Additional Problems for Self Practice (APSP)

This Section is not meant for classroom discussion. It is being given to promote self-study and self testing amongst the Resonance students.

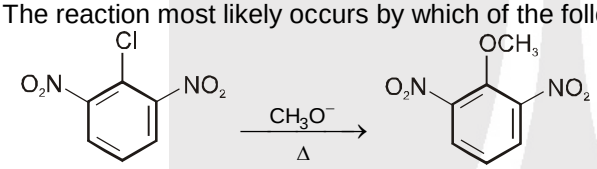
PART - I : PRACTICE TEST-1 (IIT-JEE (MAIN Pattern))

Max. Time : 1 Hr. **Max. Marks : 120**

Important Instructions

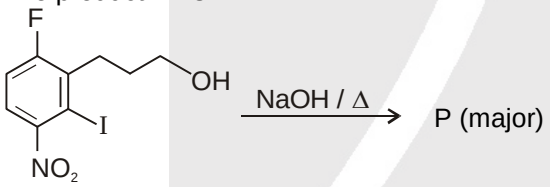
1. The test is of **1 hour** duration.
2. The Test Booklet consists of **30** questions. The maximum marks are **120.**
3. Each question is allotted **4 (four)** marks for correct response.
4. Candidates will be awarded marks as stated above in Instructions No. 3 for correct response of each question. **¼ (one fourth)** marks will be deducted for indicating incorrect response of each question. No deduction from the total score will be made if no response is indicated for an item in the answer sheet.
5. There is only one correct response for each question. Filling up more than one response in any question will be treated as wrong response and marks for wrong response will be deducted accordingly as per instructions 4 above.

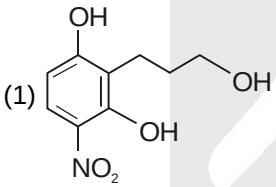
1. The reaction most likely occurs by which of the following mechanism ?

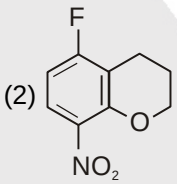


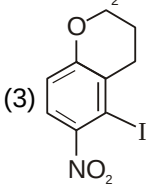
(1) Addition-elimination (2) addition only
(3) Elimination-addition (4) Neither of these

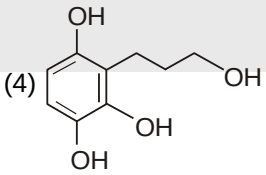
2. The product 'P' is

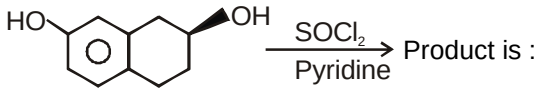


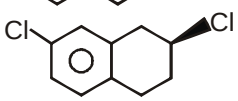
(1) 

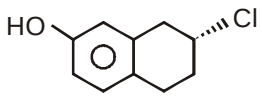
(2) 

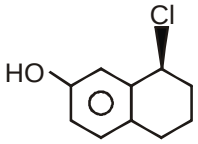
(3) 

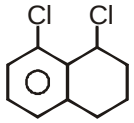
(4) 

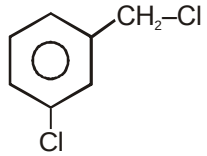
3. 

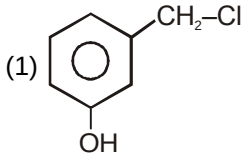
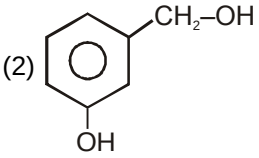
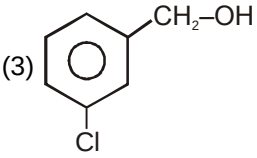
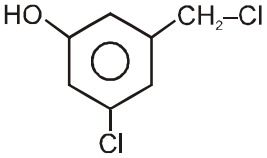
(1) 

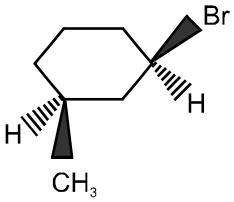
(2) 

(3) 

(4) 

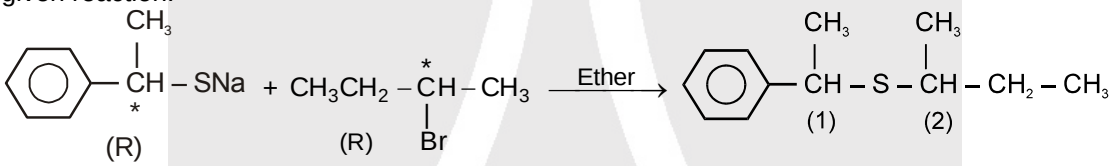
4.  $\xrightarrow{H_2O}$ Product is :

(1) 
(2) 
(3) 
(4) 

5.  + KOH $\xrightarrow{\text{acetone}}$ Product

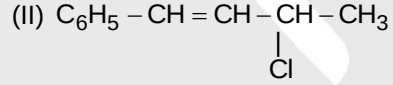
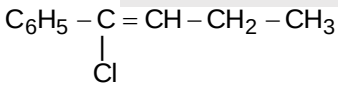
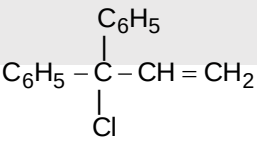
(1R, 3S)–Cis–1–Bromo–3–methylcyclohexane.
The product formed in the reaction is
(1) (1R, 3S)-Cis-3-methyl cyclohexanol
(2) (1S, 3S)-Cis-3- methyl cyclohexanol
(3) (1S, 3S)-Trans-3-methyl cyclohexanol
(4) (1R, 3R)-Trans-3-methyl cyclohexanol

6. Which configuation will be adopted by the poduct at cabon atoms marked (1) and (2) respectively in the given reaction.

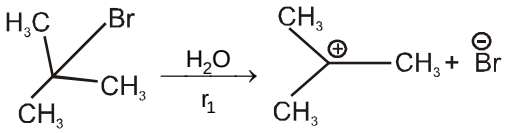
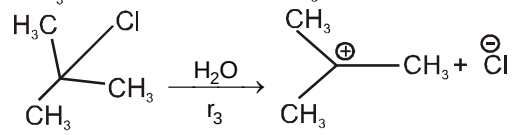
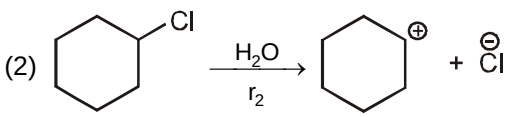


(1) R, R
(2) R, S
(3) S, S
(4) S, R

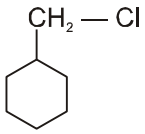
7. What is the correct order of reactivity of alcohols in the following reaction?
$R–OH + HCl + ZnCl_2 \rightarrow R–Cl + H_2O$
(1) Ethanol > Propan-1-ol > Butan-2-ol
(2) Butan-1-ol > Propan-1-ol > Butan-2-ol
(3) Neopentyl alcohol > t-Butyl alcohol > Methanol
(4) t-Butyl alcohol > Butan-2-ol > Propan-1-ol

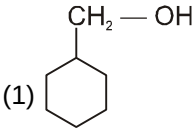
8. The increasing order of reactivity of the following isomeric halides with $AgNO_3$ (H_2O + alcohol) is :
(I) $C_6H_5–CH=CH–CH_2–CH_2–Cl$
(II) 
(III) 
(IV) 

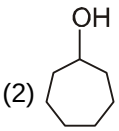
(1) III < IV < II < I
(2) I < III < IV < II
(3) III < I < II < IV
(4) I < II < IV < III

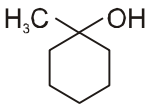
9. (1) 
(3) 
(2) 

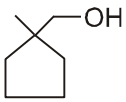
the rates r_1, r_2 and r_3 are in the order :
(1) $r_1 > r_2 > r_3$
(2) $r_3 > r_1 > r_2$
(3) $r_1 > r_3 > r_2$
(4) $r_2 > r_1 > r_3$

10.  $\xrightarrow[AgNO_3]{H_2O}$ 'Y' Product :

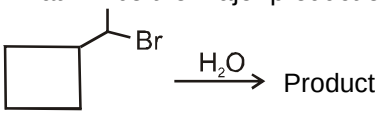
(1) 

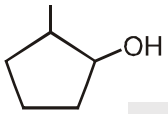
(2) 

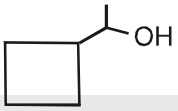
(3) 

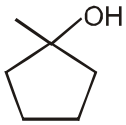
(4) 

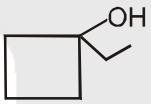
11. What will be the major product of the following reaction



(1) 

(2) 

(3) 

(4) 

12. $CH_3–CH_2–\underset{\underset{OH}{|}}{CH}–CH_3 \xrightarrow{HCl\ /\ ZnCl_2}$ [X]

Identify product X and the mechanism of the reaction.

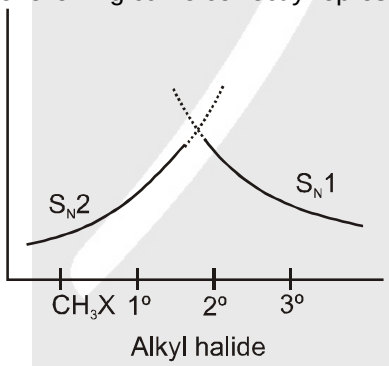
(1) $CH_3–CH_2–CH_2–CH_2–Cl$ & S_N1

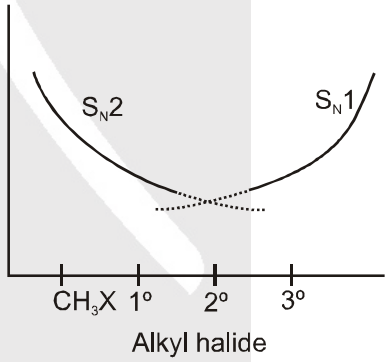
(2) $CH_3–CH_2–CH_2–CH_2–Cl$ & S_N2

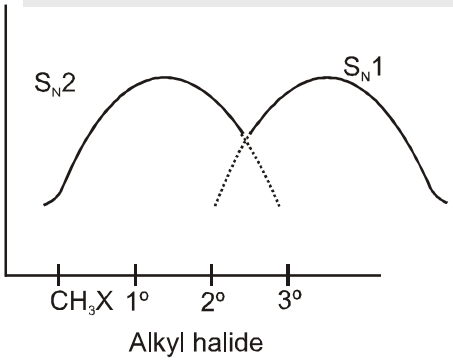
(3) $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-CH_3$ & S_N1

