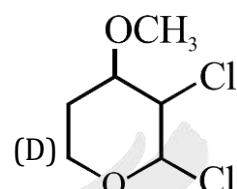
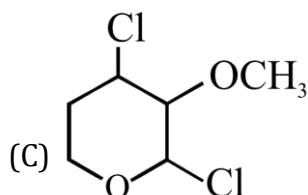
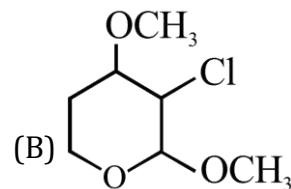
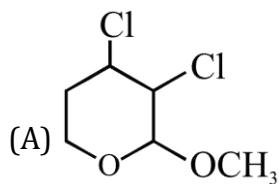
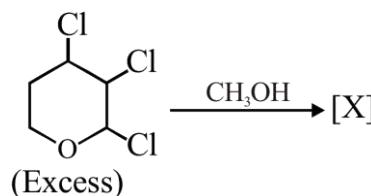
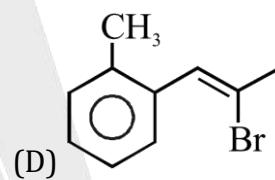
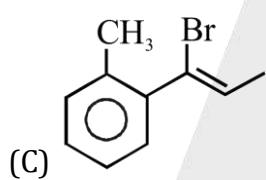
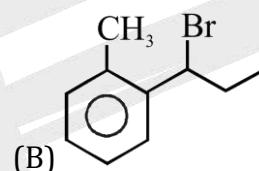
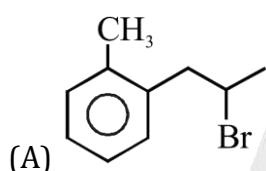


## EXERCISE - I (MAINS ORIENTED)

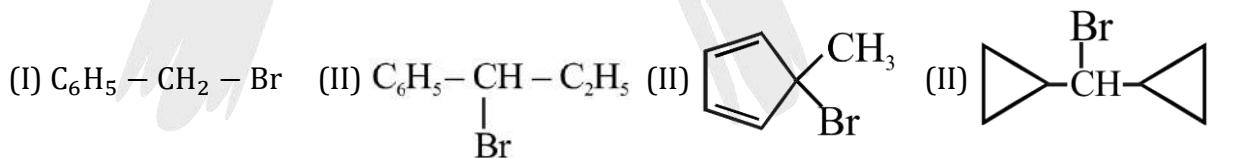
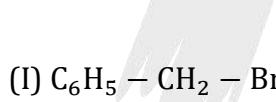
1. Major product of following reaction is:



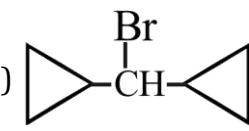
2. Which compound undergoes hydrolysis by the S<sub>N</sub>1 mechanism at the fastest rate?



3. Arrange the following compounds in decreasing order of their reactivity for hydrolysis reaction



III



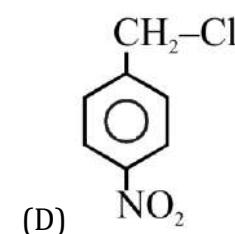
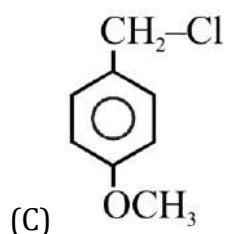
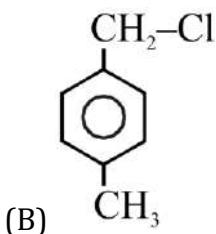
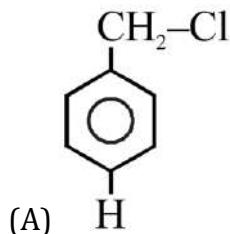
(A) I > II > III > IV

(B) IV > II > I > III

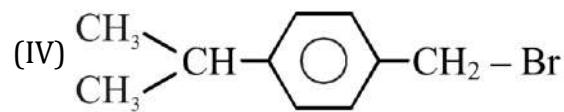
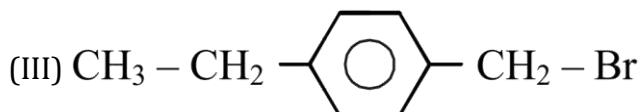
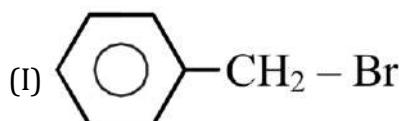
(C) III > IV > II > I

(D) IV > III > II > I

4. Arrange the following compounds in order of decreasing rate of hydrolysis for S<sub>N</sub>1 reaction:



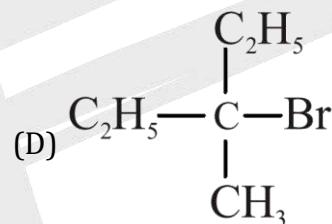
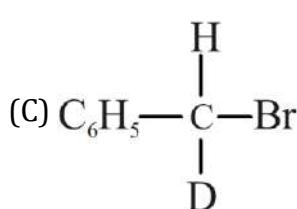
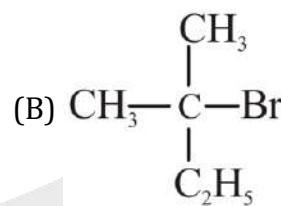
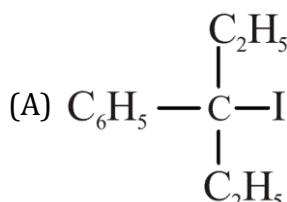
5. Which of the following is most reactive toward  $S_N1$  reaction?



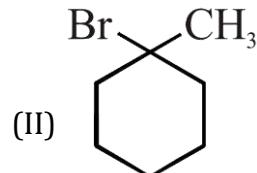
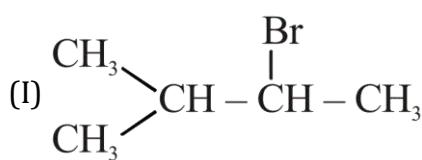
- (A) II > III > IV > I  
 (C) III > IV > II > I

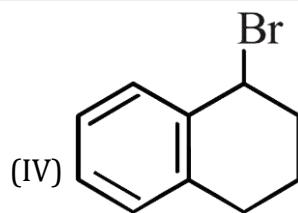
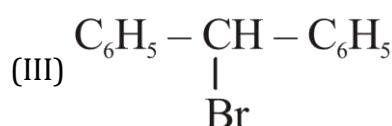
- (B) IV > III > II > I  
 (D) I > II > III > I

6. Arrange the following compounds in order of decreasing rate of hydrolysis for  $S_N1$  reaction:



7. Consider the  $S_N1$  solvolysis of the following halides in aqueous formic acid, decide decreasing order of reactivity of above alkyl halide?

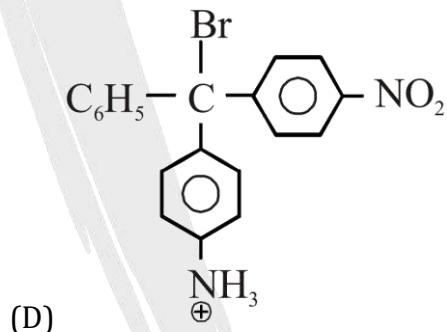
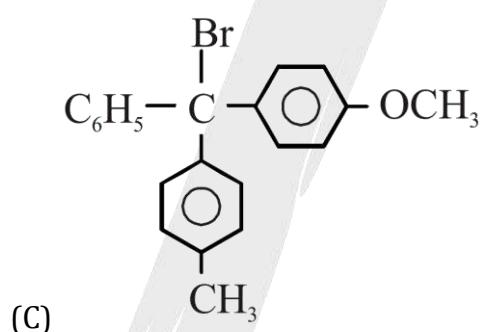
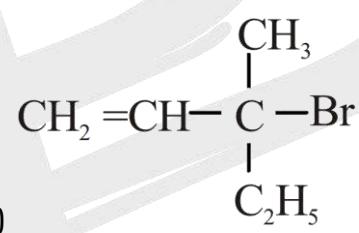
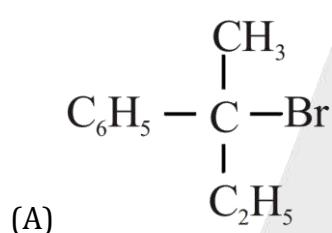
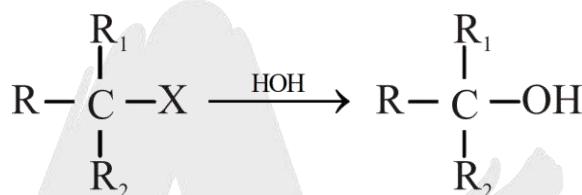




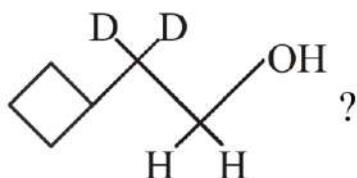
- (A) III > IV > II > I  
 (C) I > II > III > IV

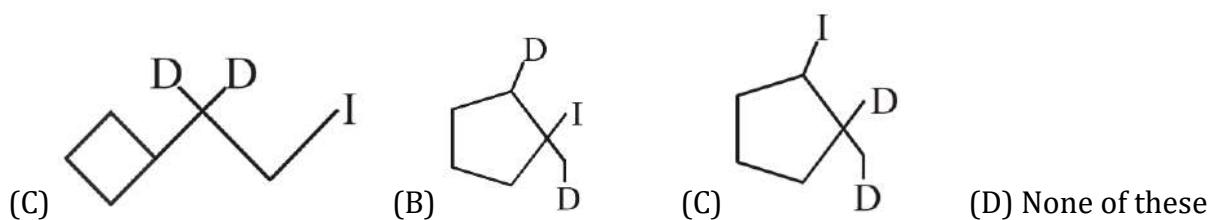
- (B) II > IV > I > III  
 (D) III > I > II > IV

8. For the given reaction, which substrate will give maximum racemisation?

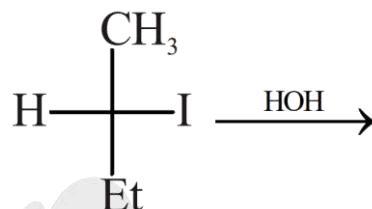


9. Major product of following reaction is:



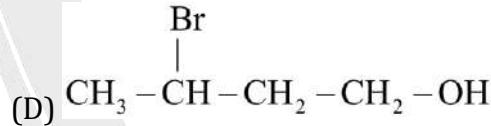
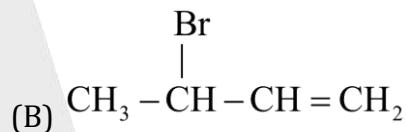
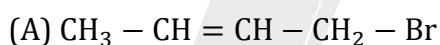
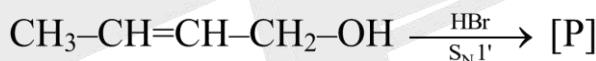


10. If 96% racemisation takes place in given reaction then find out the correct statement:

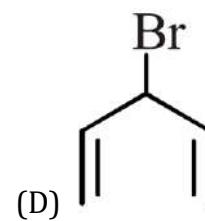
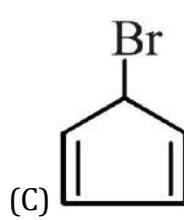
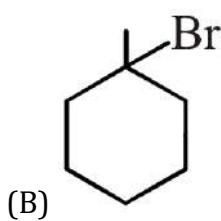
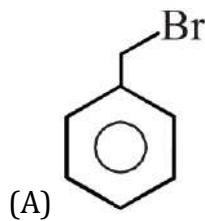


- (A) Among the products 48% S and 48%R configuration containing molecules are present  
 (B) Among the products 50% S and 50%R configuration containing molecules are present  
 (C) Among the products 48% S and 52%R configuration containing molecules are present  
 (D) Among the products 52% S and 48%R configuration containing molecules are present

11. In the given reaction the product [P] can be :

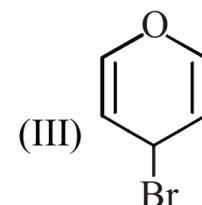
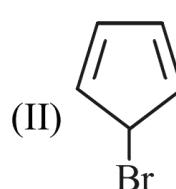
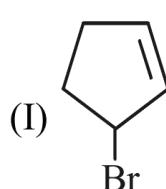


12. Which of the following can not give  $\text{S}_{\text{N}}1$  reaction easily?



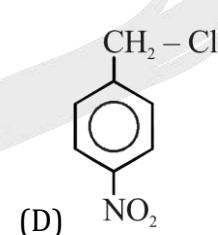
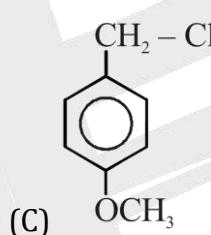
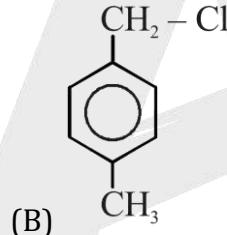
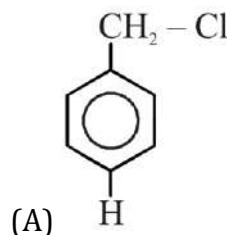
13. Which one of the following compounds will be most reactive for  $\text{S}_{\text{N}}1$  reactions?

15. Among the bromides I – III given below, the order of reactivity in  $S_N1$  reaction is:

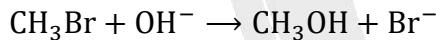


- (A) III > I > II      (B) III > II > I  
(C) II > III > I      (D) II > I > III

16. Which of the following is most reactive toward  $S_N2$ ?

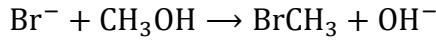


17. Which of the following is most reactive toward  $S_N2$ ?



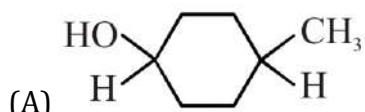
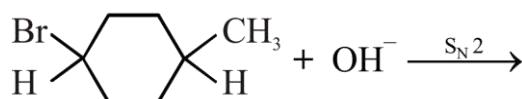
- (A) Rate =  $k[\text{CH}_3\text{Br}]$       (B) Rate =  $k[\text{OH}^-]$   
(C) Rate =  $k[\text{CH}_3\text{Br}][\text{OH}^-]$       (D) Rate =  $k[\text{CH}_3\text{Br}]^0[\text{OH}^-]^0$

18. Select suitable reason for non-occurrence of the following reaction.

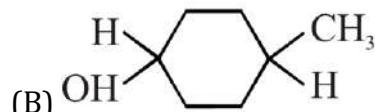


- (A) Attacking nucleophile is stronger one
  - (B) Leaving group is a stronger base than nucleophile
  - (C) Alcohols are not good substrate for  $S_N$  reaction
  - (D) Hydroxide ions are weak bases

19. Major product of following reaction is:



(C) Both



(D) None of these

20. The reactivity of given compounds towards  $\text{S}_N2$  displacement is :



(I)

(A) I > II > III



(II)

(C) II > III > I

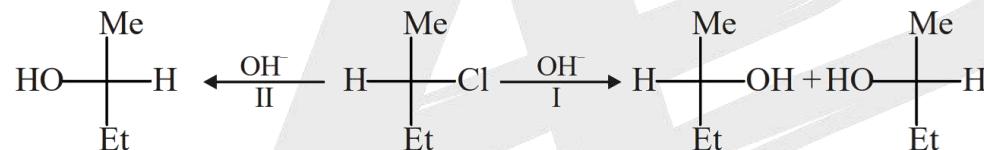


(III)

