



OC SHEET SOLUTION

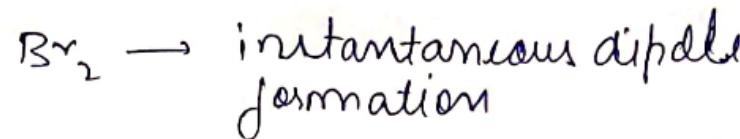
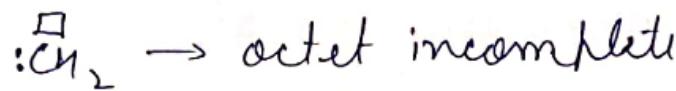
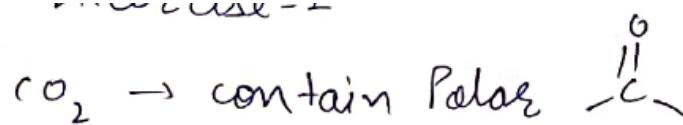
HALOGEN  
DERIVATIVES

ALLEN DIGITAL

**Team  
OC  
Allen  
Kota**

## SOLUTION OF Ex- O-1

① (A)



so option (A) contain all electrophilic

Ans (A)

②

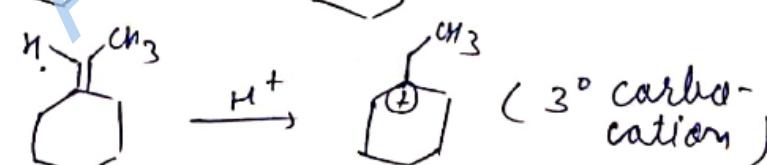
In case of option (c) either the compound is having lone pair ( $-\ddot{\text{O}}\text{H}, -\ddot{\text{N}}\text{H}_2$ ) or  $\pi$  density ( $\text{CH}_2=\text{CH}_2$ ,  $\text{C}_6\text{H}_5^-$ ) thus all are nucleophiles

Ans (C)

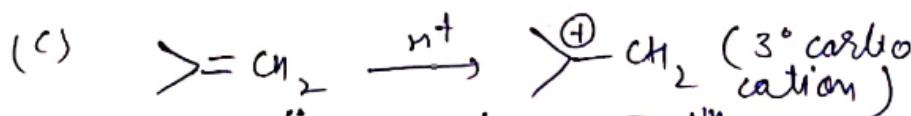
③ (A)



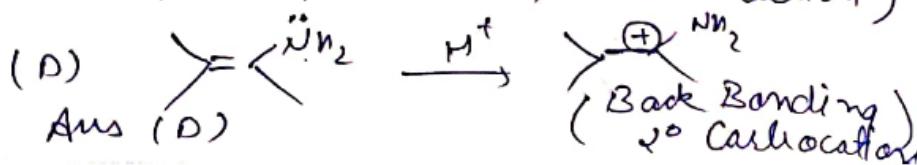
(B)



(C)



(D)



Ans (D)

## (4) Carbocation

- (i) It has vacant orbital thus can act as Lewis acid.  
 (ii) It has  $\sigma$  valence shell e<sup>-</sup>  
 (iii) It is electrophilic  
 (iv) It is always trigonal planar  
 Option (D) is incorrect as always trigonal planar is not necessary. Ans (D)

(5)