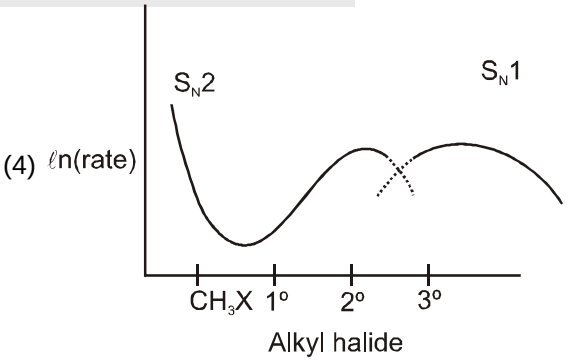
(4) $CH_3-\underset{\underset{Cl}{|}}{CH}-CH_2-CH_3$ & S_N2

13. Which of the following curve correctly represents S_N1 vs S_N2

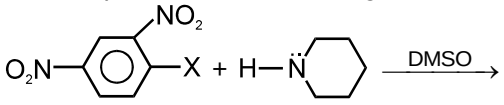
(1) 

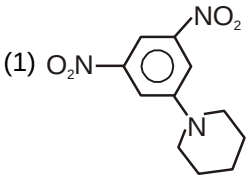
(2) 

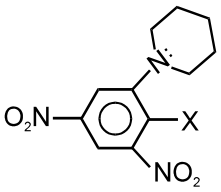
(3) 

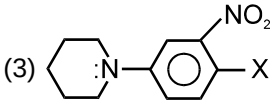
(4) 

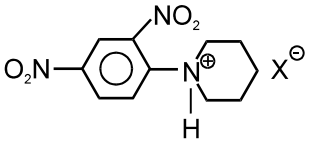
14. The final product of the following reaction is :

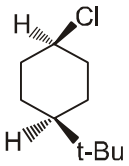


(1) 

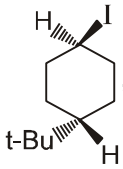
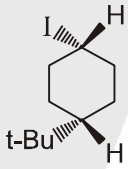
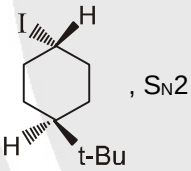
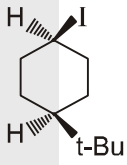
(2) 

(3) 

(4) 

15.  $\xrightarrow[50°C]{NaI\ /\ Acetone}$ Product

Product and mechanism of the reaction respectively is :

(1)  , S_N1 (2)  , S_N2 (3)  , S_N2 (4)  , S_N1

16. Consider the following reactions, which are carried out at the same temperature.

$CH_3–Br + OH^{\ominus} \xrightarrow{EtOH} CH_3–OH + Br^{\ominus}$ ....(i)

$CH_3–Br + OH^{\ominus} \xrightarrow{DMSO} CH_3–OH + Br^{\ominus}$ ....(ii)

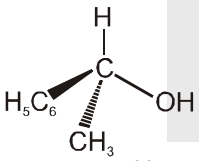
Which of the following statement is correct about these reactions.

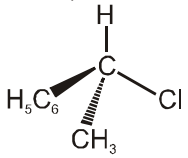
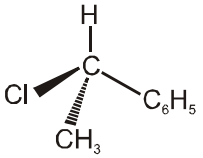
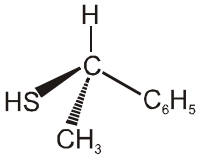
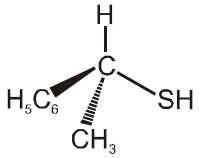
(1) Both the reactions take place at the same rate

(2) The first reaction takes place faster than second reaction.

(3) The second reaction takes place faster than first reaction.

(4) Both the reactions take place by S_N1 mechanism

17.  $\xrightarrow{SOCl_2}$ Product, Identify the product

(1)  (2)  (3)  (4) 

18. $Cl–CH_2CH_2CH_2CH_2OH \xrightarrow{NaOH(aq.)}$ A, the product A is

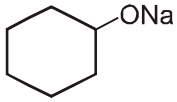
(1) $HO–CH_2CH_2CH_2CH_2OH$

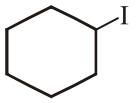
(2) 

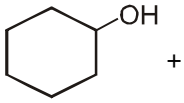
(3)

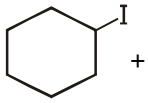
(4) $ClCH_2CH_2CH_2CH_2ONa$

19. Which of the following reactions is the best choice for preparing methyl cyclohexyl ether ?

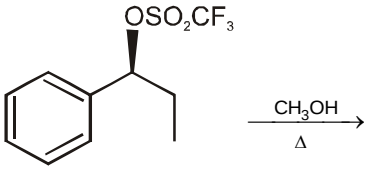
(1)  + $CH_3I \longrightarrow$

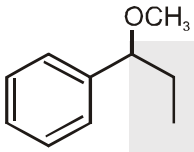
(2)  + $CH_3ONa \longrightarrow$

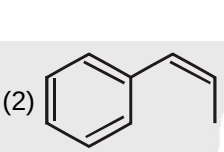
(3)  + $CH_3I \longrightarrow$

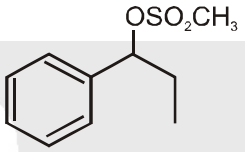
(4)  + $CH_3OH \longrightarrow$

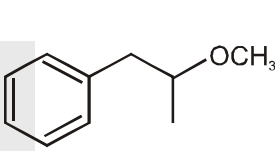
20. Which product would be expected to predominate in the given reaction ?



(1) 

(2) 

(3) 

(4) 

21. Select correct statement

(1) Solvolysis of $(CH_3)_2C=CH–CH_2–Cl$ in ethanol is faster than primary alkyl chloride (25°C)

(2) $CH_3–CH=CH–CH_2–OH$ when reacts with HBr give a mixture of 1-bromo-2-butene and 3-bromo 1-butene.

(3) When solution of 3-buten-2-ol in aqueous sulphuric acid is allowed to stand for one week, it was found to contain both 3-buten-2-ol and 2-buten-1-ol

(4) All of these

22. $(CH_3)_3C–O–CH_2–C_6H_5$ can be prepared from Williamsons synthesis, using :

(1) $(CH_3)_3C–Cl$ and $C_6H_5CH_2ONa$ (2) $C_6H_5CH_2Cl$ and $(CH_3)_3C–ONa$

(3) $(CH_3)_3C–O–CH_2–Cl$ and C_6H_5ONa (4) All of these

23. Consider the following reactions carried out at the same temperature.

(I) 

(II) 

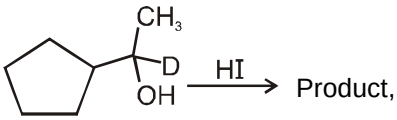
Which of the following statement is correct about these reaction.

(1) Both the reactions take place at the same rate

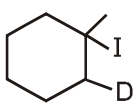
(2) The first reaction takes place faster than second reaction.

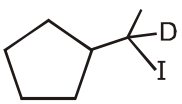
(3) The second reaction takes place faster than first reaction.

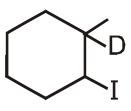
(4) Both the reactions take place by S_N1 mechanism

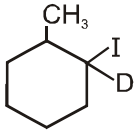
24.  Product,

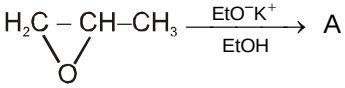
Identify the major product :

(1) 

(2) 

(3) 

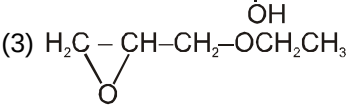
(4) 

25. 

The product A is :

(1) $CH_3CH_2O–CH_2–\underset{\displaystyle OH}{\underset{|}{CH}}–CH_3$

(2) $\underset{\displaystyle OH}{\underset{|}{CH_2}}–\underset{\displaystyle CH_3}{\underset{|}{CH}}–OCH_2CH_3$

(3) 

(4) $CH_3CH_2O–CH_2–\underset{\displaystyle OH}{\underset{|}{CH}}–OCH_2CH_3$

26. Which of the following statement is not true ?

(1) Nucleophiles possess unshared pairs of electron which are utillized in forming bonds with electrophilic substrate.

(2) The cyanide ion is an ambident nucleophile and causes nucleophilic substitution of alkyl halide by either of its carbon atom or nitrogen atom.

(3) The nitrite ion is an ambident nucleophile and causes nucleophilic substitution of alkyl halide by either of its oxygen atom or nitrogen atom.

(4) Strength of nucleophile generally decreases on going down a group in the periodic table.

27. Which of the following statements are correct for the given alcohol ?

$$R-OH \xrightarrow{X^{\Theta}} R-X + \overset{\Theta}{O}H$$

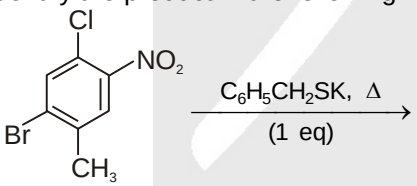
(1) Reaction will not take place because $\overset{\Theta}{O}H$ is poor leaving group; $\overset{\Theta}{X}$ is weak base and $\overset{\Theta}{O}H$ is strong base

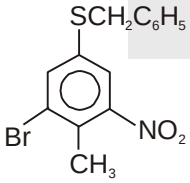
(2) Reaction will not take place because $\overset{\Theta}{O}H$ is poor leaving group; $\overset{\Theta}{X}$ is strong base and $\overset{\Theta}{O}H$ is weak base.

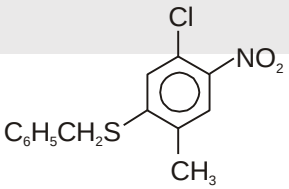
(3) Reaction will not take place because $\overset{\Theta}{O}H$ is strong leaving group; $\overset{\Theta}{X}$ is strong base and $\overset{\Theta}{O}H$ is weak base.

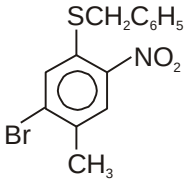
(4) Reaction will not take place because $\overset{\Theta}{O}H$ is good leaving group; $\overset{\Theta}{X}$ is weak base $\overset{\Theta}{O}H$ and is strong base.

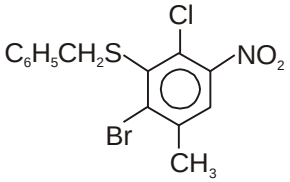
28. Identify the product in the following reaction ?



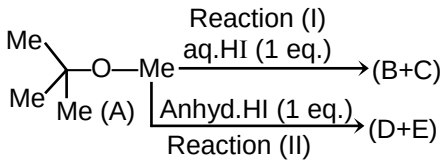
(1) 

(2) 

(3) 

(4) 

29.