(B) I > III > II

(D) II > I > III

21. For the given reaction, CORRECT option regarding mechanism involved is :



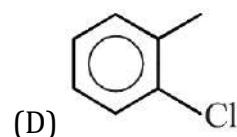
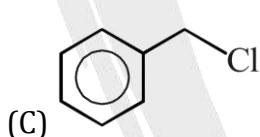
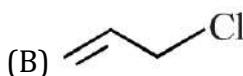
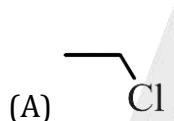
(A) I can't be  $\text{S}_N1$

(B) II can't be  $\text{S}_N2$

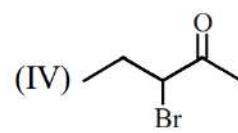
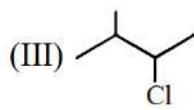
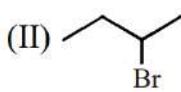
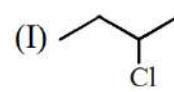
(C) I can be  $\text{S}_N1$  & II can be  $\text{S}_N2$

(D) I can be  $\text{S}_N2$  & II can be  $\text{S}_N1$

22. In which of the following replacement of  $\text{Cl}^-$  is most difficult?



23. Arrange these compounds in order of increasing  $\text{S}_N2$  reaction rate :



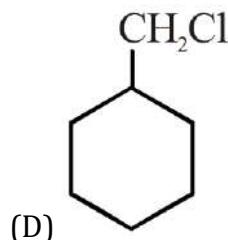
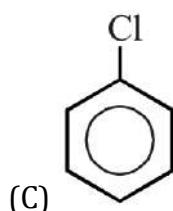
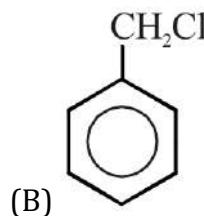
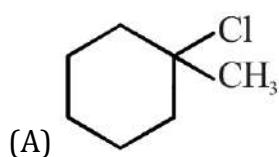
(A) III < I < II < IV

(B) III < II < I < IV

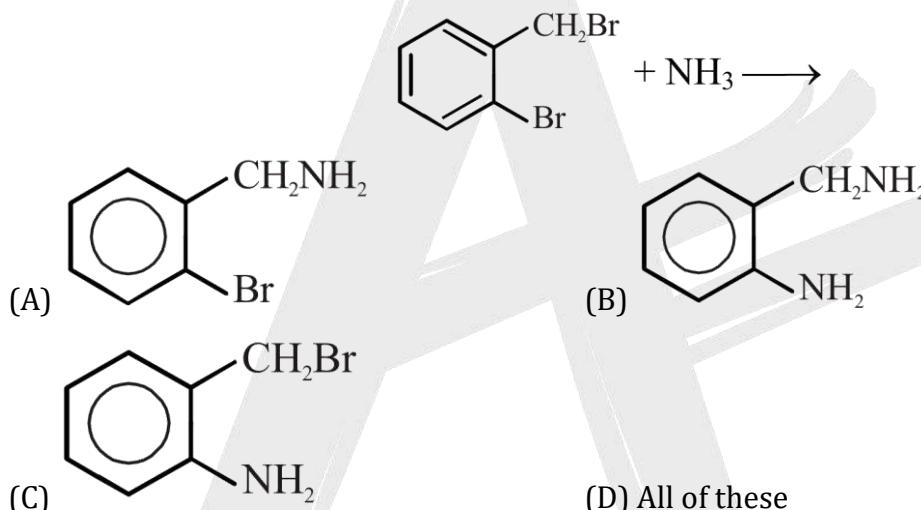
(C) IV < III < I < II

(D) III < IV < I < II

24. Which reaction proceeds faster with  $\text{NaI}$  in DMSO?



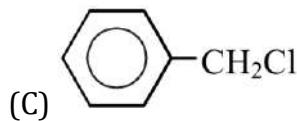
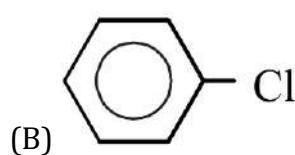
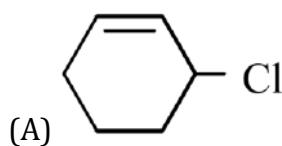
25. The major product in the given reaction is:



26. The compound  $\text{CH}_3 - \text{O} - \text{CH}_2 - \text{Br}$  gives faster rate of nucleophilic substitution reaction than :

- (A)  $\text{CH}_3\text{Br}$       (B)  $\text{CH}_3\text{CH}_2\text{Br}$   
(C)  $\text{PhCH}_2\text{Br}$       (D)  $\text{CH}_3\text{OCH}_2\text{Cl}$

27. Which will give white ppt. with  $\text{AgNO}_3$  ?



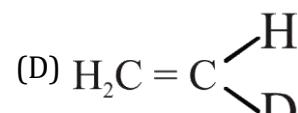
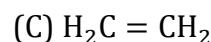
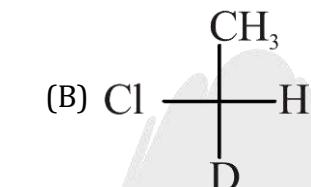
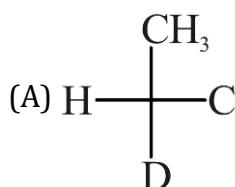
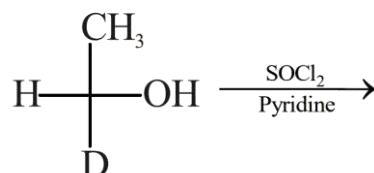
- (D) Both (A) and (C)

28. When ethyl bromide is treated with moist  $\text{Ag}_2\text{O}$ , the main product is:

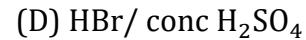
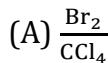
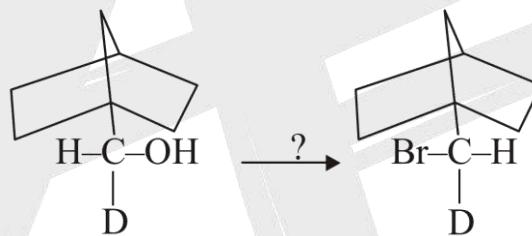
- (A) Ethyl ether      (B) Ethanol      (C) Ethoxy ethane      (D) All of these

29. When ethyl bromide is treated with dry  $\text{Ag}_2\text{O}$ , the main product is:  
 (A) Ethyl ether      (B) Ethanol      (C) Ethoxy ethane      (D) All of these

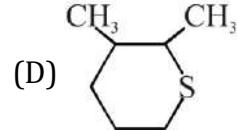
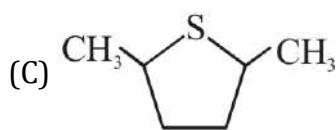
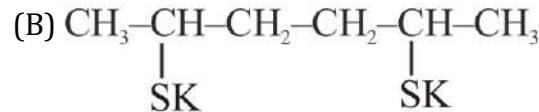
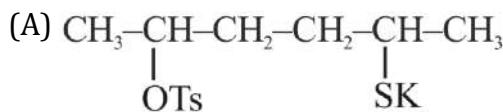
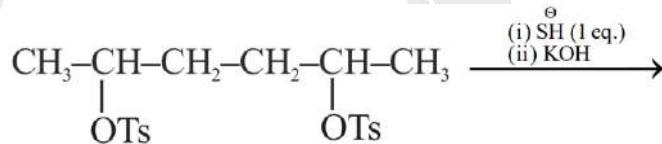
30. Major product of following reaction is:



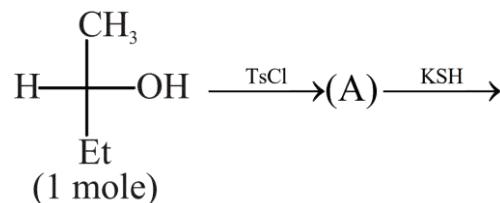
31. Which reaction conditions (reagents) is suitable for the following reaction:



32. Major product of following reaction is:



33. Assuming all the substrate convert into substitution products containing 0.05 mole of Configuration, calculate the percentage of  $\text{S}_{\text{N}}2$  mechanism.

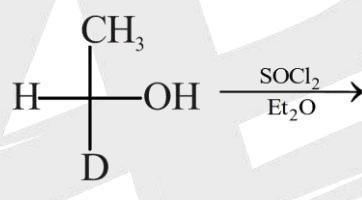





34. The reaction of  $\text{SOCl}_2$  on alkanols to form alkyl chlorides gives good yields because

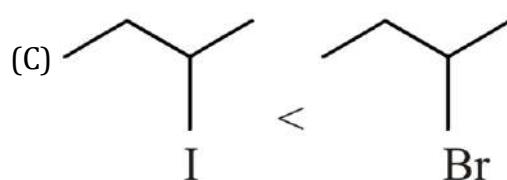
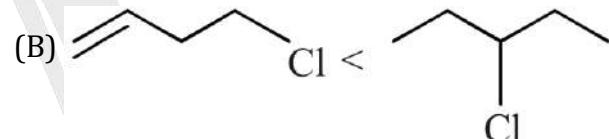
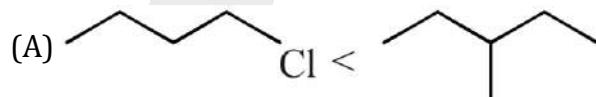
- (A) Alkyl chlorides are immiscible with  $\text{SOCl}_2$
  - (B) The other products of the reaction are gaseous and escape out
  - (C) Alcohol and  $\text{SOCl}_2$  are soluble in water
  - (D) The reaction does not occur via intermediate formation of an alkyl chloro sulphite

35. Major product of following reaction is:

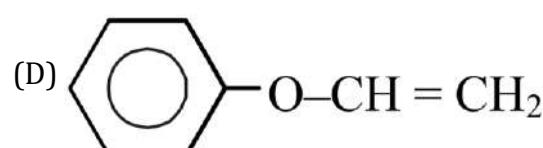
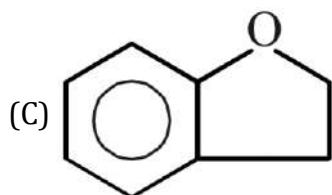
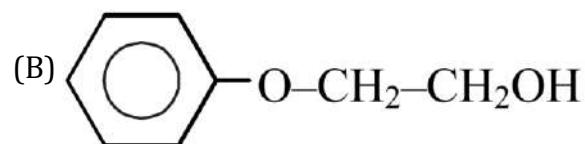
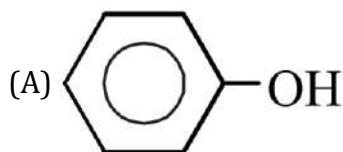
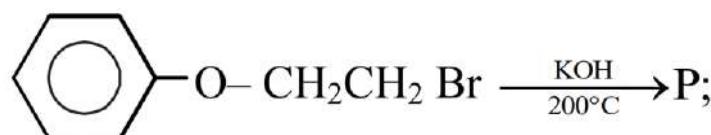


- (A)  (B)  (C)  $\text{H}_2\text{C} = \text{CH}_2$  (D) 

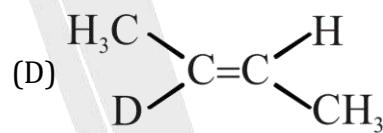
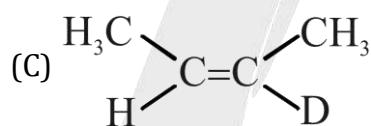
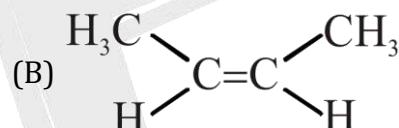
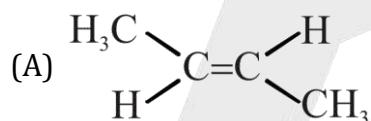
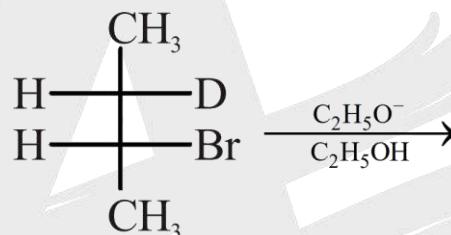
35. In the given pairs, which pair represent correct order of rate dehydrohalogenation reaction.



36. Major product of following reaction is:



38. Major product of following reaction is:



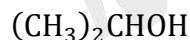
39. CORRECT order of rate of reaction for following compounds with Conc. HBr is:



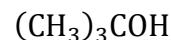
(P)



(Q)



(R)



(S)

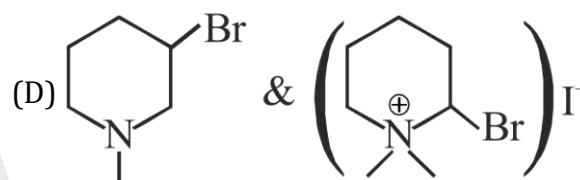
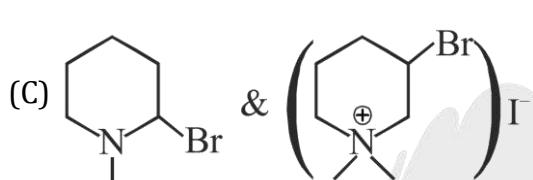
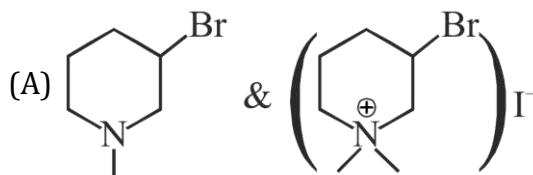
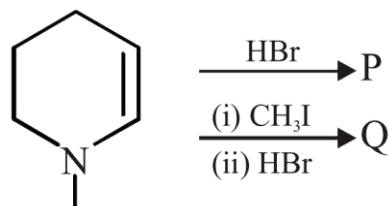
(A) S > R > Q > P

(B) P > Q > R > S

(C) S > R > P > Q

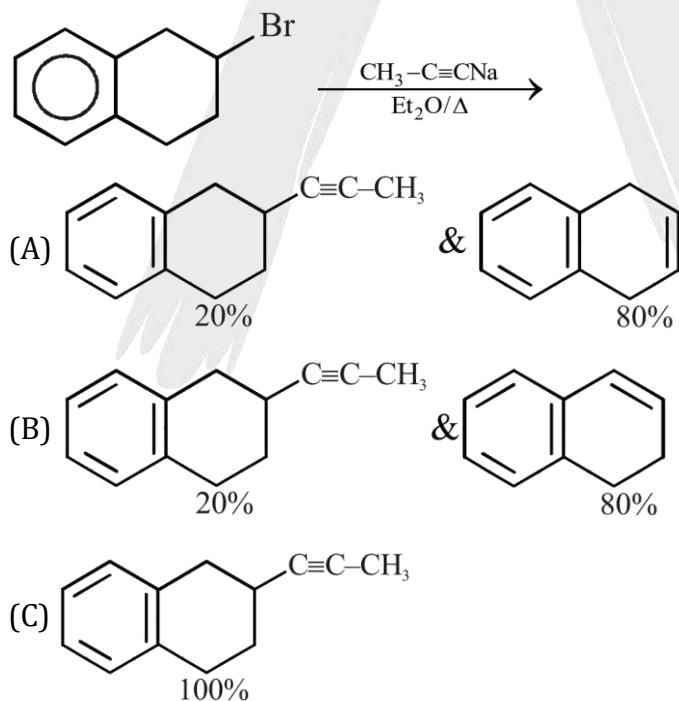
(D) P > S > Q > R

40. If P&Q are the major products then P&Q are respectively:



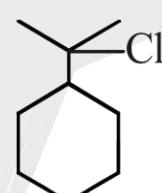
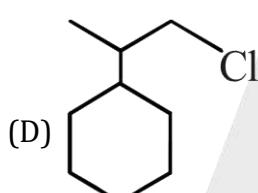
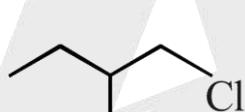
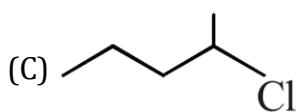
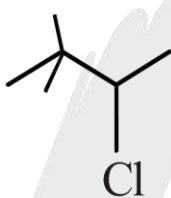
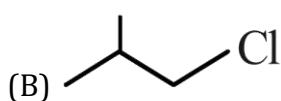
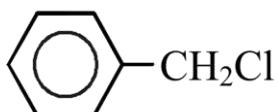
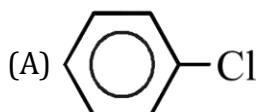


42. Major product of following reaction is:

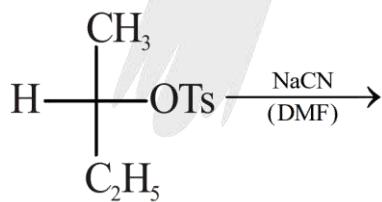


## EXERCISE # II-A

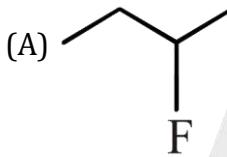
1. Rate of S<sub>N</sub>2 depends on:
- (A) Conc of Nucleophile
  - (B) Conc of substrate
  - (C) Nature of leaving group
  - (D) Nature of solvent
2. In the given pair in which pair the first compound is more reactive than second towards S<sub>N</sub>2 reaction.