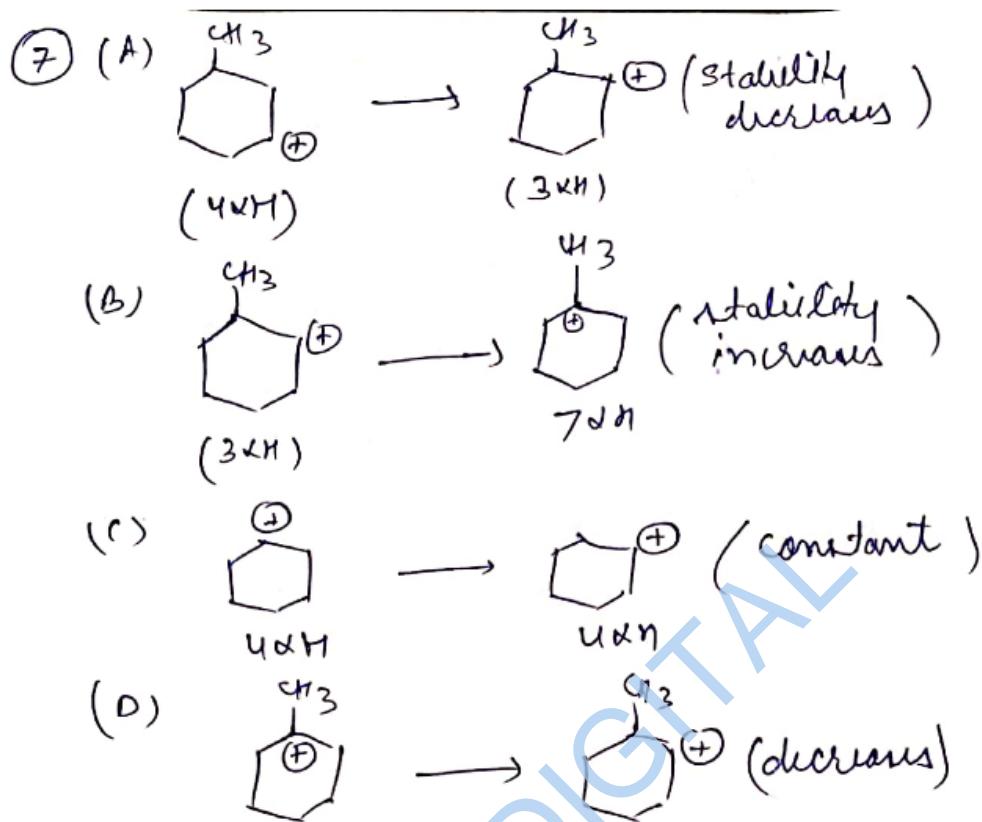
This is the most stable carbocation due to resonance i.e. Back Bonding

(6)

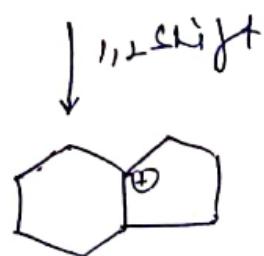
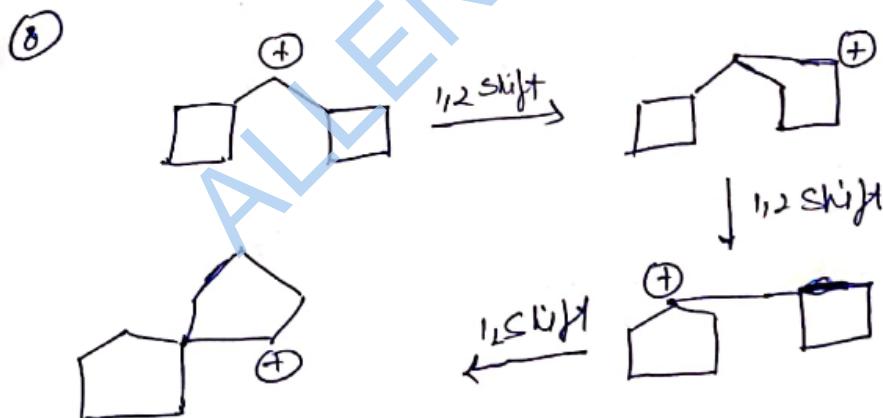


The above carbocation cannot be formed as it violates BREDT'S RULE

Ans (C)



Ans (B)

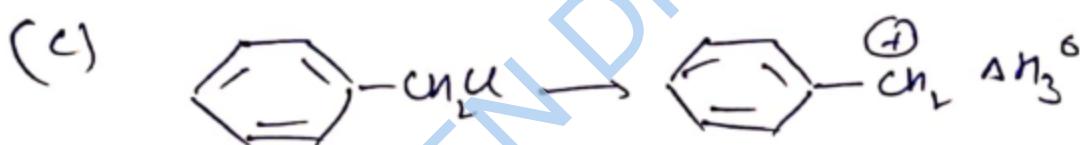
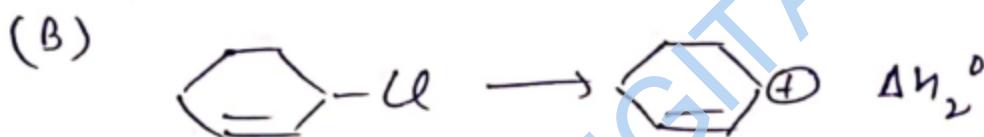
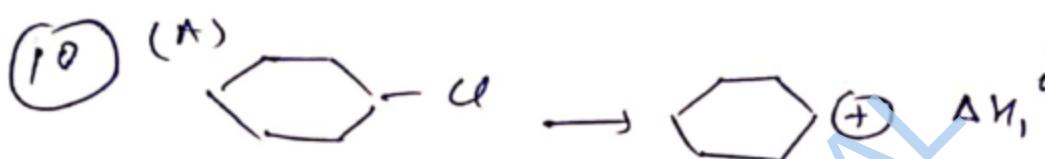


so we can see  
total no. of 1,2 shifts  
are 4  
Ans (D)