Which of the following statements is correct ?
(i) The compounds (B) and (C) are Me_3C—I and MeOH and reaction (I) proceeds by S_N1 mechanism.
(ii) The compound (B) and (C) are Me_3C–OH and MeI and reaction (I) proceeds by S_N2 mechanism.
(iii) The compound (E) and (D) are Me_3C—I and MeOH and reaction (II) proceeds by S_N1 mechanism.
(iv) The compound (E) and (D) are Me_3C—OH and MeI and reaction (II) proceeds by S_N2 mechanism.
(1) (i) and (iii) (2) (ii) and (iii) (3) (i) and (iv) (4) (ii) and (iv)

30. Which of the following compound is least reactive in the nucleophilic aromatic substitution reaction with NaOH?
(1) p-nitrofluorobenzene (2) p-nitrochlorobenzene
(3) p-nitrobromobenzene (4) p-nitroiodobenzene

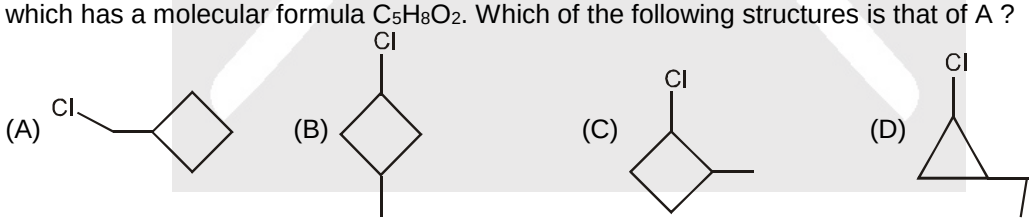
Practice Test-1 (IIT-JEE (Main Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22	23	24	25	26	27	28	29	30
Ans.										

PART - II : NATIONAL STANDARD EXAMINATION IN CHEMISTRY (NSEC) STAGE-I

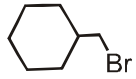
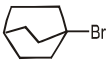
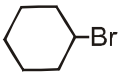
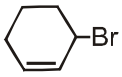
1. A compound A has the molecular formula C_5H_9Cl. It does not react with bromine in carbon tetrachloride. On treatment with a strong base it produces a single compound B. B has a molecular formula C_5H_8 and reacts with bromine in carbon tetrachloride. Ozonolysis of B produces a compound C which has a molecular formula $C_5H_8O_2$. Which of the following structures is that of A ? **[NSEC-2000]**



2. Find the identity of compound B in the following reaction sequence **[NSEC-2000]**
$CH \equiv CNa + CH_3CH_2CH_2CH_2Br \rightarrow A$
$A + Cl_2 \rightarrow B$
1 mol 1 mol
(A) trans-1,2-dichloro-1-hexene (B) cis-1,2-dichloro-1-hexene
(C) cis-1,2-dichlorobutane (D) trans-2,3-dichloro-2-hexene

3. What is the effect of doubling the concentration of HCl on the rate of reaction between t-butyl alcohol and HCl ? **[NSEC-2000]**
(A) It has no effect on the rate of reaction
(B) It halves the rate of reaction
(C) It doubles the rate of reaction
(D) It is not possible to predict its effect on the reaction.

4. The compound which undergoes S_N1 reaction most rapidly is **[NSEC-2003]**

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

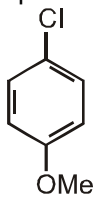
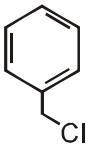
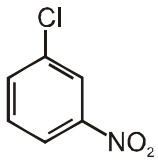
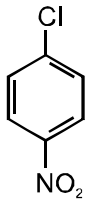
5. The aprotic polar solvent is **[NSEC-2003]**

(A) isopropanol (B) 1,2-dichloroethane (C) nitrobenzene (D) chloroform.

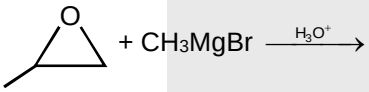
6. The reagent wihch can react with 1-chlorobutane to give substitution reaction is **[NSEC-2003]**

(A) $AlCl_3$ (B) KOH-MeOH (C) NaCN (D) Mg-ether

7. Compound which undergoes nucleophilic substitution reactions most readily is **[NSEC-2003]**

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

8. The following sequence of reactions give **[NSEC-2004]**

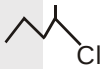


(A) 1-butanol (B) 2-butanol (C) 3,4-hexanediol (D) 3-methyl-3-pentanol.

9. The reagent which can react with 2-bromopropane to give mainly a substitution product is: **[NSEC-2004]**

(A) sodium sulphate (B) sodium cyanide (C) sodium chloride (D) sodium ethoxide.

10. Arrange in order of decrease in rates of S_N2 reaction. **[NSEC-2005]**

I.  II. CH_3Cl III.  IV. 

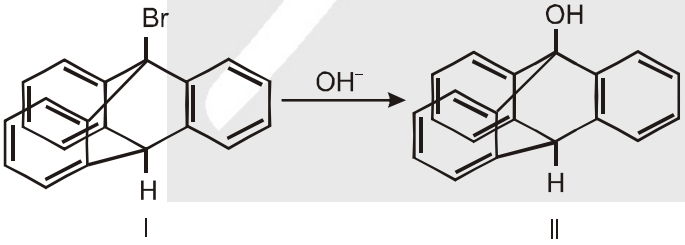
(A) I > II > III >IV (B) VI > II > I > III (C) II > I > III > IV (D) III > II > IV >I.

11. In the reactions given below:

$RCl \xrightarrow{\text{(i) KCN, (ii) } LiAlH_4}$ product A ; $RCl \xrightarrow{\text{(i) AgCN, (ii) } LiAlH_4}$ product B

the compounds A and B are : **[NSEC-2006]**

(A) chain isomers (B) position isomers (C) functional isomers (D) metamers.

12. 

I II

Conversion of I to II : **[NSEC-2006]**

(A) takes place by S_N1 (B) takes place by S_N2 (C) takes place by E1 (D) does not take place.

13. In a nucleophilic substitution reaction, the least reactive compound is **[NSEC-2006]**

(A) CH_3CH_2Cl (B) $(CH_3)_3CCl$ (C) $CH_2 = CHCl$ (D) $CH_2 = CHCH_2Cl$.

14. In the following sequence:

$CH_3CH_2Cl \xrightarrow{NaCN}$ (i)

(i) $\xrightarrow{Ni/H_2}$ (ii)

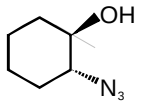
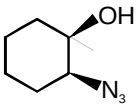
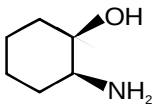
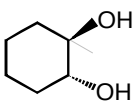
(ii) $\xrightarrow{\text{acetic anhydride}}$ (iii)

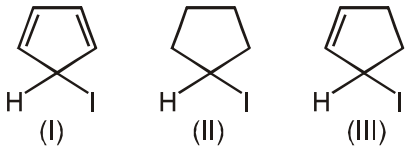
Product (iii) is : **[NSEC-2006]**

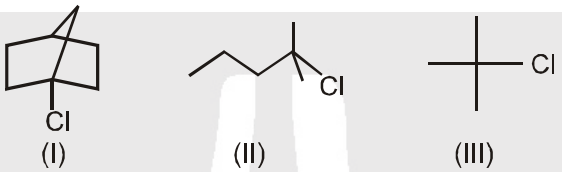
(A) $CH_3CH_2CH_2NH_2$ (B) $CH_3CH_2CH_2CONHCH_3$

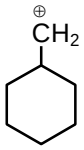
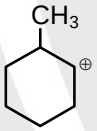
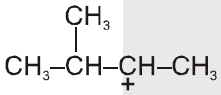
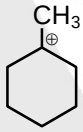
(C) $CH_3CH_2CH_2NHCOCH_3$ (D) $CH_3CH_2CH_2CONHCOCH_3$

15. The product obtained on reaction of alkyl halide with $AgNO_3$ is **[NSEC-2006]**
(A) alkyl nitrate (B) nitroalkane (C) alkyl nitrite (D) nitrosoalkane.

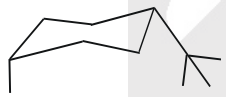
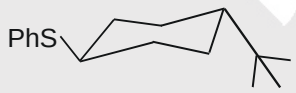
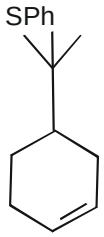
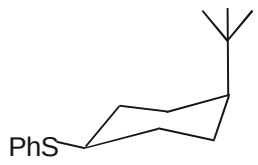
16. The reaction of cyclohexane epoxide with NaN_3 in aqueous dioxane would give **[NSEC-2006]**
(A)  (B)  (C)  (D) 

17. The order of the rate of formation of carbocations from the following iodo compounds is : **[NSEC-2007]**

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

18. Indicate the order of reactivity of the following compounds in nucleophilic substitution (unimolecular) reaction **[NSEC-2007]**

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

19. Which one of the following carbocations will not rearrange ? **[NSEC-2008]**
(A)  (B) 
(C)  (D) 

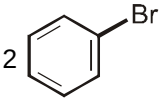
20. The major product in the following reaction is : **[NSEC-2008]**

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

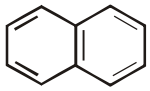
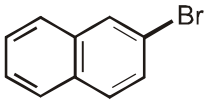
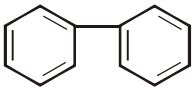
21. S_N1 reactivity of the following halides, **[NSEC-2009]**
(i) $(CH_3)_3CBr$ (ii) $(C_6H_5)_2CHBr$ (iii) $(C_6H_5)_2C(CH_3)Br$ (iv) $(CH_3)_2CHBr$
(A) iv > i > ii > iii (B) ii > i > iii > iv (C) i > iii > ii > iv (D) iii > ii > i > iv

22. The substances used for the preparation of ether by Williamson's synthesis are : **[NSEC-2009]**
(A) $(CH_3)_3CBr$ and CH_3ONa (B) $(CH_3)_3CBr$ and CH_3OH
(C) CH_3Br and $(CH_3)_3CONa$ (D) CH_3Br and $(CH_3)_3COH$

23. The compound A in the reaction is :



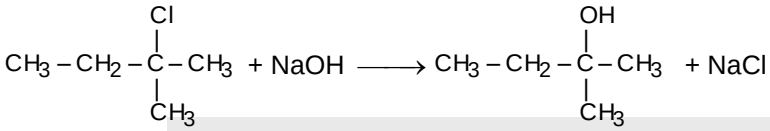
[NSEC-2009]