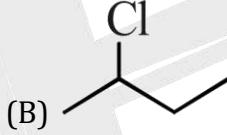
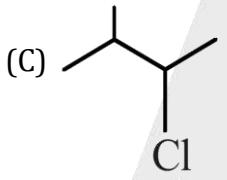


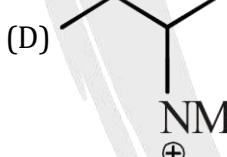
3. Which of following statements is(are) correct for the given reaction.



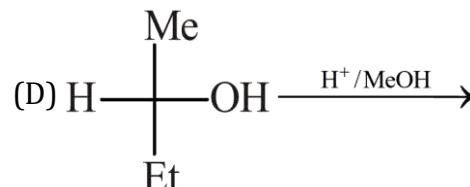
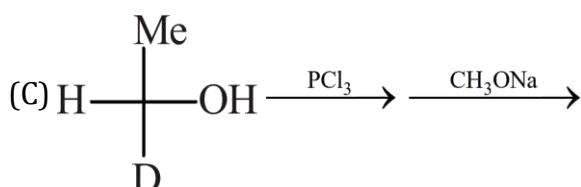
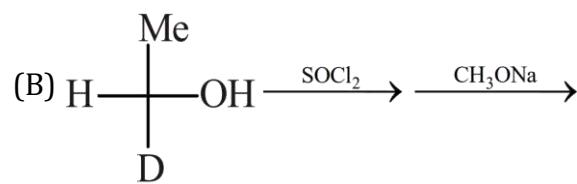
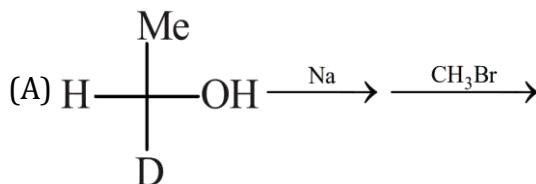
- (A) Product formation takes place due to the breaking of C – O bond
- (B) Hydrolysis of major product gives optically active carboxylic acid
- (C) Reaction involves bimolecular nucleophilic substitution reaction
- (D) Absolute configuration of major product is " R "

4. Which of the following statements is / are true?
- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{I}$  will react more readily than  $(\text{CH}_3)_2\text{CHI}$  for  $S_N2$  reactions.
  - $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Cl}$  will react more readily than  $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{Br}$  for  $S_N2$  reaction.
  - $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{Br}$  will react more readily than  $(\text{CH}_3)_3\text{C} - \text{CH}_2 - \text{Br}$  for  $S_N2$  reactions
  - $\text{CH}_3 - \text{O} - \text{C}_6\text{H}_4 - \text{CH}_2\text{Br}$  will react more readily than  $\text{NO}_2 - \text{C}_6\text{H}_5 - \text{CH}_2\text{Br}$  for  $S_N2$  reaction
5. Incorrect statement about alkyl halides is / are:
- Tertiary alkyl halides undergo  $S_N2$  substitutions
  - Alkyl iodides on exposure to sunlight gradually darken
  - Photo iodination is irreversible in presence of  $\text{HIO}_3$
  - A nucleophilic substitution is most difficult in alkyl iodides
6. Which of following reaction(s) produce Saytzeff product as a major product:
- (A)   $\xrightarrow[\Delta]{\text{NH}_2^-}$

(B)   $\xrightarrow{\text{alc. KOH}/\Delta}$
- (C)   $\xrightarrow[\Delta]{\text{Me}_3\text{CO}^- \text{K}^+}$

(D)   $\xrightarrow[\Delta]{\text{OR}^-}$
7.  $S_N1 & S_N2$  is not favourable in
- |   |   |
|---|---|
| <ol style="list-style-type: none"> <li><math>\text{H}_2\text{C} = \text{CH} - \text{Cl}</math></li> <li><math>\text{Ph} - \text{Cl}</math></li> </ol> | <ol style="list-style-type: none"> <li><math>\text{Ph} - \text{CH}_2 - \text{Cl}</math></li> <li><math>\text{H}_2\text{C} = \text{CH} - \text{CH}_2 - \text{Cl}</math></li> </ol> |
|---|---|
8. Among the following, which statement is correct?
- Alkyl-aryl product can be obtained in wurtz reaction.
  - Dipole moment of cyclohexyl chloride is more than that of chlorobenzene.
  - Alcohols are insoluble in lucas reagent while their halides are soluble.
  - Preparation of ether by acid dehydration of secondary alcohol is not suitable.

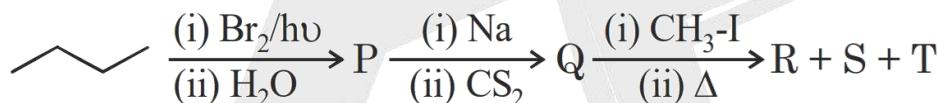
9. In which of the following reaction(s), configuration about chiral carbon is retained in the major product



10. A gem dichloride is formed in the reaction:

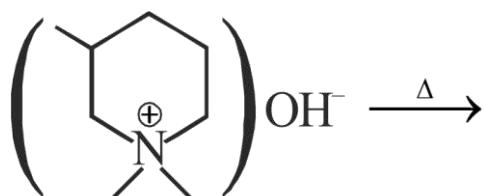
- (A)  $\text{CH}_3\text{CHO}$  and  $\text{PCl}_5$   
 (B)  $\text{CH}_3\text{COCH}_3$  and  $\text{PCl}_5$   
 (C)  $\text{CH}_2 = \text{CH}_2$  and  $\text{Cl}_2$   
 (D)  $\text{CH}_2 = \text{CHCl}$  and  $\text{HCl}$

11. Assuming that all products are major & R is hydrocarbon while T is also organic product then choose the correct option(s)?



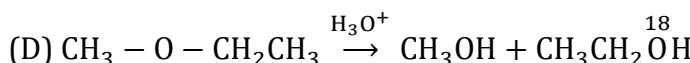
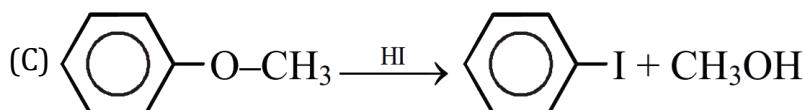
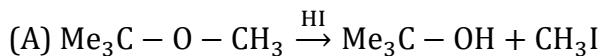
- (A) T is more acidic than P  
 (B) R has more heat of combustion than propene  
 (C) Both P & Q can show stereoisomerism  
 (D) S is not an organic product

12. Which of following are correct for given reaction



- (A) Major product of reaction is  
 (B) Major product is  
 (C) Major product formation involve substitution  
 (D) The reaction is  $E_2$  reaction

13. Which of the following reactions is (are) incorrectly matched with their major product:



14. Correct statement among the following is/are:

(A) The rate of hydrolysis of tertiary butyl bromide increases by addition of  $\text{Ag}_2\text{O}$

(B) Aqueous  $\text{Ag}_2\text{O}$  produces nucleophilic  $\text{OH}^-$

(C) The addition of a small amount of oxygen slows down the photochemical chlorination of methane.

(D)  $\text{CH}_3\text{CH}_2\text{Cl}$  is more reactive than  $\text{PhCH}_2\text{Cl}$  for bimolecular nucleophilic substitution reaction

15. Incorrect statement among the following is/are:

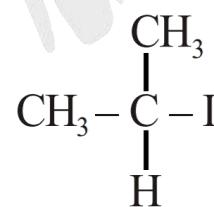
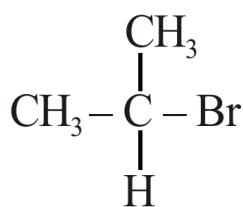
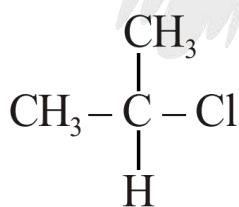
(A) ROH with NaI in the presence of phosphoric acid gives RI, but not in the presence of  $\text{H}_2\text{SO}_4$

(B) 2-methyl propane on chlorination ( $\text{Cl}_2, \text{hv}$ ) gives 1-chloro-2-methyl propane while bromination ( $\text{Br}_2, \text{hv}$ ) gives 2-bromo-2-methyl propane

(C) Usually higher temperature prefers substitution over elimination

(D) Triphenyl chloromethane cannot be hydrolysed

16. From left to right, correct statements are:



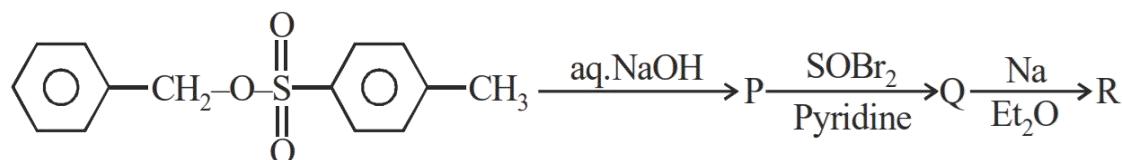
(A) Rate of  $\text{S}_{\text{N}}1$  mechanism increases in polar protic solvent

(B) Rate of  $\text{S}_{\text{N}}2$  mechanism increases in DMSO

(C) Rate of  $\text{E}_2$  mechanism increases

(D) Rate of  $\text{E}_1$  mechanism increases

17. How many monobromo derivatives are possible for Hydrocarbon (R)?



(A) 2

(B) 3

(C) 5

(D) 1



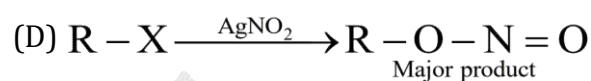
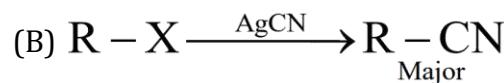
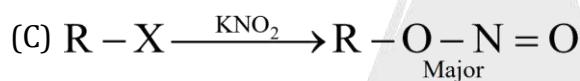
## EXERCISE # II-B

## COMPREHENSION TYPE

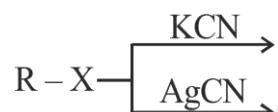
## Paragraph for Q. No. 01 to 02

Groups like  $\text{CN} & [-\text{O} - \ddot{\text{N}} = \text{O}]$  : possess two nucleophilic centre and are called ambident nucleophiles. Actually cyanide group is hybride of two contributing structures and therefore can act as nucleophile in two different ways  $\left[ \begin{array}{c} \ominus \\ \text{C} \equiv \text{N} \leftrightarrow \text{C} = \text{N}^\ominus \end{array} \right]$ . Similarly nitrite ion also represents an ambident nucleophile with two different points of linkage  $[\text{O} = \text{O}]$ .

1. Correct option among the following:



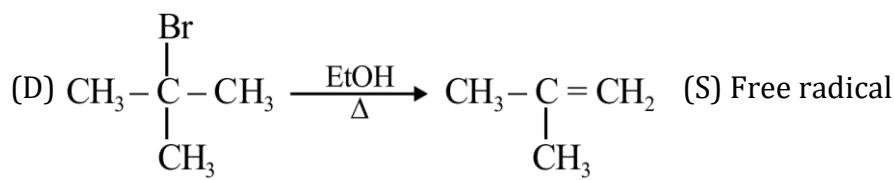
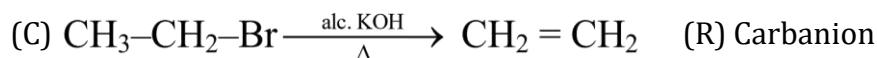
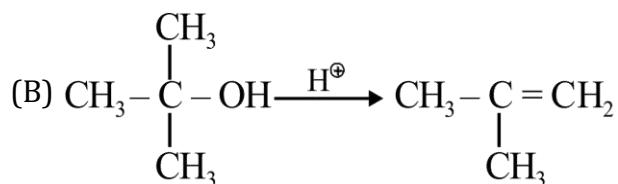
2. Incorrect statement



- (A) KCN is predominantly ionic in nature  
 (B) AgCN is mainly covalent in nature  
 (C) In AgCN, carbon is the donor atom  
 (D) In AgCN nitrogen is the donor atom

3. Match the List I with List II

## List-I



## List-II

(P) Elimination Reaction

(Q) Carbocation

(R) Carbanion

(S) Free radical



4. Match the List I with List II

List-I

(Reactions)

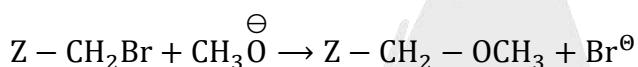
- (A)  $\text{CH}_3 - \text{O} - \text{SO}_2\text{CH}_3 + \text{C}_2\text{H}_5\text{O}^\ominus$   
 (B)  $\text{CH}_3 - \text{CH}_2 - \text{I} + \text{PH}_3$   
 (C)  $\text{HC} \equiv \overset{\ominus\oplus}{\text{C}} \text{Na} + \text{CH}_3 - \text{CH}_2 - \text{Br}$   
 (D)  $\text{CH}_3 - \text{Cl} + \text{CH}_3 - \overset{\Theta}{\text{O}}$

List-II

(Products)

- (P)  $\text{CH}_3 - \text{CH}_2 - \text{PH}_2$   
 (Q)  $\text{CH}_3 - \text{O} - \text{C}_2\text{H}_5$   
 (R)  $\text{CH}_3 - \text{O} - \text{CH}_3$   
 (S)  $\text{CH} \equiv \text{C} - \text{CH}_2 - \text{CH}_3$

5. Match the List I with List II



List-I (Z-)

- (A)  $\text{H} -$   
 (B)  $\text{CH}_3 -$   
 (C)  $\text{C}_2\text{H}_5 -$   
 (D)  $\begin{array}{c} \text{CH}_3 \\ \diagdown \\ \text{CH}_3 - \text{CH} - \end{array}$

List-II (Relative reactivity)

- (P) 0.1  
 (Q) 3  
 (R) 1  
 (S) 100

6. Match the List I with List II

List-I

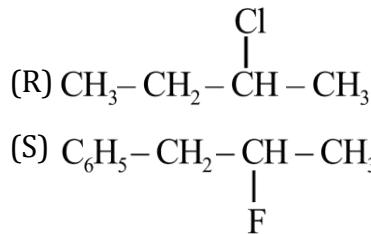
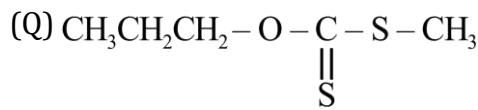
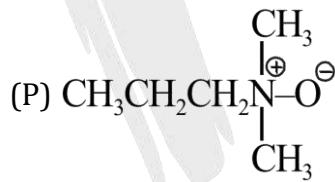
- (A)  $E_{1CB}$