- (9) In case of (a), (b), (c), (d),  
 (e), (f), (g), (h)

In all cases stability of carbocation increases after rearrangement

Ans (B)

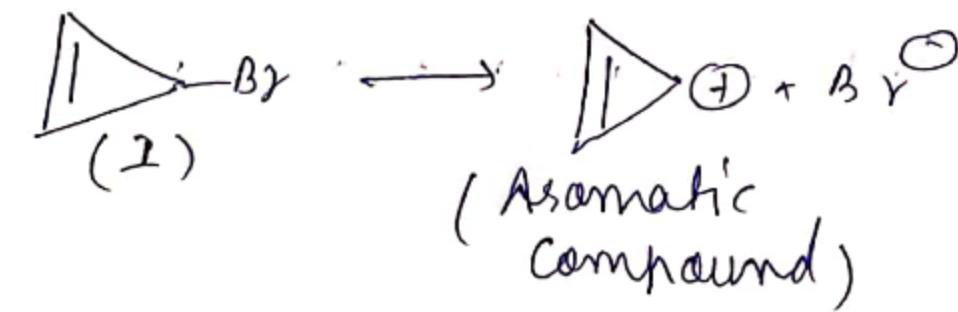


$\Delta H^\circ$  depends upon the stability of carbocation, more stable  $C^\oplus$  less  $\Delta H^\circ$

thus  $\Delta H_4^\circ > \Delta H_1^\circ > \Delta H_2^\circ > \Delta H_3^\circ$

Ans (B)

(11)

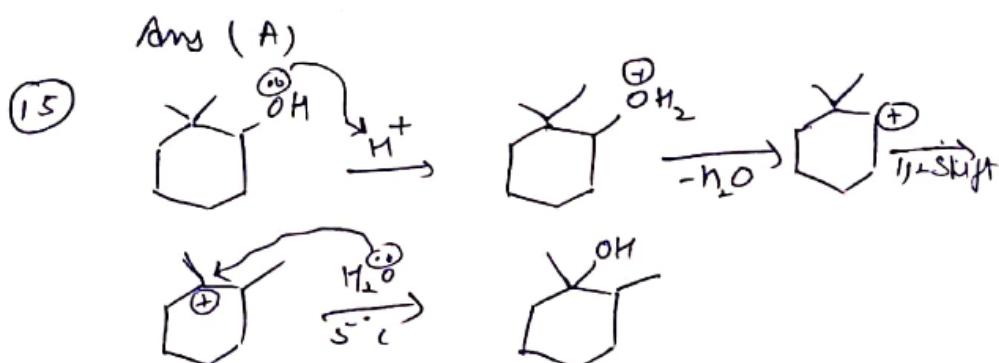
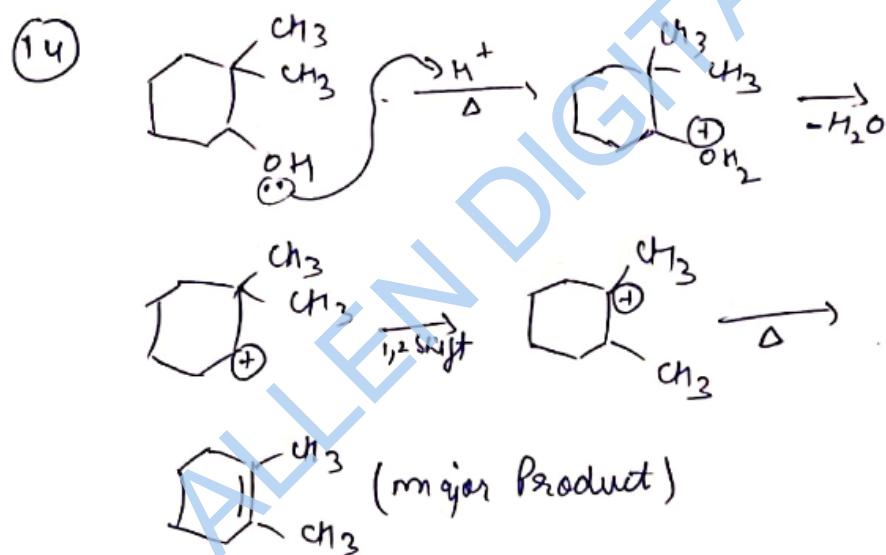
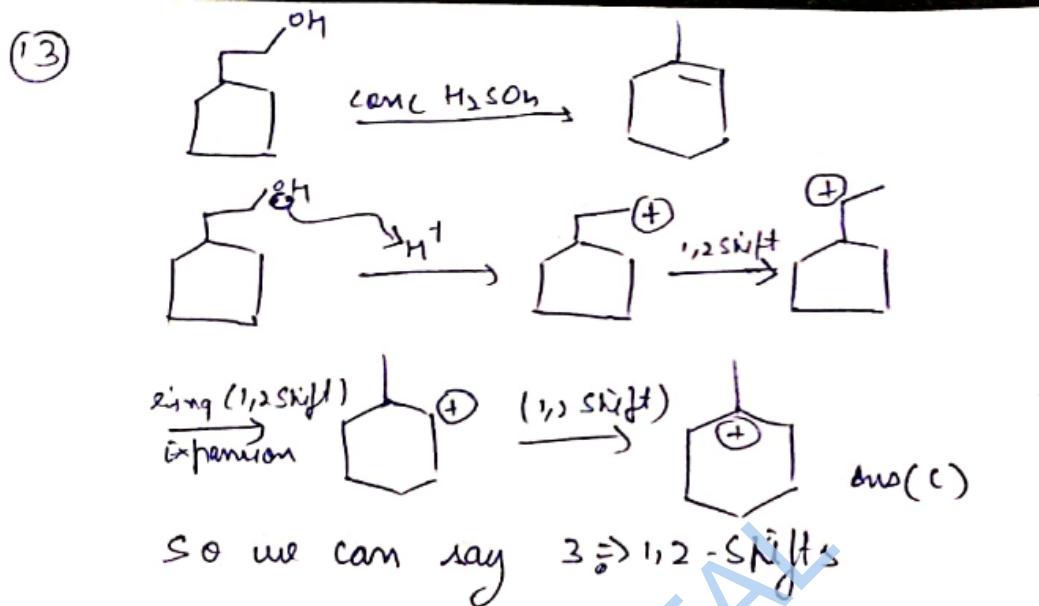