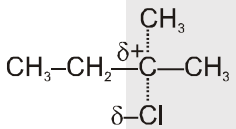
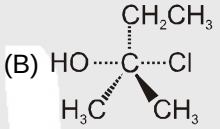
(A)  (B)  (C) 2  (D) 

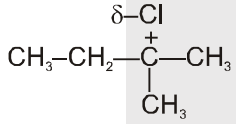
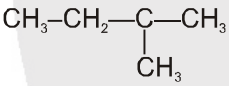
24. Among the following isomeric chloro compounds, the compound which will undergo S_N2 reaction readily is : **[NSEC-2009]**

(A) 4-chloro-1-butene (B) 1-chloro-1-butene (C) 1-chloro-2-butene (D) 2-chloro-1-butene

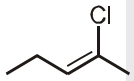
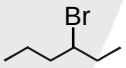
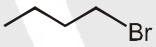
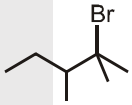
25. The intermediate formed in the following reaction is : **[NSEC-2010]**



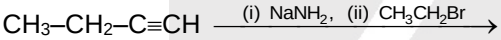
(A)  (B) 

(C)  (D) 

26. The compound which would undergo S_N2 reaction fastest is : **[NSEC-2010]**

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

27. The major product of the following reaction is **[NSEC-2010]**



(A) $CH_3–CH_2–C\equiv C–CH_2–CH_3$ (B) $CH_3 – CH(CH_2CH_3) – C \equiv CH$

(C) $CH_3 – CH_2 – CH(NH_2) – CH_3$ (D) $CH_3–CH_2–C\equiv C–NH_2$

28. The number of transition state/s and intermediate/s in a unimolecular nucleophilic substitution reaction are respectively- **[NSEC-2010]**

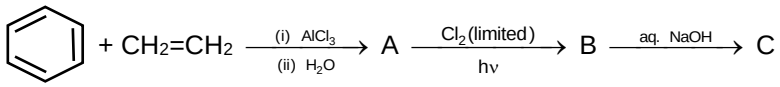
(A) 3, 1 (B) 2, 2 (C) 2, 1 (D) 1, 1

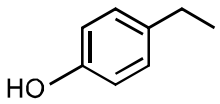
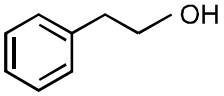
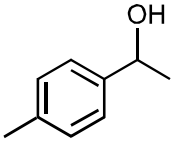
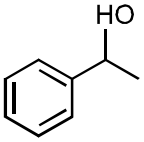
29. Ethyl phenyl ether is treated with conc. HI at 0°C and the rnixture of products is treated with thionyl chloride. The products formed are- **[NSEC-2010]**

(A) Ethanol + Chlorobenzene (B) Phenol + lodoethane

(C) lodoethane + Chlorobenzene (D) Chloroethane + Phenol

30. The product (C) of the following sequence of reactions is : **[NSEC-2011]**



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

31. The order of reactivity of ammonia with the following compound is : **[NSEC-2011]**

(I) CH_2=CHBr (II) CH_3–CH_2–COCl (III) CH_3–CH_2–CH_2–Cl (IV) $C(CH_3)_3$C-Br

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

32. The number of transition states in a unimolecular nucleophilic substitution (S_N1) reaction is **[NSEC-2012]**

(A) 0 (B) 1 (C) 2 (D) 3

33. The sequence of steps involved in aromatic nucleophilic substitution involving a benzyne intermediate is :

(A) Addition-elimination (B) Elimination-addition **[NSEC-2012]**

(C) Addition-rearrangement (D) Elimination-rearrangement

34. Select the most correct statement among the following : **[NSEC-2013]**

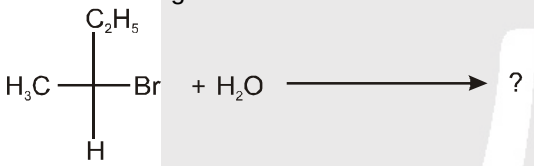
(A) S_N1 mechanism takes place in non-polar solvents

(B) S_N2 mechanism in chiral substrates gives racemic mixtures as products

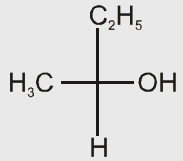
(C) S_N1 mechanism is encouraged by polar solvents

(D) The solvent never influences the mechanism

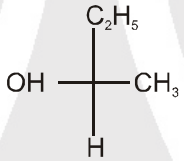
35. In the reaction given below :



the product obtained will contain : **[NSEC-2013]**



I



II

(A) Only Compound I (B) Only Compound II

(C) Both compound I and II (D) this substitution cannot take place

36. The compound which undergoes hydrolysis on just warming with water and forms the corresponding hydroxyl derivative is **[NSEC-2014]**

(A) 2,4,6-trinitrochlorobenzene (B) 2-chloro-1-butene

(C) 2-chloro-2-methylbutane (D) 2, 4-dimethoxychlorobenzene

37. The best sequence of reactions to prepare 2-heptanone is **[NSEC-2014]**

(A) Propyne $\xrightarrow{NaNH_2} X \xrightarrow{n-C_4H_9Br_4} Y \xrightarrow[H_2SO_4]{H_2O,\ Hg^{2+}}$

(B) Ethyne $\xrightarrow{NaNH_2} X \xrightarrow{n-C_5H_{11}Br} Y \xrightarrow[H_2SO_4]{H_2O,\ Hg^{2+}}$

(C) 1-hexyne $\xrightarrow{NaNH_2} X \xrightarrow{CH_3Br} Y \xrightarrow[H_2SO_4]{H_2O,\ Hg^{2+}}$

(D) 1-pentyne $\xrightarrow{NaNH_2} X \xrightarrow{C_2H_5Br} Y \xrightarrow[H_2SO_4]{H_2O,\ Hg^{2+}}$

38. 1-Phenoxypropane is treated with excess of conc. HI at 0°C and the mixture of products is treated with thionyl chloride. The products formed are **[NSEC-2014]**

(A) n-propanol + Chlorobenzene (B) Phenol + n-propyl chloride

(C) n-propyl chloride + Chlorobenzene (D) n-propyl chloride + Phenol

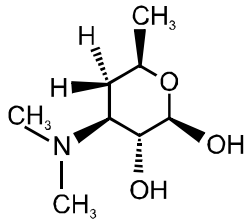
39. (i) chlorobenzene is mono-nitrated to M (ii) nitrobenzene is mono-chlorinated to N

(iii) anisole is mono-nitrated to P (iv) 2-nitrochlorobenzene is mono-nitrated to Q

Out of M, N, P and Q the compound that undergoes reaction with aq. NaOH **fastest** is: **[NSEC-2014]**

(A) M (B) N (C) P (D) Q

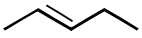
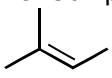
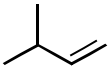
40. Desosamine has the following structure



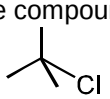
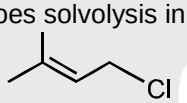
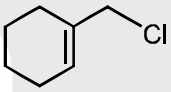
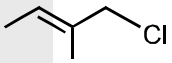
The number of functional groups which react with hydroiodic acid, the number of chiral centers, and the number of stereoisomer's possible respectively are **[NSEC-2015]**

(A) 4, 5, 8 (B) 3, 4, 16 (C) 3, 4, 8 (D) 4, 4, 16

41. Compound "X" reacts with diborane followed by alkaline hydrogen peroxide to form compound "Y". "Y" on reaction with a mixture of sodium bromide in sulphuric acid followed by bromobenzene and sodium in ether gives n-pentylbenzene. Compound "X" is : **[NSEC-2015]**

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

42. The compound that undergoes solvolysis in aq. ethanol most easily is **[NSEC-2015]**

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

43. The best reaction sequence to convert 2-methyl-1-bromopropane into 4-methyl-2-bromopentane is

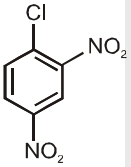
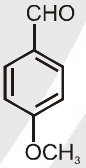
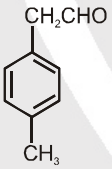
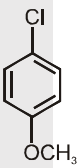
(A) (i) Mg in ether (ii) acetaldehyde (iii) H^+, H_2O (iv) Δ (v) HBr, H_2O_2 **[NSEC-2015]**

(B) (i) NaC≡CH in ether (ii) H_2, Lindlar catalyst (iii) HBr, no peroxide

(C) (i) alcoholic KOH (ii) CH_3COOOH (iii) H_2/Pt (iv) HBr, heat

(D) (i) NaC≡CH in ether (ii) H_3O^+ + $HgSO_4$ (iii) HBr, heat

44. The compound that will NOT react with hot concentrated aqueous alkali at atmospheric pressure is **[NSEC-2015]**

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

45. The appropriate sequence of reactions for obtaining 2-phenylbutanoic acid from benzene is

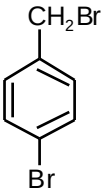
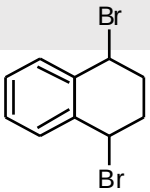
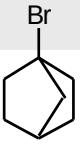
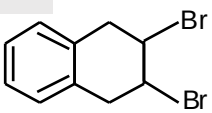
(A) (i) 1-chlorobutane/$AlCl_3$ (ii) limited Cl_2, light (iii) aq NaCN (iv) H^+, H_2O, heat **[NSEC-2015]**

(B) (i) 2-chlorobutane/$AlCl_3$ (ii) $K_2Cr_2O_7/H_2SO_4$

(C) (i) propanoyl chloride/$AlCl_3$ (ii) Zn-Hg/HCl (iii) limited Cl_2(g), light (iv) aq. NaCN (v) H^+, H_2O, heat

(D) (i) butanoyl chloride/$AlCl_3$ (ii) $NaBH_4$ (iii) CuCN (iv) H^+, H_2O, heat

46. The compound that reacts fastest with methylamine is **[NCSE-2016]**

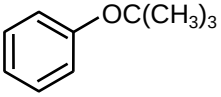
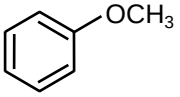
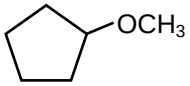
(A)  (B)  (C)  (D) 

47. One mode of 4-nitrocatechol (4-nitro-1,2-dhydroxybenzene) on treatment with an excess of NaH followed by one mole of methyl iodide gives- **[NCSE-2017]**

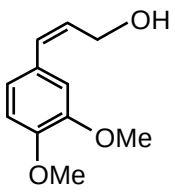
(A) 4-nitro-1, 2-diamethox ybenzene (B) 4-nitro-5methy-1, 2-dimethox ybenzene

