

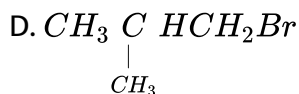
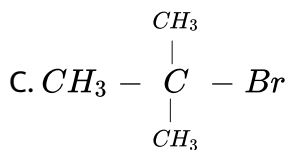
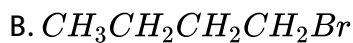
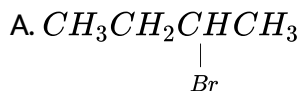
## CHEMISTRY

### BOOKS - BRILLIANT PUBLICATION

### HALOALKANES AND HALOARENES

#### Level I Homework

1. Which of the following alkyl halides is iso-butyl bromide ?



**Answer:**

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2. When silver propionate is treated with  $Br_2$  in  $CCl_4$  as solvent, the product is

- A. Propionyl bromide
- B. n-propyl bromide
- C. iso-propyl bromide
- D. ethyl bromide

**Answer:**

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3. Hunsdiecker reaction is used for preparation of alkyl chlorides and alkyl bromides starting from

A. Diazonium salts

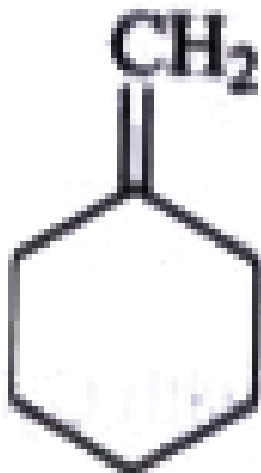
B. Silver salt of carboxylic acids

C. Sodium salt of carboxylic acids

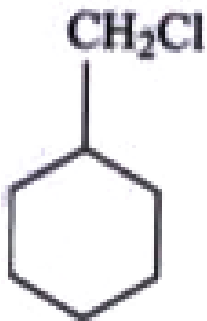
D. Alcohols

Answer:

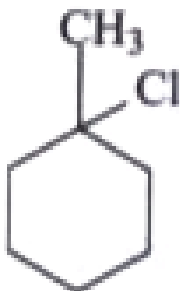
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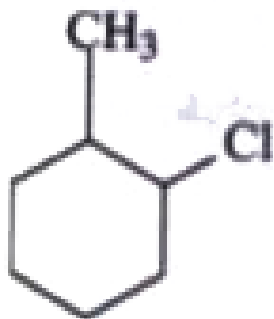
4.  $\xrightarrow{HCl}$  (A), the product (A) is



A. A.



B. B.



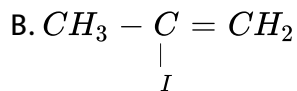
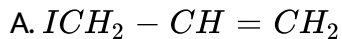
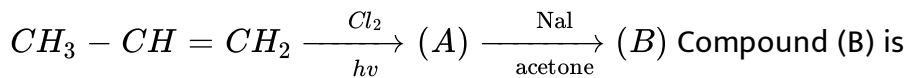
C. C.

D. D. All of these

**Answer:**

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5. Write the product of the following reaction,



C. both

D. none

**Answer:**



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6. NBS is a specific reagent for

A. Nucleophilic substitution

B. Electrophilic substitution

C. Allylic substitution

D. Electrophilic addition

**Answer:**

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7. Which of the following has the highest boiling point ?

A. 1- Chloropentane

B. isopentyl chloride

C. neopentylchloride

D. All have equal boiling point

**Answer:**

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8. Out of the following compounds which one will have zero dipole moment ?

- A. Chloromethane
- B. Dichloromethane
- C. Trichloromethane
- D. Tetrachloromethane

**Answer:**

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9. Which of the following compounds would be hydrolysed most easily ?

- A.  $C_2H_5Cl$
- B.  $C_2H_5Br$
- C.  $C_2H_5F$
- D.  $C_2H_5I$

**Answer:**



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**10.** Most reactive halide towards  $S_N1$  reaction is

- A. n-Butyl chloride
- B. sec-Butyl chloride
- C. tert-Butyl chloride
- D. Allyl chloride

**Answer:**



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**11.** Alkyl halides is converted into an alcohol by

- A. Addition



B. Elimination

C. Substitution

D. Hydrogenation

**Answer:**

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12. Which of the following would produce ethyl isocyanide as the product on reaction with  $C_2H_5Br$  ?

A. KCN

B. AgCN

C.  $CH_3CN$

D.  $CH_3NC$

**Answer:**

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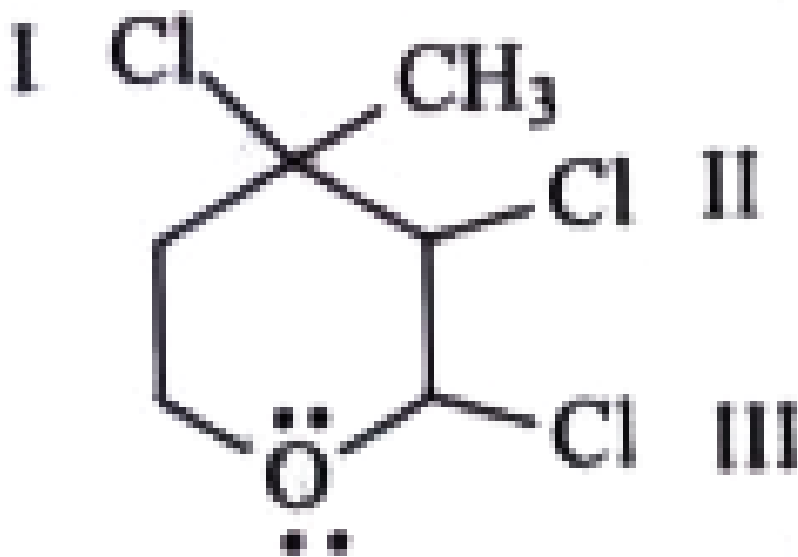
13. Which is incorrect about nucleophilic substitution reactions

- A.  $SN^1$  Favours polar protic solvent       $SN^2$  Favours polar aprotic solvents
- B.  $SN^1$   $3^\circ > 2^\circ > 1^\circ > CH_3 - X$  (order of reactivity)       $SN^2$   $CH_3X > 1^\circ > 2^\circ > 3^\circ$
- C.  $SN^1$  Two steps       $SN^2$  One steps
- D.  $SN^1$  Inversion of configuration       $SN^2$  Racemisation with some inversion

Answer:



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14.

The rate of

reaction with  $\text{AgNO}_3$  will be :

A.  $I > II > III$

B.  $III > I > II$

C.  $III > II > I$

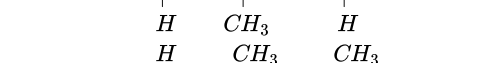
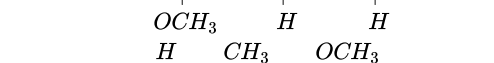
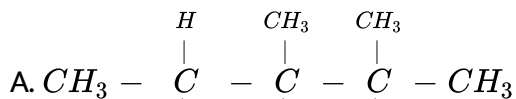
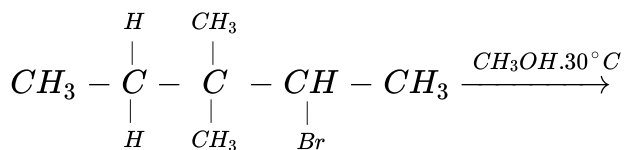
D.  $I > III > II$

Answer:



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15. What will be the major product of the following reaction ?

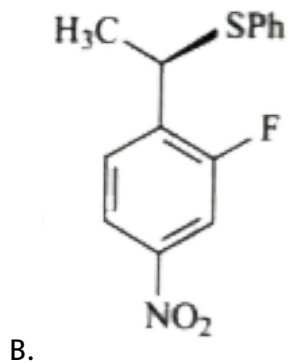
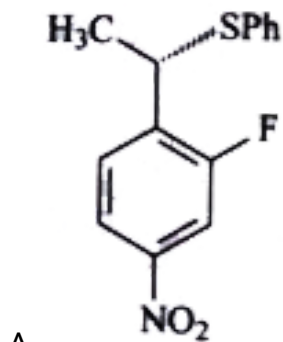
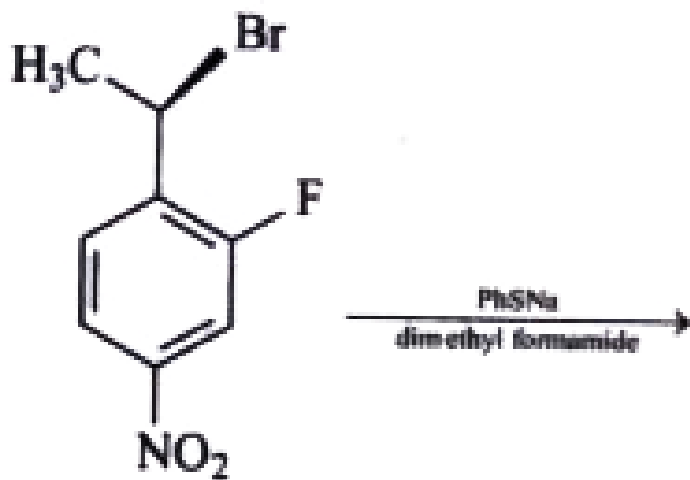


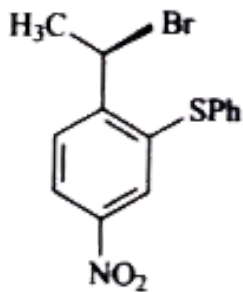
Answer:



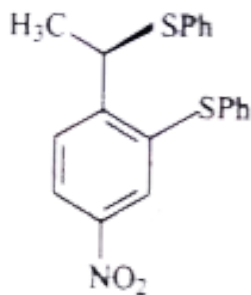
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16. The major product of the following reaction is is





C.

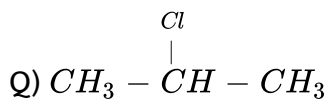
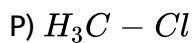


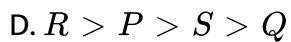
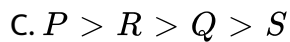
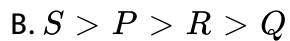
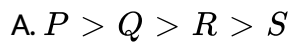
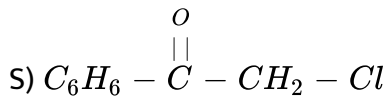
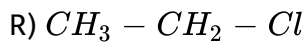
D.

**Answer:**

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17.  $\text{KI}$  in acetone, undergoes  $\text{S}_{\text{N}}2$  reaction with each of P,Q,R and S. The rates of the reaction vary as

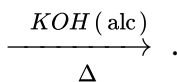
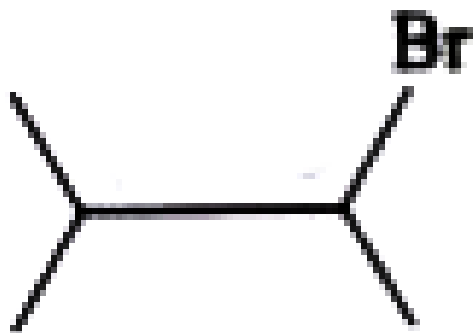




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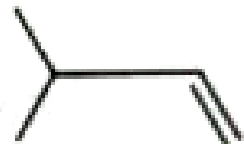
18. In the reaction The predominant product is



A.



B.



C.



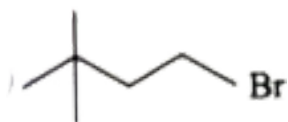
D. None

**Answer:**



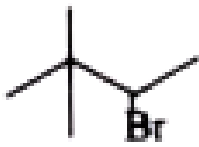
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19. Which of the following cannot undergo  $E2$  reaction ?

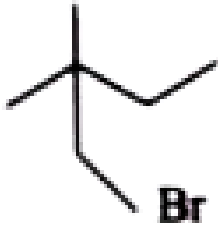


A.





B.



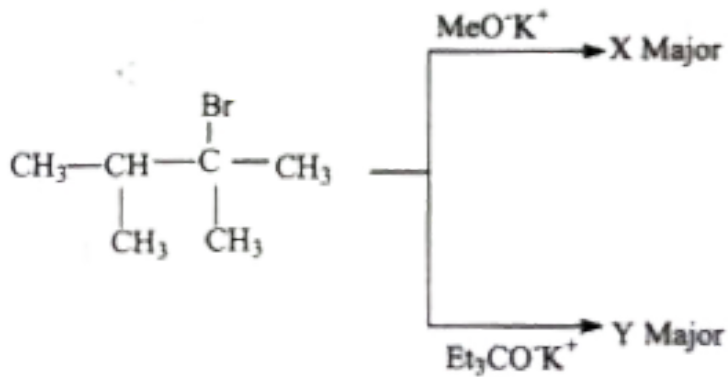
C.

D. none of these

**Answer:**

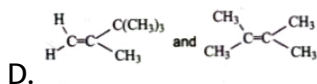
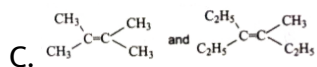
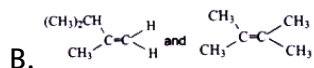
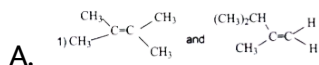


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20.

X and Y are respectively



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21.  $CH_3 - CH_2 - CH_2 - Cl \xrightarrow[\text{KOH}]{\text{alc.}} B \xrightarrow{\text{HBr}} C \xrightarrow[\text{ether}]{\text{Na}} D$ . In the above sequence of reaction, the product D is

A. Propane

B. 2, 3- Dimethylbutane

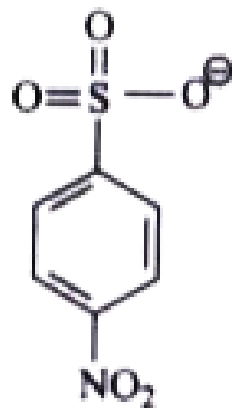
C. Hexane

D. Allyl bromide

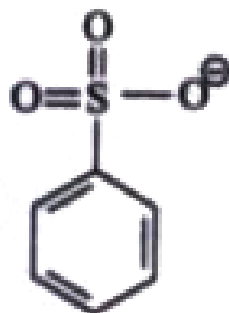
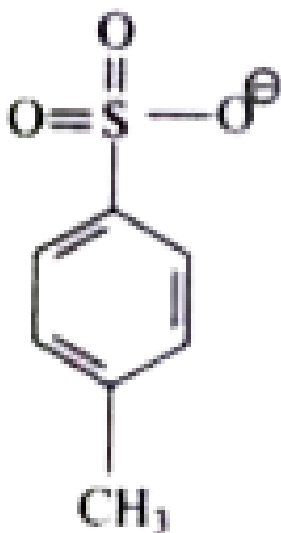
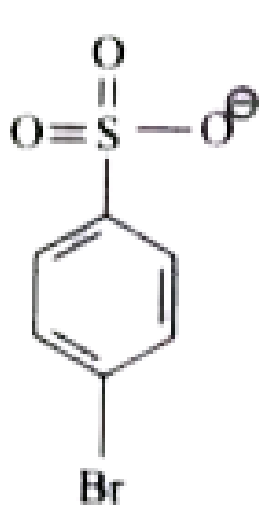
**Answer:**

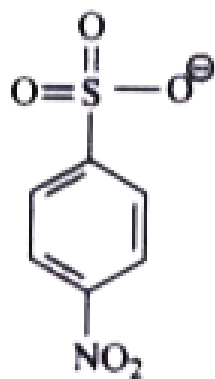


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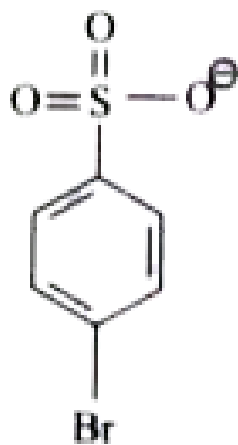


22. The best leaving group is :

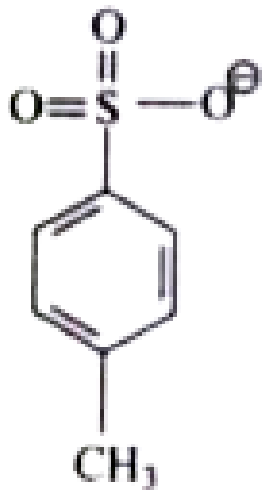




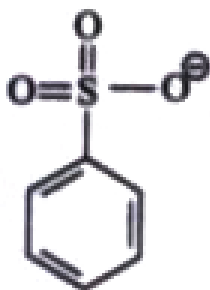
A.



B.



C.



D.

**Answer:**

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23. The reaction,  $2\text{RCl} \xrightarrow[\text{ether}]{\text{Na}} \text{R} - \text{R}$  is known as

A. Wurtz reaction

B. Fitting reaction

C. Wurtz-Fittig reaction

D. Freund reaction

**Answer:**

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**24.** IUPAC name of Gammmaxane is

A. Hexachlorobenzene

B. Benzene hexachloride

C. 1, 2, 3, 4, 5, 6 - Hexachlorocyclohexane

D. None of these

**Answer:**

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25. Pyrene is the trade name of ..... When used as fire extinguisher

A.  $CO_2$

B.  $CHCl_3$

C.  $CCl_4$

D.  $CH_3Cl_2$

**Answer:**



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26. Westron' is

A. 1, 1, 2, 2 - Tetrachloroethane

B. 1, 1- Dichloropropanone

C. 1, 3 - Dichloropropanone

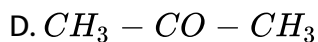
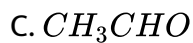
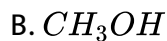
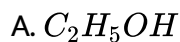
D. 1, 2- Dichloroethene



**Answer:**

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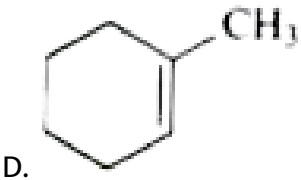
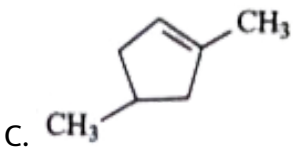
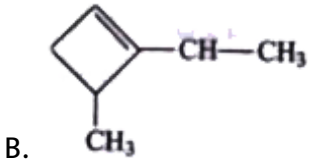
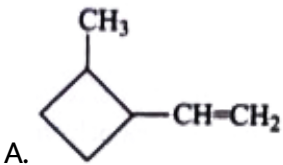
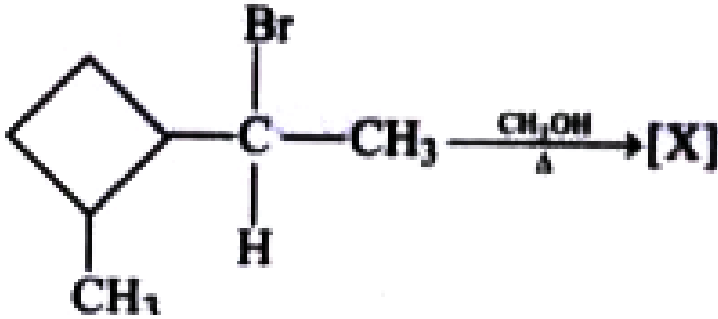
27. The starting substance for the preparation of  $CHI_3$  is any of the following except



**Answer:**

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28. [X] as the major product among the elimination products is :



Answer:



29. An alkyl bromide produces a single alkene when it reacts with sodium ethoxide and ethanol. This alkene on hydrogenation produces 2-methylbutane. What is the identity of the alkyl halide?

- A. 1-Bromo- 2, 2 - dimethyl propane
- B. 1- Bromobutane
- C. 1- Bromo - 2- methylbutane
- D. 2- Bromo - 2 - methylbutane

**Answer:**



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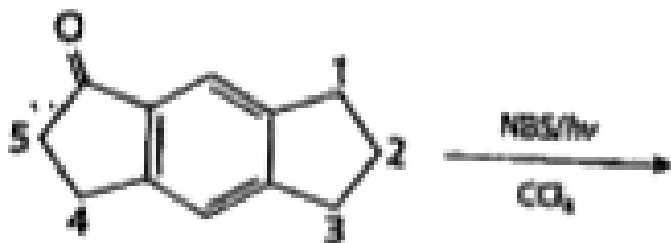
30. In a  $SN^2$  substitution reaction of the type  $R - Br + Cl^- \xrightarrow{DMF} R - Cl + Br^-$  which one of the following has the



Answer:

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32. The carbon atoms at which bromination will take place are:

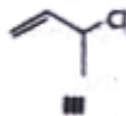
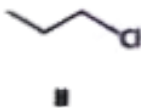
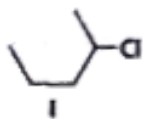


- A. 1, 2 and 3
- B. 4 and 5
- C. 1, 3, 4 and 5
- D. 1, 3 and 4

Answer:

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33. The order of reactivity of the following halides towards  $S_N1$  reaction is



A.  $II > III > I$

B.  $III > II > I$

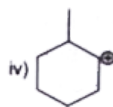
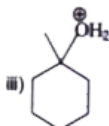
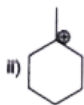
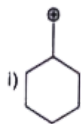
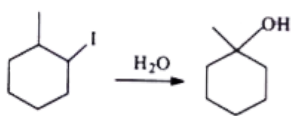
C.  $III > I > II$

D.  $I > III > II$

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34. Which of the following are expected to be intermediate of the following reaction



A. i & ii

B. ii, iii & iv

C. ii & iii

D. ii & iv

**Answer:**



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35. In the following reactions :



the rate of

reaction of (I) is faster than that of (II) . By which mechanism do both the reactions proceed ?

A. E1

B. E2

C. E1cB

D.  $\alpha$ - Elimination

Answer:



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36. Which is correct when  $SN^2$  v/s  $E_2$  : primary alkyl halide favours substitution whereas tertiary alkyl halide favours elimination, high temperature favours elimination reaction, strong, bases with less nucleophilicity ( $\overline{N}H_2, \overline{O}R$  etc.) favours elimination whereas weak, bases with strong nucleophilicity ( $Br^- , I^-$  etc.) favours  $SN^2$  , all

A. primary alkyl halide favours substitution whereas tertiary alkyl halide favours elimination

B. high temperature favours elimination reaction

C. strong, bases with less nucleophilicity ( $\overline{N}H_2, \overline{O}R$  etc.) favours elimination whereas weak, bases with strong nucleophilicity ( $Br^- , I^-$  etc.) favours  $SN^2$

D. all

**Answer:**



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**37. Assertion :** Neopentyl alcohol on treatment with conc. HCl gives neopenyl chloride

**Reason :** Less stable  $1^\circ$  and  $2^\circ$  carbocations usually rearrange to more stable  $2^\circ$  or  $3^\circ$  carbocations

- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion is false and reason is true

**Answer:**



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**38. Assertion :** Aryl halides undergo nucleophilic substitution with ease

**Reason :** Carbon-halogen bond in aryl halides has partial double bond

character.

- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion is false and reason is true

**Answer:**



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**39.** Assertion : Alcohols cannot be converted into alkyl bromides by reaction with NaBr

Reason :  $Br^-$  being very weak base cannot displace strong base  $OH^-$

- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion is false and reason is true

**Answer:**

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Level II

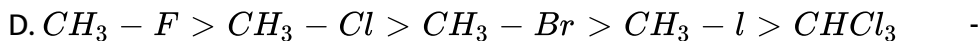
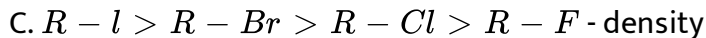
1. Which is incorrect in the physical properties of halogen compounds ?

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

B.