(B) Saytzeff alkene as major product

- (C)  $E_2$

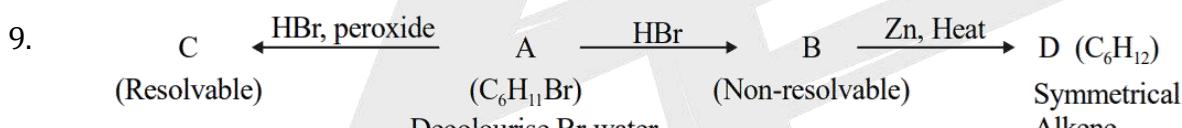
- (D)  $E_i$

List-II



- | 7. | Column-I<br>(Reactions)  | Column-II<br>(Characteristics)                          |
|----|--|---|
|    | (A) $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2 \xrightarrow{\text{HBr}}$           | (P) Bimolecular   |
|    | (B) $\text{CH}_3\text{CH}_2\text{CH} = \text{CH}_2 \xrightarrow{\text{HBr, Peroxide}}$ | (Q) Carbocation intermediate                            |
|    | (C) $\text{PhCH}(\text{CH}_3)\text{OH} \xrightarrow{\text{SOCl}_2}$                    | (R) Regioselective                                      |
|    | (D) $\text{PhCH}(\text{CH}_3)\text{OH} \xrightarrow{\text{HBr}}$                       | (S) Racemic modification<br>(T) Stereospecific reaction |

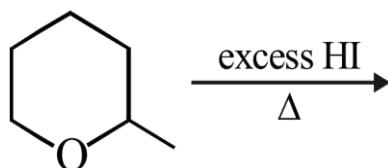
- | 8. | Column-I<br>(Statements)           | Column-II<br>(Consistent path of reaction) |
|----|------------------------------------|--|
|    | (A) Reactions are concerted        | (P) S <sub>N</sub> 1                       |
|    | (B) CH <sub>3</sub> X cannot react | (Q) S <sub>N</sub> 2                       |
|    | (C) 3°R-X > 2°R-X > 1°R-X          | (R) E <sub>1</sub>                         |
|    | (D) R-I reacts faster than R-Cl    | (S) E <sub>2</sub>                         |



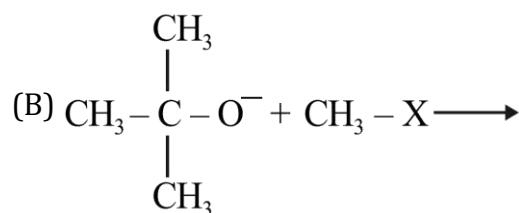
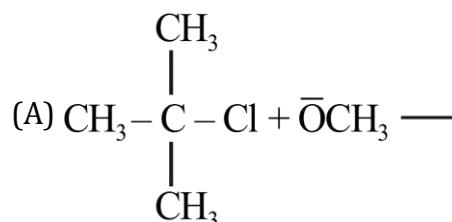
Identify A, C&E in the sequence of reaction.

10.  $\text{CH}_3 - \text{CH}_2\text{I}$  reacts more rapidly with strong base in comparison to  $\text{CD}_3\text{CH}_2\text{I}$ .

11. Predict the product(s) and write the mechanism of the given reaction:



12. What are the products of the following reactions?



13. A primary alkyl bromide (A),  $\text{C}_4\text{H}_9\text{Br}$ , reacted with alcoholic KOH to give compound (B).

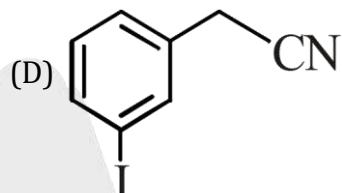
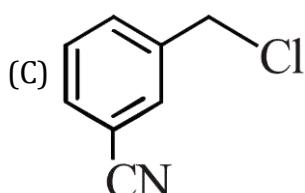
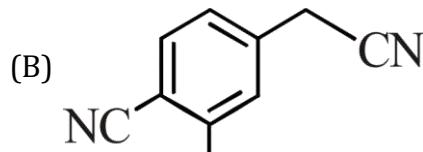
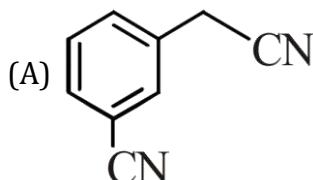
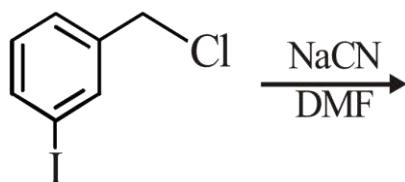
Compound (B) reacted with HBr to give an isomer of (A). When (A) was reacted with sodium metal it gave compound (D),  $\text{C}_8\text{H}_{18}$ , which was different from the compound produced when n butyl bromide was reacted with sodium. Draw the structure of (A) and write equations for all the reactions.

**EXERCISE # III (JEE MAIN)**

1. Following reaction is an example of : [AIEEE 2002]
- $$(\text{CH}_3)_3\text{C} - \text{Br} + \text{H}_2\text{O} \rightarrow (\text{CH}_3)_3\text{C} - \text{OH} + \text{HBr}$$
- (A) Elimination reaction  
 (B) Free radical substitution  
 (C) Nucleophilic substitution  
 (D) Electrophilic substitution
2.  $\text{S}_{\text{N}}1$  reaction is feasible in [AIEEE 2002]
- (A)  $\text{Cl} + \text{KOH} \rightarrow$   
 (B)  $\text{Cl} + \text{KOH} \rightarrow$   
 (C)  $\text{Cl} + \text{KOH} \rightarrow$   
 (D)  $\text{Cl} + \text{KOH} \rightarrow$
3. Bottles containing  $\text{C}_6\text{H}_5\text{I}$  and  $\text{C}_6\text{H}_5 - \text{CH}_2\text{I}$  lost their original labels. They were labelled A and B for testing. A and B were separately taken in a test tube and boiled with  $\text{NaOH}$  solution. The end solution in each tube was made acidic with dilute  $\text{HNO}_3$  and then some  $\text{AgNO}_3$  solution was added. Substance B gave a yellow precipitate. Which one of the following statements is true for this experiment. [AIEEE 2003]
- (A) A was  $\text{C}_6\text{H}_5\text{I}$  (B) A was  $\text{C}_6\text{H}_5\text{CH}_2\text{I}$   
 (C) B was  $\text{C}_6\text{H}_5\text{I}$  (D) Addition of  $\text{HNO}_3$  was unnecessary
4. The compound formed on heating chlorobenzene with chloral in the presence of concentrated sulphuric acid is [AIEEE 2003]
- (A) Gammaxe (B) DDT  
 (C) Freon (D) Hexa chloro ethane

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

[AIEEE 2003]

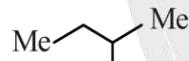
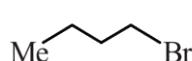


6. Which of the following on heating with aqueous KOH, produces acetaldehyde? [AIEEE 2003]

(A)  $\text{CH}_2\text{ClCH}_2\text{Cl}$       (B)  $\text{CH}_3\text{CHCl}_2$       (C)  $\text{CH}_3\text{COCl}$       (D)  $\text{CH}_3\text{CH}_2\text{Cl}$

7. Consider the following bromides:

[AIEEE 2010]



(A)

(B)

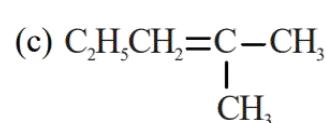
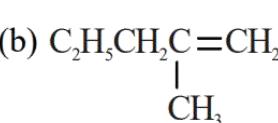
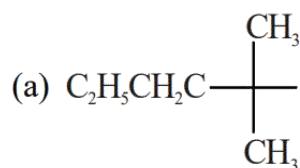
(C)

The correct order of  $S_N1$  reactivity is

(A) A > B > C      (B) B > C > A      (C) B > A > C      (D) C > B > A

8. 2-chloro-2-methylpentane on reaction with sodium methoxide in methanol yields:

[JEE MAIN 2016]



(A) (a) and (b)

(B) All of these

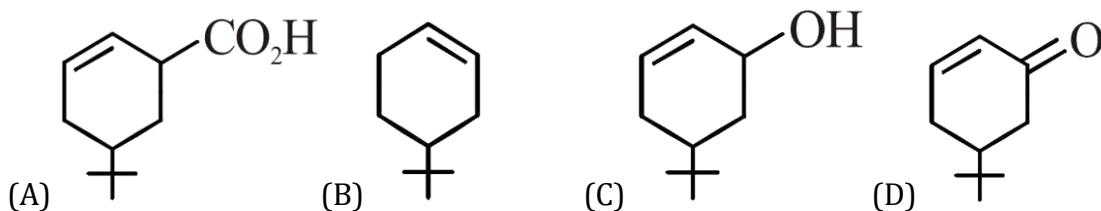
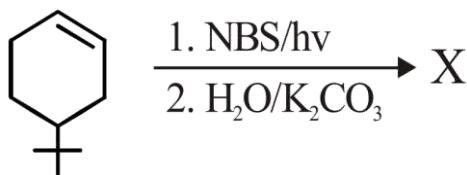
(C) (a) and (c)

(D) (c) only



9. The product of the reaction given below is:

[JEE MAIN 2016]



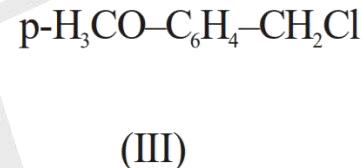
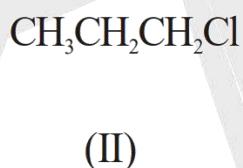
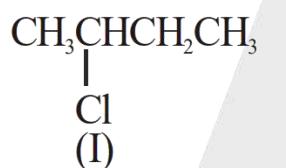
10. The reaction of propene with HOCl(Cl<sub>2</sub> + H<sub>2</sub>O) proceeds through the intermediate:

[JEE MAIN 2016]

- (A) CH<sub>3</sub> – CHCl – CH<sub>2</sub><sup>+</sup> (B) CH<sub>3</sub> – CH<sup>+</sup> – CH<sub>2</sub> – OH  
 (C) CH<sub>3</sub> – CH<sup>+</sup> – CH<sub>2</sub> – Cl (D) CH<sub>3</sub> – CH(OH) – CH<sub>2</sub><sup>+</sup>

11. The increasing order of the reactivity of the following halides for the S<sub>N</sub>1 reaction is:

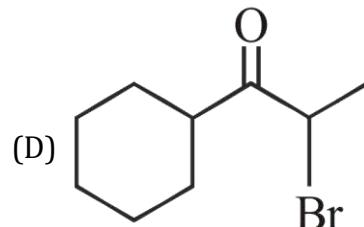
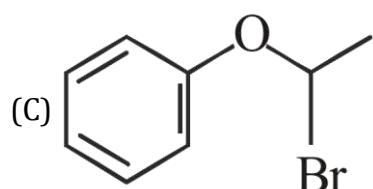
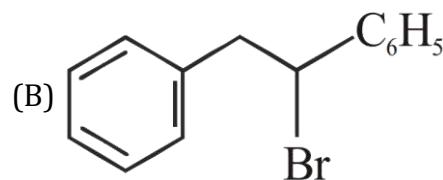
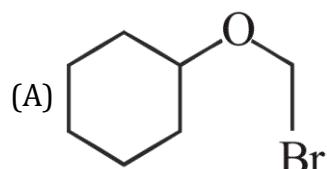
[JEE MAIN 2017]



- (A) (III) < (II) < (I) (B) (II) < (I) < (III)  
 (C) (I) < (III) < (II) (D) (II) < (III) < (I)

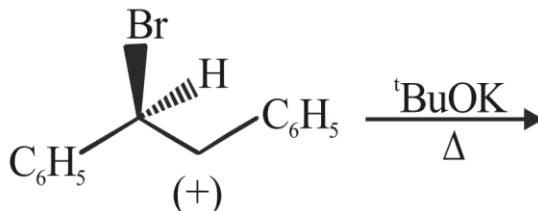
12. Which of the following, upon treatment with tert-BuONa followed by addition of bromine water, fails to decolorize the colour of bromine?

[JEE MAIN 2017]



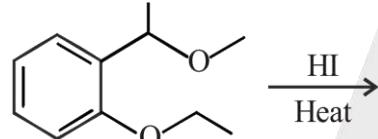
13. 3-Methyl-pent-2-ene on reaction with HBr in presence of peroxide forms an addition product. The number of possible stereoisomers for the product is :- [JEE MAIN 2017]  
(A) Six                    (B) Zero                    (C) Two                    (D) Four

14. The major product obtained in the following reaction is :- [JEE MAIN 2017]



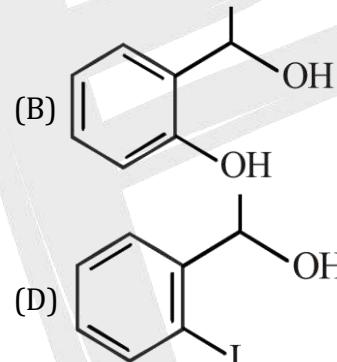
- (A)  $(\pm)\text{C}_6\text{H}_5\text{CH(O}^t\text{Bu})\text{CH}_2\text{C}_6\text{H}_5$       (B)  $\text{C}_6\text{H}_5\text{CH} = \text{CHC}_6\text{H}_5$   
 (C)  $(+)\text{C}_6\text{H}_5\text{CH(O}^t\text{Bu})\text{CH}_2\text{C}_6\text{H}_5$       (D)  $(-)\text{C}_6\text{H}_5\text{CH(O}^t\text{Bu})\text{CH}_2\text{C}_6\text{H}_5$

15. The major product formed in the following reaction is [JEE MAIN 2018]

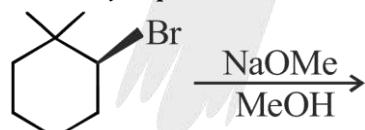


- (A) 

(C) 

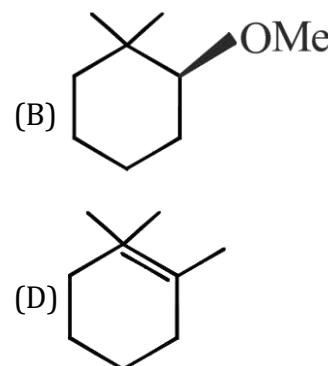


16. The major product of the following reaction is: [JEE MAINS 2018]



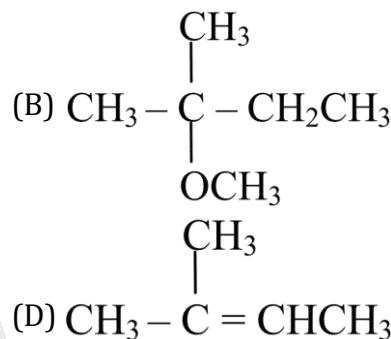
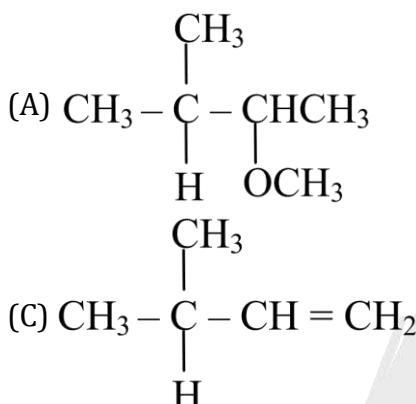
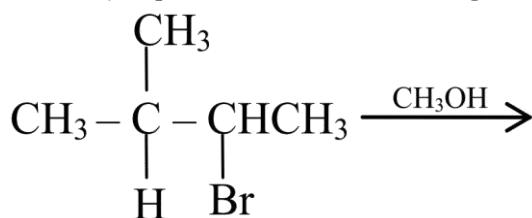
- (A) 