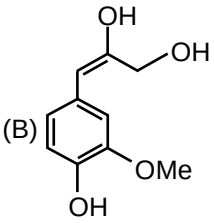
(C) 2-methox y-5 nitrophenol (D) 2-methoxy-4nitrophenol

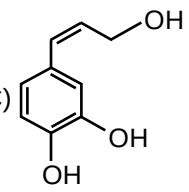
48. Which of the following ethers cannot be prepared by Williamson Synthesis ? **[NCSE-2017]**

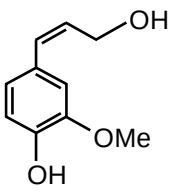
(A)  (B)  (C)  (D) 

49. Coniferyl alcohol is isolated from pine trees. The following observations were made about this alcohol.
I. It forms methylated product with MeI in presence of base
II. One equivalent of coniferyl alcohol reacts with two equivalents of benzoyl chloride
III. Upon ozonolysis, coniferyl alcohol gives a product 'Y' (M.F $C_2H_4O_2$). **[NCSE-2017]**

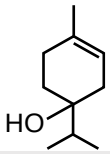
(A) 

(B) 

(C) 

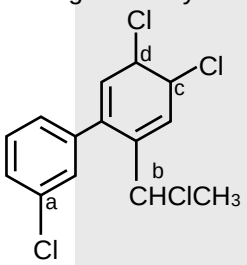
(D) 

50. Terpinen-4-ol is an active ingredient in tea tree oil has the following structure



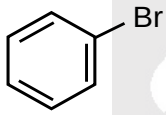
The correct observations for terpinen-4-ol is/are **[NCSE-2017]**
I. It rotates the plane of plane polarized light.
II. It reacts with Baeyer's reagent to form form a triol
III. On reaction with NaBr and H_2SO_4, it gives form a diobromo compound
IV. On ozonolysis it gives a compound with molecular formula $C_{10}H_{18}O_3$
(A) I, II, III and IV (B) I, III and IV (C) II and III (D) III and IV

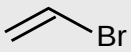
51. The increasing reactivity of the sites (a-d) in the following compound is S_N1 reaction is **[NCSE-2017]**

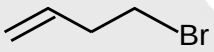


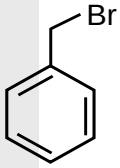
(A) d > b > c > a (B) d > c > a > b (C) d > c > b > a (D) c > d > b > a

52. The compound which would undergo a reaction with ammonia by S_N1 mechanism is **[NCSE-2018]**

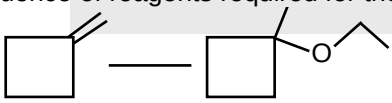
(A) 

(B) 

(C) 

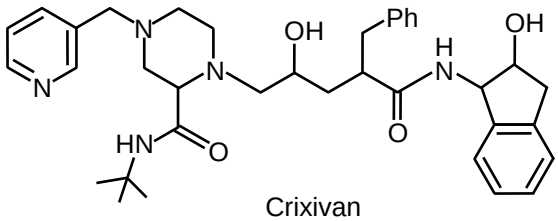
(D) 

53. The sequence of reagents required for the following conversion is **[NCSE-2018]**



(A) (i) $B_2H_6/H_2O_2/OH^-$ (ii) Na (iii) C_2H_5I (B) (i) HCl (ii) C_2H_5ONa
(C) (i) H_3O^+ (ii) Na (iii) C_2H_5OH (D) (i) H_3O^+ (ii) Na (iii) C_2H_5Cl

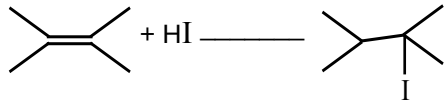
54. The maximum number of moles of CH_3I consumed by one mole of crixivan, a drug against AIDS is

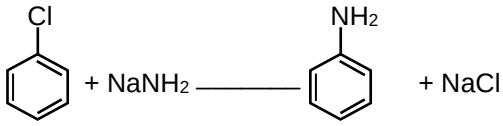


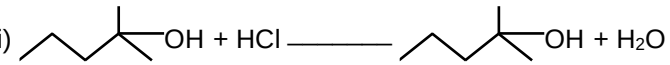
Crixivan **[NCSE-2018]**

(A) 2 (B) 3 (C) 5 (D) 7

55. The reactions from those given below that involve a carbocation intermediate are **[NCSE-2018]**

(i) 

(ii) 

(iii) 

(A) i, ii and iii (B) i and ii (C) i and iii (D) ii and iii

PART - III : PRACTICE TEST-2 (IIT-JEE (ADVANCED Pattern))

Max. Time : 1 Hr. **Max. Marks : 66**

Important Instructions

A. General :

1. The test is of 1 hour duration.
2. The Test Booklet consists of 22 questions. The maximum marks are 66.

B. Question Paper Format

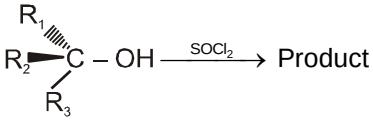
3. Each part consists of five sections.
4. Section-1 contains 8 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE is correct.
5. Section-2 contains 6 multiple choice questions. Each question has four choices (A), (B), (C) and (D) out of which ONE OR MORE THAN ONE are correct.
6. Section 3 contains 4 questions. The answer to each of the questions is a single-digit integer, ranging from 0 to 9 (both inclusive).
7. Section 4 contains 1 paragraphs each describing theory, experiment and data etc. 3 questions relate to paragraph. Each question pertaining to a partcular passage should have only one correct answer among the four given choices (A), (B), (C) and (D).
8. Section 5 contains 1 multiple choice questions. Question has two lists (list-1 : P, Q, R and S; List-2 : 1, 2, 3 and 4). The options for the correct match are provided as (A), (B), (C) and (D) out of which ONLY ONE is correct.

C. Marking Scheme

9. For each question in Section-1, 4 and 5 you will be awarded 3 marks if you darken the bubble corresponding to the correct answer and zero mark if no bubble is darkened. In all other cases, minus one (– 1) mark will be awarded.
10. For each question in Section-2, you will be awarded 3 marks. If you darken all the bubble(s) corresponding to the correct answer(s) and zero mark. If no bubbles are darkened. No negative marks will be answered for incorrect answer in this section.
11. For each question in Section-3, you will be awarded 3 marks if you darken only the bubble corresponding to the correct answer and zero mark if no bubble is darkened. No negative marks will be awarded for incorrect answer in this section.

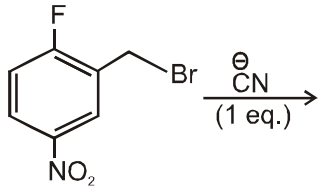
SECTION-1 : (Only One option correct Type)

This section contains 8 multiple choice questions. Each questions has four choices (A), (B), (C) and (D) out of which Only ONE option is correct.

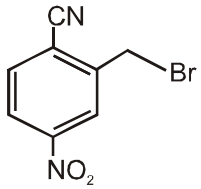
1. 

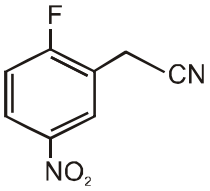
In the above reaction which phenomenon will take place :

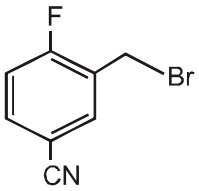
(A) Retention (B) Inversion (C) Racemisation (D) Partial racemisation

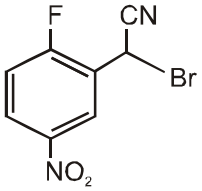
2. 

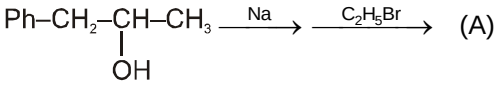
A, Product (A) is

(A) 

(B) 

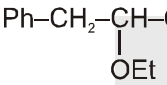
(C) 

(D) 

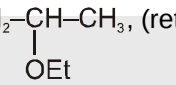
3. 

(A)

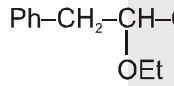
Product (A) in above reaction is

(A) 

, (inversion)

(B) 

, (retention)

(C) 

, (racemic)

(D) Ph–CH=CH–CH_3

4. An optically active, pure, four carbon containing saturated alcohol X when reacted with NaH followed by CH_3–I gives a compound M. Same alcohol (X) when treated with TsCl followed by sodium methoxide gives M′. M and M′ are

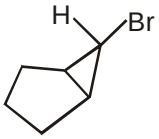
(A) Identical (B) Enantiomer (C) Diastereomer (D) Geometrical isomers

5. Replacement of chlorine from chlorobenzene to give phenol requires drastic conditions but chlorine of 2, 4-dinitrochlorobenzene is readily replaced because

(A) NO_2 makes the ring electron rich at ortho- and para-positions.
(B) NO_2 withdraws electrons at meta position.
(C) NO_2 donates electrons at meta position.
(D) NO_2 withdraws electrons from ortho and para positions.

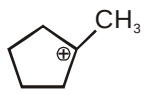
6. Which of the following statement is correct.

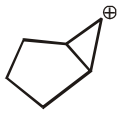
(A) Nucleophiles have an unshared electron pair and can make use of this to react with an electron rich species.
(B) $AgNO_3$ increases the rate of solvolysis in S_N1 reaction of alkyl halide.
(C) Inversion of configuration occurs at the carbon undergoing S_N1 reaction.
(D) Aryl halides are more reactive towards nucleophilc substitution reaction as compared to alkyl halide.

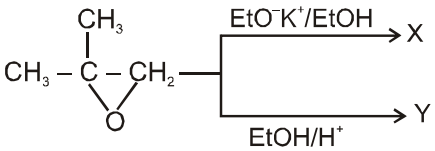
7. 

$\xrightarrow{Ag^{\oplus}}$ Rearranged Carbocation + AgBr

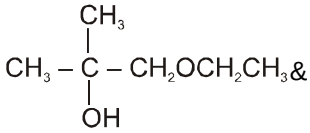
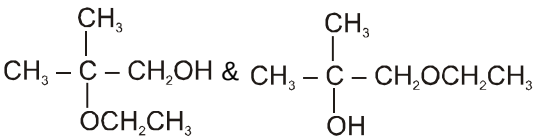
Rearranged carbocation is :

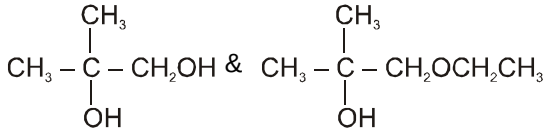
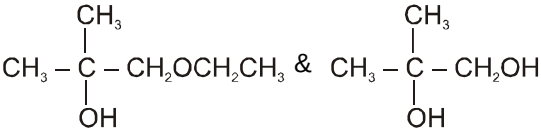
(A) 

(B) 
(C) 
(D) 

8. 