- Boiling point

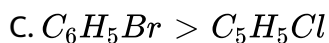
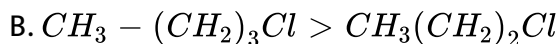
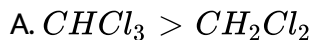


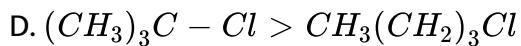
dipole moment

**Answer:**

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2. Which one of the following is not the correct order of boiling points of halides ?





**Answer:**



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3. Which among the following has highest density ?

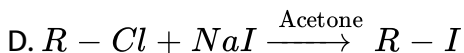
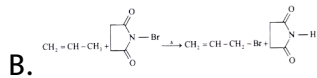
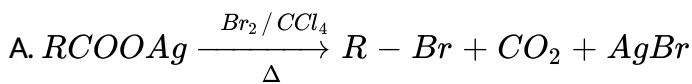


**Answer:**



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4. Which of the following reaction is known as Hunsdiecker reaction ?



**Answer:**

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5. Alkyl halides can be prepared by the following reaction except

A. Groves process

B. Darzen's process

C. Finkelstein reaction

D. Birnbaum - Simmonini reaction

**Answer:**

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6.  $2\text{CH}_3 - \text{CH}_2 - \text{Cl} + \text{Hg}_2\text{F}_2 \rightarrow 2\text{CH}_3 - \text{CH}_2 - \text{F} + \text{Hg}_2\text{Cl}_2$  . This reaction is called

- A. Finkelstein reaction
- B. Swartz reaction
- C. Brodine- Hunsdieker reaction
- D. Raschig process

**Answer:**

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7. The function of halogen carrier (catalyst) in halogenation of benzene is

- A. To make the halogen a better electroophile
- B. To make the halogen a weak electrophile
- C. To make the halogen a better nucleophile



D. To make the halogen a weak nucleophile

**Answer:**

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8. Neopentyl alcohol on treatment with HBr gives (1) neopentyl bromide (2) 2-bromo-2-methyl butane (3) 2-methyl-2-butene (4) 2-methyl-1-butene

- A. neopentyl bromide
- B. 2-bromo-2-methyl butane
- C. 2-methyl-2-butene
- D. 2-methyl-1-butene

**Answer:**

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9. Which of the following combinations is correctly matched

	Compound	Reaction	Stereochemistry
A.	$\begin{array}{c} H \\   \\ CH_3 - C - Cl \\   \\ D \end{array}$	$SN_N^1$	Walden inversion
	Compound	Reaction	Stereochemistry
B.	$\begin{array}{c} C_2H_5 \\   \\ Ph - C - Cl \\   \\ CH_3 \end{array}$	$SN_N^1$	Retention of configuration only
	Compound	Reaction	Stereochemistry
C.	$\begin{array}{c} C_2H_5 \\   \\ Ph - C - Cl \\   \\ CH_3 \end{array}$	$SN_N^1$	Inversion of configuration only
	Compound	Reaction	Stereochemistry
D.	$\begin{array}{c} H \\   \\ CH_3 - C - Cl \\   \\ D \end{array}$	$SN_N^2$	Walden inversion

Answer:



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10. A dextrorotatory optically active alkyl halide undergo hydrolysis by  $SN^2$  mechanism. The resulting alcohol is (1)dextrorotatory

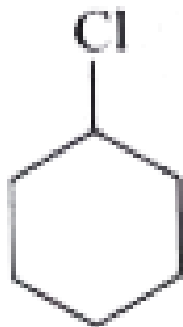
(2)laevorotatory (3)optically inactive due to racemisation (4)may be dextro or laevo rotatory

- A. dextro
- B. laevo
- C. optically inactive due to racemisation
- D. may be dextro or laevo rotatory

**Answer:**

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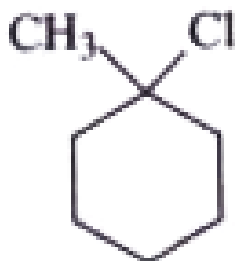
11. Which of the following compounds is most soluble in water?



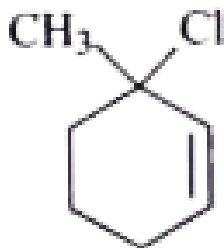
A.



B.



C.



D.

**Answer:**



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12. In which of the following solvent  $S_N1$  reaction is maximum

A.  $H_2O$

B. Acetone

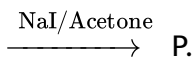
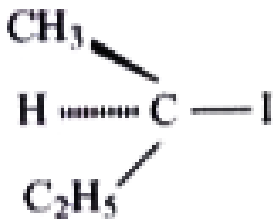
C. DMSO

D. DMF

Answer:

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13.



The product is:

A. *d* isomer

B. *l* isomer

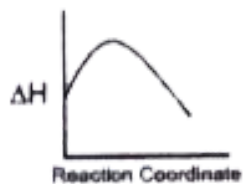
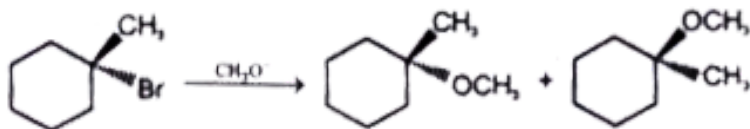
C. Meso form

D. Mixture of *d* and *l*

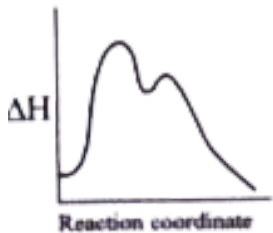
Answer:

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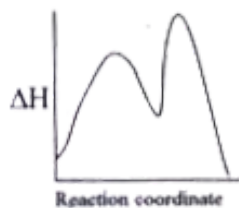
14. Which is the correct reaction coordinate diagram for the following solvolysis reaction ?



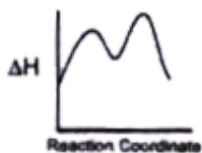
A.



B.



C.



D.

**Answer:**

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15. When concentration of alkyl halide is tripled and the concentration of  $\text{OH}^-$  ion is reduced to half, the rate of  $\text{S}_{\text{N}}2$  reaction increased by

A. 3 times

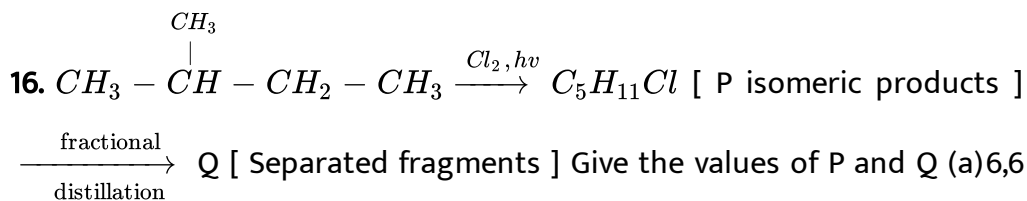
B. 2 times

C. 1.5 times

D. 6 times

**Answer:**

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(b) 6,4 (c) 4,4 (d) 7,3

A. 6, 6

B. 6, 4

C. 4, 4

D. 7, 3

**Answer:**

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17. ( - )2- methylbutan- 1 - ol on heating with conc. HCl gives ( + )1-chloro - 2 - methylbutane by  $SN^2$  mechanism. Which of the following statement are correct

- i) reaction proceeds through retention of configuration at stereocentre
- ii) reaction proceeds through inversion of configuration at stereocentre
- iii) reaction proceeds directly through a transition state
- iv) reaction proceeds through carbocation intermediate

A. i and iii

B. i and iv

C. ii and iii

D. i, iii and iv

**Answer:**



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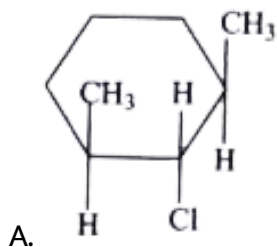
18. 1, 3 dichloro propane reacts with zinc or NaI gives (major product)

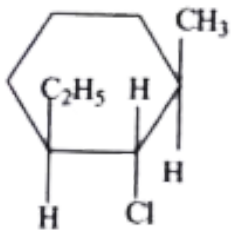
- A. propane
- B. propene
- C. cyclopropane
- D. n-propyl iodide

Answer:

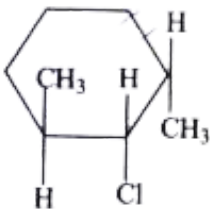
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19. Which of the following is most reactive towards  $E_2$  reaction

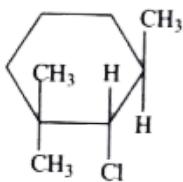




B.



C.

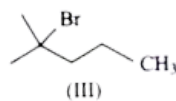
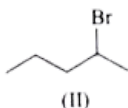
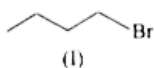


D.

Answer:

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20. Dehydrobromination of the following is in the order



(I)

A.  $III > II > I$

B.  $I > II > III$

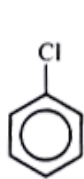
C.  $II > III > I$

D.  $II > I > III$

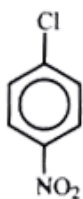
Answer:

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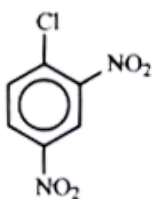
21. Order of reactivity towards nucleophilic substitution reaction of the compounds



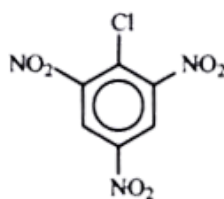
I



II



III



IV

(1)

(1)  $I > II > III$

> IV (2)  $II > I > II > IV$  (3)  $IV > III > II > I$  (4)  $II > IV > II > I$

A.  $I > II > III > IV$

B.  $II > I > II > IV$

C.  $IV > III > II > I$

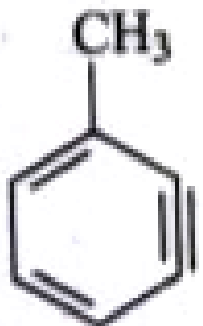
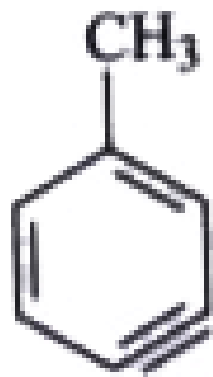
D.  $II > IV > II > I$

**Answer:**

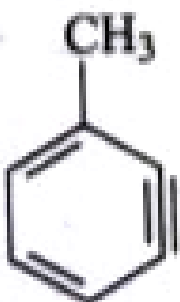
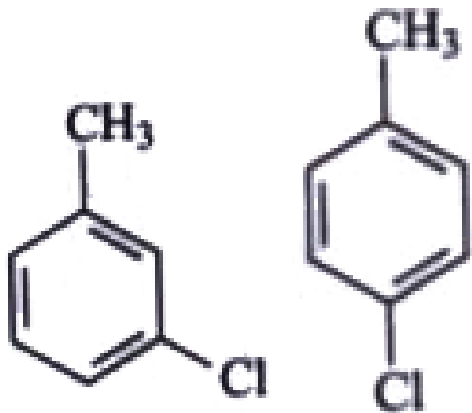


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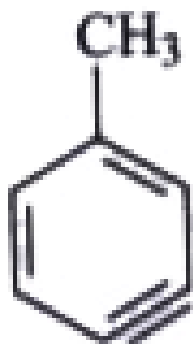
22. O- Chlorotoluence reacts with  $NaNH_2$  in liq.  $NH_3$  to give o-toludine and m-toludine. Which of the following is an intermediate in the above



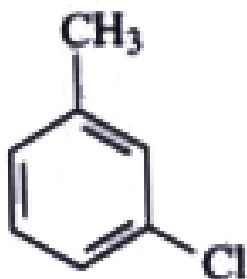
reaction



A.



B.



C.



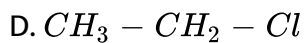
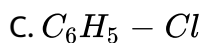
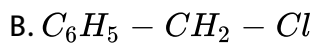
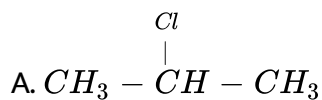
D.

Answer:



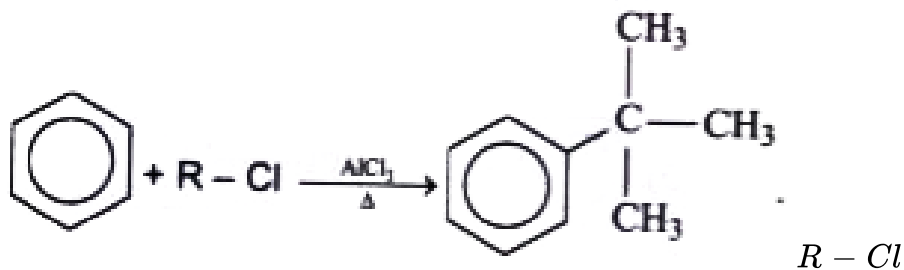
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23. The halide which will not react with benzene in presence of anhydrous  $AlCl_3$  is



Answer:

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can be



A. 2 - chloro - 2 - methyl propane

B. 2 - chloro - 2 - methyl butane

C. 1 - chloro - 2 - methyl propane

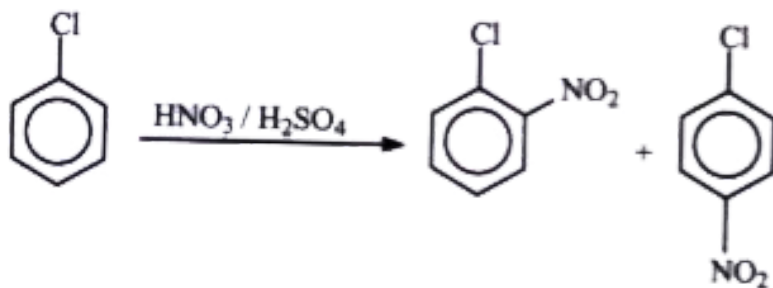
D. 1 or 3

**Answer:**

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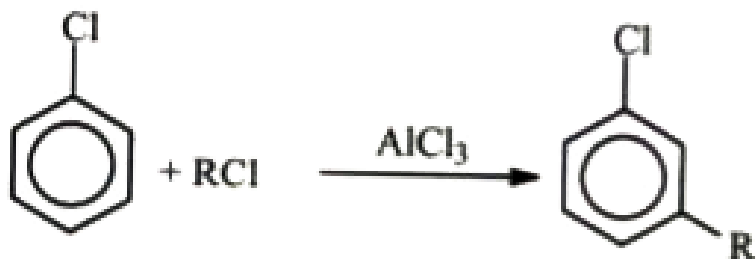
25. Which of the following statements are correct about electrophilic substitution reactions of chlorobenzene

1) Chlorine is meta directing deactivator ?



2)

3) Chlorine is an o,p- directing deactivator



4)

5) Reactivity of the ring is controlled by strong-I effect of chlorine and orientation of the electrophile is controlled by its weak + R effect

A. 2, 3 and 5 are correct

B. 1 only is correct

C. 2 and 3 are correct

D. 4 and 5 are correct

**Answer:**



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26. Which is incorrectly matched

A. Chloroform - Acidic hydrogen

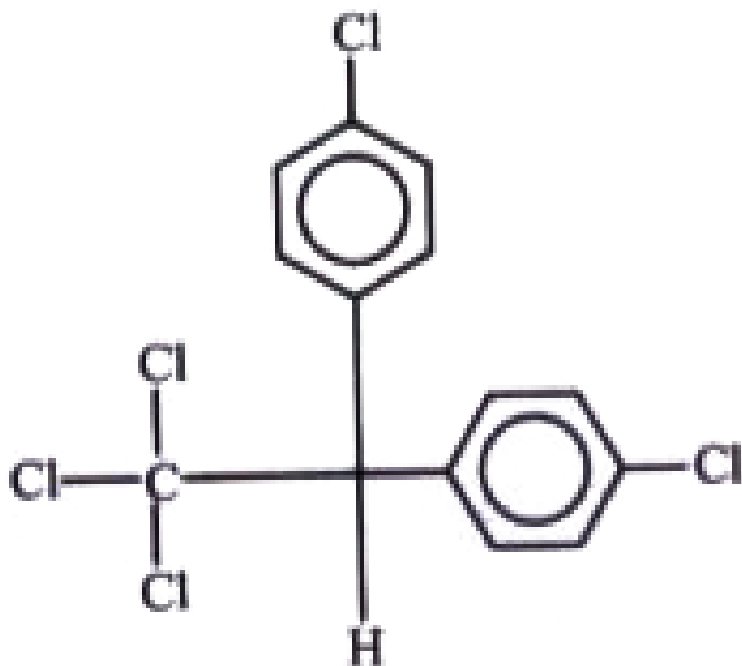
B. Chloroform + acetone - Chloretone

C. Pyrene-  $CCl_4$

D. Westron - Chloropicrin

Answer:

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27.

compound is

the given

A. DDT

B. insecticide proved by Paul Muller in 1939

C. insecticide prepared in 1873

D. all

**Answer:**

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**28.** Chloroform on boiling with conc. aqueous or alcoholic KOH, the product is

A. potassium acetate

B. potassium formate

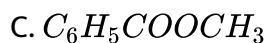
C.  $CCl_4$

D. Chloretone

**Answer:**

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29. At higher temperature, iodoform reaction is given by



**Answer:**

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30.  $CCl_4$  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 flammable at higher temperatures

B. It is toxic

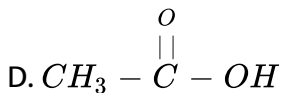
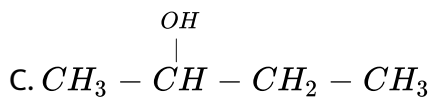
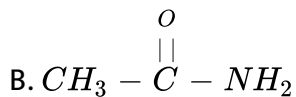
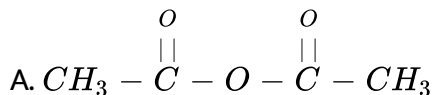
C. It produces phosgene by reaction with water vapour at higher temperatures

D. It is corrosive

**Answer:**

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



**Answer:**

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32. Assertion : Dipole moment of  $CH_3F$  is greater than  $CH_3Cl$

Reason : C-Cl bond is more polar than C-F bond.

- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion and reason are false

**Answer:**



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33. Assertion : Chlorination of  $CH_4$  with  $Cl_2/h\nu$  produces traces of  $CH_3 - CH_3$

Reason : Chlorination of  $CH_4$  with  $Cl_2/h\nu$  proceeds by free radical mechanism.

- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion and reason are false

**Answer:**



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**34.** Assertion : Optically active alkyl halide undergo racemisation in  $S_N1$  reaction

Reason : Intermediate carbocation has planar geometry.



- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion and reason are false

**Answer:**

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35. Assertion :  $CH_3 - CH_2 - O - CH_2 - Cl$  reacts faster with water than  $CH_3 - O - CH_2 - CH_2 - Cl$

Reason : Carbonium ion of  $CH_3 - CH_2 - O - CH_2 - Cl$  is more stable than the carbonium ion of  $CH_3 - O - CH_2 - CH_2 - Cl$

- A. A.Both assertion and reason are true and reason is the correct explanation of assertion

B. B.Both assertion and reason are true but reason is not the correct explanation of assertion

C. C.Assertion is true, reason is false

D. D.Assertion and reason are false

**Answer:**

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**36.** Assertion :  $S_N1$  reaction is carried out in polar protic solvents.

Reason : Polar protic solvents increases the stability of carbocation due to solvation.

A. Both assertion and reason are true and reason is the correct explanation of assertion

B. Both assertion and reason are true but reason is not the correct explanation of assertion

C. Assertion is true, reason is false

D. Assertion and reason are false

**Answer:**

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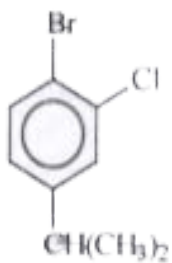
37. Assertion : Benzene reacts with ICl in presence of  $AlCl_3$  to form chlorobenzene

Reason : ICl gives  $Cl^+$  and  $I^-$

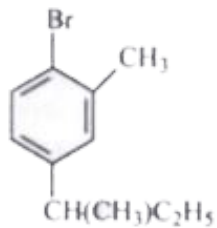
- A. Both assertion and reason are true and reason is the correct explanation of assertion
- B. Both assertion and reason are true but reason is not the correct explanation of assertion
- C. Assertion is true, reason is false
- D. Assertion and reason are false

**Answer:**

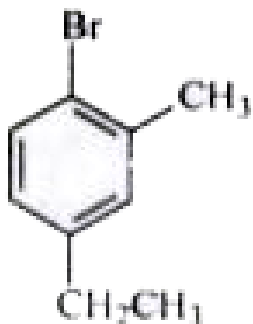
38. Write the structures of the following compounds 1-Bromo-4-sec butyl-2-methylbenzene



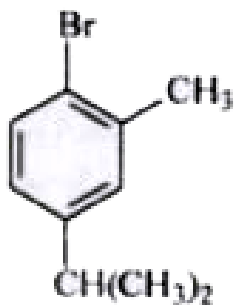
A.



B.



C.



D.

Answer: B

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39. Arrange the following compounds in the order of reactivity with alcoholic silver nitrate,

$C_6H_5CH_2CH_2Br$  (I),  $C_6H_5CHBrCH_3$  (II) and

$C_6H_5CH = CHBr$  (III)

A.  $II > I > III$

B.  $I > II > III$

C.  $III > II > I$

D.  $II = I > III$

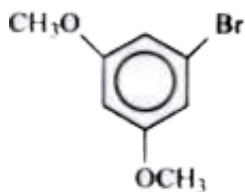
Answer: A

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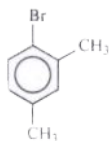
40. Which of the following compounds is the most likely to undergo a bimolecular nucleophilic substitution reaction with aqueous NaOH?



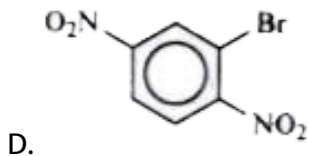
A.



B.



C.

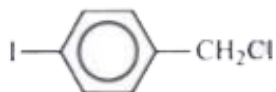


Answer: D

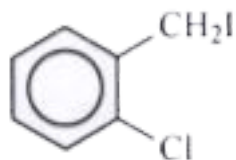
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41. Which of the following will give yellow precipitate on shaking with an aqueous solution of NaOH followed by, acidification with dil  $HNO_3$  and addition of  $AgNO_3$  solution?

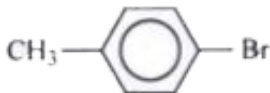
A.  $C_2H_5I$



C.



D.



**Answer: C**



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42. A dihalogen derivative  $X$  of a hydrocarbon with three carbon atom react 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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43. In methyl alcohol solution, bromine reacts with ethylene to yield  $BrCH_2CH_2OCH_3$  in addition to 1,2-dibromoethane because

- A. the ion formed initially may react with Br-or  $CH_3OH$
- B. the methyl alcohol solvates the bromine
- C. the reaction follows Markownikoff's rule
- D. this is a free-radical mechanism

**Answer: A**

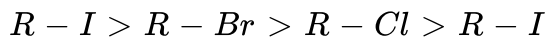


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44. Which of the following statements is wrong?