$\Delta \text{Br}$  Brønse cycle Propane

(I) is having higher dipole moment due to formation of complete Positive chargl.  
Ans (C)

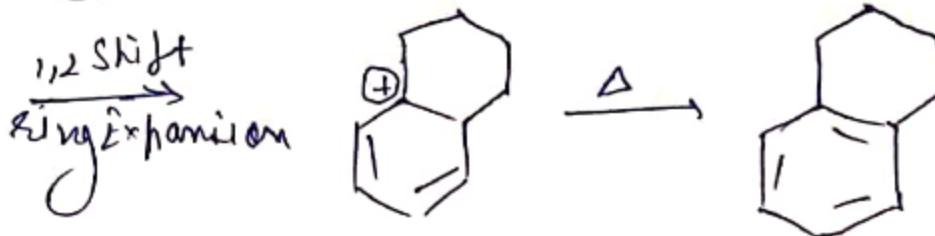
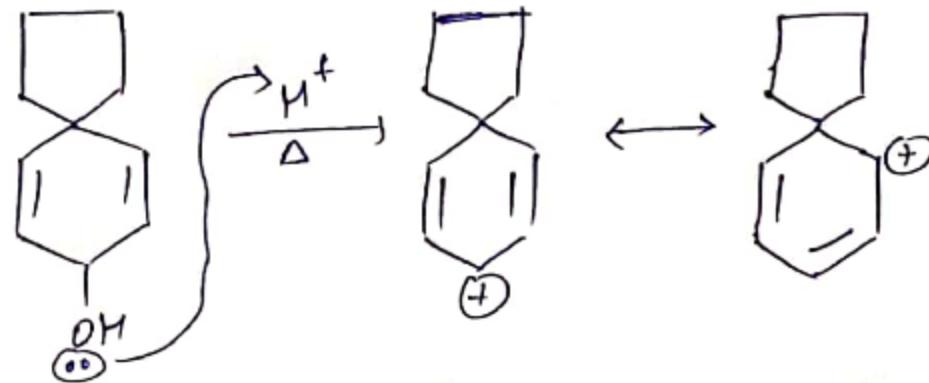
(12) Ramification occurs when carbocation is formed as an intermediate

Ans (C)