(C) 



17. The major product of the following reaction is:

[JEE MAIN-2019]



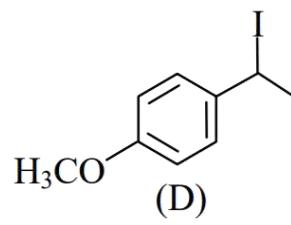
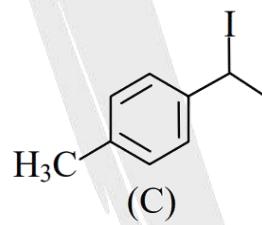
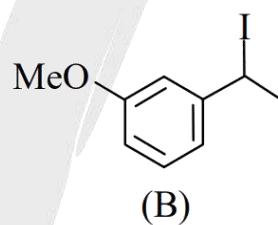
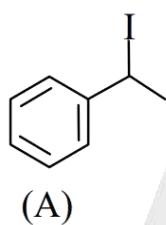
18. The increasing order of nucleophilicity of the following nucleophiles is :

[JEE MAIN-2019]

- (a)  $\text{CH}_3\text{CO}_2^-$       (b)  $\text{H}_2\text{O}$       (c)  $\text{CH}_3\text{SO}_3^-$       (d)  $\text{OH}^-$   
 (A) (b) < (c) < (d) < (a)  
 (C) (a) < (d) < (c) < (b)  
 (B) (b) < (c) < (a) < (d)  
 (D) (d) < (a) < (c) < (b)

19. Increasing rate of  $S_N1$  reaction in the following compounds is:

[JEE MAIN-2019]

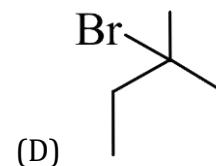
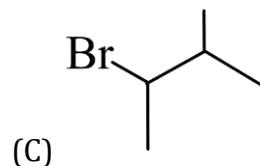
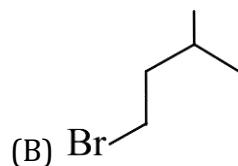
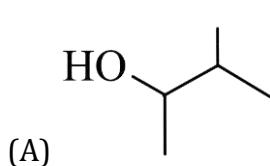
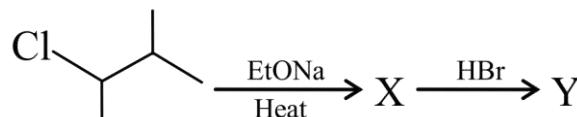


- (A) (B) < (A) < (C) < (D)  
 (C) (B) < (A) < (D) < (C)

- (B) (A) < (B) < (C) < (D)  
 (D) (A) < (B) < (D) < (C)

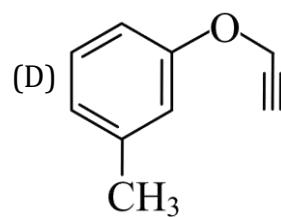
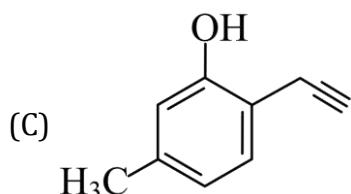
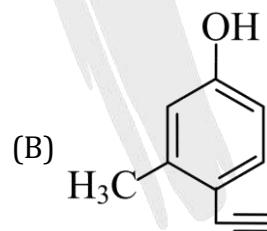
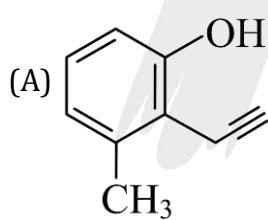
20. The major product 'Y' in the following reaction is:

[JEE MAIN-2019]



21. The major product of the following addition reaction is: [JEE MAIN-2019]
- $$\text{H}_3\text{C} - \text{CH} = \text{CH}_2 \xrightarrow{\text{Cl}_2/\text{H}_2\text{O}}$$
- (A) (B)
- (C) (D)
22. An 'Assertion' and a 'Reason' are given below. Choose the correct answer from the following options: [JEE MAIN-2019]
- Assertion (A): Vinyl halides do not undergo nucleophilic substitution easily.
- Reason (R): Even though the intermediate carbocation is stabilized by loosely held  $\pi$ -electrons, the cleavage is difficult because of strong bonding.
- (A) (A) is a correct statement but (R) is a wrong statement.  
 (B) Both (A) and (R) are correct statements but (R) is not the correct explanation of (A).  
 (C) Both (A) and (R) are wrong statements  
 (D) Both (A) and (R) are correct statements and (R) is the correct explanation of (A).

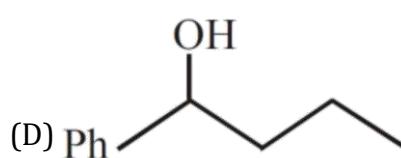
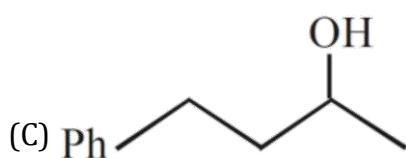
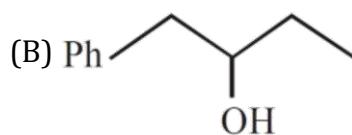
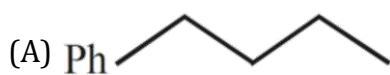
23. Which one of the following is likely to give a precipitate with  $\text{AgNO}_3$  solution? [JEE MAIN-2019]
- (A)  $(\text{CH}_3)_3\text{CCl}$  (B)  $\text{CCl}_4$  (C)  $\text{CHCl}_3$  (D)  $\text{CH}_2 = \text{CH} - \text{Cl}$
24. What will be the major product when m-cresol is reacted with propargyl bromide ( $\text{HC} \equiv \text{C} - \text{CH}_2\text{Br}$ ) in presence of  $\text{K}_2\text{CO}_3$  in acetone? [JEE MAIN-2019]



## (Organic Chemistry)

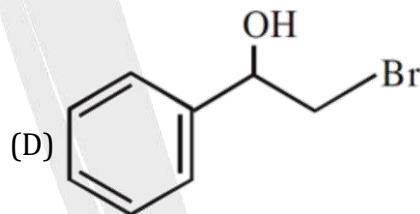
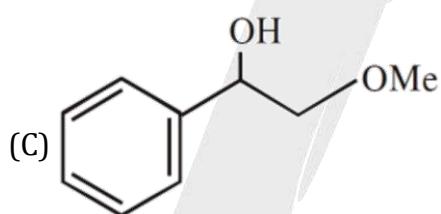
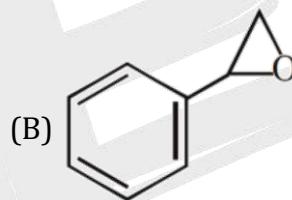
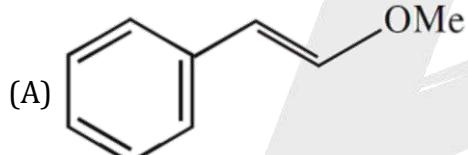
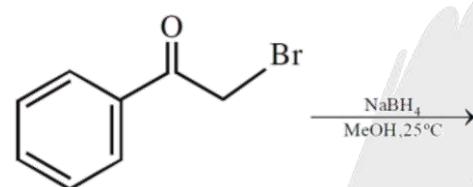
**SUBSTITUTION ELIMINATION**

25. Heating of 2-chloro-1-phenylbutane with EtOK/EtOH gives X as the major product. Reaction of X with  $\text{Hg}(\text{OAc})_2/\text{H}_2\text{O}$  followed by  $\text{NaBH}_4$  gives Y as the major product. Y is:[JEE MAIN-2019]



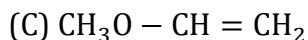
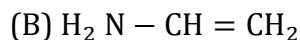
26. The major product of the following reaction is:

[JEE MAIN-2019]



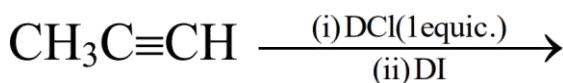
27. Which one of the following alkenes when treated with  $\text{HCl}$  yields majorly an anti Markovnikov product?

[JEE MAIN-2019]



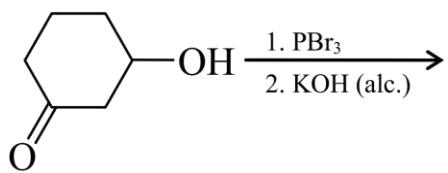
28. The major product of the following reaction is:

[JEE MAIN-2019]



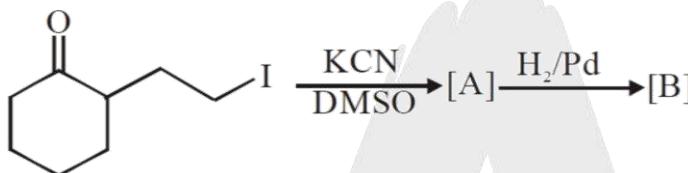
29. The major product of the following reaction is:

[JEE MAIN-2019]



- (A) (B) (C) (D)

30. The major products A and B for the following reactions are, respectively: [JEE MAIN-2019]



- (A) ;

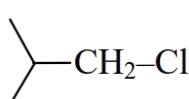
- (B) ;

- (C) ;

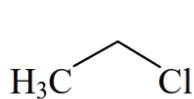
- (D) ;

31. Increasing order of reactivity of the following compounds for S<sub>N</sub>1 substitution is:

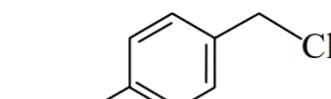
[JEE MAIN-2019]



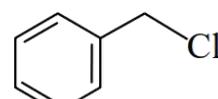
(A)



(B)



(C)

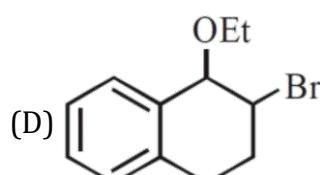
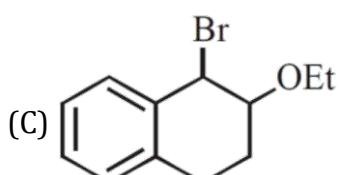
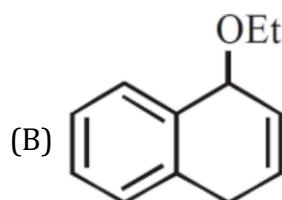
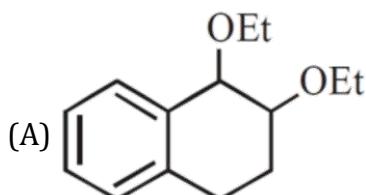
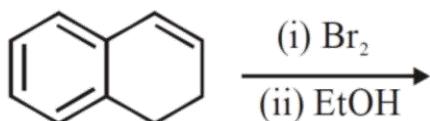


(D)

- (A) B < A < D < C    (B) B < C < A < D    (C) B < C < D < A    (D) A < B < D < C

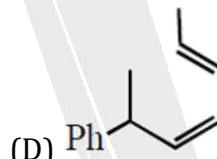
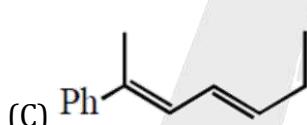
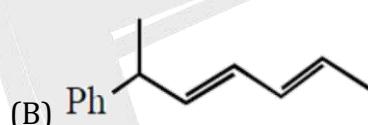
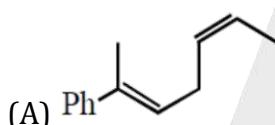
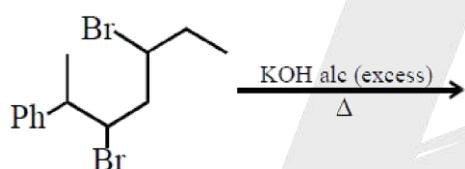
32. The major product the following reaction is:

[JEE MAIN-2019]



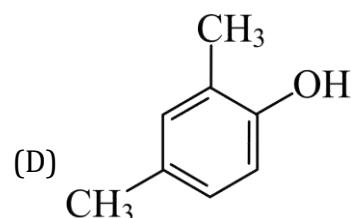
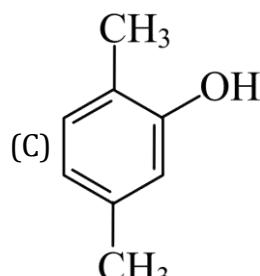
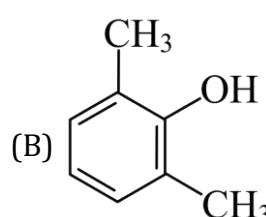
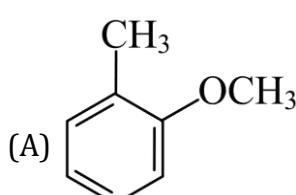
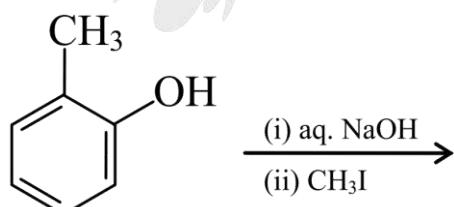
33. The major product the following reaction is:

[JEE MAIN-2019]



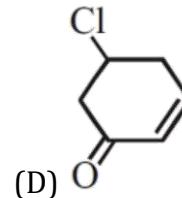
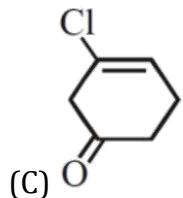
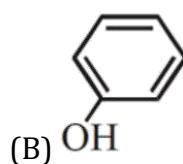
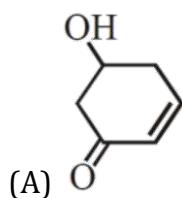
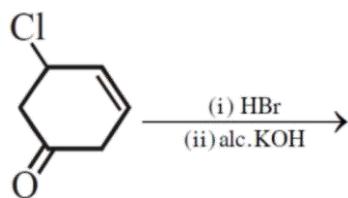
34. The major product the following reaction is:

[JEE MAIN-2019]

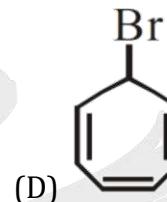
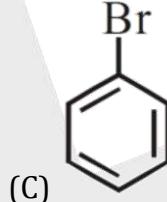
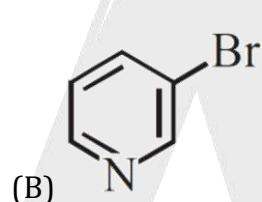
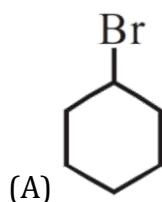


35. The major product the following reaction is:

[JEE MAIN-2019]

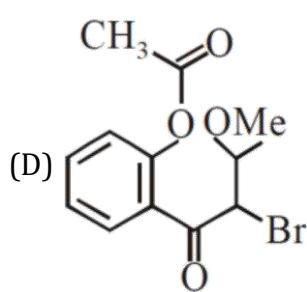
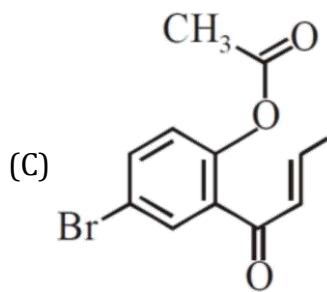
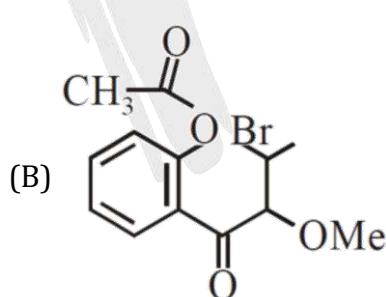
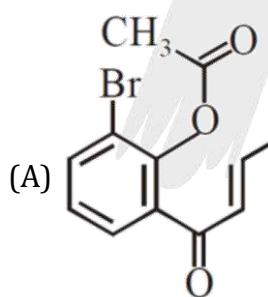
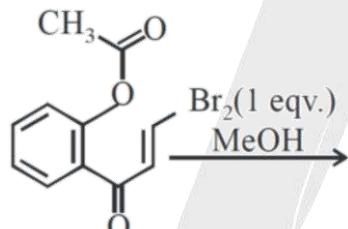