- A. Ethyl chloride on reduction with Zn-Cu couple and alcohol gives ethane
- B. The reaction of methyl magnesium bromide with acetone gives butanol-2

C. Alkyl halides follow the following reactivity sequence on reaction with alkenes.

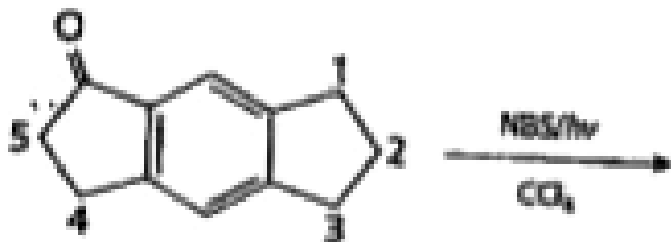


D.  $C_2H_4Cl_2$  may exist in two isomeric forms

Answer: B

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45. The carbon atoms at which bromination will take place are:



A. 1, 2 and 3

B. 4 and 5

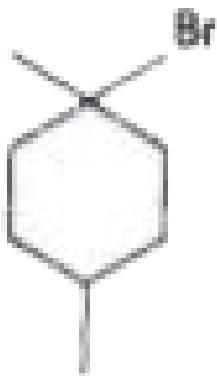
C. 1, 3, 4 and 5

D. 1, 3 and 4

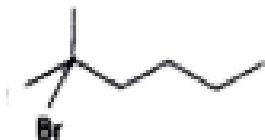
Answer: D

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46. Which of the following compounds can be prepared by free radical halogenation without complication by formation of isomeric by-products?



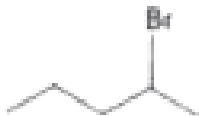
A.



B.



C.

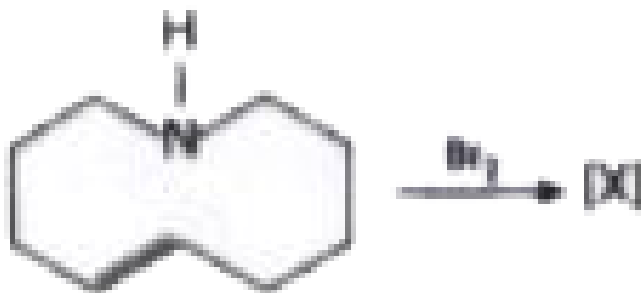


D.

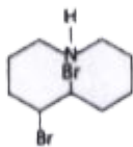
Answer: C

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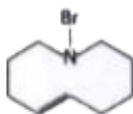
47. In the given reaction:



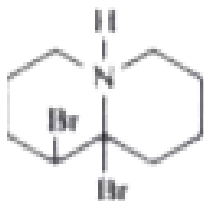
The structure of X is



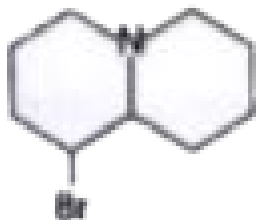
A.



B.



C.



D.

Answer: D

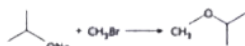


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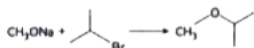
48. Which of the following reactions would give the best yield?



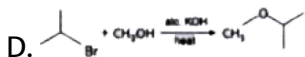
A.



B.



C.

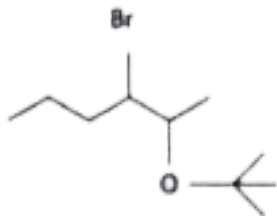
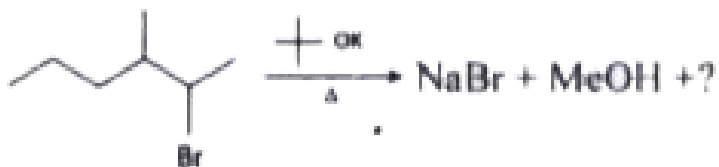


D.

Answer: B

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49. What is the major product of the following reaction?



A.



B.



C.

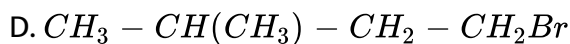
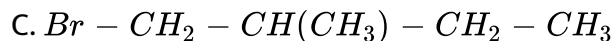
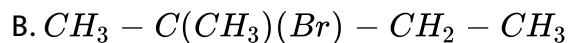
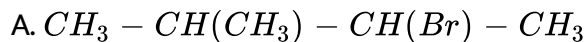


D.

**Answer: B**

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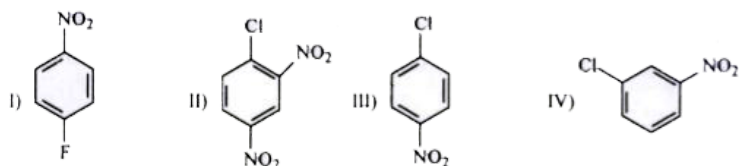
50. Potassium phthalimide on reaction with compound (A) followed by hydrolysis forms isopentyl amine. The compound (A) will be:



Answer: D

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51. Arrange the following in increasing order of reactivity towards aromatic nucleophilic substitution reaction.



A. I < IV < III < II

B. IV < III < I < II

C. I < IV < II < III

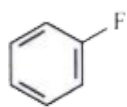
D. IV < I < II < III

Answer: B

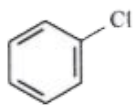
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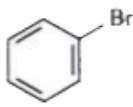
52. Consider the nitration of haloarenes given below in the presence of concentrated nitric acid and sulphuric acid.



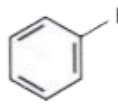
(I)



(II)



(III)



(IV)

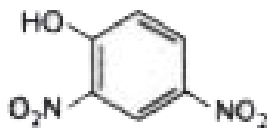
Select the incorrect statement about it?

- A. A) Nitration of all aryl halides is slower than benzene.
- B. B) Rate of nitration follows the order  $I > IV > II > III$ .
- C. C) Order of yield of para nitro product is  $I > II > III > IV$
- D. D) Order of yield of ortho product is  $I > II > III > IV$ .

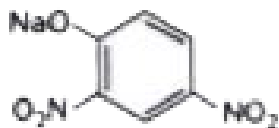
**Answer: D**

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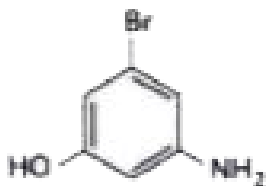
53. What product(s) would you expect from the following reaction?



A.



B.



C.

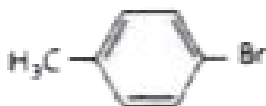
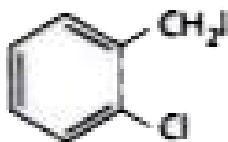
D. Substantial amounts of I and II

Answer: A

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54. Which of the following will give yellow precipitate on shaking with an aqueous solution of NaOH followed by, acidification with dil  $HNO_3$  and addition of  $AgNO_3$  solution?

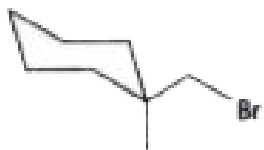
A.  $C_2H_5I$



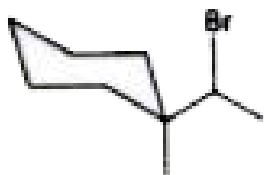
Answer: C

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55. Which of the following alkyl halides is the most reactive in solvolysis of alkyl chlorides in 50% aqueous ethanol?



A.



B.



C.



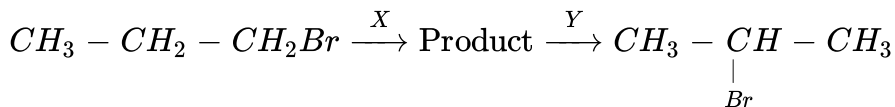
D.

Answer: D



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56. Identify the set of reagent/reaction conditions X and Y, in the following set of transformations.

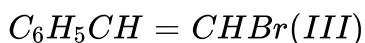


- A. X = dilute aqueous NaOH, 20° C, Y = HBr/acetic acid, 20° C
- B. X = concentrated alcoholic NaOH, 80° C, Y = HBr/acetic acid, 20° C
- C. X = dilute aqueous NaOH, 20° C, Y = Br<sub>2</sub>/CHCl<sub>3</sub>, 0° C
- D. X = concentrated alcoholic NaOH, 80° C, Y = Br<sub>2</sub>/CHCl<sub>3</sub>, 0° C

**Answer: B**

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57. Arrange the following compounds in the order of reactivity with alcoholic silver nitrate,



A. II > I > III

B. I > II > III

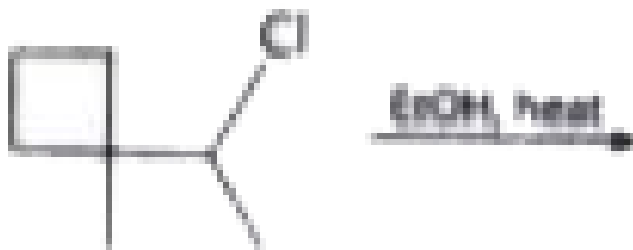
C. III > II > I

D. II = I > III

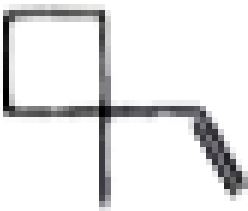
Answer: A

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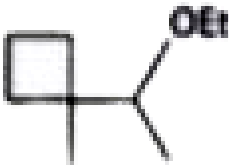
58. What is the major product of the following reaction?



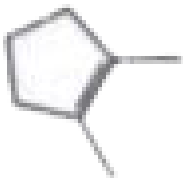
A. 



B.



C.



D.

Answer: D

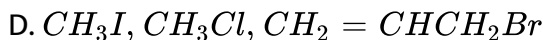
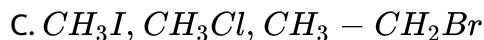
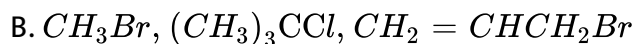
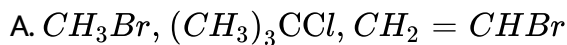


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59. Which compound in each of the following pairs will react faster in  $S_N2$  reaction with  $\text{OH}^-$ ?

1)

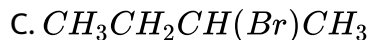
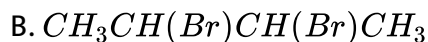
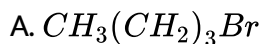
$\text{CH}_3\text{Br}$  or  $\text{CH}_3\text{I}$ ) ( $\text{CH}_3$ )<sub>3</sub> $\text{CCl}$  or  $\text{CH}_3\text{Cl}$ )  $\text{CH}_2 = \text{CHBr}$  or  $\text{CH}_2 =$



**Answer: D**

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**60.** An unknown alkyl halide (A) reacts with alcoholic KOH to produce a hydrocarbon ( $C_4H_8$ ). Ozonolysis of the hydrocarbon affords 1 mol of propionaldehyde and 1 mol of formaldehyde. Suggest which organic structure of the above alkyl halide (A)?





Answer: A



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61. Two bottles containing  $C_6H_5I$  and  $C_6H_5CH_2I$  lost their original labels. They were labelled as A and B for testing A and B were separately taken in test tubes and boiled with Na OH solution. The solution in each tube was made acidic with dilute  $HNO_3$  and some  $AgNO_3$  solution was added. Substance B gave a yellow precipitate. Which of the following statements is true for this experiment : Addition of  $HNO_3$  was unnecessary, A was  $C_6H_5I$ , A was  $C_6H_5CH_2I$ , B was  $C_6H_5I$

A. A was  $C_6H_5I$

B. A was  $C_6H_5CH_2I$

C. B was  $C_6H_5I$

D. Addition of  $HNO_3$  was unnecessary

Answer: A





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62. Give the reagent needed to convert benzyl bromide into benzyl alcohol and benzyl iodide.

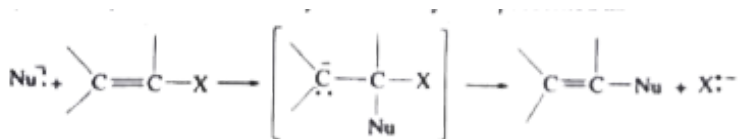
- A. ale.KOH, Nat in dry acetone
- B. aq.KOH, Na in dry ether
- C. aq .KOH, Nat in dry acetone
- D. ale. KOH, NaOH in dry ether

Answer: C

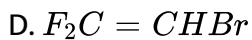
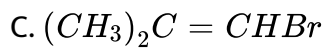
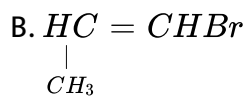
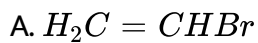


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63. Nucleophilic displacement on a vinyl halide may be represented as



Which of the following vinyl halide is expected to follow this mechanism?



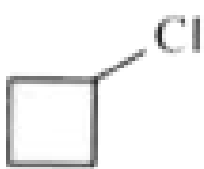
Answer: D

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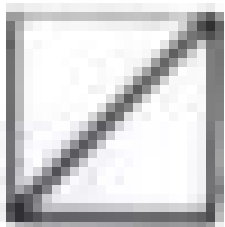
64. 1-Bromo-3-chlorocyclobutane when treated with two equivalents of Na in the presence of ether results into



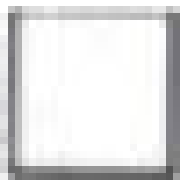
A.



B.



C.



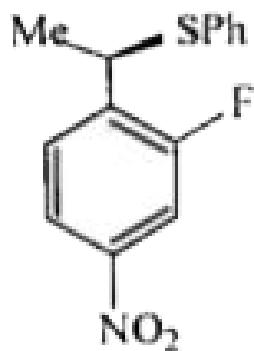
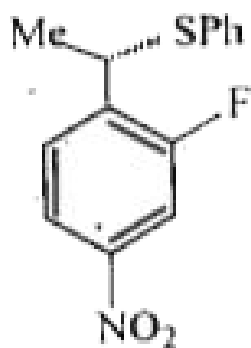
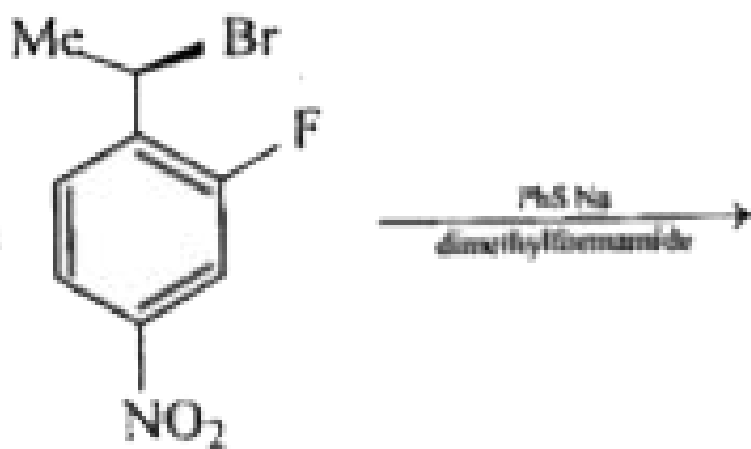
D.

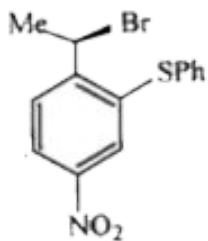
**Answer: C**



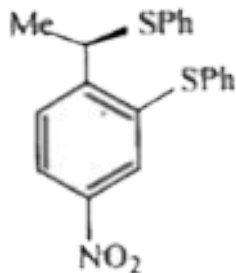
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65. The major product of the reaction





C.



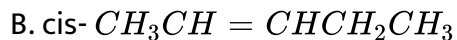
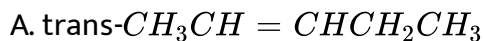
D.

**Answer: A**



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66. Which of the following products is obtained in Highest yield when 2-bromopentane is treated with  $\text{CH}_3\text{CH}_2\text{O} - \text{Na}^+$  ?



D. 2-pentanol

**Answer: A**

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67. Dehalogenation of vic-dihalides with active metals or I- involve anti elimination of halogens. The products obtained in dehalogenation of meso-2,3-dibromobutane and (S, S)-2,3-dibromobutane, respectively are

- A. trans-2-butene, cis-2-butene
- B. trans-2-butene, tras-2-butene
- C. cis-2-butene, trans-2-butene
- D. cis-2-butene, cis-2-butene

**Answer: A**

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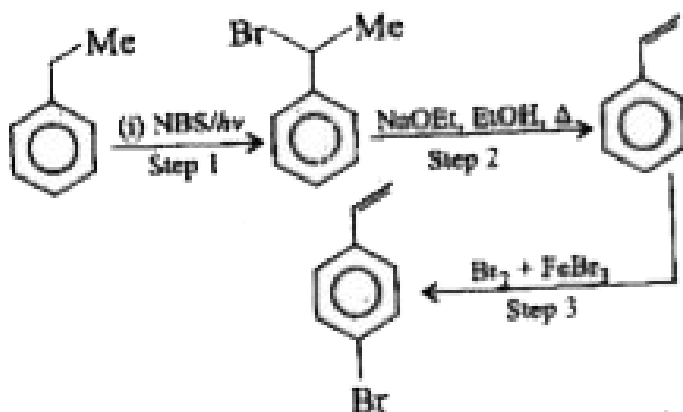
68. The chlorine atom in chlorobenzene is ortho and para director because

- A. resonance effect predominates over inductive effect
- B. inductive effect predominates over resonance effect
- C. both inductive and resonance effects are evenly matched
- D. only resonance effect and not inductive effect is operating

Answer: A

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69. In the following reaction, which of the following steps is wrong?





A. Step 1

B. Step 2

C. Step 3

D. None

Answer: C

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Which of the following statements is correct about the above reaction? :

The reaction proceeds by  $\alpha$  elimination via the formation of a carbene as an intermediate., The reaction proceeds by  $\alpha$  elimination via the formation of a carbanion as an intermediate., The reaction proceeds by E1 mechanism., The reaction proceeds E1cB mechanism.

- A. The reaction proceeds by  $\alpha$ elimination via the formation of a carbene as an intermediate.
- B. The reaction proceeds by  $\alpha$ elimination via the formation of a carbanion as an intermediate.
- C. The reaction proceeds by E1 mechanism.
- D. The reaction proceeds E1cB mechanism.

Answer: A

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71. Complete the following reaction



A.





B.



C.

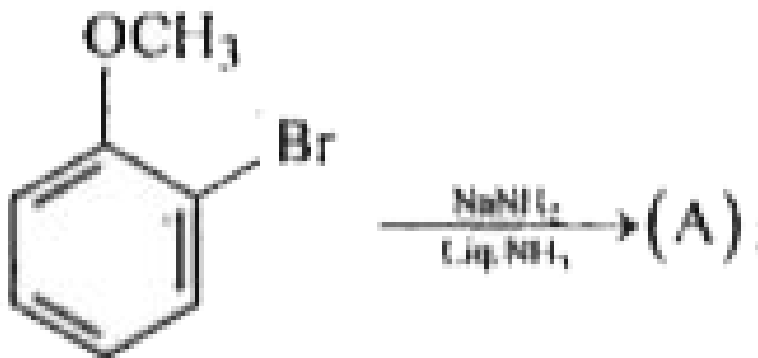


D.

**Answer: C**

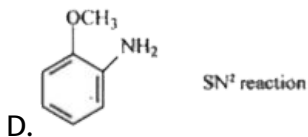
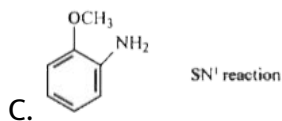
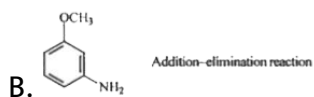
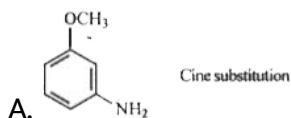


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72.

The major product (A) and reaction R are:



Answer: A

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73. In the reaction  $CH_3C \equiv \overset{-}{C}\overset{+}{Na} + (CH_3)_2CHCl \rightarrow$  the product formed is:

- A. 4-Methyl-2-pentyne only
- B. Propyne
- C. Propyne and propylene
- D. Mixture of propene, propyne, and 4-methyl-2-pentyne

**Answer: D**



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74. (X) on treatment with sodium hydroxide followed by the addition of silver nitrate gives white precipitate at room temperature which is soluble in  $NH_4OH$ . (X) can be:

- A. Chlorobenzene
- B. Ethyl bromide

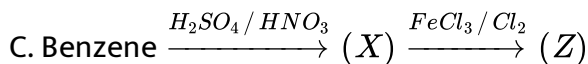
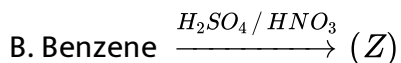
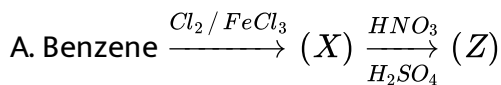
C. Benzylchloride

D. Vinyl chloride

**Answer: C**

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75. Which of the following sequences would yield m-nitrochlorobenzene (Z) from benzene?



D. All of these above will produce (Z).

**Answer: C**

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76.  $C_3H_7Cl \xrightarrow{KOH (alc)} (A) \xrightarrow[770K]{Cl_2 (g)} (X)$ . (X) can be:

- A. Vinyl chloride
- B. Allyl chloride
- C. Ethyl chloride
- D. Ethyl iodide

**Answer: B**



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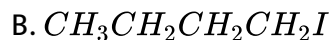
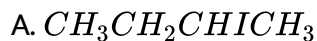
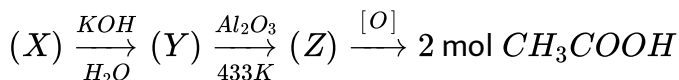
77.  $C_6H_5Cl \xrightarrow[625 K \text{ and } 300 \text{ atm}]{NaOH (aq)}$ . The product can be:

- A. Benzal
- B. Sodium benzoate
- C. Benzol
- D. Sodium phenate

Answer: D

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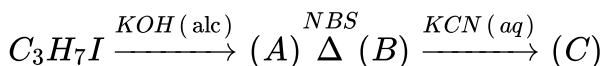
78. In the given sequence of reactions, predict (X).



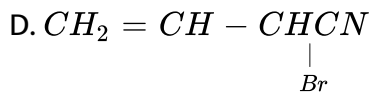
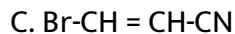
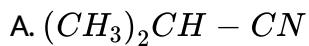
Answer: A

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79. Identify (C) in the following series.





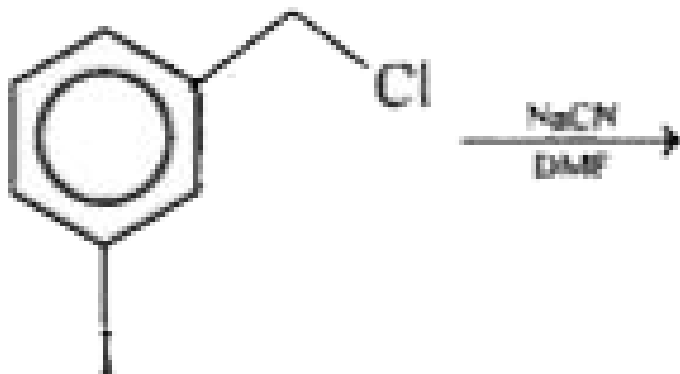


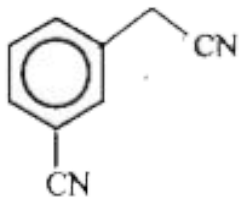
Answer: B

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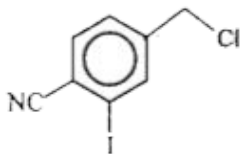
80. The structure of the major product formed in the following reaction is:

is:

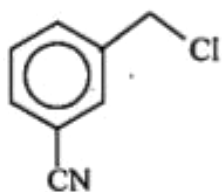




A.



B.



C.



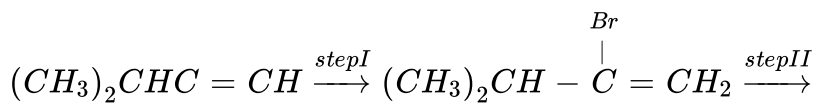
D.

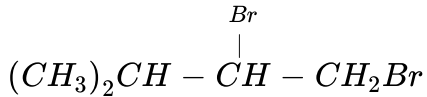
**Answer: D**



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**81.** In the following reaction:





Which of the following sets of reagents can be used for step I and step II

?