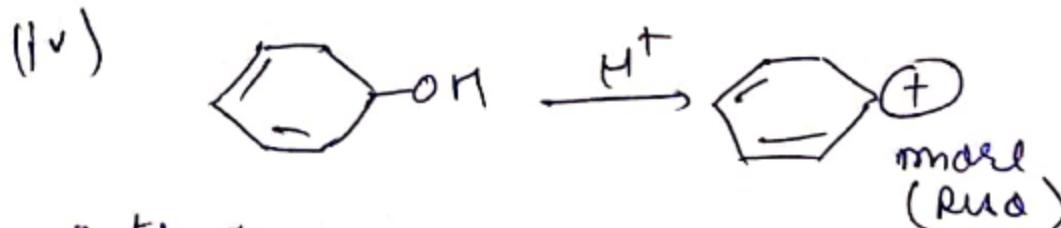
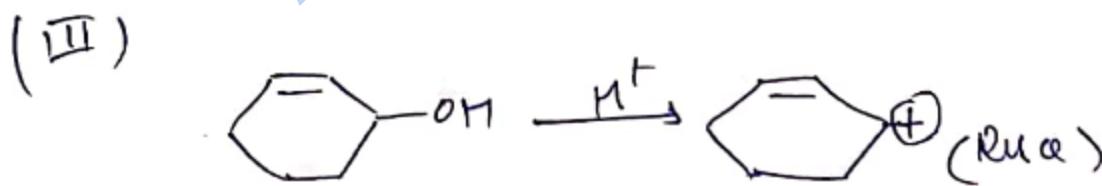
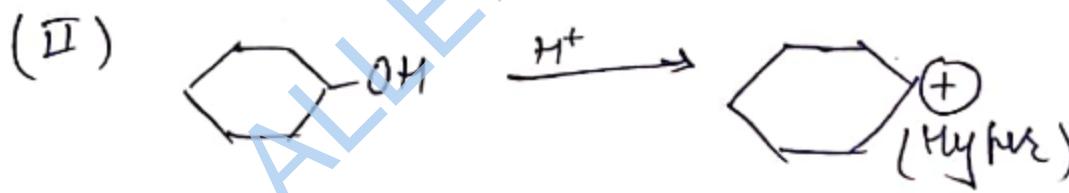
No elimination as heat is not given  
Ans (D)

(16)

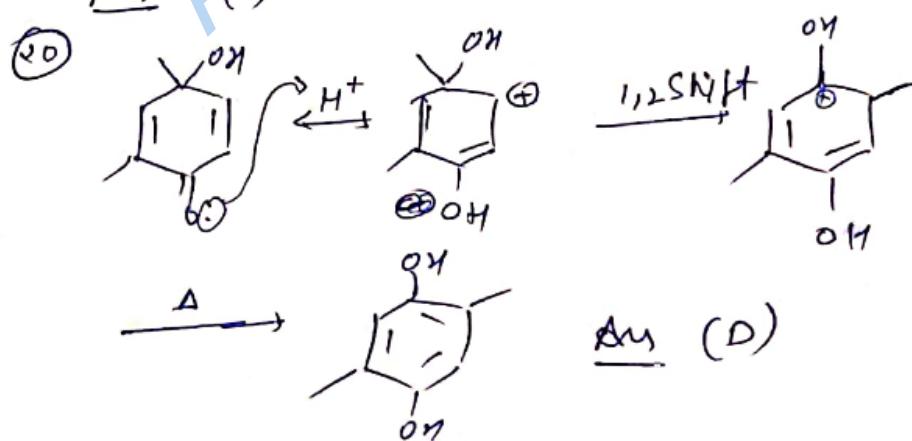
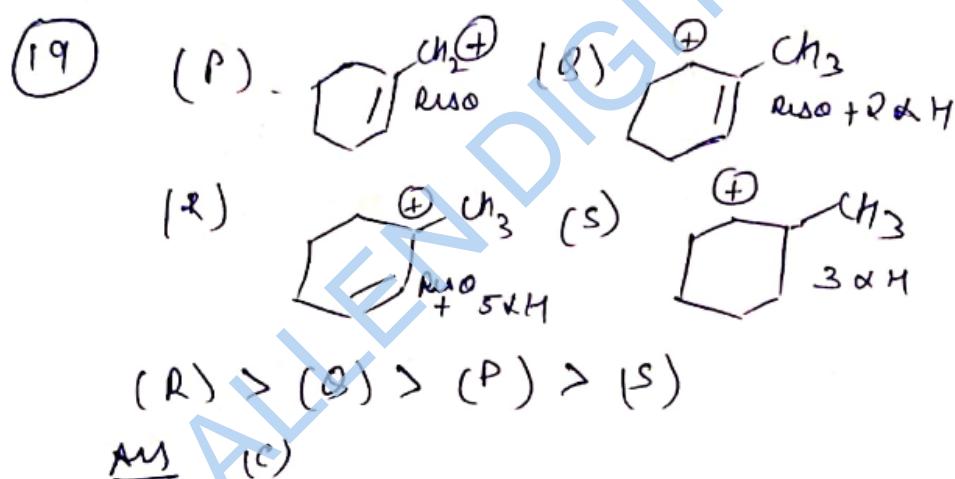
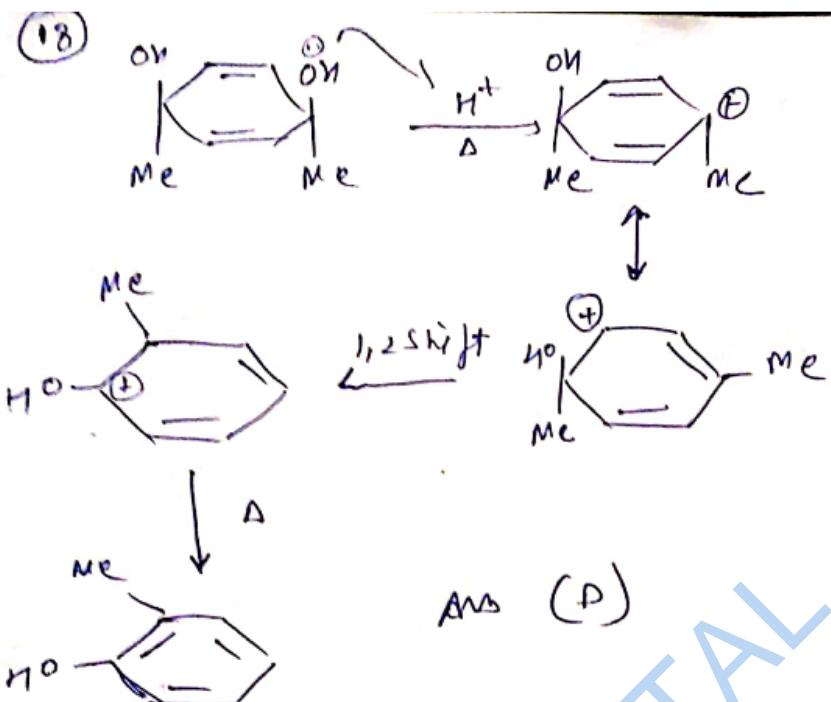