The product X and Y are respectively :

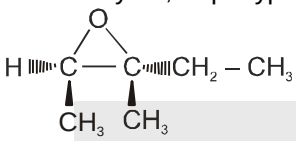
(A)  (B) 

(C)  (D) 

Section-2 : (One or More than one options correct Type)

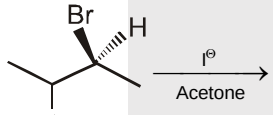
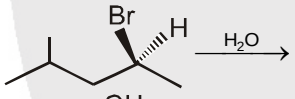
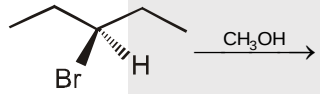
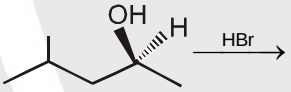
This section contains 6 multipole choice questions. Each questions has four choices (A), (B), (C) and (D) out of which ONE or MORE THAN ONE are correct.

9. When Cis-3-Methyl- 2,3-epoxypentane treated with aqueous acid.

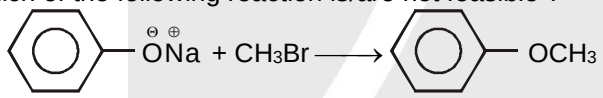
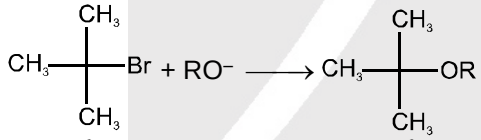
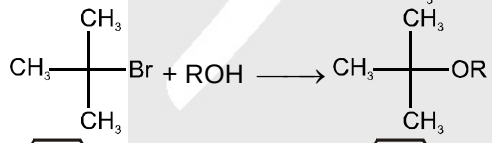
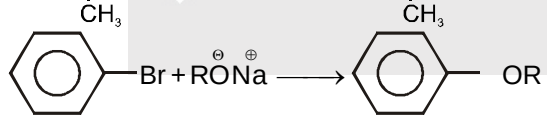
 Cis-3-Methyl-2,3-epoxypentane

(A) Ring opeing takes palce.
(B) The product is chiral.
(C) The product is achiral.
(D) Protonation takes place initially.

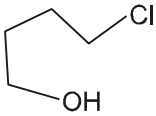
10. Which reaction results in the formation of a pair of enantiomers ?

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

11. Which of the following reaction is/are not feasible ?

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

12. Which of the following reactions take place by S_N2 mechanism :

(A) $CH_3–CH_2–ONa + CH_3–CH_2–Cl \longrightarrow$ (B)  $+ NaOH \longrightarrow$

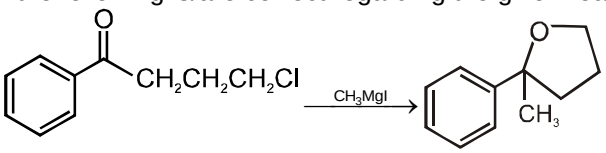
(C) $(CH_3)_3–C–CH_2–CH_2–Br$ + excess $NH_3 \longrightarrow$ (D) $CH_3–CH_2–OH + HBr \longrightarrow$

13. The relative rates of nucleophilic substitution for the given substrates are as follows

Compoud	**Approx. Relative rate**
CH_3CH_2Br	1.0
$CH_3CH_2CH_2Br$	0.28
$(CH_3)_2CHCH_2Br$	0.030
$(CH_3)_3\ CCH_2Br$	0.00000042

The correct statement (s) is/are :
(A) Each of the above reactions is likely to be S_N2
(B) Each of the above reactions is likely to be S_N1
(C) First two reactions follow S_N2 and next two reactions follow S_N1 pathway
(D) The important factor behind this order of reactivity is "steric effect"

14. Which of the following is/are correct regarding the given reaction ?

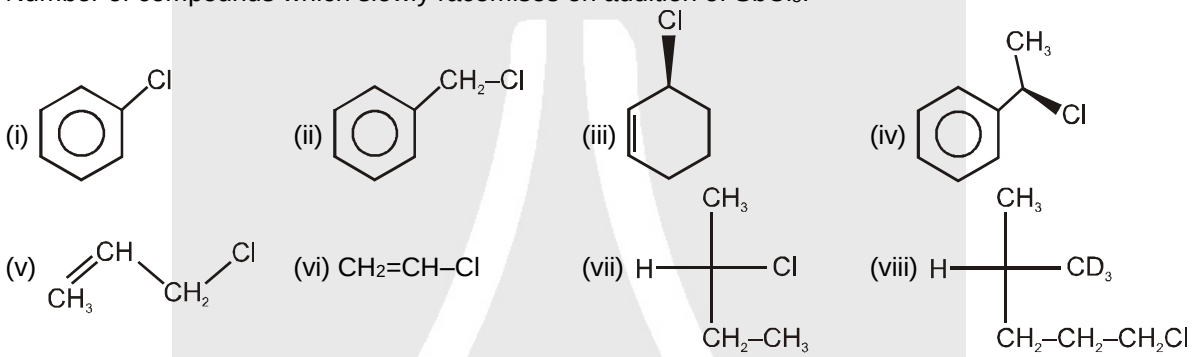


(A) Nucleophilic substitution
(B) Intramolecular nucleophilic attack
(C) Dehydration
(D) Nucleophilic addition

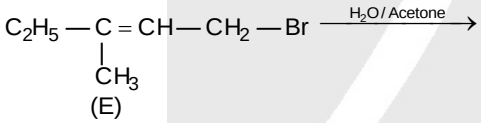
Section-3 : (One Integer Value Correct Type.)

This section contains 4 questions. Each question, when worked out will result in one integer from 0 to 9 (both inclusive)

15. Number of compounds which slowly racemises on addition of $SbCl_5$.



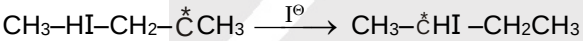
16.



(E)

How many total substitution products are formed including stereoisomers in the above reaction ?

17. In the given reaction, the percentage of (-) enantiomer formed is :



$(\alpha)_{obs} = -15.90°$ $(\alpha)_{obs} = -15.26°$

18. For the reaction: $R–X + OH^- \longrightarrow R–OH + X^-$; the rate expression is given as rate = 6.0×10^{-5} $[R–X][OH^-] + 2 \times 10^{-7}$ [R–X]. What percentage of R–X react by the S_N2 mechanism when $[OH^-] = 0.01$ molar.

SECTION-4 : Comprehension Type (Only One options correct)

This section contains 1 paragraphs, each describing theory, experiments, data etc. 3 questions relate to the paragraph. Each question has only one correct answer among the four given options (A), (B), (C) and (D)

Paragraph for Questions 19 to 21

A kinetic distinction between the operation of S_N1 and S_N2 modes can be made by observing the effect on the overall reaction rate by adding a competing nucleophile. The total nucleophilic concentration is thus increased, so this will result in an increased reaction rate in S_N2 route. By contrast for S_N1 mode, the $[Nu:^{\ominus}]$ will not appear in the rate equation, the addition of competing nucleophile will fails significant effect on the observed reaction rate, though it will naturally influcence the composition of the products.

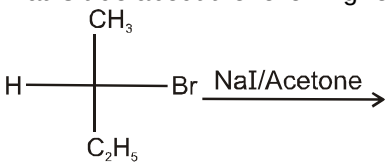
19. In which of the following reactions the overall reaction rate may increase by addition of NaN_3.

(i) $CH_3Cl + NaOH \longrightarrow$ (ii) $(CH_3)_3CCl + H_2O \longrightarrow$

(iii) $CH_3-\underset{\underset{O}{\|}}{C}-CH_2-Cl + NaI \longrightarrow$ (iv) $(CH_3)_2CH-OH + NaBr + H_2SO_4 \longrightarrow$

(A) (ii) and (iv) (B) (i) and (iii) (C) (i), (ii) and (iii) (D) (iv) only

20. What is true about the following reaction



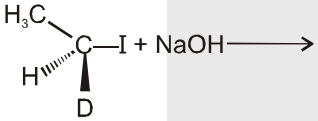
(A) If α–H is displaced by $-CD_3$ group walden inversion will be observed in the product.

(B) If NaN_3 is added the rate of decrease in concentration of reactant will slow down.

(C) On addition of KI the molecularity of reaction will be three.

(D) If KI is added rate of reaction will increase.

21. On addition of NaN_3 in the following reaction, the correct observation will be



$[\alpha] = + x^o$

(A) The rate of formation of alcohol will increase

(B) The rate of disappearance of alkyl halide will increase

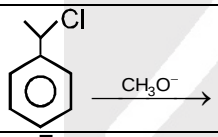
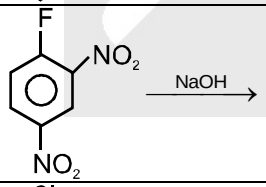
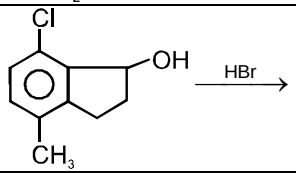
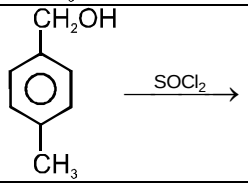
(C) The product alkyl azide will have optical rotation zero.

(D) The product mixture will have optical rotation $-x^o$.

SECTION-5 : Matching List Type (Only One options correct)

This section contains 1 questions, each having two matching lists. Choices for the correct combination of elements from List-I and List-II are given as options (A), (B), (C) and (D) out of which one is correct

22. Match List I (Reaction) with List II (Mechanism) and select the correct answer using the code given below the lists :

	List I		**List II**
(P)		(1)	S_N1
(Q)		(2)	S_N2
(R)		(3)	S_Ni
(S)		(4)	S_N2 Ar

Codes :
(A) P–4 ; Q–1 ; R–2 ; S–3
(B) P–2 ; Q–1 ; R–3 ; S–4
(C) P–2 ; Q–4 ; R–1 ; S–3
(D) P–4 ; Q–2 ; R–1 ; S–3

Practice Test-2 ((IIT-JEE (ADVANCED Pattern))

OBJECTIVE RESPONSE SHEET (ORS)

Que.	1	2	3	4	5	6	7	8	9	10
Ans.										
Que.	11	12	13	14	15	16	17	18	19	20
Ans.										
Que.	21	22								
Ans.										