**Step I**

1. HBr

2. HBr and peroxide

3. Br<sub>2</sub>

4. Br<sub>2</sub>

**Step II**

HBr and peroxide

HBr

HBr

HBr and peroxide

Select the correct answer using the codes given below

A. 1, 2 and 4

B. 2 and 4

C. 3 and 4

D. 1 alone

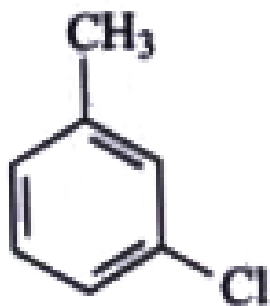
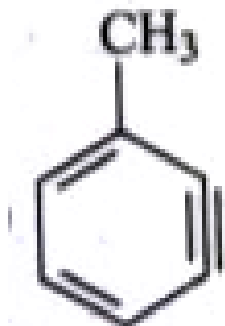
**Answer: D**

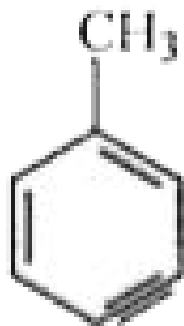


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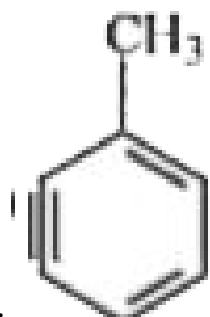
82. O-Chlorotoluence reacts with  $\text{NaNH}_2$  in liq.  $\text{NH}_3$  to give o-toludine and m-toludine. Which of the following is an intermediate in the above

reaction

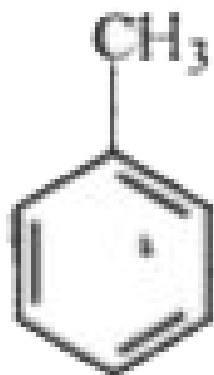




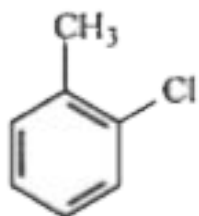
A.



B.



C.

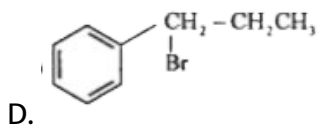
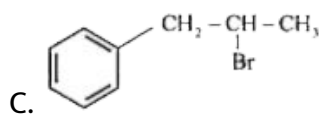
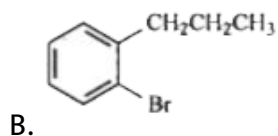
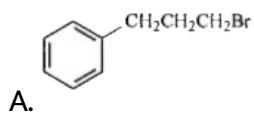


D.

Answer: B

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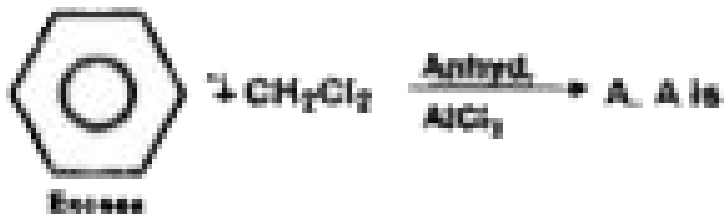
83. Propylbenzene reacts with bromine, in presence of light or heat to give:



Answer: D

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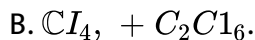
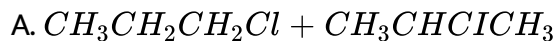
84. Complete the following reaction



Answer: D

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85. When propane is heated with excess of  $Cl_2$  at 573-673 K under 75-100 atm. Pressure, the products obtained are:



Answer: B



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

A. Propane

B. Propene

C. Propyne



D. Propanol

**Answer: B**

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87. Carbylamine test is performed in alcoholic KOH by heating a mixture of

- A. Chloroform and silver powder
- B. Trihalogenated methane and a primary amine
- C. An alkyl halide and a primary amine
- D. An alkyl cyanide and a primary amine

**Answer: B**

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1. 2-bromopentane is heated with potassium hydroxide in ethanol. The major product obtained is- pent-1-ene 2-ethoxypentane trans-2-pentene cis-2-pentene

- A. pentene-1
- B. 2-ethoxypentane
- C. trans-pentene-2
- D. cis-pentene-2

**Answer: C**



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2. The yield of chlorobenzene obtained by reaction of phenol with  $PCl_5$  is less due to the formation of

- A. p-chlorophenol
- B. o-chlorophenol

C. henyl phosphate

D. phosphorus oxychloride

**Answer: C**

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

A. 1-bromo-1,1-diethylmethane

B. 3-bromopentane

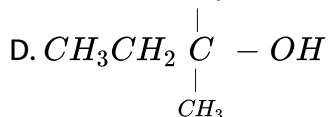
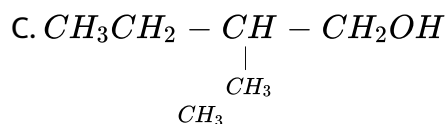
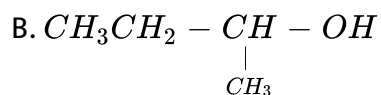
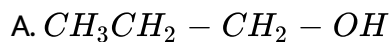
C. 1-bromo-1-ethylpropane

D. 1-bromopentane

**Answer: B**

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



Answer: D

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5. The reaction of ethyl bromide and silver cyanide results in the formation of

A. ethylene

B. ethyl cyanide

C. ethyl isocyanide

D. ethyl alcohol

**Answer: C**

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6. The bad smelling substance formed by the reaction of chloroform with methyl amine and alcoholic KOH will be

A. methyl amine

B. methyl alcohol

C. methyl cyanide

D. methyl isocyanide

**Answer: D**

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7. Chlorobenzene on fusing with solid NaOH followed by acidification gives

- A. Benzene
- B. Benzoic acid
- C. Phenol
- D. Benzene chloride

**Answer: C**



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8. On sulphonation of  $C_6H_5Cl$

- A. m-Chlorobenzenesulphonic acid is formed
- B. Benzenesulphonic acid is formed
- C. o-Chlorobenzenesulphonic acid is formed
- D. o- and p-Chlorobenzenesulphonic acid is formed

**Answer: D**

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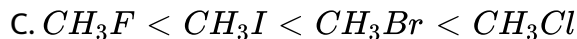
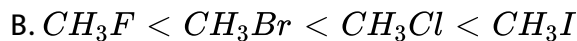
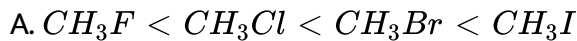
**9.** The Wurtz-Fittig reaction involves condensation of:

- A. two molecules of aryl halides
- B. one molecule of each of aryl-halide and alkyl-halide
- C. one molecule of each aryl-halide and phenol
- D. two molecules of aralkyl-halides

**Answer: B**

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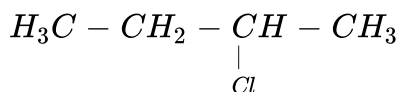
**10.** For the compounds  $CH_3Cl$ ,  $CH_3Br$ ,  $CH_3I$  and  $CH_3F$ , the correct order of increasing C-halogen bond length is:



**Answer: A**

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11. The product obtained on chlorination of n-butane will be:



A. meso-form

B. racemic mixture

C. d-form only

D. 1-form only

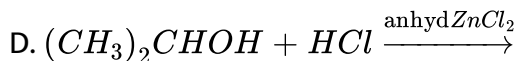
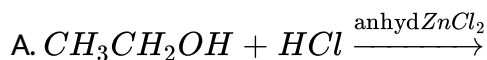
**Answer: B**





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12. Which- of the following reactions .cannot be used for the preparation of alkyl halides?



Answer: B



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13. A solution of (-) -1 -chloro-1-phenylethane in toluene racemizes slowly in the presence of a small amount of  $SbCl_5$ , due to the formation of:

A. carbene

B. carbocation

C. free radical

D. carbanion

**Answer: B**



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**14.** The major product formed when 1,1,1-trichloropropane is treated with aqueous potassium hydroxide is

A. propyne

B. 1-propanol

C. 2-propanol

D. propanoic acid

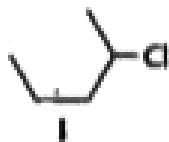
**Answer: D**



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15. The order of reactivity of the following halides towards  $S_N1$  reaction

is:



A.  $II > III > I$

B.  $III > II > I$

C.  $III > I > II$

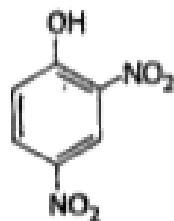
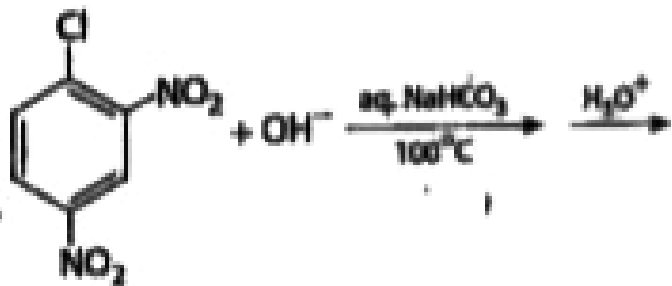
D.  $I > III > II$

Answer: C

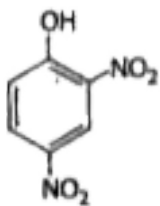
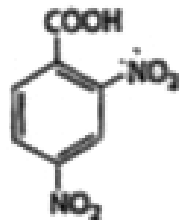
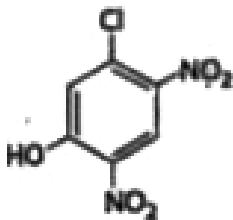
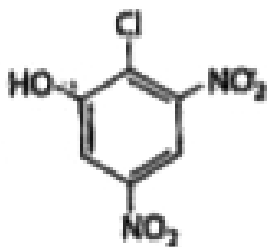


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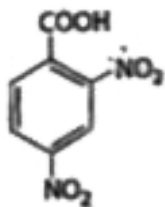
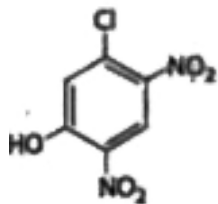
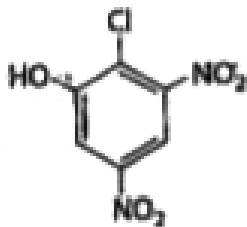
16. Consider the reaction given below:



The final major product of the reaction is:



A.



Answer: A

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17. How many constitutional isomers are formed when following compound under goes monochlorination?



A. 1

B. 3

C. 5

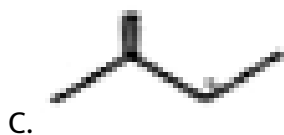
D. 7

Answer: C

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18. Which of the following compounds would you expect to be the major product when 2-bromo-2methylbutane is refluxed with KOH/ethanol?





Answer: D

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19. Which alkyl halide has the highest density?



**Answer: B**

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**20.** How will you obtain 1-bromopropane from propene?

- A. Markownikov addition of HBr
- B. Anti-Markownikov addition of HBr
- C. Electrophilic addition of HBr
- D. Using thionyl chloride of HBr

**Answer: B**

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**21.** A hydrocarbon  $C_5H_{12}$  gives only one monochlorination product.

Identify the hydrocarbon.



A. 2,2-Dimethylpropane

B. 2,3-Dimethylpropane

C. Methylpentane

D. 2-Methylbutane

**Answer: A**



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22. Tertiary alkyl halides are practically inert to substitution by  $SN^2$  mechanism because of

A. insolubility

B. instability

C. inductive effect

D. steric hindrance

**Answer: D**

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23. The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid is:

- A. gammexene
- B. hexachloroethane
- C. freon
- D. DDT

**Answer: D**

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24. Elimination of bromine from 2-bromobutane results in the formation of:

- A. equimolar mixture of 1-butene and 2-butene

B. predominantly 2-butene

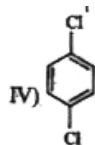
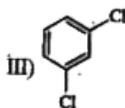
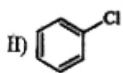
C. predominantly 1-butene

D. predominantly 2-butyne

Answer: B

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



$I < II < III < IV,$      $I < III < IV < II,$      $IV < III < II < I,$   
 $II < IV < III < I$

A.  $I < II < IV < III$

B.  $I < III < IV < II$

C.  $IV < III < II < I$

D.  $II < IV < III < I$

**Answer: A**

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26. Position of bromine in the compound in  $CH_3CH = CHC(Br)(CH_3)_2$  can be classified as.....

A. Allyl

B. Aryl

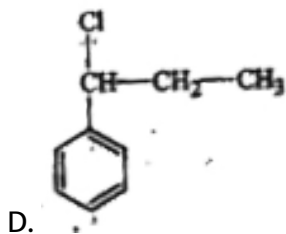
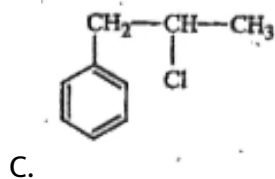
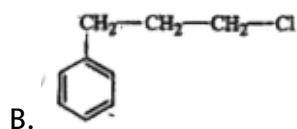
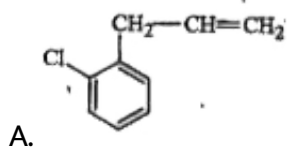
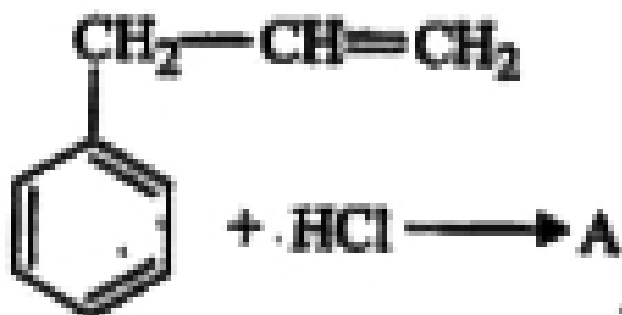
C. Vinyl

D. Secondary

**Answer: A**

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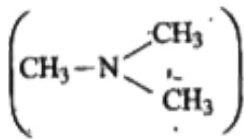
27. What is 'A' in the following reaction?



Answer: D

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28. Chloromethane on treatment with excess of ammonia yields mainly:



A. N, N-Dimethylmethanamine

B. N-methylmethanamine ( $\text{CH}_3 - \text{NH} - \text{CH}_3$ )

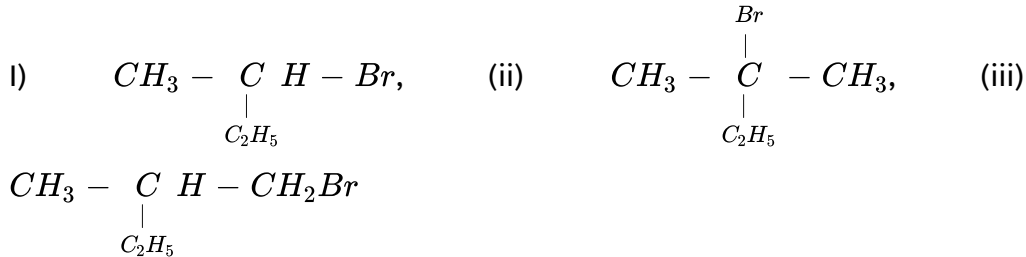
C. Methanamine ( $\text{CH}_3\text{NH}_2$ )

D. Mixture containing all these in equal proportion

Answer: C

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



A. I

B. I,II,III

C. II, III

D. I,III

**Answer: A**

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

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

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

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

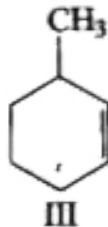
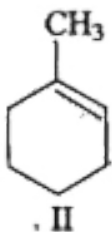
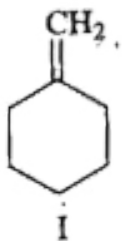
C. Butane < 1-Iodobutane < 1-Bromobutane < 1-Chlorobutane

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

**Answer: A**

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



A. I

B. II

C. III



D. I and II

Answer: D

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32. The intermediate during the addition of HCl to propene in presence of peroxide is :  $CH_3CHCH_2Cl$ ,  $CH_3CH^+CH_3$ ,  $CH_3CH_2CH \cdot CH_2$ ,  $CH_3CH_2CH_2$ ,

A.  $CH_3CHCH_2Cl$

B.  $CH_3CHCH_3$

C.  $CH_3CH_2CH_3$

D.  $CH_3CH_2CH_2$

Answer: B

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33. The synthesis of alkyl fluorides is best accomplished by

- A. Finkelstein reaction
- B. Swarts reaction
- C. free radical fluorination
- D. Sandmeyer's reaction

Answer: B

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34. The compound,  $C_7H_8 \xrightarrow{3Cl_2 / \Delta} A \xrightarrow{Br_2 / Fe} B \xrightarrow{Zn / HCl} C$

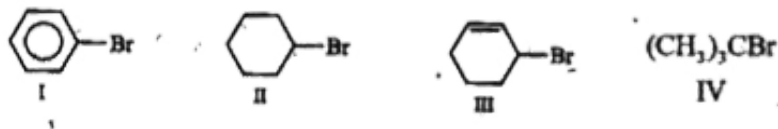
The compound C is:

- A. o-Bromotoluene
- B. m-Bromotoluene
- C. p-Bromotoluene
- D. 3-Bromo-2,4,6-trichlorotoluene

Answer: B

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35. The increasing order of hydrolysis of the following compounds is:



$I < IV < II < III,$        $I < II < III < IV,$        $I < II < IV < III,$   
 $IV < III < II < I$

A.  $I < IV < II < III$

B.  $I < II < III < IV$

C.  $I < II < IV < III$

D.  $IV < III < II < I$

Answer: C

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36. Consider the reaction,  
 $CH_3CH_2CH_2Br + NaCN \rightarrow CH_3CH_2CH_2CN + NaBr.$  This  
reaction will be the faster in:

- A. ethanol
- B. methanol
- C. N,N'-dimethylformamide (DMF)
- D. water

**Answer: C**

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37. Which one of the following halogen compounds when heated with alcoholic potassium hydroxide does not undergo dehydrohalogenation reaction?

- A. Secondary butyl chloride

B. Neopentyl chloride

C. Isobutyl chloride

D. Tertiary butyl chloride

**Answer: B**



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**38.** An alkyl bromide produces a single alkene when it reacts with sodium ethoxide and ethanol. This alkene on hydrogenation produces 2-methylbutane. What is the identity of the alkyl halide?

A. 1-Bromo-2,2-dimethylpropane

B. 1-Bromobutane

C. 1-Bromo-2-methylbutane

D. 2-Bromopentane

**Answer: C**



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39. Which of the following can be used as the halide component for Friedel-Crafts reaction?

- A. Chlorobenzene
- B. Bromobenzene
- C. Chloroethene
- D. Isopropyl chloride

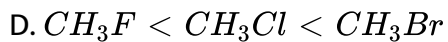
Answer: D



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40. The dipole moment of  $CH_3X$  (where X is a halogen) follows the order

- A.  $CH_3F > CH_3Cl > CH_3Br$
- B.  $CH_3F > CH_3Br > CH_3Cl$



**Answer: C**

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41. The hydrolysis of 2-bromo-3-methylbutane yields.

A. 3-methyl-2-butanol

B. 2-methyl-2-butanol

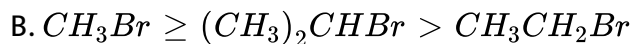
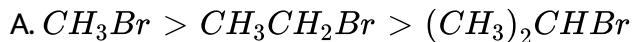
C. 3-methylbutanol

D. 2-methylbutanol

**Answer: B**

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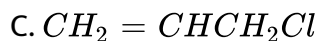
42. The rate of formation of alcohols from  $CH_3Br$ ,  $CH_3CH_2Br$ ,  $(CH_3)_2CHBr$  which follow  $SN_2$  mechanism is :



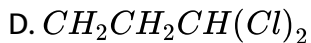
Answer: A

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43. Which of the following compounds reacts rapidly with the cold  $AgNO_3$  solution?







Answer: C

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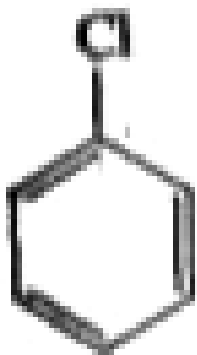
44. Which of the following statements is correct?

- A. Alkyl halides are more reactive than aryl halides towards nucleophilic substitution reactions
- B. Alkyl halides are less reactive than aryl halides towards nucleophilic substitution reactions
- C. The presence of an electron-withdrawing substituent at ortho and/or para position decreases the reactivity of nucleophilic substitution of chlorine in the substituted chlorobenzene
- D. The replacement of chlorine in chlorobenzene by strong bases proceeds via elimination-addition reaction

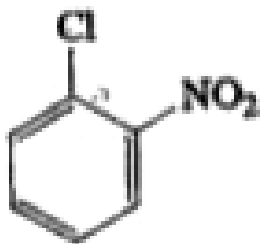
Answer: A

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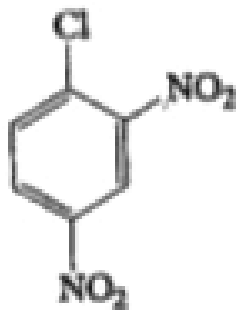
45. Which of the following compounds undergoes nucleophilic substitution reaction with aqueous NaOH?



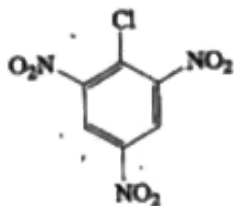
A.



B.



C.

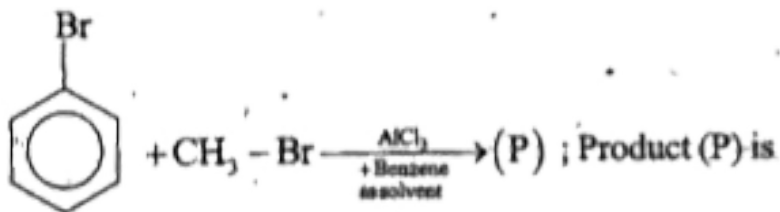


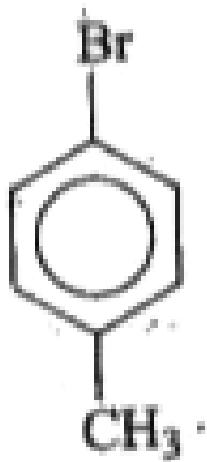
D.

Answer: D

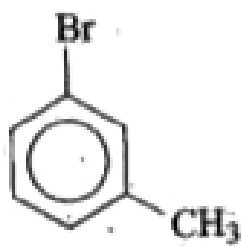
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46. Complete the following reaction

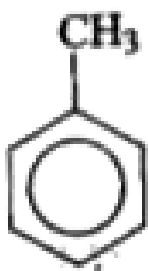




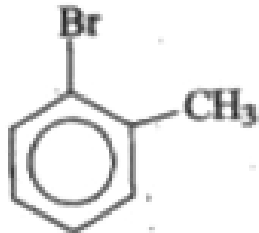
A.



B.



C.

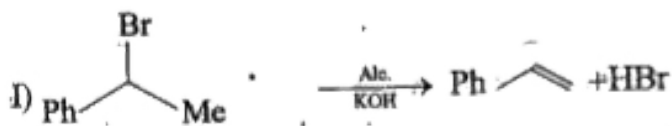


D.