36. Which of the following compounds will produce a precipitate with  $\text{AgNO}_3$ ? [JEE MAIN-2019]



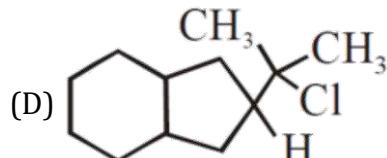
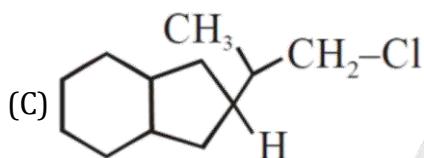
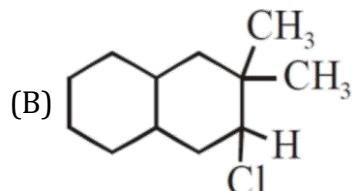
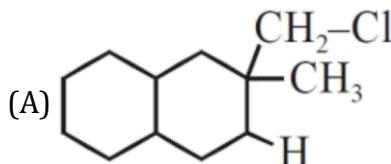
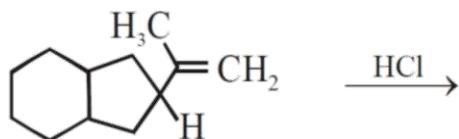
37. The major product obtained in the following conversion is:-

[JEE MAIN-2019]



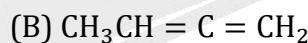
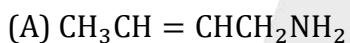
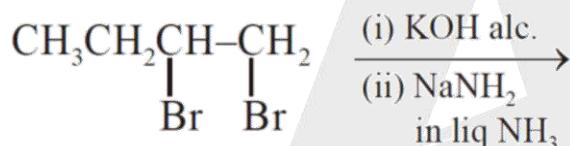
38. The major product the following reaction is:

[JEE MAIN-2019]



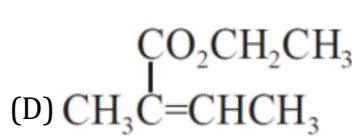
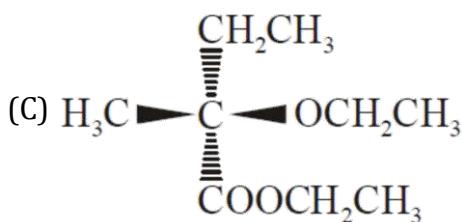
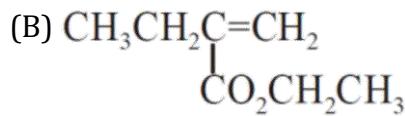
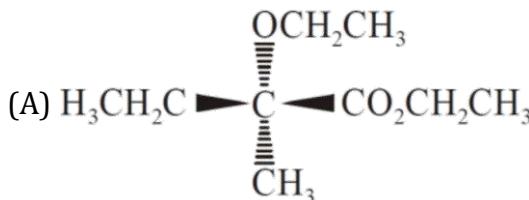
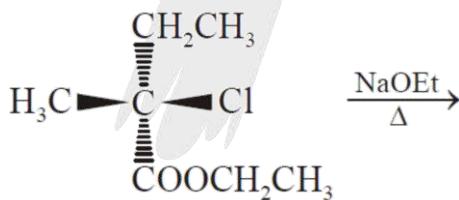
39. The major product the following reaction is:

[JEE MAIN-2019]



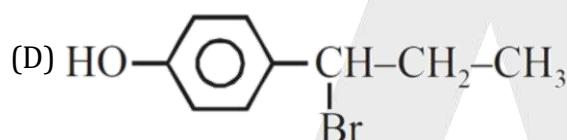
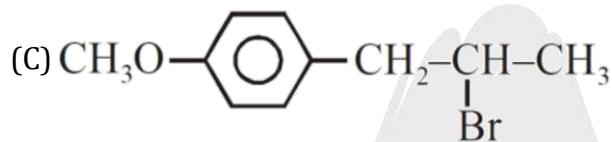
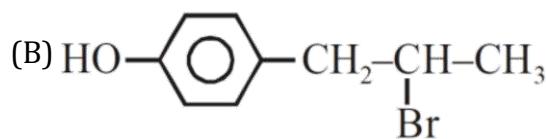
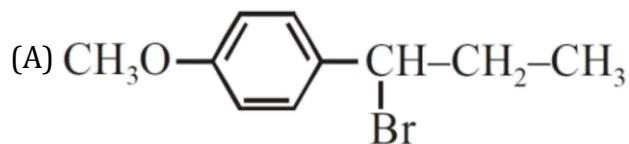
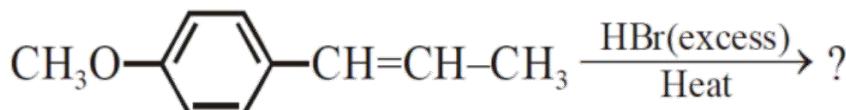
40. The major product the following reaction is:

[JEE MAIN-2019]



41. The major product the following conversion is:

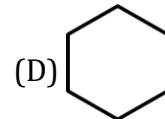
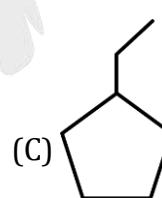
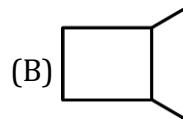
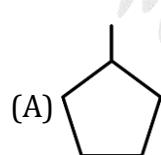
[JEE MAIN-2019]



42. Compound X  $\xrightarrow[\substack{(1) \text{ Br}_2, \text{ hv} \\ (2) \text{ alc. KOH} \\ (3) \text{ O}_3 \\ (4) \text{ Me}_2\text{S} \\ (5) \text{ dil. NaOH, } \Delta}]{} \text{CH} = \text{O}$

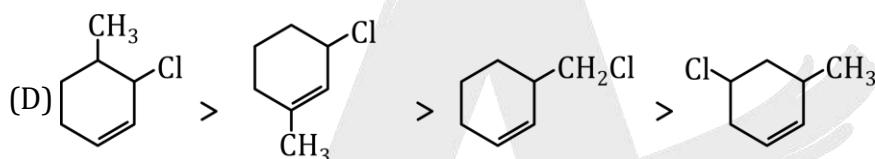
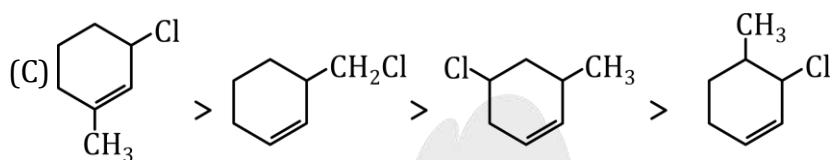
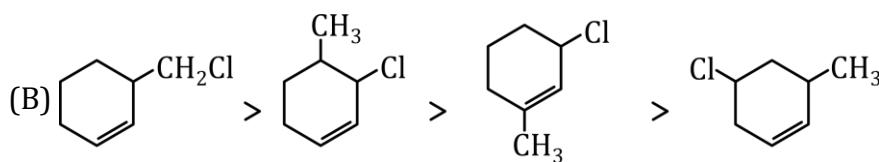
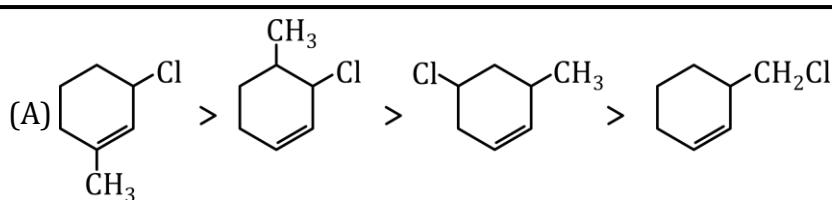
[JEE MAIN-2020]

Compound X will be:

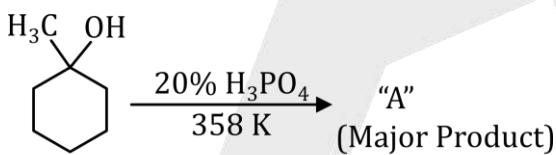


43. The correct order of reactivity of the given chlorides with acetate in acetic acid is:

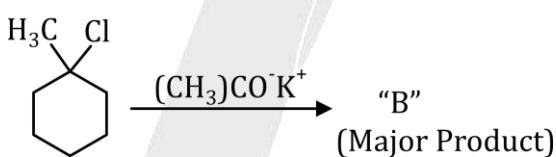
[JEE MAIN-2021]



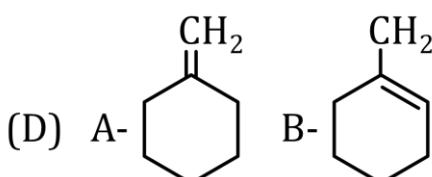
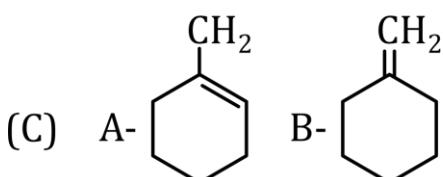
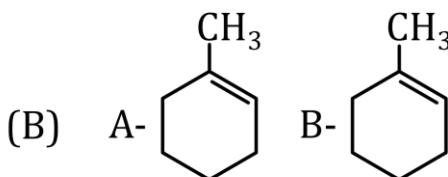
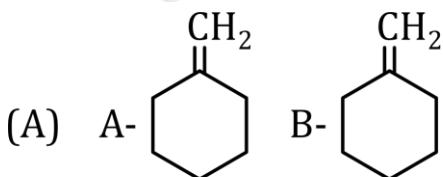
44.



[JEE MAIN-2021]

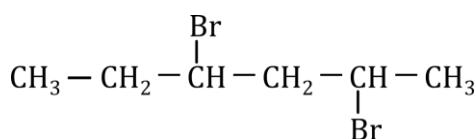
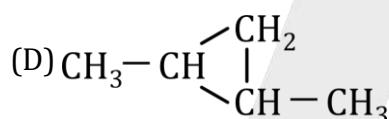
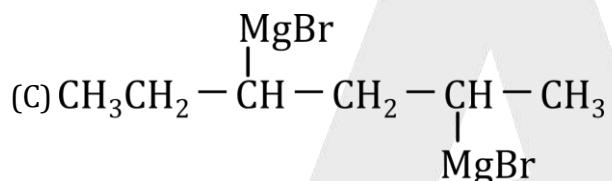
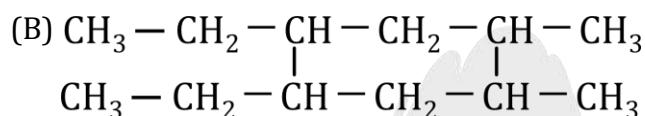
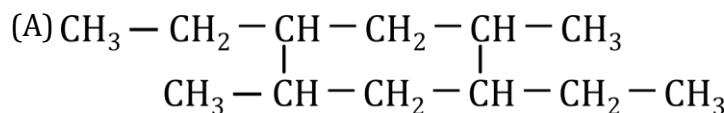


The product "A" and "B" formed in above reactions are



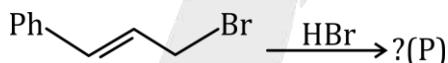
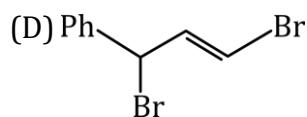
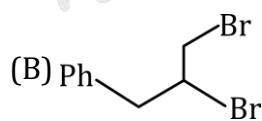
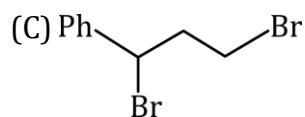
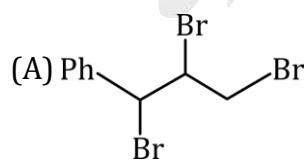
45. The product formed in the first step of the reaction of

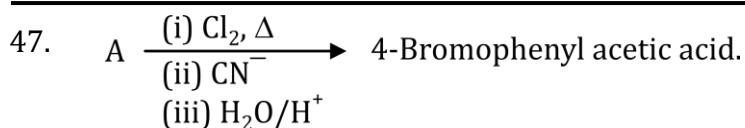
[JEE MAIN-2021]

with excess Mg/Et<sub>2</sub>O (Et = C<sub>2</sub>H<sub>5</sub>) is:

46. The major product (P) in the reaction

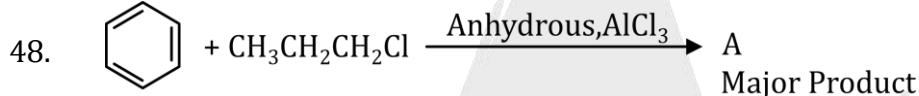
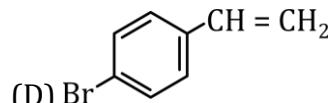
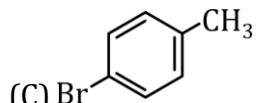
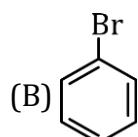
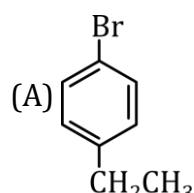
[JEE MAIN-2022]

[Ph is  $-\text{C}_6\text{H}_5$ ] is



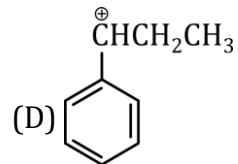
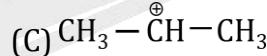
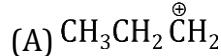
[JEE MAIN-2022]

In the above reaction 'A' is

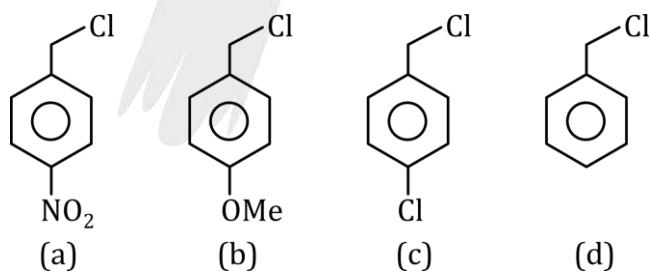


The stable carbocation formed in the above reaction is:

[JEE MAIN-2022]

49. Decreasing order towards S<sub>N</sub>1 reaction for the following compounds is:

[JEE MAIN-2023]



(A) a &gt; c &gt; d &gt; b

(B) a &gt; b &gt; c &gt; d

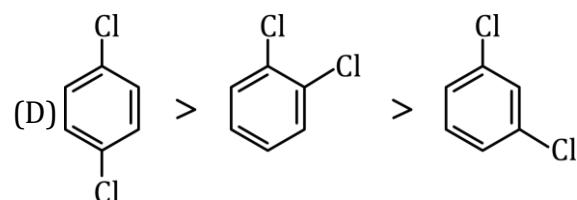
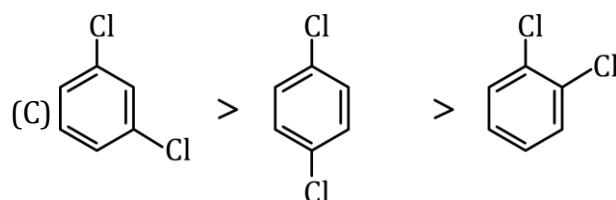
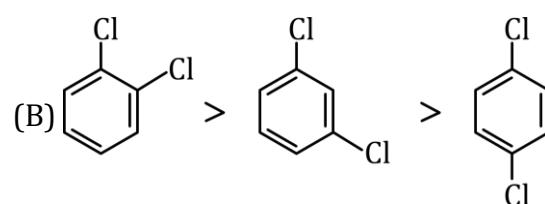
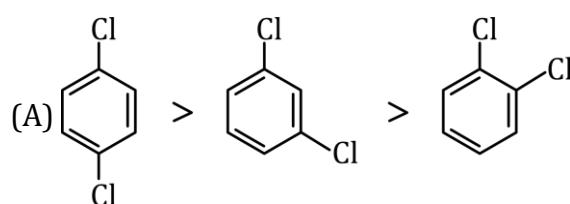
(C) b &gt; d &gt; c &gt; a