Additional Problems for Self Practice (APSP)

PART - I

1.	(1)	**2.**	(3)	**3.**	(2)	**4.**	(3)	**5.**	(3)
6.	(2)	**7.**	(4)	**8.**	(3)	**9.**	(3)	**10.**	(3)
11.	(3)	**12.**	(3)	**13.**	(2)	**14.**	(4)	**15.**	(3)
16.	(3)	**17.**	(1)	**18.**	(2)	**19.**	(1)	**20.**	(1)
21.	(4)	**22.**	(2)	**23.**	(2)	**24.**	(1)	**25.**	(1)
26.	(4)	**27.**	(1)	**28.**	(3)	**29.**	(3)	**30.**	(4)

PART - II

1.	(B)	**2.**	(A)	**3.**	(A)	**4.**	(D)	**5.**	(C)
6.	(C)	**7.**	(B)	**8.**	(B)	**9.**	(B)	**10.**	(C)
11.	(C)	**12.**	(D)	**13.**	(C)	**14.**	(C)	**15.**	(A)
16.	(A)	**17.**	(C)	**18.**	(B)	**19.**	(D)	**20.**	(B)
21.	(D)	**22.**	(C)	**23.**	(D)	**24.**	(C)	**25.**	(C)
26.	(C)	**27.**	(A)	**28.**	(C)	**29.**	(D)	**30.**	(D)
31.	(B)	**32.**	(C)	**33.**	(B)	**34.**	(C)	**35.**	(C)
36.	(A)	**37.**	(B)	**38.**	(B)	**39.**	(D)	**40.**	(D)
41.	(D)	**42.**	(B)	**43.**	(B)	**44.**	(D)	**45.**	(C)
46.	(A)	**47.**	(D)	**48.**	(B)	**49.**	(D)	**50.**	(A)
51.	(C)	**52.**	(D)	**53.**	(D)	**54.**	(B)	**55.**	(B)

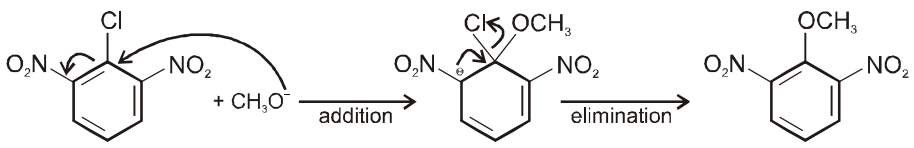
PART - III

1.	(A)	**2.**	(B)	**3.**	(B)	**4.**	(B)	**5.**	(D)
6.	(B)	**7.**	(B)	**8.**	(A)	**9.**	(ABD)	**10.**	(BD)
11.	(BD)	**12.**	(ABCD)	**13.**	(AD)	**14.**	(ABD)		
15.	3 (iii, iv, vii)	**16.**	4	**17.**	98%	**18.**	75%	**19.**	(B)
20.	(D)	**21.**	(B)	**22.**	(C)				

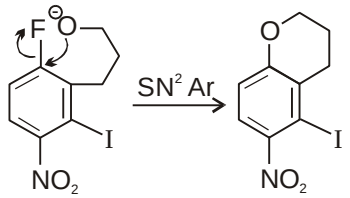
Additional Problems for Self Practice (APSP)

PART - I

1.

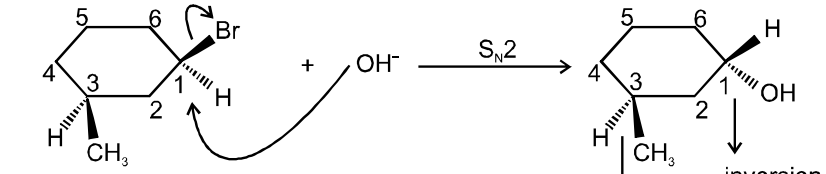


2.



3. It is a S_N2 reaction, so inversion takes place at sp^3 carbon.

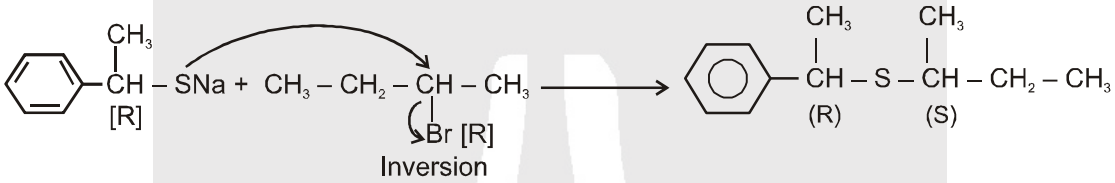
5.



(1R, 3S)-Cis-1-Bromo-3-methyl cyclohexane

(1S,3S)-trans-3-methyl cyclohexanol

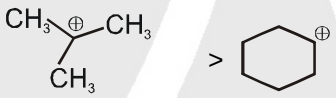
6.



7. Rate of reaction $\propto$ stability of carbocation intermediate

8. On the basis of carbocation stability.

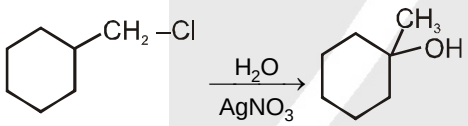
9. Carbocation Stability



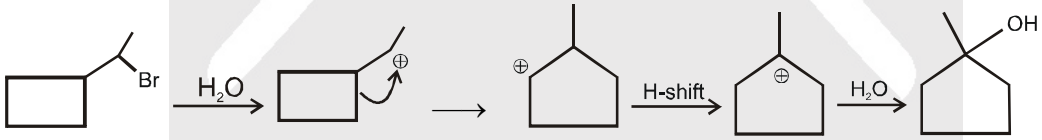
Leaving group ability is $Br^{\ominus} > Cl^{\ominus}$

Over all reaction order $r_1 > r_3 > r_2$

10.



11.



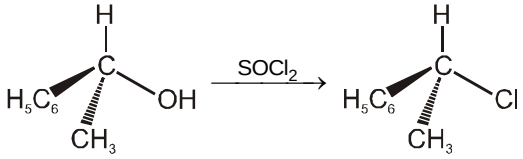
13. 1º R-X gives S_N2 reaction fastest and 3º R-X gives S_N1 reaction fastest.

14. It is a nucleophillc aromatic substitution reaction.

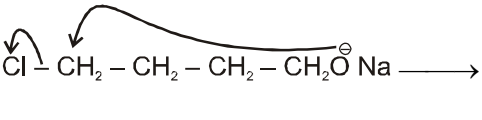
15. Strong anionic Nucleophile so mechanism is S_N2.

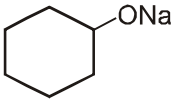
16. Polar aprotic solvent favours S_N2 mechanism.

17.



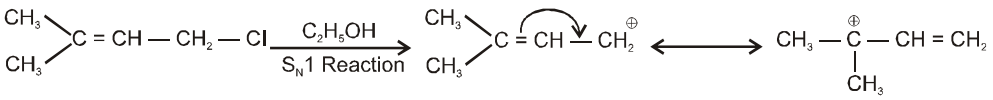
This reaction follows S_Ni mechanism, so retention of configuration takes place.

18. $Cl–CH_2–CH_2–CH_2–CH_2–OH \xrightarrow[-H_2O]{NaOH}$  

19.  $+ CH_3I \longrightarrow$

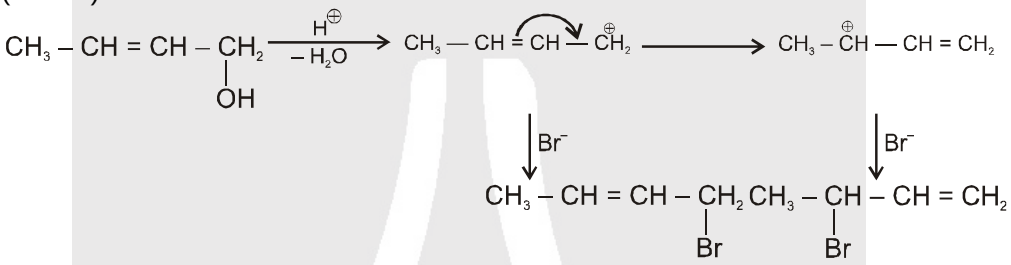
strong anionic nucleophile and 1º alkyl halide favours S_N2 mechansim.

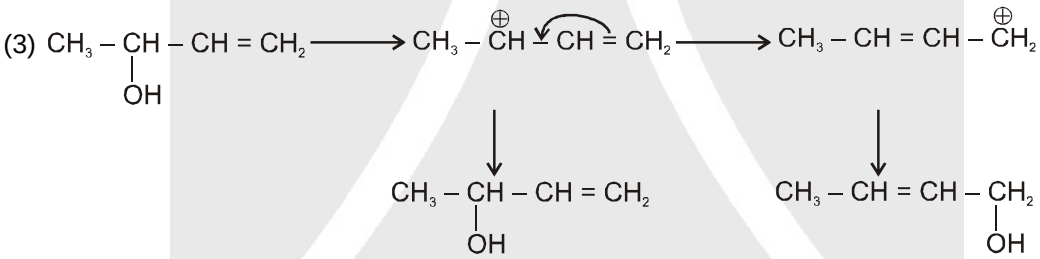
20. $-\overset{\Theta}{O}SO_2CF_3$ is better Leaving group and CH_3OH give S_N1 product as a major product.

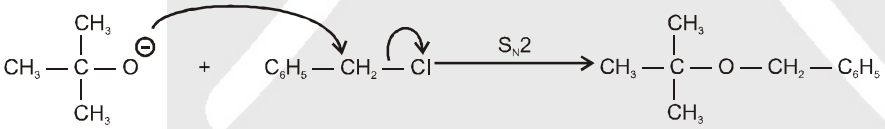
21. (1) 

$R—X \xrightarrow{S_N}$ No stable carbocation

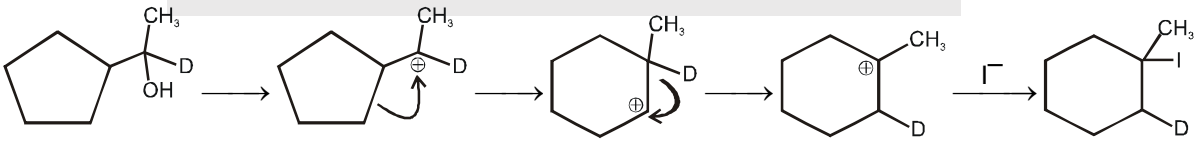
(1° R–X)

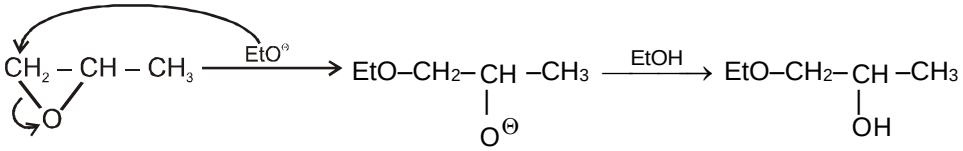
(2) 

(3) 

22. 