Answer: C

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47. In the following reactions:



the rate of reaction of (I) is faster than that of (II). By which mechanism do

both the reactions proceed? (1) E1 (2) E2 (3) E1cB (4)  $\alpha$  - Elimination

A. E1

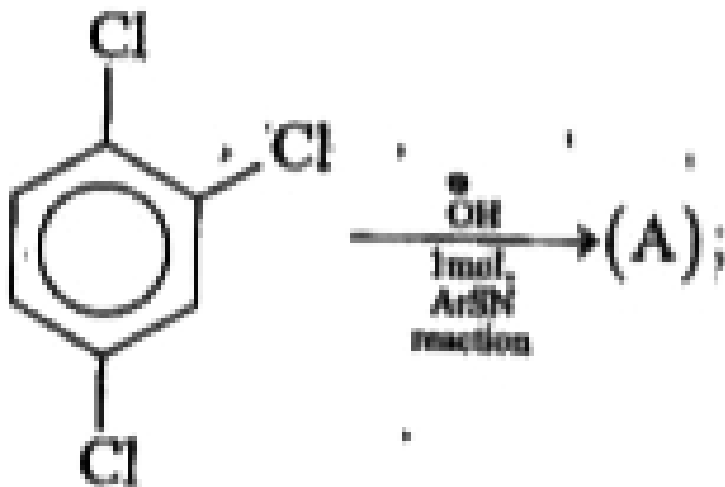
B. E2

C. E1cB

D.  $\alpha$ - Elimination

Answer: B

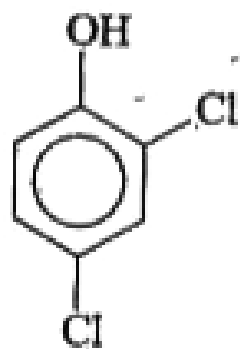
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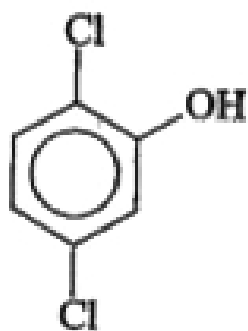
48.

be:

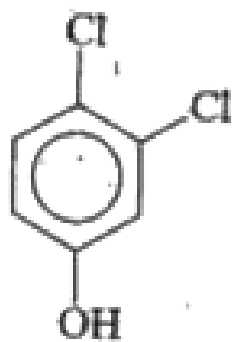
(A) Would



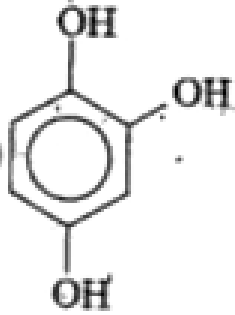
A.



B.



C.

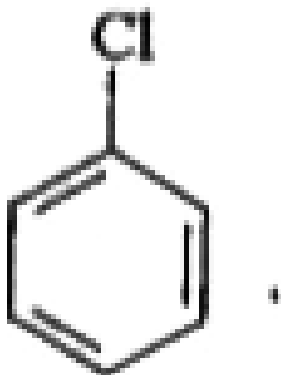


D.

Answer: A

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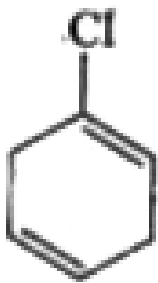
49. Which of the following compounds will give curdy precipitate with  $AgNO_3$  solution?



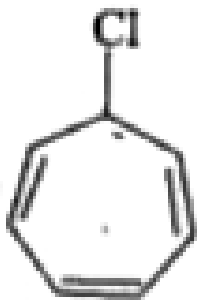
A.

B.  $CH_2 = CH - Cl$





C.

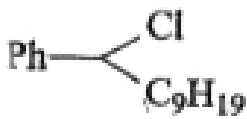


D.

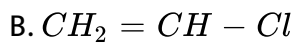
Answer: D

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50. Which of the following substrates will give racemised product?



A.



Answer: A

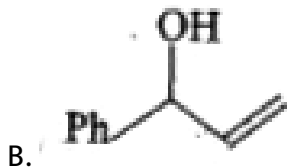
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51. In the reaction



, [X] will be:





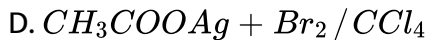
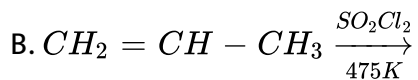
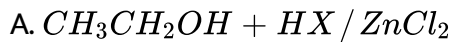
C. Equimolar mixture of (A) and (B)



Answer: C

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52. Alkyl halides can be obtained by all methods except:



Answer: C



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53. Which of the following cannot be used for the preparation of iodoform?

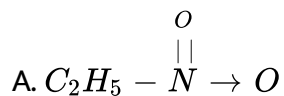
- A. Acetone
- B. Methanol
- C. Ethanol
- D. Acetaldehyde

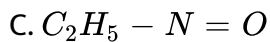
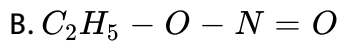
Answer: B



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54.  $C_2H_5I \xrightarrow{AgNO_2} (X)$ . Here (X) is:





D. All of the above

**Answer: A**

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55. Which of the following alkyl halides undergoes  $S_N1$  reaction the fastest?

A. Methyl chloride

B. Ethyl chloride

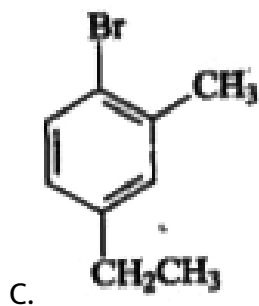
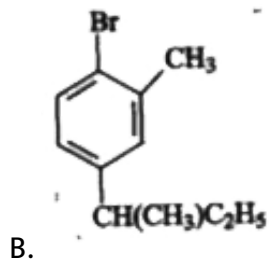
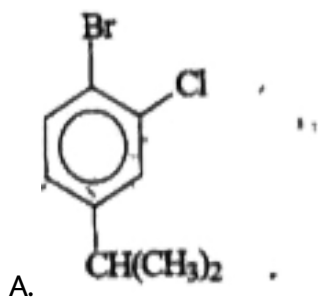
C. Isobutyl chloride

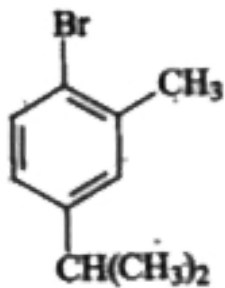
D. tert-Butyl chloride

**Answer: D**

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1. Write the structures of the following compounds 1-Bromo-4-sec butyl-2-methylbenzene





D.

Answer: B

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2. Arrange the following compounds in the order of reactivity with alcoholic silver nitrate,

$C_6H_5CH_2CH_2Br$  (I),  $C_6H_5CHBrCH_3$  (II) and

$C_6H_5CH = CHBr$  (III)

A.  $II > I > III$

B.  $I > II > III$

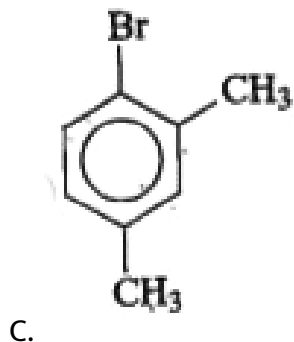
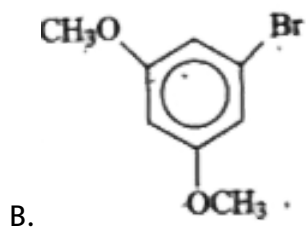
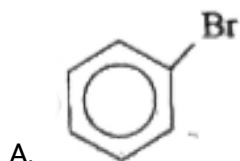
C.  $III > II > I$

D.  $II = I > III$

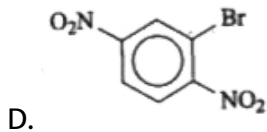
Answer: A

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





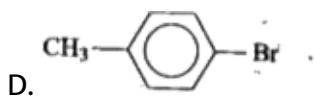
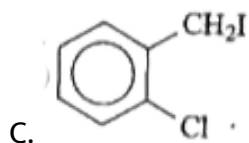
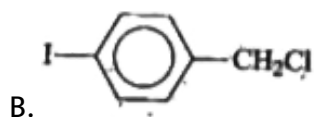


Answer: D

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4. Which of the following will give yellow precipitate on shaking with an aqueous solution of NaOH followed by, acidification with dil  $HNO_3$  and addition of  $AgNO_3$  solution?

A.  $C_2H_5I$



Answer: C



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5. A dihalogen derivative  $X$  of a hydrocarbon with three carbon atom react with alcoholic  $KOH$  and produces another hydrocarbon which forms a red precipitate with ammoniacal  $Cu_2Cl_2 \cdot X$  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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6. In methyl alcohol solution, bromine reacts with ethylene to yield  $BrCH_2CH_2OCH_3$  in addition to 1,2-dibromoethane because

- A. the ion formed initially may react with Br or  $CH_3OH$
- B. the methyl alcohol solvates the bromine
- C. this is a free-radical mechanism
- D. this is a free-radical mechanism

**Answer: A**

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7. Which of the following statements is wrong?

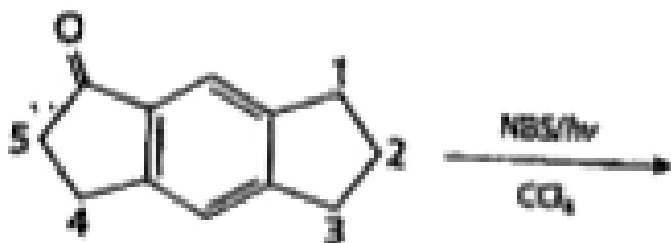
- A. Ethyl chloride on reduction with Zn-Cu couple and alcohol gives ethane.
- B. The reaction of methyl magnesium bromide with acetone gives butanol-2
- C. Alkyl halides follow the following reactivity sequence on reaction with alkenes.  $R - I > R - Br > R - Cl > R - F$

D.  $C_2H_4Cl_2$  may exist in two isomeric forms

Answer: B

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8. The carbon atoms at which bromination will take place are:



A. 1,2 and 3

B. 4 and 5

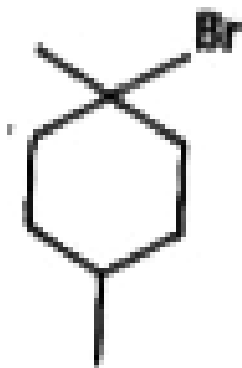
C. 1, 3,4 and 5

D. 1, 3 and 4

Answer: D

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9. Which of the following compounds can be prepared by free radical halogenation without complication by formation of isomeric by-products?



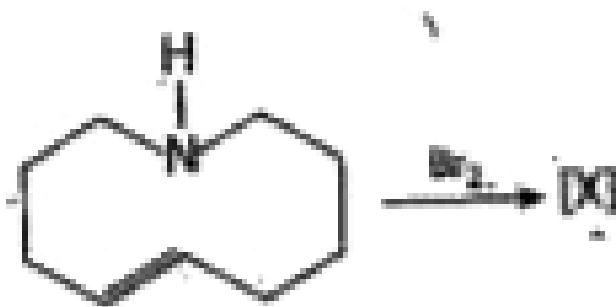


D.

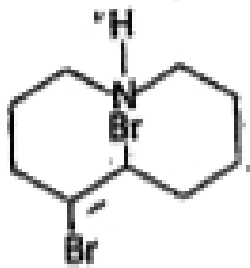
Answer: C

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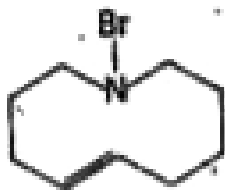
10. In the given reaction the structure of X will be:



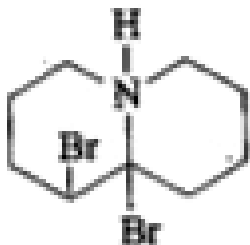
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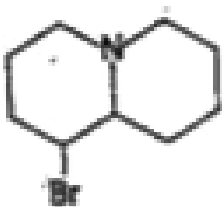
A.



B.



C.

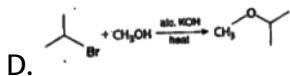
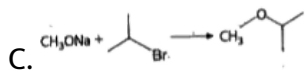
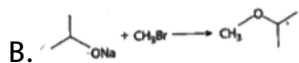
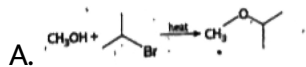


D.

Answer: D

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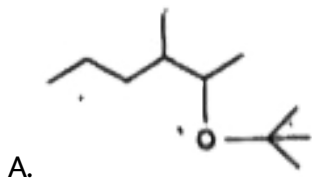
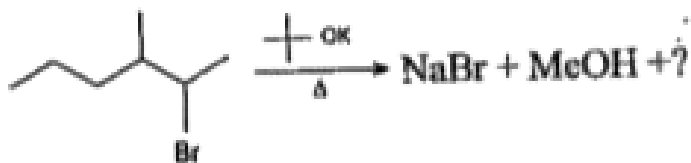
11. Which of the following reactions would give the best yield of ether?



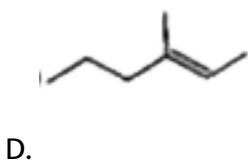
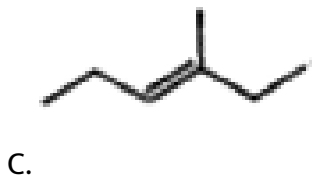
Answer: B

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12. What is the major product of the following reaction?



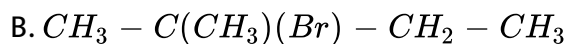
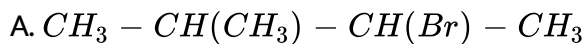


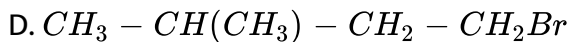
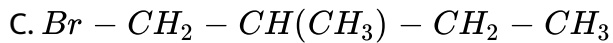


**Answer: B**

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13. Potassium phthalimide on reaction with compound (A) followed by hydrolysis forms isopentyl amine. The compound (A) will be:

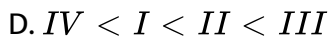
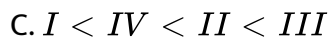
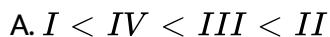
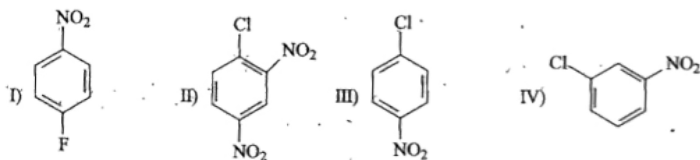




Answer: D

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14. Arrange, the following in increasing order of reactivity towards aromatic nucleophilic substitution reaction:

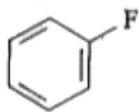


Answer: B

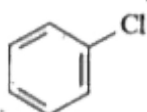


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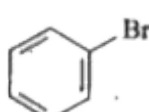
15. Consider the nitration of haloarenes given below in the presence of concentrated nitric acid and sulphuric acid.



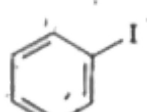
(I)



(II)



(III)



(IV)

Select the incorrect statement about it?

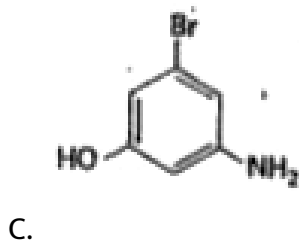
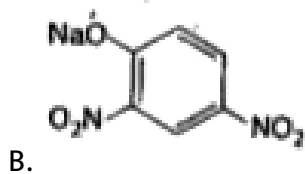
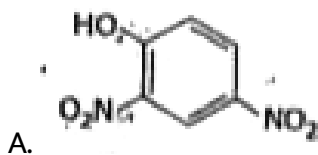
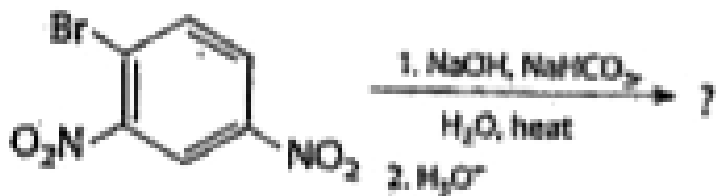
- A. Nitration of all aryl halides is slower than benzene.
- B. Rate of nitration follows the order  $I > IV > II > III$
- C. Order of yield of para nitro product is  $I > II > III > IV$
- D. Order of yield of ortho product is  $I > II > III > IV$

Answer: D



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16. What products would you expect from the following reaction?



D. Substantial amounts of I and II

Answer: A

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17. Which of the following will give yellow precipitate on shaking with an aqueous solution of NaOH followed by, acidification with dil  $HNO_3$  and addition of  $AgNO_3$  solution?

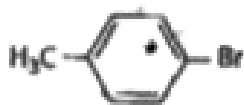
A.  $C_2H_5I$



C.



D.

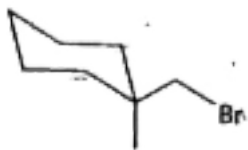


Answer: C



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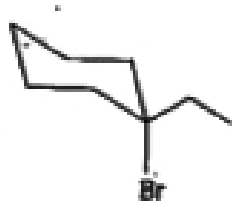
18. Which of the following alkyl halides is the most reactive in solvolysis of alkyl chlorides in 50% aqueous ethanol?



A.



B.



C.



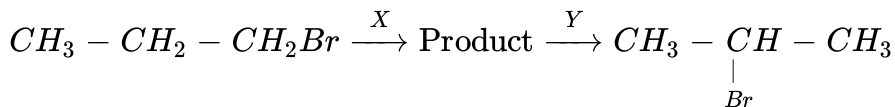
D.

Answer: D



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19. Identify the set of reagent/reaction conditions X and Y, in the following set of transformations.

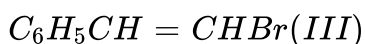


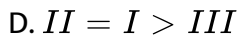
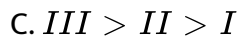
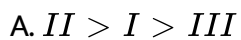
- A. X=dilute aqueous NaOH, 20°C, Y=HBr/acetic acid, 20°C
- B. X = concentrated alcoholic NaOH, 80°C, Y=HBr/acetic acid, 20°C
- C. X = dilute aqueous NaOH, 20°C, Y = Br<sub>2</sub>/CHCl<sub>3</sub>, 0°C
- D. X=concentrated alcoholic NaOH, 80°C, Y = Br<sub>2</sub>/CHCl<sub>3</sub>, 0°C

Answer: B

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20. Arrange the following compounds in the order of reactivity with alcoholic silver nitrate,

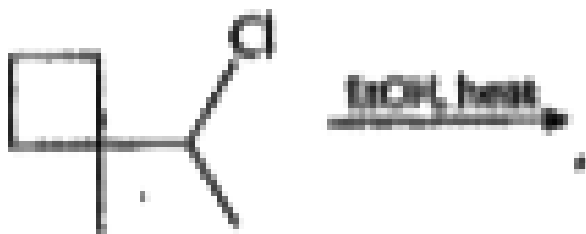




Answer: A

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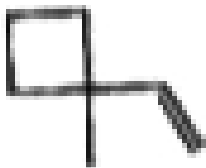
21. What is the major product of the following reaction?



A.







B.



C.



D.

Answer: D

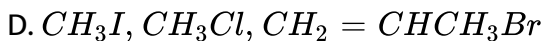
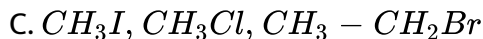


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22. Which compound in each of the following pairs will react faster in  $S_N2$  reaction with  $-OH^-$ ? i.  $CH_3Br$  or  $CH_3I$  ii.  $(CH_3)_3CCl$  or  $CH_3Cl$

A.  $CH_3Br$ ,  $(CH_3)_3CCl$ ,  $CH_2 = CHBr$

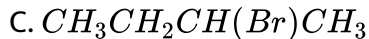
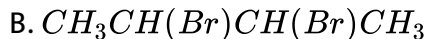
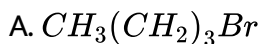
B.  $CH_3Br$ ,  $(CH_3)_3CCl$ ,  $CH_2 = CHCH_2Br$



**Answer: D**

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23. An unknown alkyl halide (A) reacts with alcoholic KOH to produce a hydrocarbon ( $C_4H_8$ ). Ozonolysis of the hydrocarbon affords 1 mol of propionaldehyde and 1 mol of formaldehyde. Suggest which organic structure of the above alkyl halide (A)?



**Answer: A**

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24. Two bottles containing  $C_6H_5I$  and  $C_6H_5CH_2I$  lost their original labels. They were labelled as A and B for testing A and B were separately taken in test tubes and boiled with Na OH solution. The solution in each tube was made acidic with dilute  $HNO_3$  and some  $AgNO_3$  solution was added. Substance B gave a yellow precipitate. Which of the following statements is true for this experiment : Addition of  $HNO_3$  was unnecessary, A was  $C_6H_5I$ , A was  $C_6H_5CH_2I$ , B was  $C_6H_5I$

A. A was  $C_6H_5I$

B. A was  $C_6H_5CH_2I$

C. B was  $C_6H_5I$

D. Addition of  $HNO_3$  was unnecessary

**Answer: A**



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25. Give the reagent needed to convert benzyl bromide into benzyl alcohol and benzyl iodide.

A. alc.KOH, NaI in dry acetone

B. aq.KOH, Na in dry ether

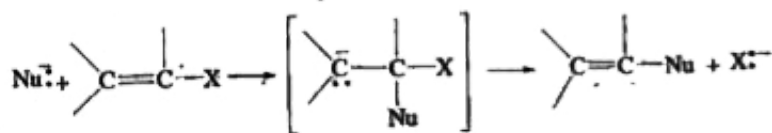
C. aq. KOH, NaOH in dry ether

D. aq.KOH, NaI in dry acetone

Answer: C

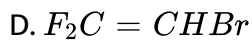
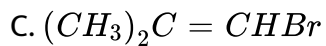
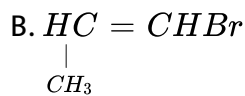
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26. Nucleophilic displacement on a vinyl halide may be represented as



Which of the following vinyl halide is expected to follow this mechanism?

A.  $\text{H}_2\text{C} = \text{CHBr}$



Answer: D

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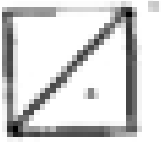
27. 1-Bromo-3-chlorocyclobutane when treated with two equivalents of Na in the presence of ether results into



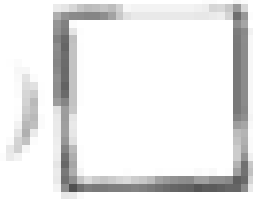
A.



B.



C.



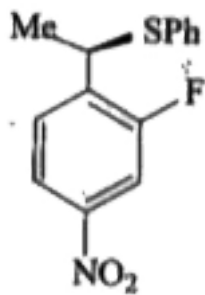
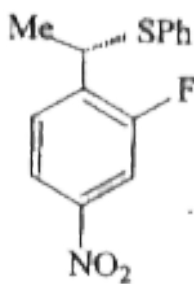
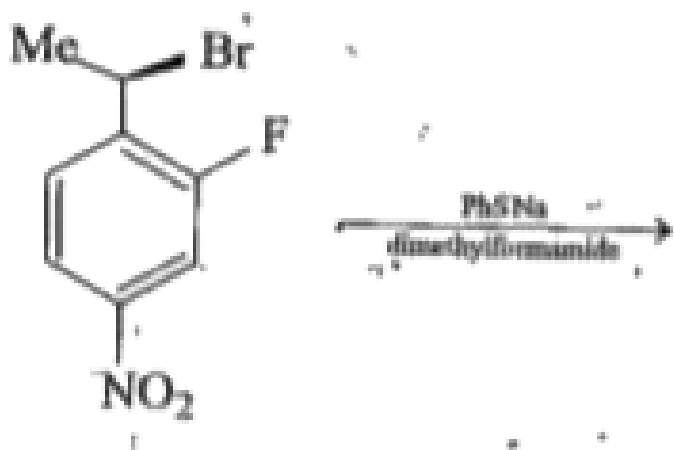
D.

