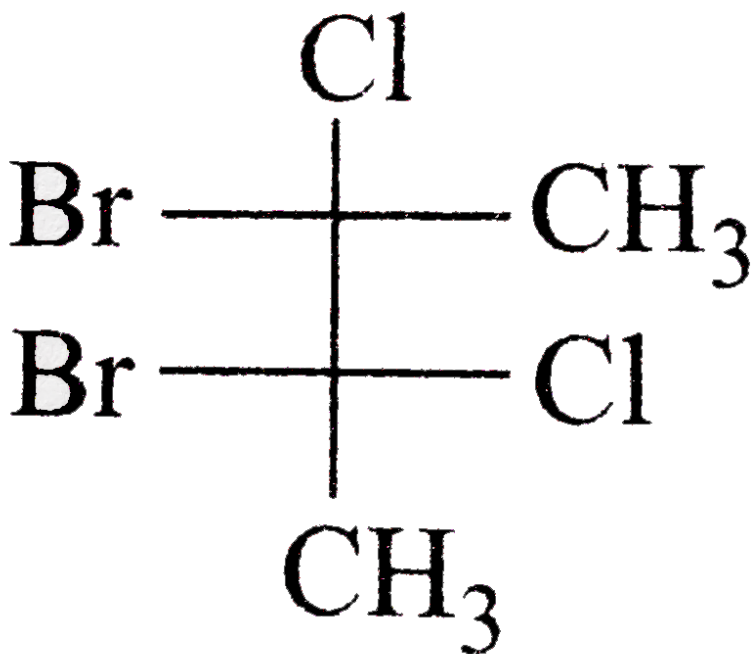
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7. How many types of substituted alcohols (stereoisomers are not considered) are possible in the given reaction ?



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8. The total number(s) of stable conformers with non-zero dipole moment for the following compound is/are



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9. How many structural isomers are possible for the molecular formula  $C_5H_{11}Br$ ?

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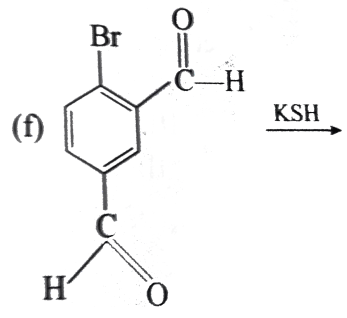
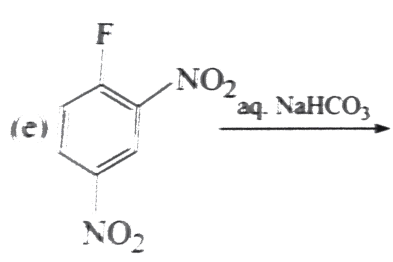
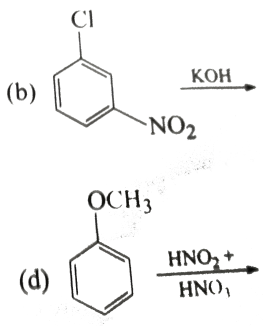
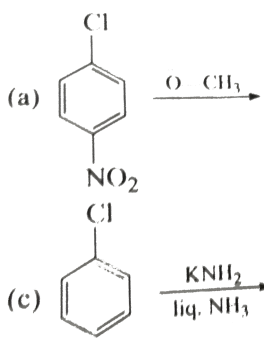
10. How many isomers are possible for  $C_4H_8F_2$  and give their IUPAC names:

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11. Excess chlorine is passed through boiling toluene how many chloroderivatives would you get?

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12. Identify number of reactions that can give nucleophilic aromatic substitution products.

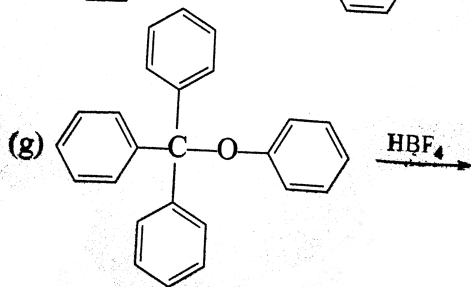
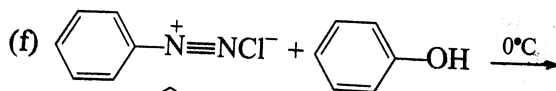
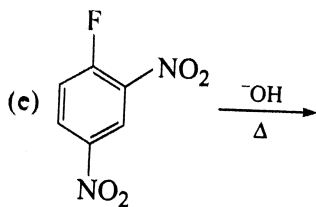
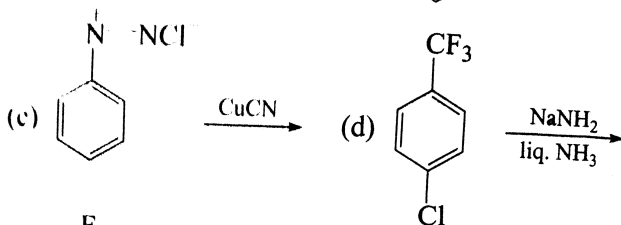
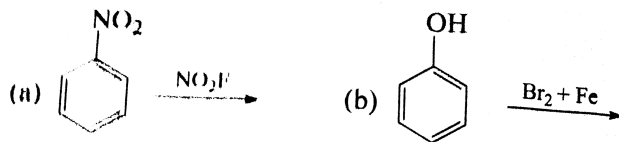


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13. Find out number of reactions that are electrophilic aromatic substitution in nature



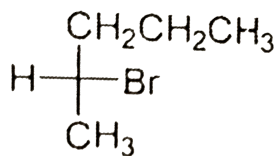
13. Find out number of reactions that are electrophilic aromatic substitution in nature.



14. In the following monobromination reaction, the number

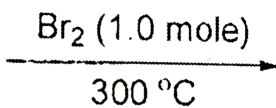
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14. In the following monobromination reaction, the number of possible chiral products is



(1.0 mole)

(enantiomerically pure)



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