23. Bridge head carbocation is not formed.

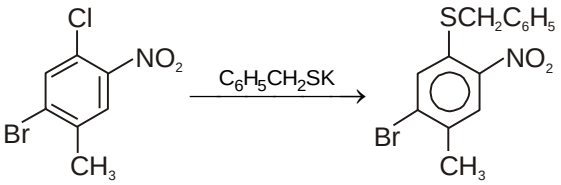
24. 

25. 

26. Strength of Nucleophile generally increases on going down a group in the periodic table, so (4) is not true.

27. Nucleophilic substitution of alcohol is acid catalysed reaction.

28.

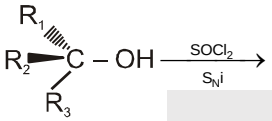


29. Product (B + C) by S_N1 Mech.
Product (D + E) by S_N2 Mech.

30. Because rate of S_N2 Ar is Ar–F > Ar–Cl > Ar–Br > Ar–I.

PART - III

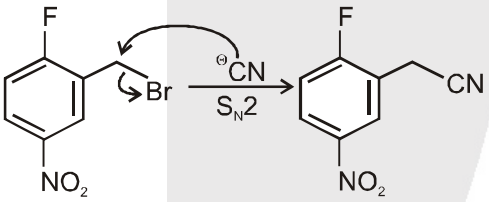
1.



Product (Retention)

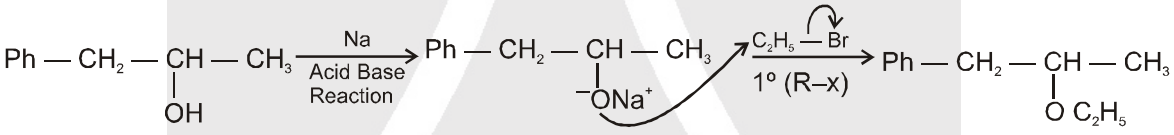
S_Ni Reaction condition follow retention of configuration.

2.



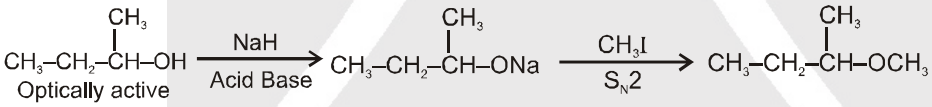
Aromatic halides do not give SN reaction in normal condition.

3.

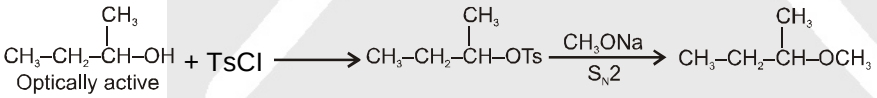


(Retention)

4.



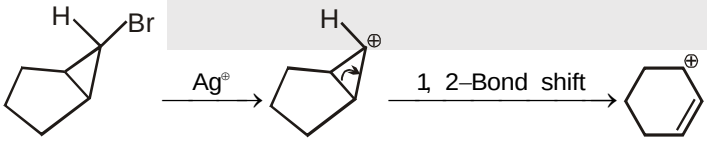
Retention of product.



Inverstion take place.

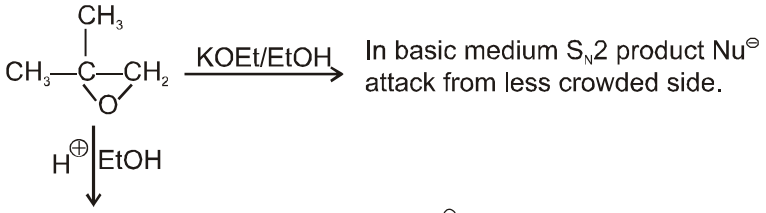
M = Retention product and M′ = inversion product, so they are enantiomers.

7.



(Rearranged carbocation)

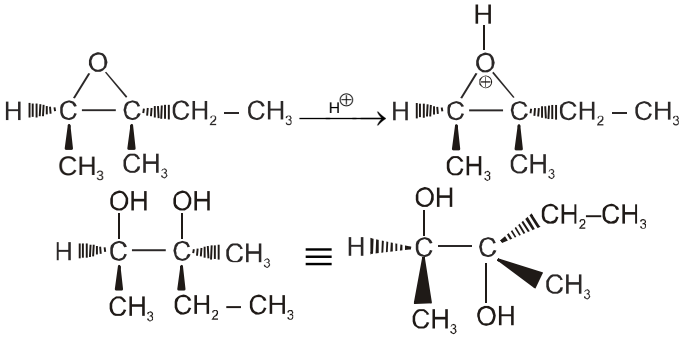
8.



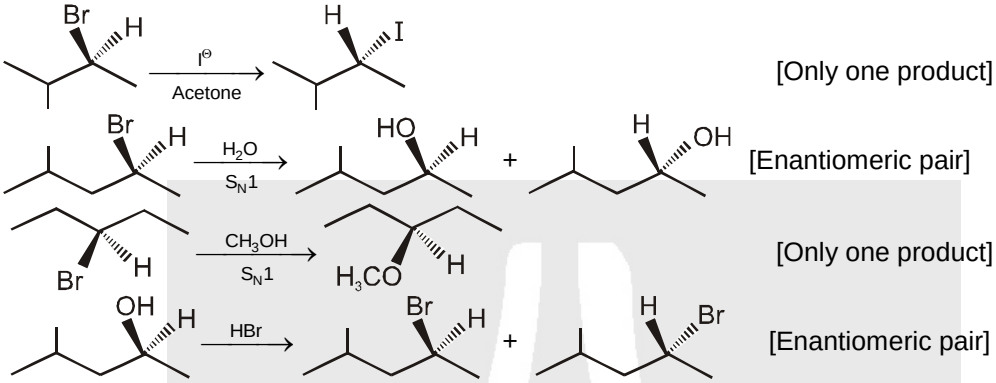
In basic medium S_N2 product $Nu^{\ominus}$ attack from less crowded side.

In acidic medium S_N1 type product, $Nu^{\ominus}$ attack from crowded side.

9. (i)



10.



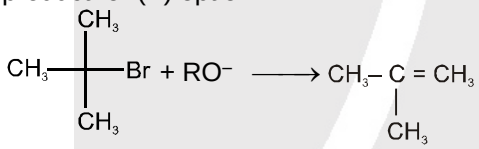
[Only one product]

[Enantiomeric pair]

[Only one product]

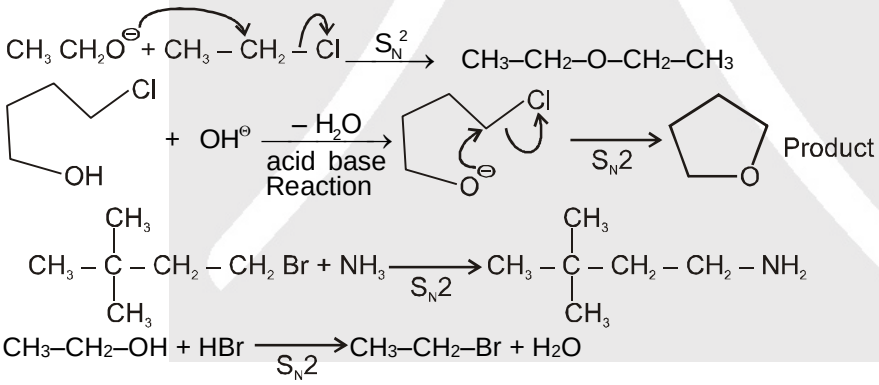
[Enantiomeric pair]

11. Correct product for (B) option.



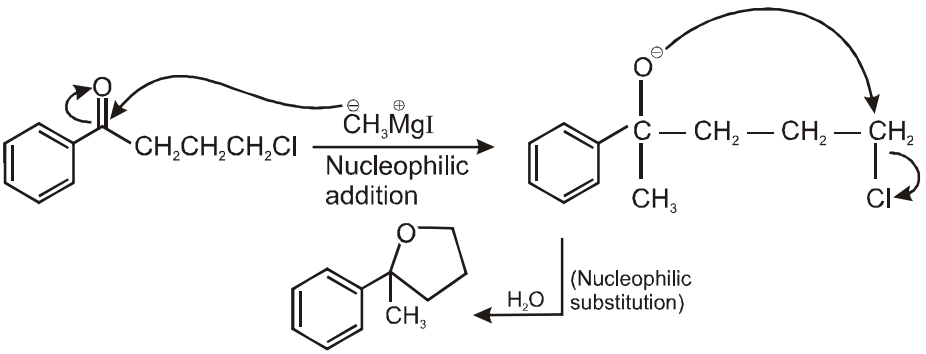
Option (D) is also not feasible because aromatic halide do not give SN reaction in normal condition.

12.



13. Due to steric effect.

14.



16. $C_2H_5-\underset{\underset{CH_3}{|}}{C}=CH-CH_2-Br \xrightarrow{H_2O/Acetone} C_2H_5-\underset{\underset{CH_3}{|}}{C}=CH-CH_2-OH + C_2H_5-\underset{\underset{CH_3}{|}}{\overset{\overset{OH}{|}}{C}}-CH=CH_2$

(E) (E/Z) (R/S)

17. $CH_3-\underset{\underset{I}{|}}{CH}-CH_2-CH_3 \xrightarrow{I^-} CH_3-\underset{\underset{I}{|}}{CH}-CH_2-CH_3$

$[\alpha]_{obs} = -15.90^o$ $[\alpha]_{obs} = -15.26^o$

% of (–) enantiomers = $\frac{-15.26}{15.96} \times 100 = 96\ \%$

Racemic mixture = (100 – 96) = 4%
Racemic mixture = 2% (+) + 2% (–)
(+) enantiomer = 2%
Total (–) enantiomer = 96 + 2 = 98 %

18. The rate is made up of two parts S_N1 and S_N2 rate
$= 6.0 \times 10^{-5}\ [RX][OH^-] + 2 \times 10^{-7}\ [RX]$

Thus % $S_N2 = \left[\frac{S_N2}{S_N2 + S_N1}\right] \times 100 = \left[\frac{6.0 \times 10^{-5}\ [RX][OH^-]}{6.0 \times 10^{-5}\ [RX][OH^-] + 2 \times 10^{-7}[RX]}\right] \times 100 = 75\%$