(D) d &gt; b &gt; c &gt; a



50. The correct order of melting point of dichlorobenzenes is

[JEE MAIN-2023]



**EXERCISE # IV (JEE ADVANCE-OBJECTIVE)**

1. Chlorination of toluene in the presence of light and heat followed by treatment with aqueous NaOH gives: [IIT 1990]
 

(A) o-cresol      (B) p-cresol      (C) 2,4-dihydroxytoluene    (D) Benzoic acid
  
2. Aryl halides are less reactive towards nucleophilic substitution reaction as compared to alkyl halides due to [IIT 1990]
 

(A) The formation of less stable carbonium ion  
 (B) Resonance stabilization  
 (C) The inductive effect  
 (D)  $sp^2$  hybridised carbon attached to the halogen
  
3. 1-Chlorobutane on reaction with alcoholic potash gives: [IIT 1990]
 

(A) 1-butene      (B) 1-butanol      (C) 2-butene      (D) 2-butanol
  
4. The products of reaction of alcoholic  $AgNO_2$  with ethyl bromide are [IIT 1991]
 

(A) Ethane      (B) Ethyl nitrite      (C) Nitroethane      (D) Ethyl alcohol
  
5. Arrange the following compounds in order of increasing dipole moment [IIT 1996]
 

Toluene      m-dichlorobenzene      o-dichlorobenzene      p-dichlorobenzene

I	II	III	IV
---	----	-----	----

(A) I < IV < II < III    (B) IV < I < II < III    (C) IV < I < III < II    (D) IV < II < I < III
  
6.  $(CH_3)_3CMgCl$  reaction with  $D_2O$  produces: [IIT 1997]
 

(A)  $(CH_3)_3CD$       (B)  $(CH_3)_3OD$       (C)  $(CD_3)_3CD$       (D)  $(CH_3)_3OD$
  
7. Benzyl chloride ( $C_6H_5CH_2Cl$ ) can be prepared from toluene by chlorination with: [IIT 1998]
 

(A)  $SO_2Cl_2$       (B)  $SOCl_2$       (C)  $Cl_2, (hv)$       (D)  $NaOCl$
  
8. The order of reactivity of the following alkyl halides for a  $S_N2$  reaction is: [IIT 2000]
 

(A) R-F > R-C > R-Br > R-I      (B) R - F > R - Br > R - Cl > R - I  
 (C) R-Cl > R - Br > RF > RI      (D) R-I > RBr > R-Cl > R-F

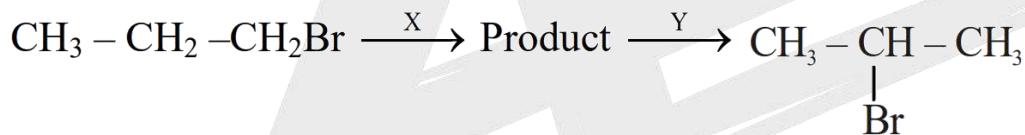


9. Which of the following has the highest nucleophilicity? [IIT 2000]  
 (A)  $\text{F}^-$       (B)  $\text{OH}^-$       (C)  $\text{CH}_3^-$       (D)  $\text{NH}_2^-$

10. An  $\text{S}_{\text{N}}2$  reaction at an asymmetric carbon of a compound always gives. [IIT 2001]  
 (A) an enantiomer of the substance  
 (B) a product with opposite optical rotation  
 (C) a mixture of diastereomers  
 (D) a single stereoisomer

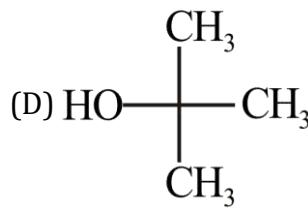
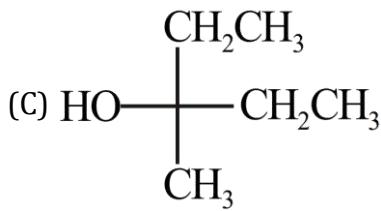
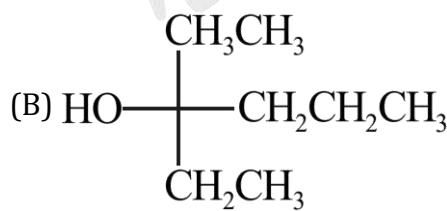
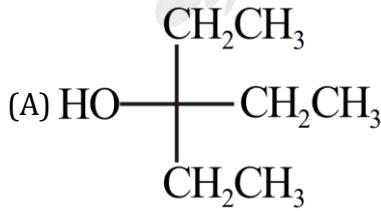
11. The compound that will react most readily with  $\text{NaOH}$  to form methanol is [IIT 2001]  
 (A)  $(\text{CH}_3)_4 \text{N}^+ \text{I}^-$       (B)  $\text{CH}_3\text{OCH}_3$       (C)  $(\text{CH}_3)_3 \text{S}^+ \text{I}^-$       (D)  $(\text{CH}_3)_3\text{Cl}$

12. Identify the set of reagents / reaction conditions 'X' and 'Y' in the following set of transformation: [IIT 2002]



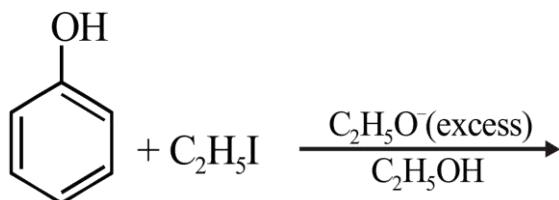
- (A) X = dilute aqueous  $\text{NaOH}$ ,  $20^\circ\text{C}$ ; Y =  $\text{HBr}$  / acetic acid,  $20^\circ\text{C}$   
 (B) X = concentrated alcoholic  $\text{NaOH}$ ,  $80^\circ\text{C}$ ; Y =  $\text{HBr}$  / acetic acid  $20^\circ\text{C}$   
 (C) X = dilute aqueous  $\text{NaOH}$ ,  $20^\circ\text{C}$ ; Y =  $\text{Br}_2/\text{CHCl}_3$ ,  $0^\circ\text{C}$   
 (D) X = concentrated alcoholic  $\text{NaOH}$ ,  $80^\circ\text{C}$ ; Y =  $\text{Br}_2/\text{CHCl}_3$ ,  $0^\circ\text{C}$

13.  $\text{CH}_3\text{MgBr} + \text{Ethyl ester} \rightarrow$  which can be formed as product. [IIT 2003]  
 excess



14. The product of following reaction is

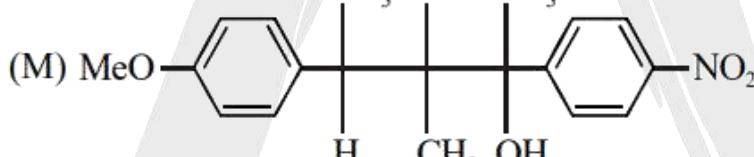
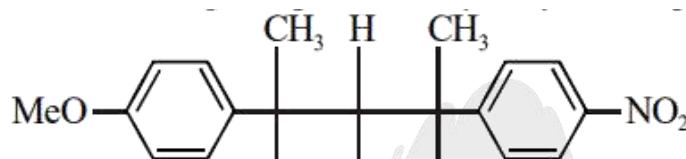
[IIT 2003]



- (A)  $\text{C}_6\text{H}_5\text{OC}_2\text{H}_5$       (B)  $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$       (C)  $\text{C}_6\text{H}_5\text{OC}_6\text{H}_5$       (D)  $\text{C}_6\text{H}_5\text{I}$

15. The following compound on hydrolysis in aqueous acetone will give:

[IIT 2005]



It mainly gives

- (A) K and L      (B) Only K      (C) L and M      (D) Only M

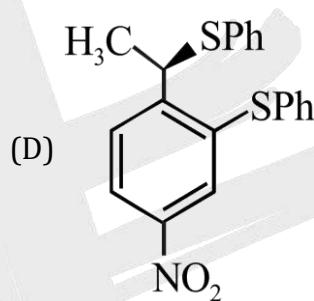
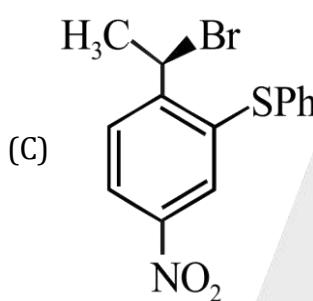
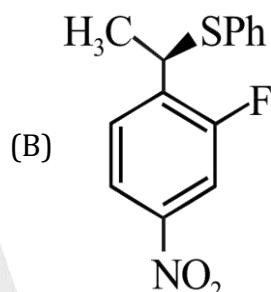
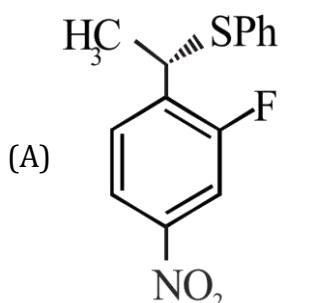
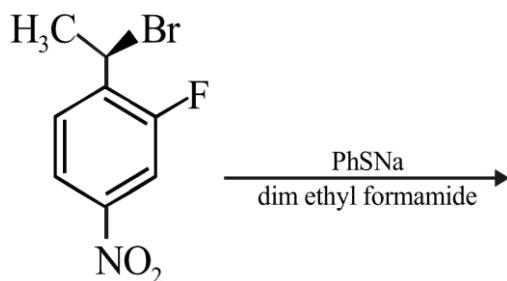
16. Match the following:

[IIT 2006]

	Column-I		Column-II
(A)	$\text{CH}_3 - \text{CHBr} - \text{CD}_3$ on treatment with alc. KOH gives $\text{CH}_2 = \text{CH} - \text{CD}_3$ as a major product.	(A)	E1 reaction
(B)	$\text{Ph} - \text{CHBr} - \text{CH}_3$ reacts faster than $\text{Ph} - \text{CHBr} - \text{CD}_3$ .	(B)	E2 reaction
(C)	$\text{Ph} - \text{CD}_2 - \text{CH}_2\text{Br}$ on treatment with $\text{C}_2\text{H}_5\text{OD}/\text{C}_2\text{H}_5\text{O}^-$ gives $\text{Ph} - \text{CD} = \text{CH}_2$ as the major product.	(C)	E1cb reaction
(D)	$\text{PhCH}_2\text{CH}_2\text{Br}$ and $\text{PhCD}_2\text{CH}_2\text{Br}$ react with same rate.	(D)	First order reaction

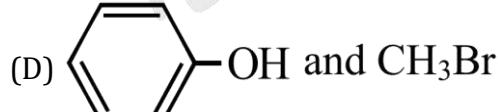
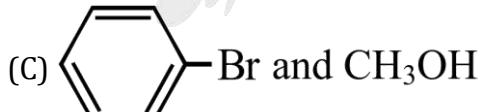
17. The major product of the following reaction is

[IIT 2008]



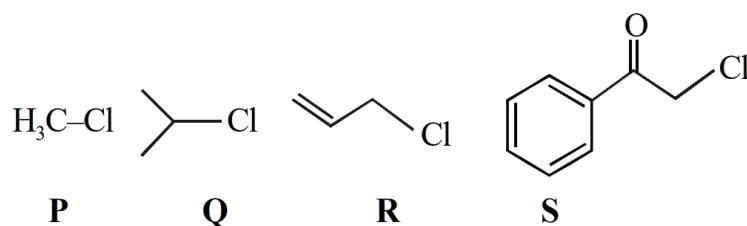
18. In the reaction the products are

[IIT 2010]



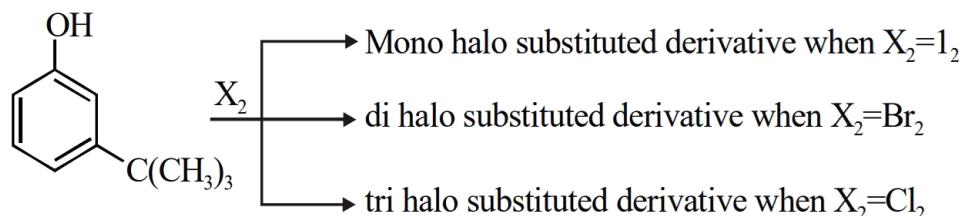
19. KI in acetone, undergoes  $\text{S}_{\text{N}}2$  reaction with each of P, Q, R and S. The rates of the reaction vary as

[IIT 2013]



- (A)  $\text{P} > \text{Q} > \text{R} > \text{S}$     (B)  $\text{S} > \text{P} > \text{R} > \text{Q}$     (C)  $\text{P} > \text{R} > \text{Q} > \text{S}$     (D)  $\text{R} > \text{P} > \text{S} > \text{Q}$

20. The reactivity of compound Z with different halogens under appropriate conditions is given below [IIT 2014]



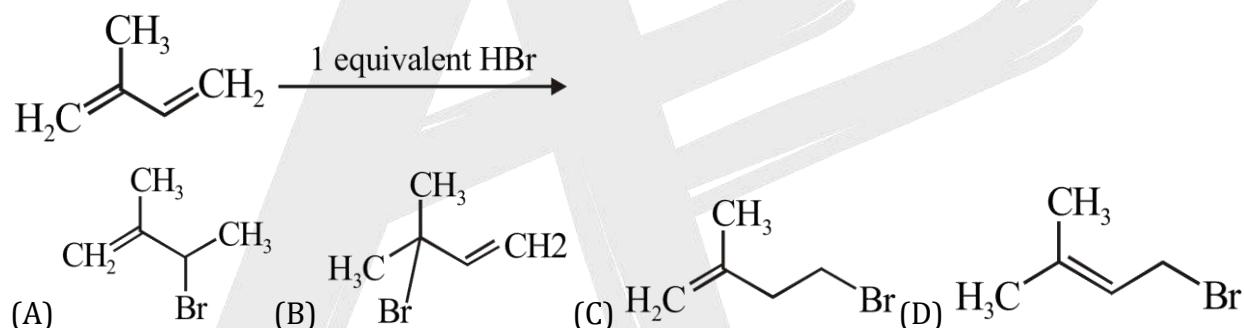
The observed pattern of electrophilic substitution can be explained by

[IIT 2014]

- (A) The steric effect of the halogen
- (B) The steric effect of the tert-butyl group
- (C) The electronic effect of the phenolic group
- (D) The electronic effect of the tert-butyl group

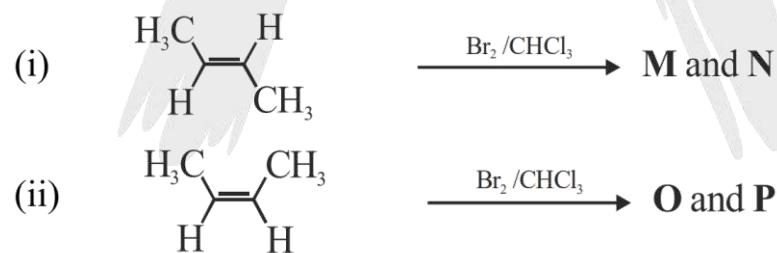
21. In the following reaction, the major product is

[IIT 2015]



22. The correct statement(s) for the following addition reactions is (are)

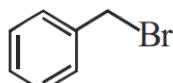
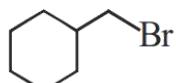
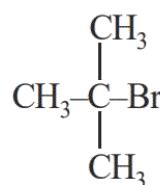
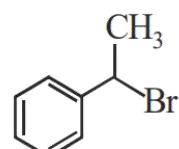
[IIT 2017]