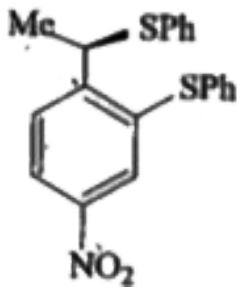
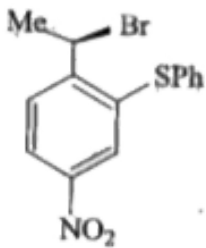
**Answer: C**



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28. The major product of the reaction

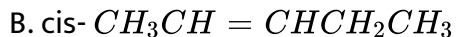
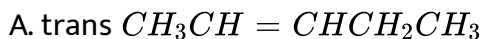




Answer: A

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29. Which of the following products is obtained in Highest yield when 2-bromopentane is treated with  $CH_3CH_2O - Na^+$  ?





D. 2-pentanol

**Answer: A**

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30. Dehalogenation of vic-dihalides with active metals or  $I^-$  involve anti elimination of halogens. The products obtained in dehalogenation of meso-2,3-dibromobutane and (S, S) -2,3-dibromobutane, respectively are

- A. trans-2-butene, cis-2-butene
- B. trans-2-butene, trans-2-butene
- C. cis-2-butene, trans-2-butene
- D. cis-2-butene, cis-2-butene

**Answer: A**

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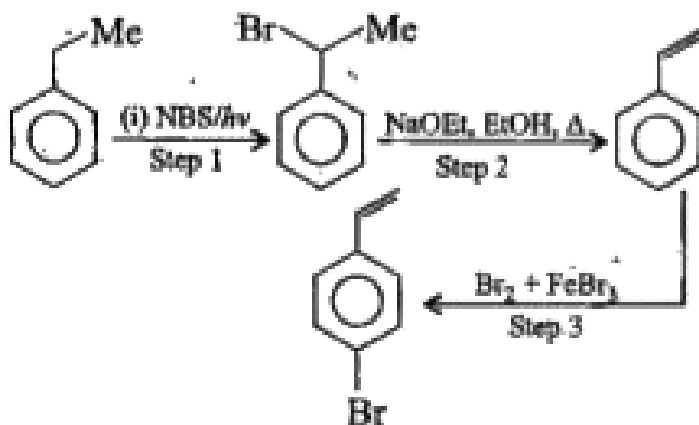
31. The chlorine atom in chlorobenzene is ortho and para director because

- A. resonance effect predominates over inductive effect
- B. inductive effect predominates over resonance effect
- C. both inductive and resonance effects are evenly matched
- D. only resonance effect and not inductive effect is operating

Answer: A

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32. In the following reaction, which of the following steps is wrong?



A. Step 1

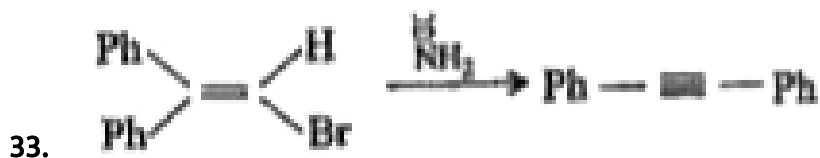
B. Step 2

C. Step 3

D. None

Answer: C

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Which of the following statements is correct about the above, reaction?

A. The reaction proceeds by  $\alpha$  - elimination via the formation of a carbene as an intermediate.

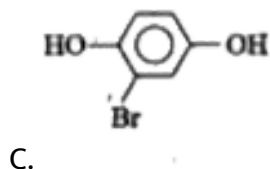
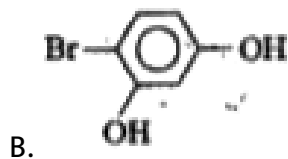
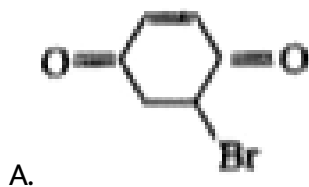
B. The reaction proceeds by  $\alpha$ - elimination via the formation of a carbanion as an intermediate.

C. The reaction proceeds by E1 mechanism.

D. The reaction proceeds by E1cB mechanism.

Answer: A

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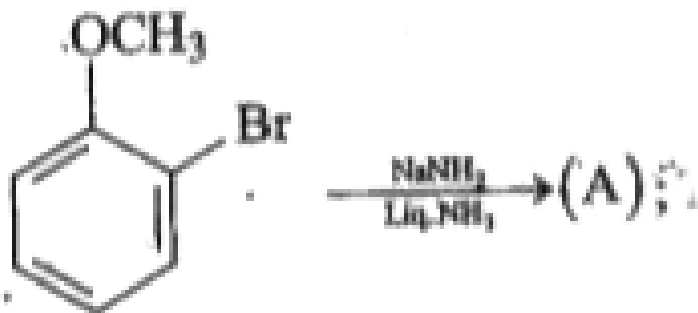




D.

Answer: C

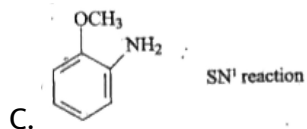
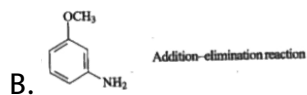
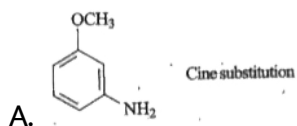
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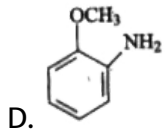


35.

The major

product (A) and reaction R are:





$S_N2$  reaction

Answer: A

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36. In the reaction  $CH_3C \equiv \overset{-}{C}\overset{+}{N}a + (CH_3)_2CHCl \rightarrow$  the product formed is:

- A. 4-Methyl-2-pentyne only
- B. Propyne
- C. Propyne and propylene
- D. Mixture of propene, propyne, and 4-methyl-2-pentyne

Answer: D

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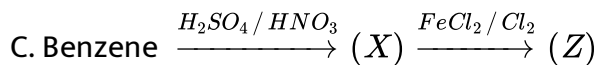
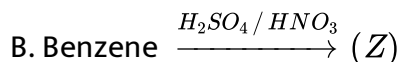
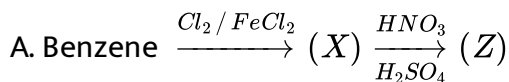
37. (X) on treatment with sodium hydroxide followed by the addition of silver nitrate gives white precipitate at room temperature which is soluble in  $NH_4OH$ . (X) can be:

- A. Chlorobenzene
- B. Ethyl bromide
- C. Benzylchloride
- D. Vinyl chloride

Answer: C

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38. Which of the following sequences would yield in m-nitrochlorobenzene (Z) from benzene?



D. All of these above will produce (Z)

Answer: C

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39.  $C_3H_7Cl \xrightarrow{KOH (alc)} (A) \xrightarrow[770K]{Cl_2 (g)} (X)$ . (X) can be:

A. Vinyl chloride

B. Allyl chloride

C. Ethyl chloride.

D. Ethyl iodide

Answer: B

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40.  $C_6H_5Cl \xrightarrow[625 K \text{ and } 300 \text{ atm}]{NaOH (aq)}$  . The product can be:



A. Benzal

B. Sodium benzoate

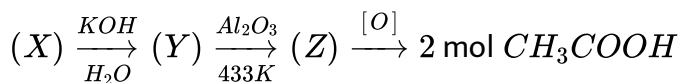
C. Benzol

D. Sodium phenate

**Answer: D**

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**41.** In the given sequence of reactions, predict (X).



A.  $CH_3CH_2CHICH_3$

B.  $CH_3CH_2CH_2CH_2I$

C.  $CH_3CHICHICH_3$

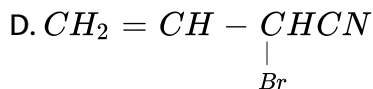
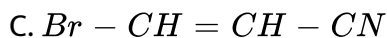
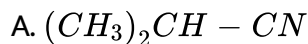
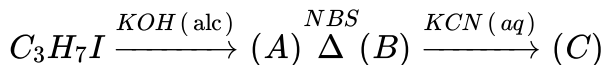
D.  $CH_3CHICH_2CH_2I$

**Answer: A**



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42. Identify (C) in the following series.



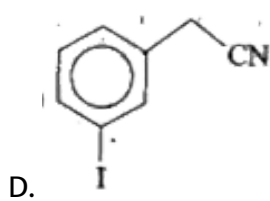
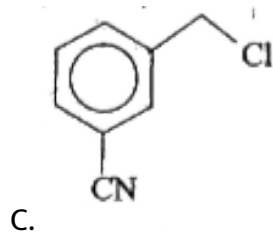
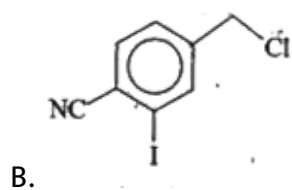
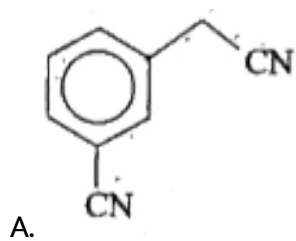
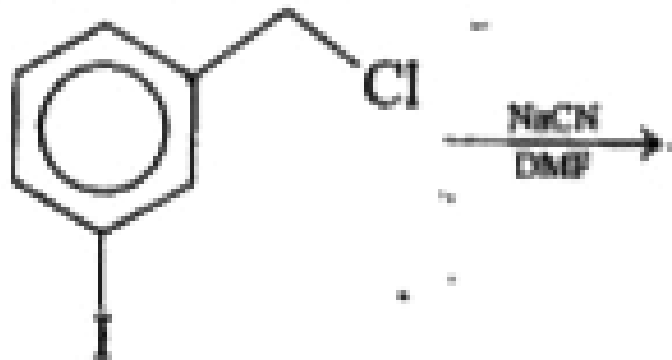
Answer: B



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43. The structure of the major product formed in the following reaction

is:

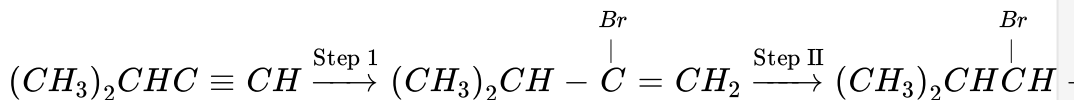


Answer: D



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44. In the following:



Which of the following sets of reagents can be used for step I and step II?

**Step I**

1. HBr

2. HBr and peroxide

3. Br<sub>2</sub>

4. Br<sub>2</sub>

**Step II**

HBr and peroxide

HBr

HBr

HBr and peroxide

Select the correct answer using the codes given below

A. 1,2 and 4

B. 2 and 4

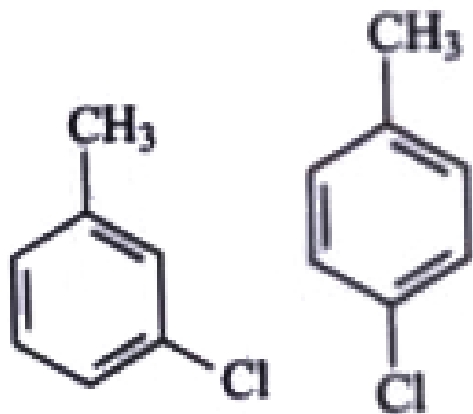
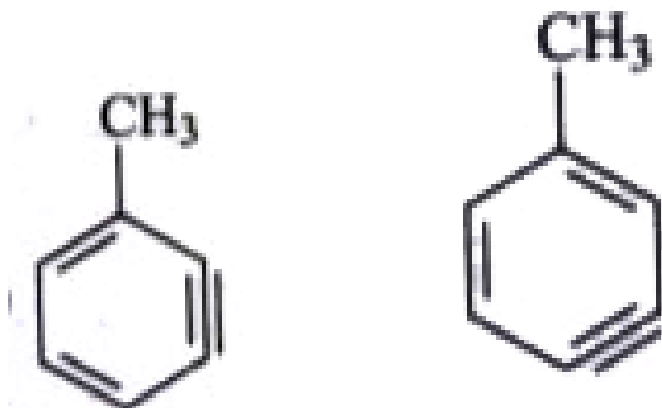
C. 3 and 4

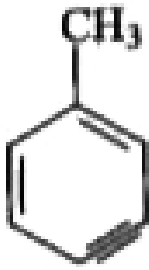
D. 1 alone

Answer: D

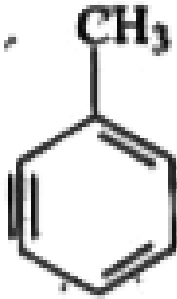
45. O-Chlorotoluene reacts with  $NaNH_2$  in liq.  $NH_3$  to give o-toluidine and m-toluidine. Which of the following is an intermediate in the above

reaction

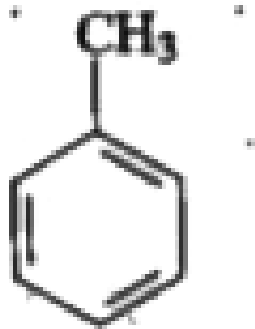




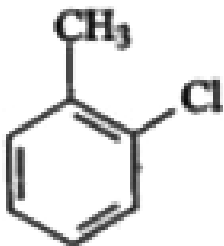
A.



B.



C.

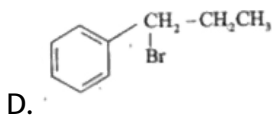
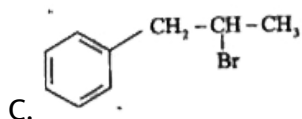
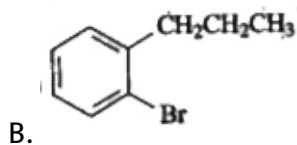
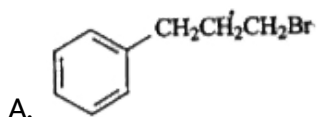


D.

**Answer: B**

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46. Propylbenzene reacts with bromine, in presence of light or heat to give:

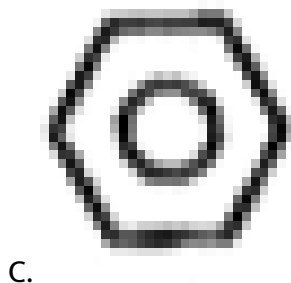


Answer: D

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47.

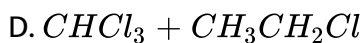
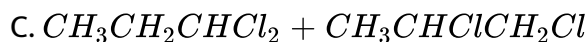
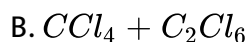
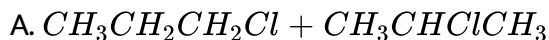


Answer: D

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48. When propane is heated with excess of  $Cl_2$  at 573-673 K under 75-100 atm. Pressure, the products obtained are:



Answer: B



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

A. Propane

B. Propene

C. Propyne

D. Propanol

**Answer: B**

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50. Carbylamine test is performed in alcoholic KOH by heating a mixture of

A. Chloroform and silver powder,

B. Trihalogenated methane and a primary amine

C. An alkyl halide and a primary amine

D. An alkyl cyanide and a primary amine

**Answer: B**

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1. Assertion: Alkyl halides, though polar, are immiscible with water.

Reason : Alkyl halides are polar due to the presence of polar C-X 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 both (A) and (R) are incorrect.

**Answer: B**



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2. Assertion: Addition of bromine to trans-2-butene yields meso-2,3-dibromobutane

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

- 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: B**

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**3. Assertion:** Arylhalides cannot be-prepared by replacement of hydroxyl group of phenol by halogen atom.

**Reason :** Phenols react with halogen acids violently

- 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: C**

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4. Assertion:  $S_N2$  reaction proceeds with racemisation while  $S_N1$  reaction proceeds with complete stereochemical inversion.

Reason :  $S_N2$  is two step reaction while  $S_N1$  is one step reaction.

- 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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5. Assertion: Aryl halides are highly reactive towards nucleophilic substitution reactions.

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

A. If both (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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**6. Assertion:** The boiling point of the compounds increases in the order:  
Isopropylchloride < I-Chloropropane < 1-Chlorobutane.

**Reason :** Boiling point depends upon the molecular mass and surface area.

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: A**

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7. Assertion: Electron withdrawing groups in aryl halides increase their activity towards nucleophilic substitution.

Reason : 2,4-Dinitrochlorobenzene is less reactive than chlorobenzene.

- 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: C**

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8. Assertion: Optically active 2-iodobutane on treatment with NaI in acetone undergoes racemization.

Reason : Repeated Walden inversions on the reactant and its product eventually gives a racemic mixture.

- 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: A**



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9. Assertion: It is difficult to replace chlorine by -OH in chlorobenzene in comparison to that in chloroethane.

Reason : Chlorine-carbon (C-Cl) bond in chlorobenzene has a partial double bond character due to resonance.

- A. 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: A**



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10. Assertion: In monohaloarenes, further electrophilic substitution occurs at ortho and para positions.

Reason : Halogen atom is a ring deactivator.

- 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: B**



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11. Assertion : p-Dichlorobenzene is less soluble in organic solvents than the-corresponding o- isomer.

Reason : o-Dichlorobenzene is polar while p dichlorobenzene is non-polar.

- 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: B**



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**12.** Assertion: 2-Bromobutane on reaction with sodium ethoxide in ethanol gives 1-butene as a major product.

Reason : 1-Butene is more 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 both (A) and (R) are incorrect.

**Answer: D**

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**13. Assertion:** In comparison to ethyl chloride, it is difficult to carry out nucleophilic substitution on vinyl chloride.

**Reason :** Vinyl group is electron-donating.

- 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: C**

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**14.** Assertion: The presence of nitro group facilitates nucleophilic substitution reaction in aryl halide.

Reason : The intermediate carbanion is stabilised due to the presence of the nitro group.

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: A**



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**15.** Assertion: NBS is a specific reagent for allylic bromination.

Reason : Allylic bromination occurs through free radical intermediates.

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: B**

16. Assertion : 'Nucleophilic s'ubstitution on an optically active alkyl halide gives a mixture of enantiomers.

Reason : The reaction occurs according to  $S_N2$  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 both (A) and (R) are incorrect.

**Answer: C**



17. Assertion: Ethyl chloride is more reactive than vinyl chloride towards nucleophilic substitution reactions.

Reason : 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 both (A) and (R) are incorrect.

**Answer: C**



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**18.** Assertion: The presence of nitro group facilitates nucleophilic substitution reaction in aryl halide.

Reason : The intermediate carbanion is stabilised due to the presence of the nitro group.

- 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: A**



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19. Assertion: Bromobenzene upon reaction with  $Br_2/Fe$  gives 1,4-dibromobenzene as the major product.

Reason : In bromobenzene, the inductive effect of the bromo group is more dominant than the mesomeric effect in directing the incoming electrophile.

- 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: A**



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20. Assertion: Benzyl bromide when kept in acetone and  $H_2O$  produces benzyl alcohol.

Reason : The reaction follows  $SN_2$  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 both (A) and (R) are incorrect.

**Answer: C**



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Level I

1. 2-bromopentane is heated with potassium hydroxide in ethanol. The major product obtained is- pent-1-ene 2-ethoxypentane trans-2-pentene cis-2-pentene

- A. pentene-1
- B. 2-ethoxypentane
- C. trans-pentene-2
- D. cis-pentene-2

**Answer: C**



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2. The yield of chlorobenzene obtained by reaction of phenol with  $PCl_5$  is less due to the formation of

- A. p-chlorophenol
- B. o-chlorophenol

C. triphenyl phosphate

D. phosphorus oxychloride

**Answer: C**

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

A. 1-bromo-1, 1-diethylmethane

B. 3-bromopentane

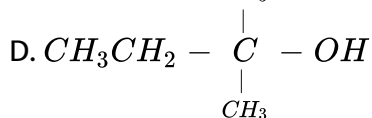
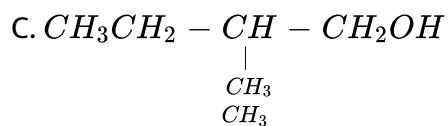
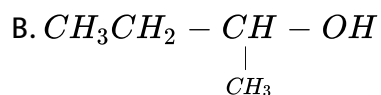
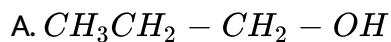
C. 1-bromo-1-ethylpropane

D.

**Answer: B**

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



Answer: D



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5. The reaction of ethyl bromide and silver cyanide results in the formation of

A. ethylene

B. ethyl cyanide

C. ethyl isocyanide

D. ethyl alcohol

**Answer: C**

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6. The bad smelling substance formed by the reaction of chloroform with methyl amine and alcoholic KOH will be

A. methyl amine

B. methyl alcohol

C. methyl cyanide

D. methyl isocyanide

**Answer: D**

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7. Chlorobenzene on fusing with solid NaOH followed by acidification gives

- A. Benzene
- B. Benzoic acid
- C. Phenol
- D. Benzene chloride

**Answer: C**



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8. On sulphonation of  $C_6H_5Cl$

- A. m-Chlorobenzenesulphonic acid is formed
- B. Benzenesulphonic acid is formed
- C. o-Chlorobenzenesulphonic acid is formed
- D. o-and p-Chlorobenzenesulphonic acid is formed

**Answer: D**

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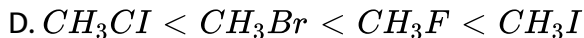
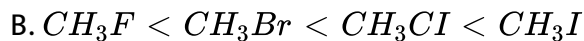
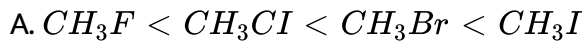
**9.** The Wurtz-Fittig reaction involves condensation of:

- A. two molecules of aryl halides
- B. one molecule of each of aryl-halide and alkyl-halide
- C. one molecule of each aryl-halide and phenol
- D. two molecules of aralkyl-halides

**Answer: B**

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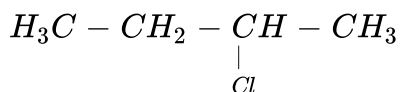
**10.** For the compounds  $CH_3Cl$ ,  $CH_3Br$ ,  $CH_3I$  and  $CH_3F$ , the correct order of increasing C-halogen bond length is:



**Answer: A**

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11. The product obtained on chlorination of n-butane will be:



A. meso-form

B. racemic mixture

C. d-form only

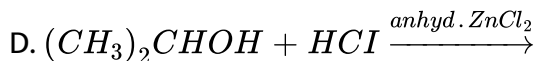
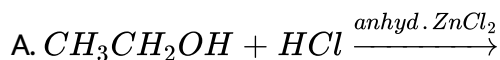
D. l-form only

**Answer: B**



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12. Which- of the following reactions .cannot be used for the preparation of alkyl halides?