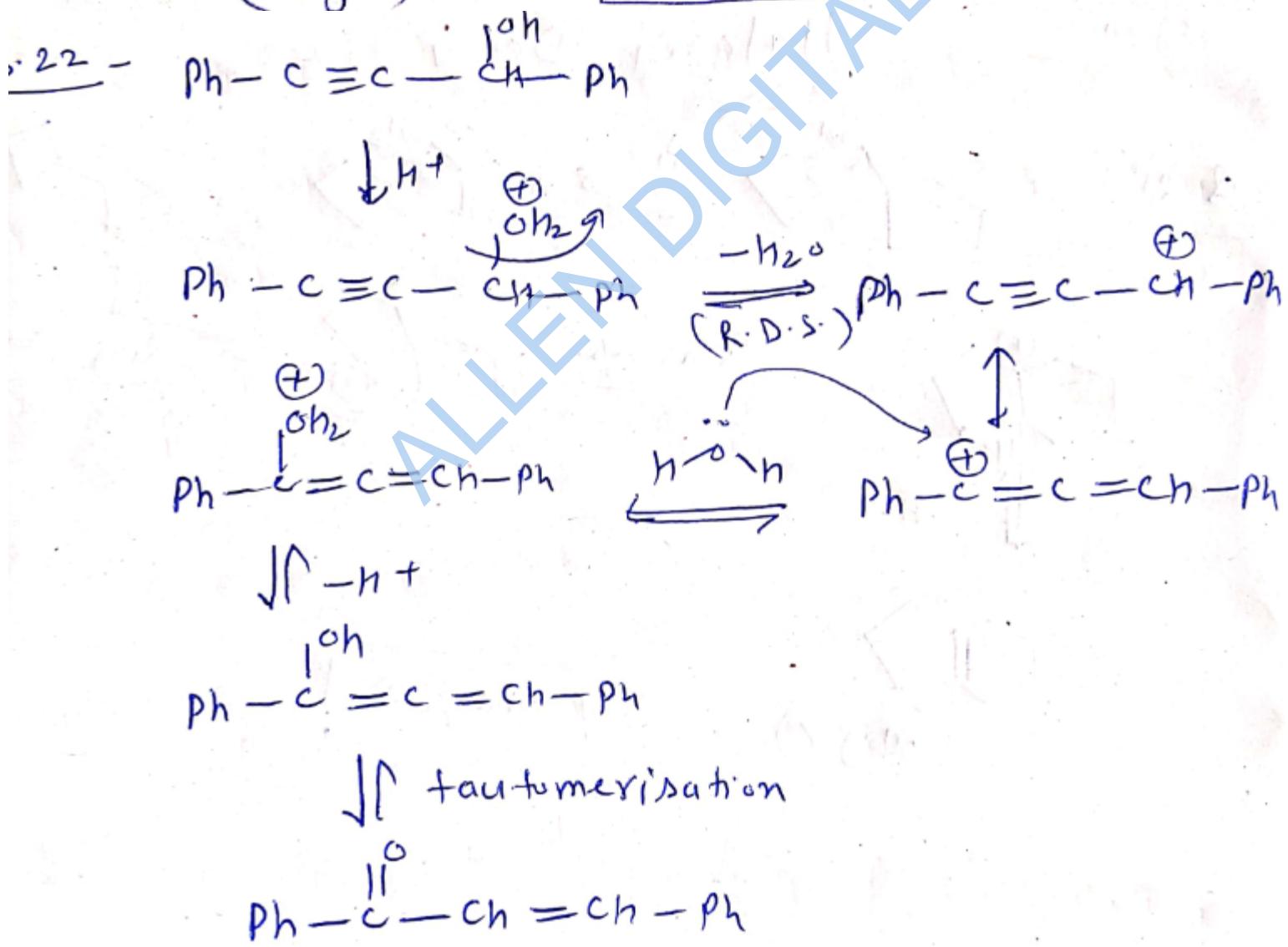