- (A) (M and O) and (N and P) are two pairs of diastereomers
- (B) Bromination proceeds through trans-addition in both the reactions
- (C) O and P are identical molecules
- (D) (M and O) and (N and P) are two pairs of enantiomers

23. For the following compounds, the correct statement(s) with respect to nucleophilic substitution reactions is (are)

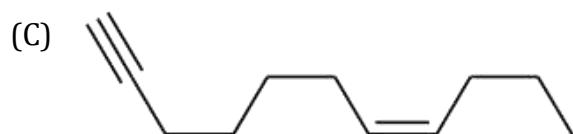
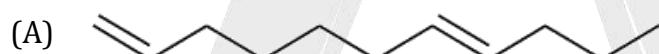
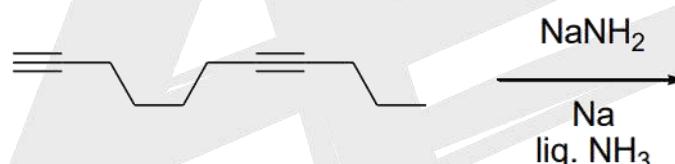
[IIT 2017]

**I****II****III****IV**

- (A) Compound IV undergoes inversion of configuration
- (B) The order of reactivity for I, III and IV is: IV > I > III
- (C) I and III follow  $S_N1$  mechanism
- (D) I and II follow  $S_N2$  mechanism

24. The major product formed in the following reaction of

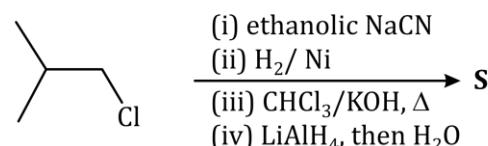
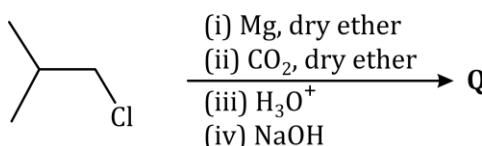
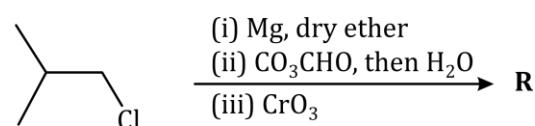
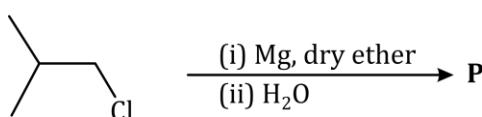
[IIT 2021]





25. In the following reactions, P, Q, R, and S are the major products.

[IIT 2023]



The correct statement about P, Q, R, and S is:

- (A) P is a primary alcohol with four carbons.
- (B) Q undergoes Kolbe's electrolysis to give an eight-carbon product.
- (C) R has six carbons and it undergoes Cannizzaro reaction.
- (D) S is a primary amine with six carbons.



## EXERCISE # V (JEE ADVANCE-SUBJECTIVE)

1. Fill in the blanks:

(a) Butane nitrile can be prepared by heating \_\_\_\_\_ with alcoholic KCN. [IIT 1992]

(b) Amongst three isomers of nitrophenol, the one that is least soluble in water is \_\_\_\_\_

2. Arrange the following in order of their

(i) Increasing basicity

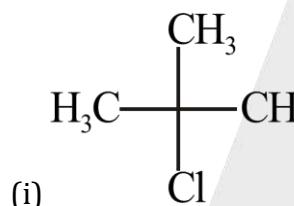


(ii) Increasing reactivity in nucleophilic substitution reactions



[IIT 1992]

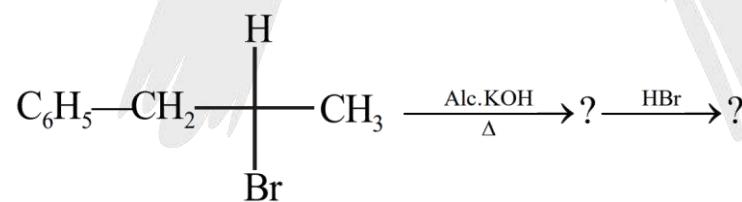
3. Write the structures of the major organic product expected from each of the following reactions: [IIT 1992]



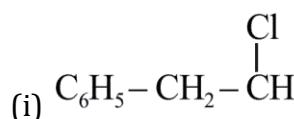
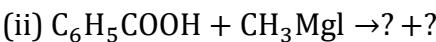
Alc. KOH



4. Identify the major product in the following reaction. [IIT 1993]



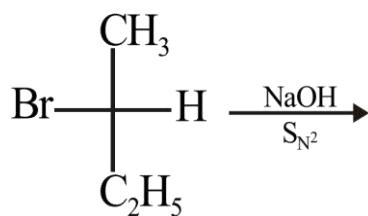
5. Identify the major product in the following reactions: [IIT 1993]

 $\xrightarrow{\text{alcoholic KOH}\Delta}$  ? $\xrightarrow{\text{HBr}}$  ?

6. Aryl halides are less reactive than alkyl halides towards nucleophilic reagents. Give reason. [IIT 1994]

7. Draw the stereochemical structure of product in the following reaction.

[IIT 1994]



8. Optically active 2 -iodobutane on treatment with NaI in acetone gives a product which does not show optical activity. Explain briefly.

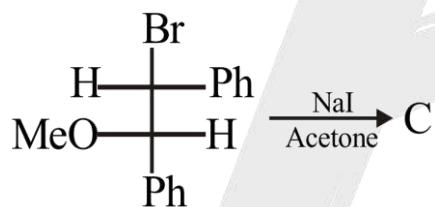
[IIT 1995]

9. An alkyl halide X of formula  $\text{C}_6\text{H}_{13}\text{Cl}$  on treatment with potassium tertiary butoxide gives two isomeric alkenes Y and Z( $\text{C}_6\text{H}_{12}$ ). Both alkenes on hydrogenation give 2,3-dimethylbutane. Predict the structures of X, Y and Z.

[IIT 1996]

10. Predict the structure of the intermediates/products in the following reaction sequence-

[IIT 1996]



11. Which of the following is the correct method for synthesising methyl-t-butyl ether and why?  
 $(\text{CH}_3)_3\text{CBr} + \text{NaOMe} \rightarrow$  or  $\text{CH}_3\text{Br} + \text{NaO} - \text{t-Bu} \rightarrow$

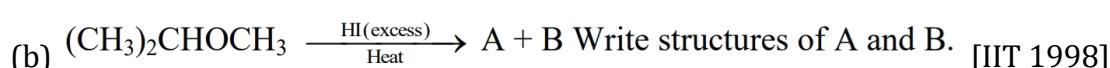
[IIT 1997]

12. Write the structures of the products:

[IIT 1998]

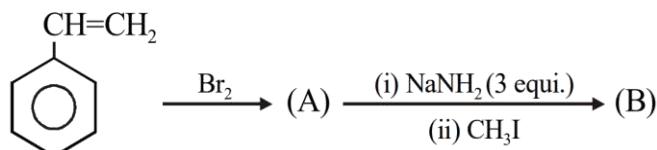


13. (a)  $\text{C}_6\text{H}_5\text{CH}_2\text{CHCl} \xrightarrow[\text{Heat}]{\text{alc. KOH}} \text{A} + \text{B}$  Write structures of (A) and (B).

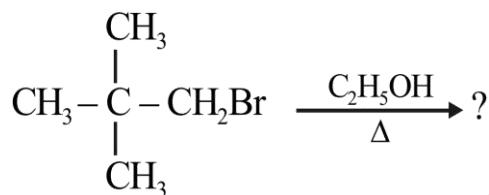


[IIT 1998]

14. Complete the following reaction with appropriate structures of products/reagents. [IIT 1998]



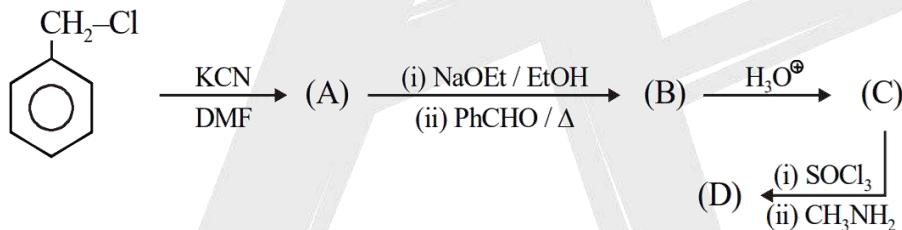
15. What would be major product? [IIT 2000]



16. Identify X, Y and Z in the following synthetic scheme and write their structures [IIT 2002]

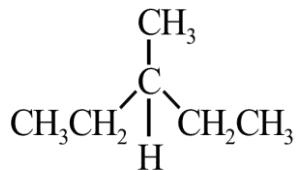


17. Give major products A, B, C and D in following reaction sequence. [IIT 2004]



18. The total number of alkenes possible by dehydrobromination of 3-bromo-3-cyclopentylhexane using alcoholic KOH is [IIT 2011]

19. The maximum number of isomers (including stereoisomers) that are possible on monochlorination of the following compounds, is [IIT 2011]





## ANSWER KEY

## EXERCISE # I (MAINS ORIENTED)

- |     |   |     |   |     |   |     |   |     |      |     |   |     |   |
|-----|---|-----|---|-----|---|-----|---|-----|------|-----|---|-----|---|
| 1.  | A | 2.  | B | 3.  | B | 4.  | C | 5.  | A    | 6.  | C | 7.  | A |
| 8.  | C | 9.  | B | 10. | C | 11. | B | 12. | C    | 13. | A | 14. | C |
| 15. | A | 16. | D | 17. | C | 18. | B | 19. | B    | 20. | C | 21. | C |
| 22. | D | 23. | A | 24. | B | 25. | A | 26. | ABCD | 27. | D | 28. | B |
| 29. | C | 30. | B | 31. | C | 32. | C | 33. | A    | 34. | B | 35. | A |
| 36. | A | 37. | D | 38. | C | 39. | C | 40. | C    | 41. | B | 42. | B |

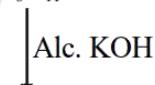
## EXERCISE # II-A

- |     |      |     |     |     |      |     |      |     |      |     |    |
|-----|------|-----|-----|-----|------|-----|------|-----|------|-----|----|
| 1.  | ABCD | 2.  | BD  | 3.  | ABCD | 4.  | AC   | 5.  | AD   | 6.  | B  |
| 7.  | AC   | 8.  | D   | 9.  | AC   | 10. | ABD  | 11. | ABCD | 12. | AD |
| 13. | ABCD | 14. | ABC | 15. | CD   | 16. | ABCD | 17. | C    |     |    |

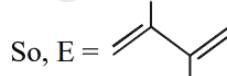
## EXERCISE # II-B

- |    |  |    |   |
|----|--|----|---|
| 1. | C  | 2. | C |
| 3. | (A) → P, R; (B) → P, Q; (C) → P; (D) → P, Q                |    |   |
| 4. | (A) → Q; (B) → P; (C) → S; (D) → R                         |    |   |
| 5. | (A) → S; (B) → Q; (C) → R; (D) → P                         |    |   |
| 6. | (A) → S; (B) → R, S; (C) → R; (D) → P, Q                   |    |   |
| 7. | (A) → P, Q, R, S; (B) → P, R; (C) → T; (D) → Q, S;         |    |   |
| 8. | (A) → Q, S; (B) → P, R, S; (C) → P, R, S; (D) → P, Q, R, S |    |   |
| 9. |  |    |   |

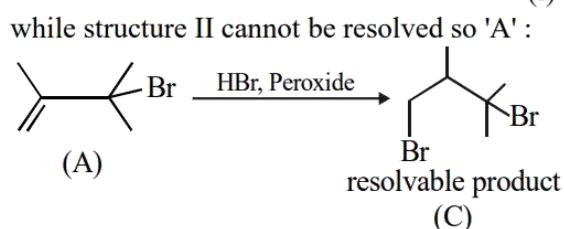
Molecule A,  $C_6H_{11}Br$  has 1 unsaturation



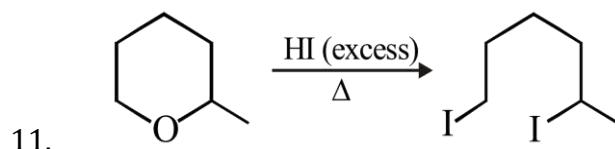
A single possible product , it suggests a symmetrical arrangement



There are only two possibilities of (I) (II) Br structure I can be resolved while structure II cannot be resolved so 'A':

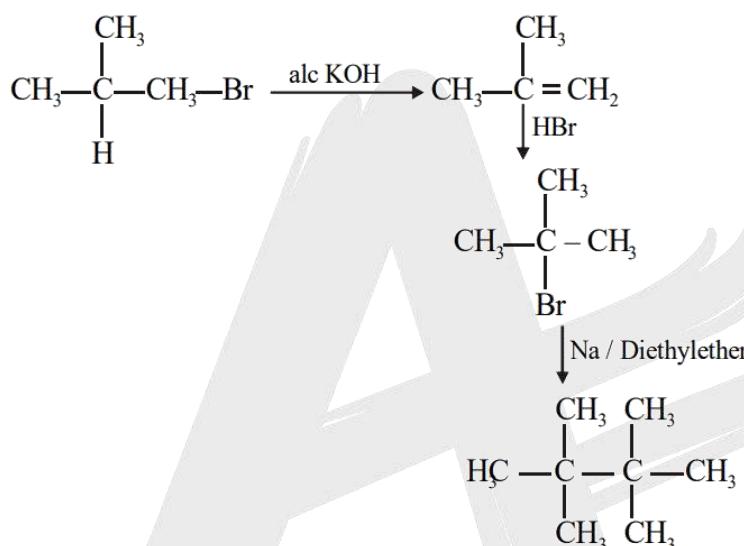


10. The elimination of HI (or DI) in presence of strong base shows E2 elimination. The rate determining step involves breaking up of C – H (or C – D ) bond. The C – D bond being stronger than C – H and thus elimination is faster in case of  $\text{CH}_3 - \text{CH}_2\text{I}$ .



12. Not available.

- 13.



#### EXERCISE # III (JEE MAIN)

- |       |       |       |       |       |       |       |
|-------|-------|-------|-------|-------|-------|-------|
| 1. C  | 2. A  | 3. A  | 4. B  | 5. D  | 6. B  | 7. B  |
| 8. B  | 9. C  | 10. C | 11. B | 12. A | 13. D | 14. B |
| 15. A | 16. C | 17. B | 18. D | 19. A | 20. D | 21. B |
| 22. A | 23. A | 24. D | 25. D | 26. B | 27. A | 28. D |
| 29. B | 30. A | 31. A | 32. D | 33. C | 34. A | 35. B |
| 36. D | 37. D | 38. B | 39. D | 40. D | 41. D | 42. D |
| 43. A | 44. C | 45. C | 46. C | 47. C | 48. C | 49. C |
| 50. D |       |       |       |       |       |       |

#### EXERCISE # IV (JEE-ADVANCE-OBJECTIVE)

- |                     |                                     |       |         |       |        |       |
|---------------------|-------------------------------------|-------|---------|-------|--------|-------|
| 1. D                | 2. BD                               | 3. A  | 4. C    | 5. B  | 6. A   | 7. AC |
| 8. D                | 9. C                                | 10. D | 11. A   | 12. B | 13. D  | 14. B |
| 15. A               | 16. (A)-Q;(B)-Q; (C)-R, S; (D)-P, S |       |         |       |        |       |
| 17. A               | 18. D                               | 19. B | 20. ABC | 21. D | 22. AB |       |
| 23. (ACD) or (ABCD) |                                     | 24. B | 25. B   |       |        |       |