Answer: B



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13. A solution of (-) -1 -chloro-1-phenylethane in toluene racemizes slowly in the presence of a small amount of  $SbCl_5$ , due to the formation of:

A. carbene

B. carbocation

C. free radical

D. carbanion

**Answer: B**



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14. The major product formed when 1,1,1-trichloropropane is treated with aqueous potassium hydroxide is

A. propyne

B. 1-propanol

C. 2-propanol

D. propanoic acid

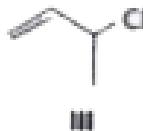
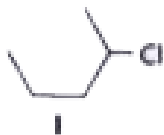
**Answer: D**



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15. The order of reactivity of the following halides towards  $S_N1$  reaction

is



A. II > III > I

B. III > II > I

C. III > I > II

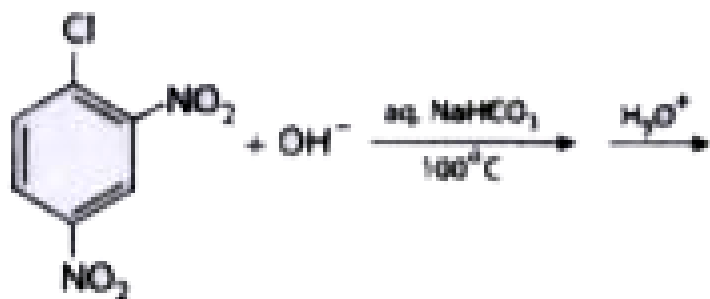
D. I > III > II

Answer: C

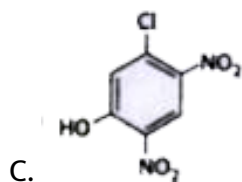
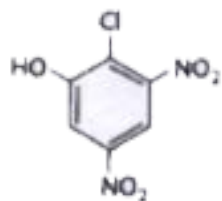
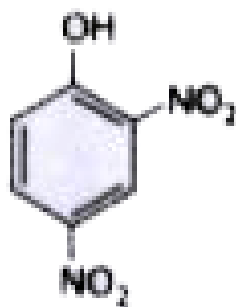


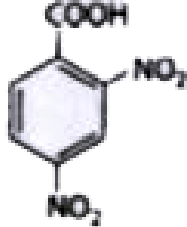
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16. Consider the reaction given below:



The final major product of the reaction is





D.

Answer: A

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17. How many constitutional isomers are formed when following compound under goes monochlorination?



A. 1

B. 3

C. 5

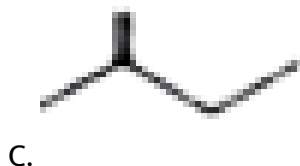
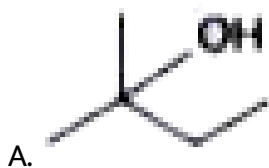
D. 7



Answer: C

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18. Which of the following compounds would you expect to be the major product when 2-bromo-2methylbutane is refluxed with KOH/ethanol?



Answer: D

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19. Which alkyl halide has the highest density?



**Answer: B**



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20. How will you obtain 1-bromopropane from propene?

A. Markownikov addition of HBr

B. Anti-Markownikov addition of HBr

C. Electrophilic addition of HBr

D. Using thionyl chloride

**Answer: B**

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21. A hydrocarbon  $C_5H_{12}$  gives only one monochlorination product.

Identify the hydrocarbon.

A. 2,2-Dimethylpropane

B. 2,3-Dimethylpropane

C. Methylpentane

D. 2-Methylbutane

**Answer: A**

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22. Tertiary alkyl halides are practically inert to substitution by  $SN^2$  mechanism because of

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

**Answer: D**



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23. The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid is:

- A. gammexene
- B. hexachloroethane
- C. freon

D. DDT

**Answer: D**

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**24.** Elimination of bromine from 2-bromobutane results in the formation of:

A. equimolar mixture of 1-butene and 2-butene

B. predominantly 2-butene

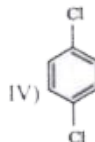
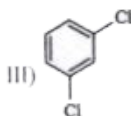
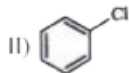
C. predominantly 1-butene

D. predominantly 2-butyne

**Answer: B**

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



A. I < II < IV < III

B. I < III < IV < II

C. IV < III < II < I

D. II < IV < III < I

Answer: A

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26. Position of bromine in the compound in  $CH_3CH = CHC(Br)(CH_3)_2$  can be classified as.....

A. Allyl

B. Aryl

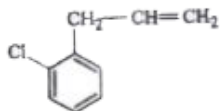
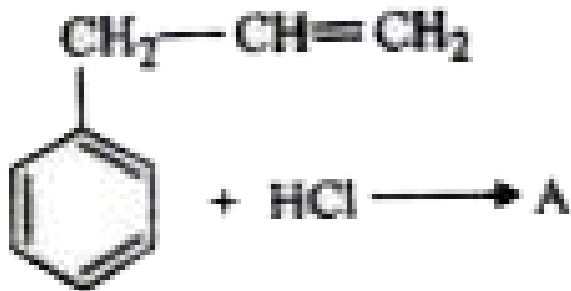
C. Vinyl

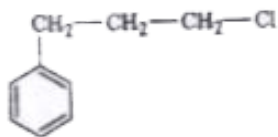
D. Secondary

**Answer: A**

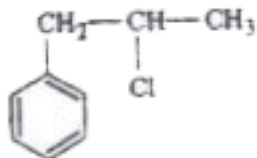
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27. What is 'A' in the following reaction?

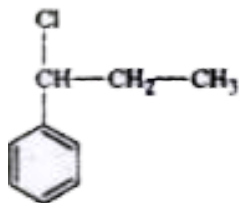




B.



C.

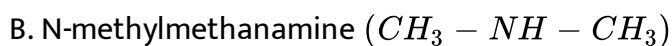


D.

Answer: D

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28. Chloromethane on treatment with excess of ammonia yields mainly:





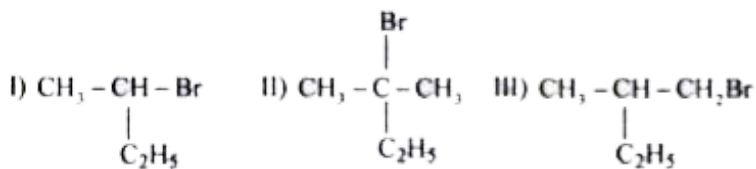
C. Methanamine ( $CH_3NH_2$ )

D. Mixture containing all these in equal proportion

**Answer: C**

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



A. I

B. I, II, III

C. II, III

D. I, III

**Answer: A**



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

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

- A. Butane < I-Chlorobutane < I-Bromobutane < I-Iodobutane
- B. I-Iodobutane < I-Bromobutane < I-Chlorobutane < Butane
- C. Butane < I-Iodobutane < I-Bromobutane < I-Chlorobutane
- D. Butane < I-Chlorobutane < I-Iodobutane < I-Bromobutane

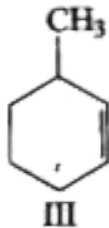
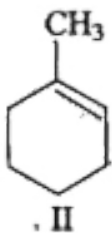
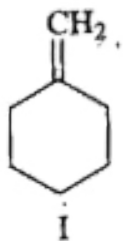
**Answer: A**



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31. In the reaction with HCl, an alkene reacts in accordance with the Markownikov's rule to give a product 1-chloro-1- methylcyclohexane. The

possible alkene is:



A. I

B. II

C. III

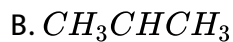
D. I and II

**Answer: D**



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32. The intermediate during the addition of HCl to propene in presence of peroxide is :  $CH_3CHCH_2Cl$ ,  $CH_3CH^+CH_3$ ,  $CH_3CH_2CH\cdot CH_2$ ,  $CH_3CH_2CH_2$ ,



**Answer: B**

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**33.** The synthesis of alkyl fluorides is best accomplished by

A. Finkelstein reaction

B. Swarts reaction

C. free radical fluorination

D. Sandmeyer's reaction

**Answer: B**

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34. The compound,  $C_7H_8 \xrightarrow{3Cl_2 / \Delta} A \xrightarrow{Br_2 / Fe} B \xrightarrow{Zn / HCl} C$

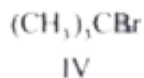
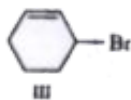
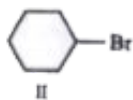
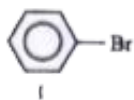
The compound C is:

- A. o-Bromotoluene
- B. m-Bromotoluene
- C. p-Bromotoluene
- D. 3-Bromo-2,4,6-trichlorotoluene

Answer: B

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



- A. I < IV < II < III

B. I < II < III < IV

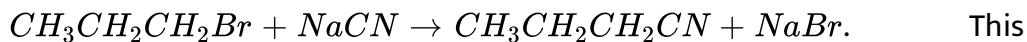
C. I < II < IV < III

D. IV < III < II < I

**Answer: C**

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36. Consider the reaction,



reaction will be the faster in:

A. ethanol

B. methanol

C. N, N' -dimethylformamide(DMF)

D. water

**Answer: C**



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37. Which one of the following halogen compounds when heated with alcoholic potassium hydroxide does not undergo dehydrohalogenation reaction?

- A. Secondary butyl chloride
- B. Neopentyl chloride
- C. Isobutyl chloride
- D. Tertiary butyl chloride

**Answer: B**



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38. An alkyl bromide produces a single alkene when it reacts with sodium ethoxide and ethanol. This alkene on hydrogenation produces 2-methyl butane. What is the identity of the alkyl halide?

A. 1-Bromo-2, 2-dimethylpropane

B. 1-Bromobutane

C. 1-Bromo-2-methylbutane

D. 2-Bromopentane

**Answer: C**

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**39.** Which of the following can be used as the halide component for Friedel-Crafts reaction?

A. Chlorobenzene

B. Bromobenzene

C. Chloroethene

D. Isopropyl chloride

**Answer: D**



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40. The dipole moment of  $CH_3X$  (where X is a halogen) follows the order

- A.  $CH_3F > CH_3Cl > CH_3Br$
- B.  $CH_3F > CH_3Br > CH_3Cl$
- C.  $CH_3Cl > CH_3F > CH_3Br$
- D.  $CH_3F < CH_3Cl < CH_3Br$

Answer: C

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41. The hydrolysis of 2-bromo-3-methylbutane yields.

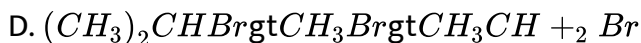
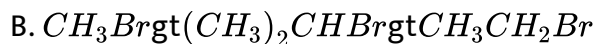
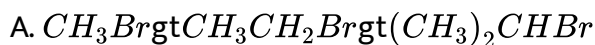
- A. 3-methyl-2-butanol
- B. 2-methyl-2-butanol
- C. 3-methylbutanol

## D. 2-methylbutanol

Answer: B

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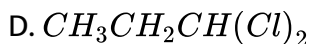
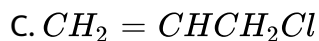
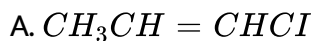
42. The rate of formation of alcohols from  $CH_3Br$ ,  $CH_3CH_2Br$ ,  $(CH_3)_2CHBr$  which follow  $SN_2$  mechanism is :



Answer: A

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43. Which of the following compounds reacts rapidly with the cold  $AgNO_3$  solution?



Answer: C



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44. Which of the following statements is correct?

A. Alkyl halides are more reactive than aryl halides towards nucleophilic substitution reactions

B. Alkyl halides are less reactive than aryl halides towards nucleophilic substitution reactions

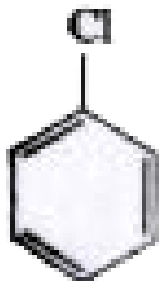
C. The presence of an electron-withdrawing substituent at ortho and/or para position decreases the reactivity of nucleophilic substitution of chlorine in the substituted chlorobenzene

D. The replacement of chlorine in chlorobenzene by strong bases proceeds via elimination-addition reaction

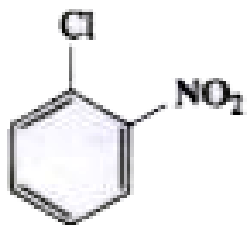
**Answer: A**

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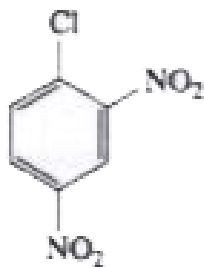
45. Which of the following compounds undergoes nucleophilic substitution reaction with aqueous NaOH?



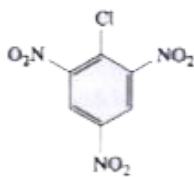
A.



B.



C.

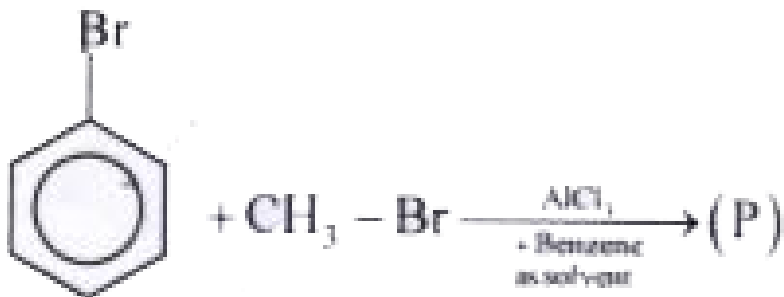


D.

**Answer: D**



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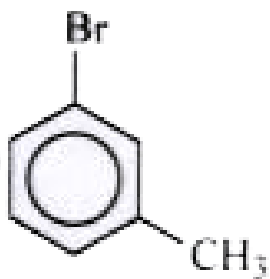
46.

, Product

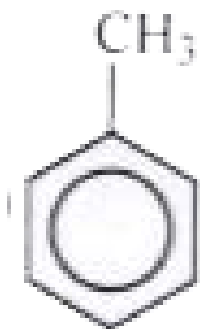
(P) is



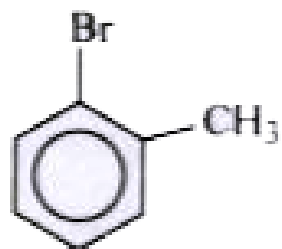
A.



B.



C.



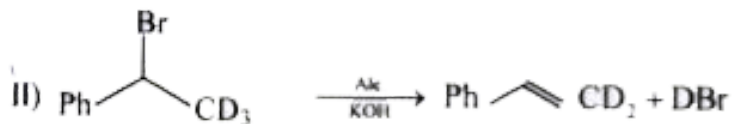
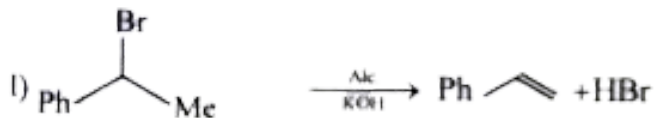
D.

**Answer: C**



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47. In the following reactions:



the rate of reaction of (I) is faster than that of (II). By which mechanism do both the reactions proceed?

A. E1

B. E2

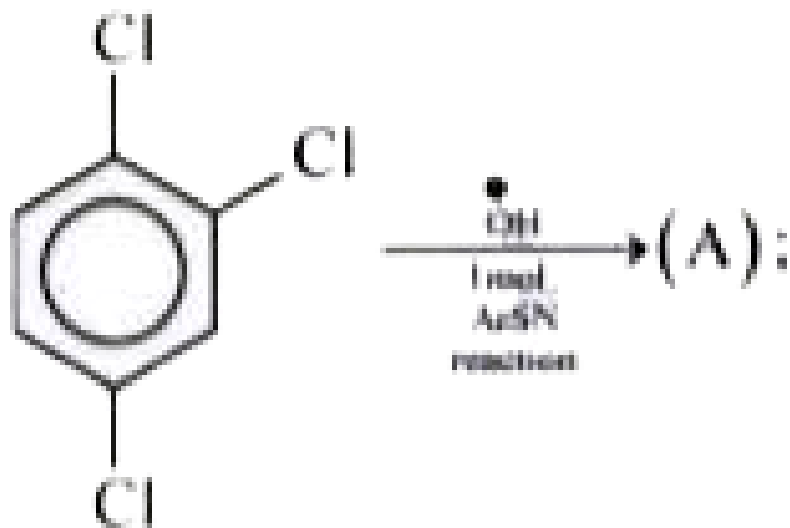
C. E1cB

D.  $\alpha$ -Elimination

**Answer: B**

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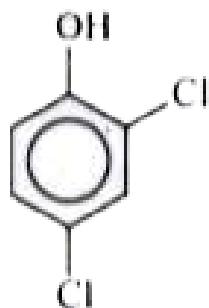




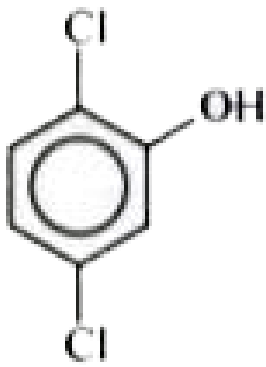
48.

(A) would

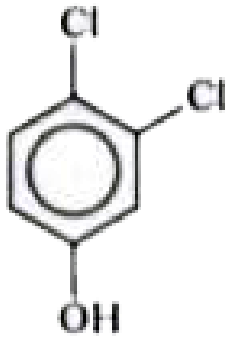
be:



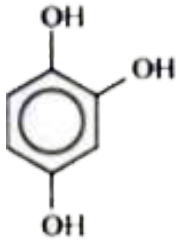
A.



B.



C.



D.

**Answer: A**



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49. Which of the following compounds will give curdy precipitate with  $AgNO_3$  solution?

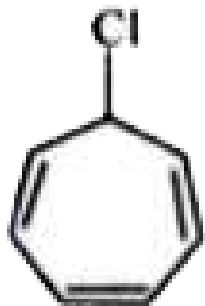


A.

B.  $CH_2 = CH - Cl$



C.



D.

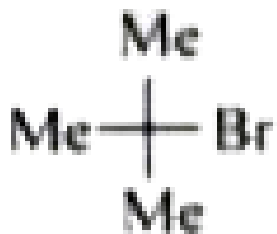
Answer: D

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50. Which of the following substrates will give racemised product?



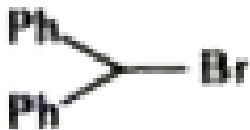
A.



B.



C.



D.

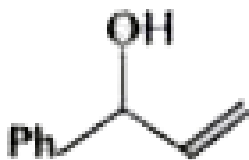
Answer: A

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51. In the reaction Ph



will be:



B.

C. Equimolar mixture of (A) and (B)

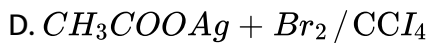
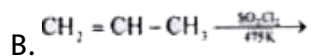
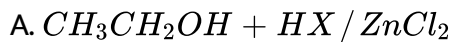


D.

Answer: C

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52. Alkyl halides can be obtained by all methods except:



Answer: C

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53. Which of the following cannot be used for the preparation of iodoform?

A. Acetone

B. Methanol

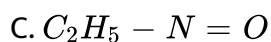
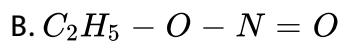
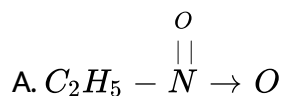
C. Ethanol

D. Acetaldehyde

**Answer: B**

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54.  $C_2H_5I \xrightarrow{AgNO_2} (X)$ . Here (X) is:



D. All of the above

**Answer: A**

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55. Which of the following alkyl halides undergoes  $S_N1$  reaction the fastest?

A. Methyl chloride

B. Ethyl chloride

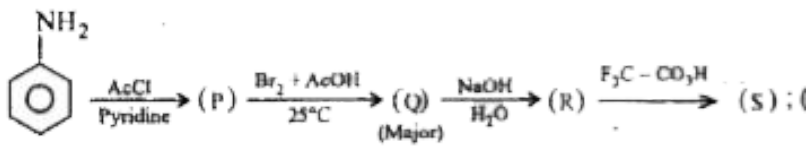
C. Isobutyl chloride

D. tert-Butyl chloride

**Answer: D**

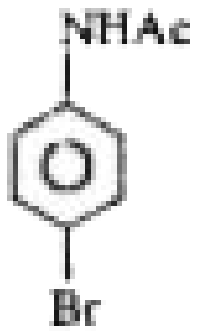
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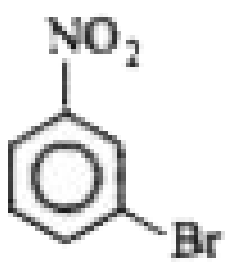


1.

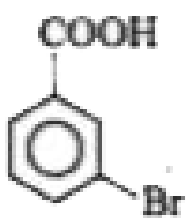
(S) would be



A.



B.



C.

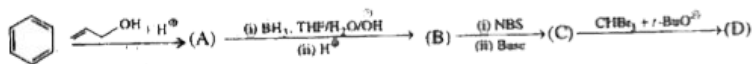


D.

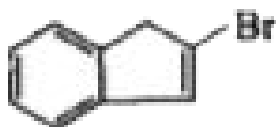
Answer: D

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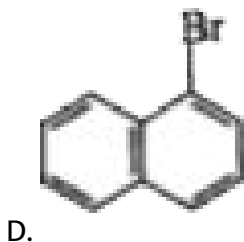
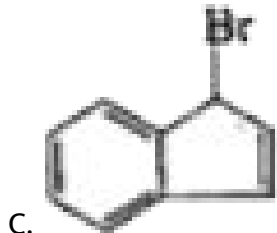
2. What is the end product (D) of the following reaction?



A.



B.



**Answer: A**

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3. A white precipitate was formed slowly when  $AgNO_3$  was added to a compound A with molecular formula  $C_6H_{13}Cl$ . Compound 'A' on treatment with hot alcoholic KOH gave a mixture of 2 isomeric alkenes B and C having 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)  $(CH_3)_2CHCHO$ . What are A, B and C.

A. 2-Bromohexane

B. 3-Bromo-2-methylpentane

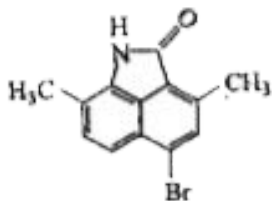
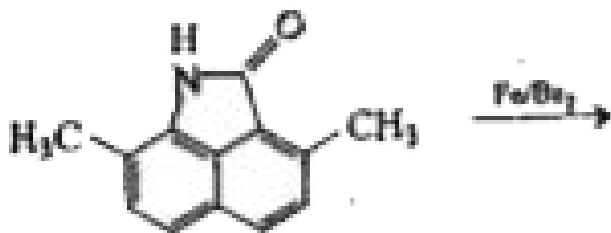
C. 2, 2-Dimethyl-1-bromohexane

D. Unpredictable

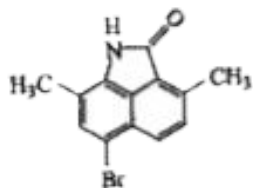
Answer: B

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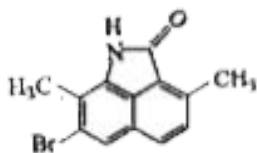
4. The product on monobromination of this compound is:



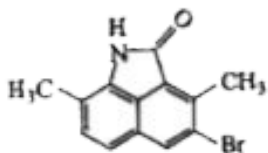
A.



B.



C.

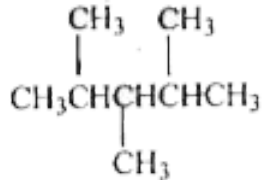


D.

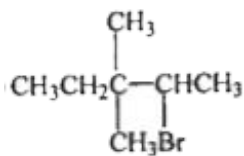
**Answer: B**

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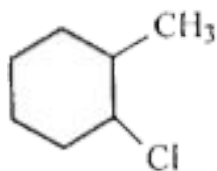
5. Which of the following alkyl halides forms a substitution product in an  $S_N1$  reaction that is the same as the substitution product formed in an  $S_N2$  reaction?



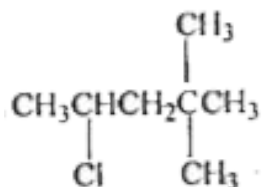
A.



B.



C.



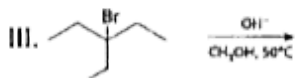
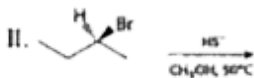
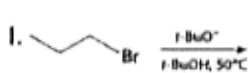
D.

Answer: D



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6. Consider the following reactions:



Which of the following statements is correct about the reactions?

- A. The major product of the reactions I and II is an unsaturated hydrocarbon and via E2.
- B. The major product of the reactions III and IV is the same and produced through  $S_N1$ .
- C. The major product of reactions I and III are unsaturated hydrocarbons via the same mechanism.
- D. The major product of the reaction II is optically active compound with inverted configuration.