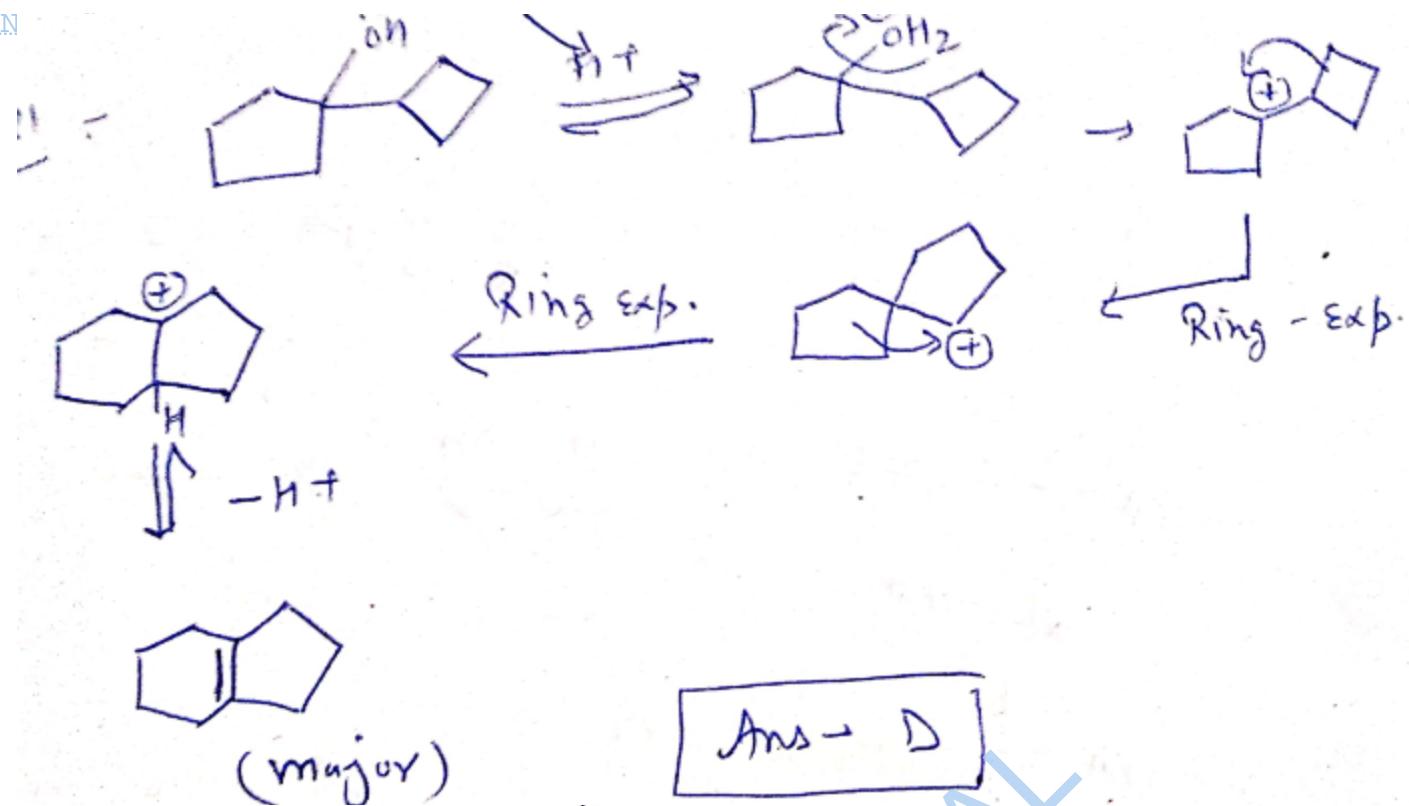
Ans (B)