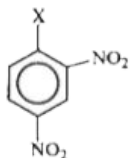
Answer: D

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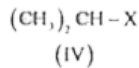
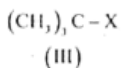
7. The correct order of increasing reactivity of C-X bond towards is nucleophilic, the following compound is



(I)



(II)



A. III < II < I < IV

B. I < II < IV < III

C. II < III < I < IV

D. IV < III < I < II

**Answer: B**



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8. 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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9. Which of the following compounds undergo nucleophilic substitution reactions?

- A. Isopropyl chloride
- B. Ethyl bromide

C. Benzyl chloride

D. Vinyl chloride

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

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**10. Which of the following statements about benzyl chloride are correct?**

A. It can be oxidised to benzaldehyde by boiling with copper nitrate solution

B. It is a lachrymatory liquid and answers Beilstein's test

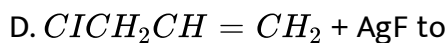
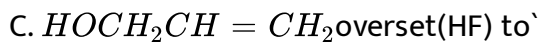
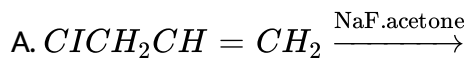
C. It gives a white precipitate with alcoholic silver nitrate

D. It is less reactive than alkyl halides

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

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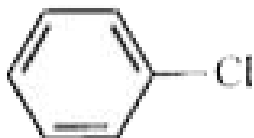
11. Which of the following methods cannot be used to prepare allyl fluoride?



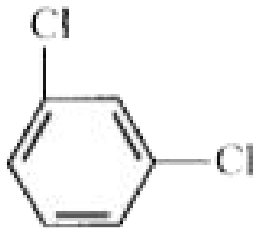
Answer: A::B::D

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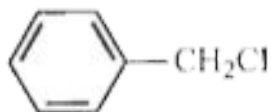
12. Which of the following compounds have approximately the same dipole moment?



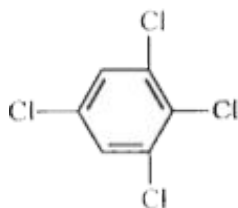
A.



B.



C.

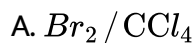


D.

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

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**13.** The reagents which cannot be used to distinguish benzyl chloride from chlorobenzene are



B. Shaking with an aqueous solution of  $AgNO_3$

C. Boiling with aqueous KOH solution followed by acidification with dil.

$HNO_3$  and addition of  $AgNO_3$  solution

D. Fusion with sodium metal followed by acidification with dil.  $HNO_3$

and addition of  $AgNO_3$  solution`.

**Answer: A::D**

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14. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halide due to

A. The formation of less stable carbonium ion

B. Resonance stabilization

C. Longer carbon-halogen bond

D.  $sp^3$ -hybridized carbon attached to the halogen

**Answer: B::D**

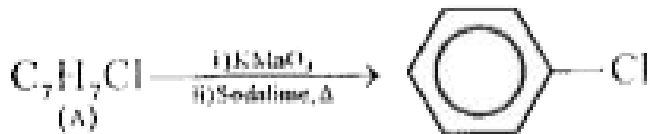
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15. The products of reaction of alcoholic silver nitrite with ethyl bromide are

- A. Ethane
- B. Ethene
- C. Nitro ethane
- D. Ethyl nitrite

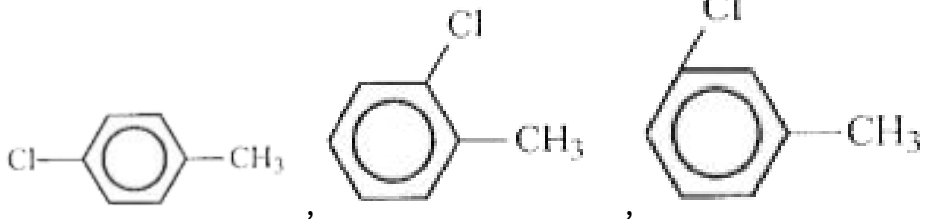
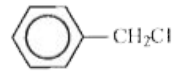
**Answer: C::D**

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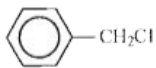


16.

In the reaction, compound (A) is :



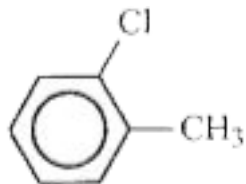
A.



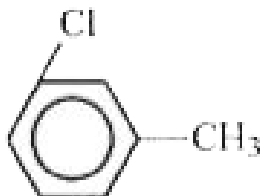
B.



C.



D.



Answer: B::C::D



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17. When nitrobenzene is treated with  $Br_2$  in the presence of  $FeBr_3$ , the major product formed is m-bromonitrobenzene. Statements which are related to obtain the m isomer are`

- A. The electron density on meta carbon is more than that on ortho and para positions
- B. The intermediate carbonium ion formed after initial attack of  $Br^-$  at the meta position is least destabilised
- C. Loss of aromaticity when  $Br^+$  attacks at the ortho and para positions and not at meta position
- D. Easier loss of  $H^+$  to regain aromaticity from the meta position than from ortho and para positions



**Answer: A::B**

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**18.** A  $I_2 / NaOH$  Iodoform +Sodium succinate. In this sequence, A can be

- A. pentan-2-one
- B. acetophenone
- C. 4-ketopentanoic acid
- D. hexane-2, 5-dione

**Answer: C::D**

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**19.** Which of the following statements are incorrect?

- A. The C-Cl bond in chlorobenzene is longer than in chloromethane.

- B. The C-Cl bond in chlorobenzene has some double bond character
- C. It is difficult to replace chlorine from chlorobenzene than from benzyl chloride
- D. Chlorobenzene on further chlorination gives m-dichlorobenzene

**Answer: A:D**

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**20.** What is the total number of products obtained on monochlorination of 2, 2, 5-trimethyl hexane in the presence of light and chlorine?

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**21.** The number of alkenes among the following that would give the same product on addition of HBr, in absence or presence of peroxide is .....

Propene, 1-butene, 2-butene, 2-methyl propene, 3-methyl 1-butene, 2, 3-dimethyl-1-butene, 2-pentene



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22. Excess chlorine is passed through boiling toluene, how many chloro derivatives would you get?



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23. Total number of compounds among the following having zero dipole moment is/are  $CCl_4$ ,  $CH_3Cl$ ,  $CH_2Cl_2$ ,  $CHCl_3$ , o-,m- and p-dichlorobenzenes,



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24. The total number of alkenes possible by dehydrobromination of 3-bromo-3-cyclopentylhexane using alcoholic KOH is



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25.

five compounds with formula  $\text{C}_4\text{H}_8\text{Br}_2$ . How many structures of (X) are possible?

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	Column I (Reaction)		Column II (Type)
A	$\text{CF}_3\text{CH}=\text{CH}_2 + \text{HCl} \rightarrow$	p	Markownikoff's addition
B	$\text{CH}_3\text{C}\equiv\text{C} + \text{HBr} \xrightarrow{\text{hydrobromic acid}} \rightarrow$	q	Anti-Markownikoff's addition
C	$\text{CH}_3\text{CH}_2\text{CH}_2\text{Cl} \xrightarrow{\text{H}_2\text{O}, \text{I}^{\oplus}} \rightarrow$	r	Primary carbocation
D	$\text{CH}_3\text{CH}=\text{CH}_2 + \text{HCl} \xrightarrow{\text{hydrochloric acid}} \rightarrow$	s	Secondary carbocation

26.

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
27. Match the following

	Column I (Type)		Column II (Reaction)
A	Two isomeric products	p	$\text{CH}_3\text{CH}(\text{CH}_3)\text{CH}=\text{CH}_2 + \text{HBr} \rightarrow$
B	Markownikoff's rule	q	$\text{H} \begin{array}{c} \text{Me} \\   \\ \text{C}_6\text{H}_5 \end{array} \text{Br} + \text{H}_2\text{O} \longrightarrow$
C	S <sub>N</sub> 1 reaction	r	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} + \text{HBr} \rightarrow$
D	1, 2-hydride shift	s	$\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{OH} \xrightarrow[\Delta]{\text{H}_2\text{O}_2} \rightarrow$



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28. Match the reactions in Column 1 with their characteristics in column 2

	Column I Reaction	Column II Characteristics
A	$\text{CHCl}_3 + \text{HNO}_3 \longrightarrow$ An insecticide and tear gas	p. Gammaxene
B	Benzene + $\text{Cl}_2 \xrightarrow{\text{h}\nu}$ Product	q. Borodinene-Hunsdiecker reaction
C	 + Chloral $\xrightarrow[\text{H}_2\text{SO}_4]{\text{conc}}$ Products	r. Chloropicrin
D	Silver acetate $\xrightarrow[\text{CCl}_4]{\text{O}_2}$ $\text{CH}_2\text{Br}$	s. Compounds containing oxygen
E	 $\xrightarrow[\text{PhCOCH}_2\text{Cl}]{\text{O}_2}$ <small>Phenylchloride</small>	t. Dichlorodiphenyl trichloroethane
		u. Used as a lachrymator (weeping gas). Used to disperse the mob by police.

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29. Match the following columns

	Column I		Column II
A.	$\text{CH}_3\text{CHBrCD}_3$ on treatment with alc. $\text{KOH}$ gives $\text{CH}_2=\text{CH-CD}_3$	p.	E1 reaction
B.	$\text{PhCHBrCH}_3$ reacts faster than $\text{PhCHBrCD}_3$	q.	E2 reaction
C.	$\text{PhCH}_2\text{CH}_2\text{Br}$ on treatment with $\text{C}_2\text{H}_5\text{OD}/\text{C}_2\text{H}_5\text{O}^-$ gives $\text{PhCD}=\text{CH}_2$	r.	E1cB reaction
D.	$\text{PhC}(\text{CH}_3)_2\text{CH}_2\text{Br}$ and $\text{PhCD}_2\text{CH}_2\text{Br}$ react with the same rate	s.	First-order reaction

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30. Match the reaction the driving force of the reaction.

Column I

A. Nitrite ion

B.  $\text{S}_{\text{N}}2$  mechanism

C.  $\text{S}_{\text{N}}1$  mechanism

D. Cyanide ion

Column II

p. Ambident nucleophile

q. Nucleophilic substitution

r. Carbocation

s. Inversion

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31. Match the reaction with the reagents involved.

Column I

- A. Sandmeyer reaction
- B. Balz-Schiemann reaction
- C. Hunsdiecker reaction
- D. Finkelstein reaction

Column II

- p.  $C_6H_5COOAg, Br_2/CCl_4, \text{heat}$
- q.  $CH_3CH_2CH_2Br, KI, \text{acetone, heat}$
- r.  $C_6H_5N_2Cl, HBF_4, \text{heat}$
- s.  $C_6H_5N_2Cl, CuCl/HCl, \text{heat}$

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32. Match the following columns

Column I (compounds)		Column II (reaction)	
A	isobutane	p	Ozonolysis
B	Propene	q	$H_2/Pd$ reduction
C	Ethyne	r	reaction with chlorine water
D	Benzene	s	$KMnO_4$ oxidation

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33. Each of these questions contains two statements: Statement 1 and Statement 2. Each of these questions has four alternative choices, only one of which is the correct answer.



Statement 1 :  $S_N2$  reaction of an optically active aryl halide with an aqueous solution of KOH always gives an alcohol with opposite sign of rotation.

Statement 2:  $S_N2$  reactions always proceed with inversion of configuration

A. Statement 1 is True, Statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: D**



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34.

Statement 1 :Chlorination of ethyl benzene with  $Cl_2$  in presence of heat and light mainly yields 1-chloro-2- phenylethane.

Statement 2 : The reaction occurs through intermediate formation of the radical,  $C_6H_5CHCH_3$

- A. Statement 1 is True, Statement 2 is True, Statement 2 is Correct explanation for Statement 1.
- B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.
- C. Statement 1 is True, Statement 2 is False.
- D. Statement 1 is False, Statement 2 is True.

Answer: D



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35.

Statement 1 :Aryl halides cannot be prepared by replacement of hydroxyl group of phenol by halogen atom.

Statment 2 :Phenols react with halogen acids violently.

A. Statement 1 is True, Statement 2 is True, Statement 2 is Correct explanation for Statement 1.

B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.

C. Statement 1 is True, Statement 2 is False.

D. Statement 1 is False, Statement 2 is True.

**Answer: C**



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36.

Statement 1: Haloalkanes react with KCN to form alkyl cyanides as main product while with AgCN form isocyanide as the main product.

Statement 2: KCN and AgCN, both are ionic compounds.

- A. Statement 1 is True, Statement 2 is True, Statement 2 is Correct explanation for Statement 1.
- B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.
- C. Statement 1 is True, Statement 2 is False.
- D. Statement 1 is False, Statement 2 is True.

**Answer: C**



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37. Assertion: Electron withdrawing groups in aryl halides increase their activity towards nucleophilic substitution.

Reason : 2,4-Dinitrochlorobenzene is less reactive than chlorobenzene.

- A. Statement 1 is True, Statement 2 is True, Statement 2 is Correct explanation for Statement 1.
- B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.
- C. Statement 1 is True, Statement 2 is False.
- D. Statement 1 is False, Statement 2 is True.

**Answer: C**



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38. Assertion: Optically active 2-iodobutane on treatment with NaI in acetone undergoes racemization.

Reason : Repeated Walden inversions on the reactant and its product eventually gives a racemic mixture.

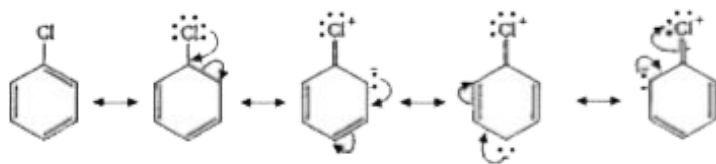
- A. Statement 1 is True, Statement 2 is True, Statement 2 is Correct explanation for Statement 1.
- B. Statement 1 is True, Statement 2 is True, Statement 2 is NOT a correct explanation for Statement 1.
- C. Statement 1 is True, Statement 2 is False.
- D. Statement 1 is False, Statement 2 is True.

**Answer: A**



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39. Due to  $sp^2$ -hybridisation of C-atom holding the halogen atom, resonance effect and smaller polarity of the C-X bond, aryl halides do not undergo nucleophilic substitution reactions. Chlorobenzene can be written as a resonance hybrid of the following structures:



Due to resonance, chlorobenzene gets stabilised. In chlorobenzene, the C-Cl bond acquires some double bond character and hence, it is difficult to break it as compared to C-Cl bond in alkyl halides. Similarly vinyl halides due to resonance are less reactive towards nucleophilic substitution reactions.



Which of the following is most reactive towards nucleophilic substitution reactions?

- A.  $ClCH_2CH = CH_2$
- B.  $CH_3CH = CHCl$
- C.  $C_6H_5Cl$
- D.  $CH_3Cl$

**Answer: A**





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40.

Vinyl chloride on treatment with aqueous KOH gives

- A. acetylene
- B. acetaldehyde
- C. vinyl alcohol
- D. No reaction occurs

**Answer: D**



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41.

In chlorobenzene, all the six C-C bonds have the same length because of

- A. inductive effect



B. Resonance

C. tautomerism

D.  $sp^2$ -hybridisation

**Answer: D**

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42.

Which of the following will give Walden inversion?

A.  $C_4H_9 - CHD - Br$



B.



C.

D. All

**Answer: A**



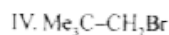
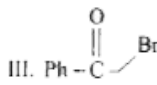
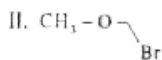
### 43. Paragraph II

$S_N2$  reaction is a bimolecular reaction which takes place by the formation of transition state. Velocity of the reaction depends on the concentration of the substrate as well as the nucleophile. The reaction is favoured by strong nucleophile, and in the presence of polar aprotic solvent, optically active halides give Walden inversion by  $S_N2$  mechanism. The presence of

hetero group (atom) at  $\beta$ -C atom, unsaturation at  $\beta$ -C, and  $\left( \begin{array}{c} o \\ || \\ -C- \end{array} \right)$  group at  $\alpha$ -C atom favour  $S_N2$  mechanism.

Allyl halides and benzyl halides give  $S_N1$  and  $S_N2$  reactions. Allyl halides also give  $S_N2$  mechanism. EWG at ortho- and para-positions in benzyl halides favours  $S_N1$  mechanism, whereas EDG favour  $S_N2$  mechanism.

Which of the following will give  $S_N2$  reaction?



A. I and II

B. I and III

C. I, II and III

D. All

**Answer: C**



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#### 44. Paragraph II

$S_N2$  reaction is a bimolecular reaction which takes place by the formation of transition state. Velocity of the reaction depends on the concentration of the substrate as well as the nucleophile. The reaction is favoured by strong nucleophile, and in the presence of polar aprotic solvent, optically active halides give Walden inversion by  $S_N2$  mechanism. The presence

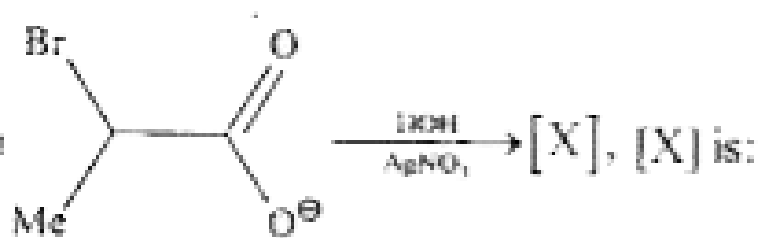
of hetero group (atom) at  $\beta$ -C atom, unsaturation at  $\beta$ -C, and  $\left( \begin{array}{c} \text{O} \\ || \\ -\text{C}- \end{array} \right)$

group at  $\alpha$ -C atom favour  $S_N2$  mechanism.

Allyl halides and benzyl halides give  $S_N1$  and  $S_N2$  reactions. Allyl halides

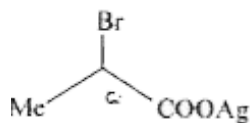
also give  $S_N2$  mechanism. EWG at ortho- and para-positions in benzyl halides favours  $S_N1$  mechanism, whereas EDG favour  $S_N2$  mechanism.

In the reaction

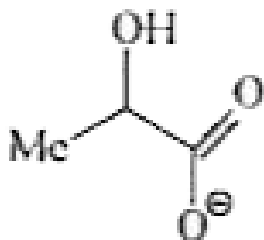


to  $[\text{x}]$ ,  $[\text{x}]$  is:

A.  $\text{C}_3\text{H}_5\text{Br}$



B.



C.

D.  $\text{CH}_2 = \text{CH}_2$

Answer: C

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#### 45. Paragraph III

Elimination reactions of alkyl halides are important reactions that compete with substitution reactions. An alkyl halide with hydrogen atoms on beta-carbon atom when reacted with a base or a nucleophile can undergo either substitution ( $S_N1$  and  $S_N2$ ) or elimination. The path of the reaction will be determined by the nature of the alkyl halide, strength and size of the base/nucleophile, reaction conditions and solvent used. In general, bulkier nucleophile acts as base and removes a proton because substitution is hindered due to steric reasons.

2-Bromopropane is separately heated with aqueous  $CH_3CO_2Na$  or with  $CH_3CH_2ONa$  or with  $CH_3CH_2OH$ , the major product obtained in each case, respectively, is

- A. propene, isopropyl ethyl ether
- B. isopropyl acetate, propene
- C. isopropyl acetate, isopropyl ethyl ether
- D. propene in both the cases

**Answer: B**



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**46.**

2-Chloropentane is heated with potassium ethoxide in ethanol. The major product obtained is

A. 2-ethoxypentane

B. 1-pentene

C. cis-2-pentene

D. trans-2-pentene

**Answer: D**



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47.

Isopropyl bromide on heating with a concentrated solution of alcoholic (ethanolic) KOH predominantly gives

- A. propene
- B. propan-2-ol
- C. propan-1-ol
- D. isopropyl ethyl ether

**Answer: A**



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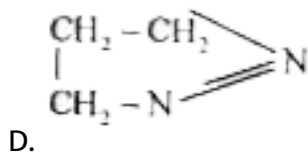
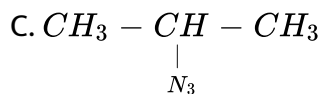
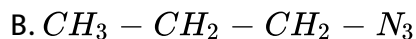
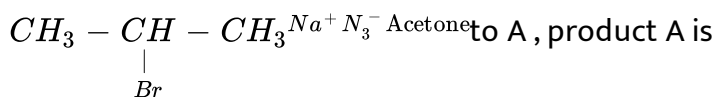
48. Paragraph IV

There are several factors which decide the fate of substrate in presence of nucleophile. One of them is nature of solvent.

In mildly basic, neutral or acidic solution primarily substitution takes place. This will occur via  $S_N2$  mechanism for  $1^\circ$  alkyl halides and via  $S_N1$

mecahanism for 3° alkyl halides. When 2° alkyl halides react with (-) charge nucleophile in polar protic solvents, the  $S_N2$  mechanism is followed when 2° alkyl halides react with  $H_2O$  or ROH as solvent  $S_N1$  mechanism is followed.

In strongly basic solutions primarily elimination takes place with 2° and 3° alkyl halides. When we use strong and sterically hindered base, KOtBu, even 1° alkyl halides given elimination products primarily.



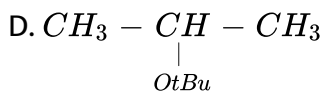
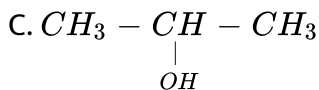
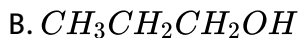
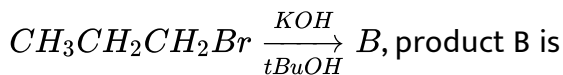
**Answer: C**



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49.



**Answer: A**



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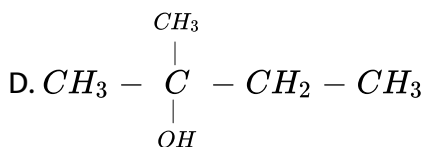
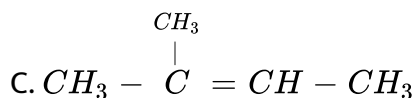
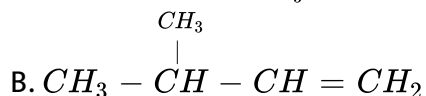
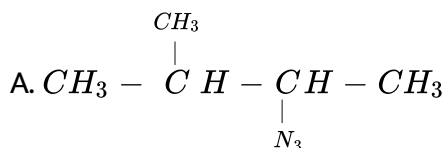
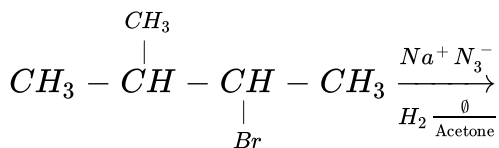
50. Paragraph IV

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In mildly basic, neutral or acidic solution primarily substitution takes place. This will occur via  $S_N2$  mechanism for  $1^\circ$  alkyl halides and via  $S_N1$  mechanism for  $3^\circ$  alkyl halides. When  $2^\circ$  alkyl halides react with (-) charge

nucleophile in polar protic solvents, the  $S_N2$  mechanism is followed when  $2^\circ$  alkyl halides react with  $H_2O$  or ROH as solvent  $S_N1$  mechanism is followed.

In strongly basic solutions primarily elimination takes place with  $2^\circ$  and  $3^\circ$  alkyl halides. When we use strong and sterically hindered base, KOtBu, even  $1^\circ$  alkyl halides given elimination products primarily.



**Answer: D**



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