(17) Correct Order of Dehydration

rate  $\Rightarrow$  IV > III > II > I

Ans (A)



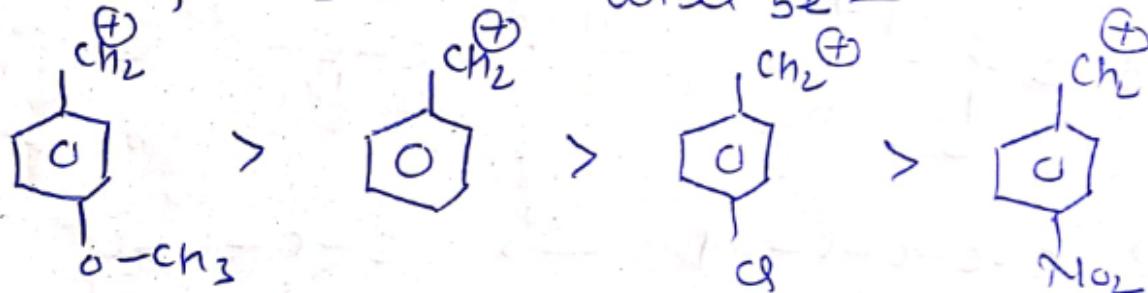


Ans → A

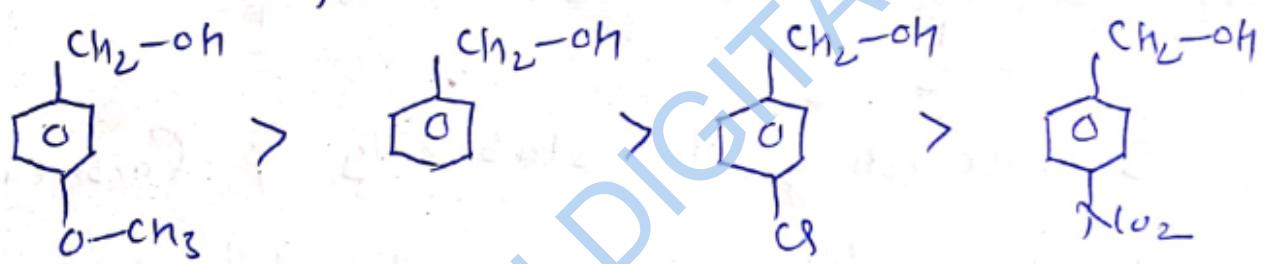
23 - given reaction is an example of SN<sub>1</sub>.

So Rate of SN<sub>1</sub> & Stability of formed Int Carbocation.

Stability of Carbocation will be -

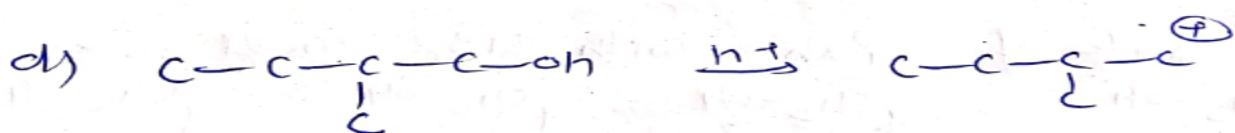
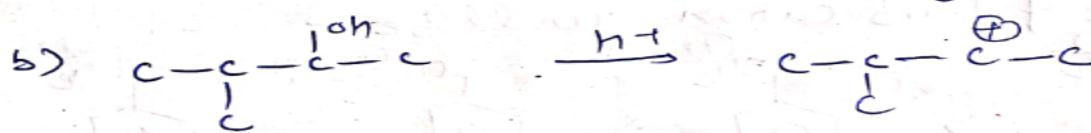
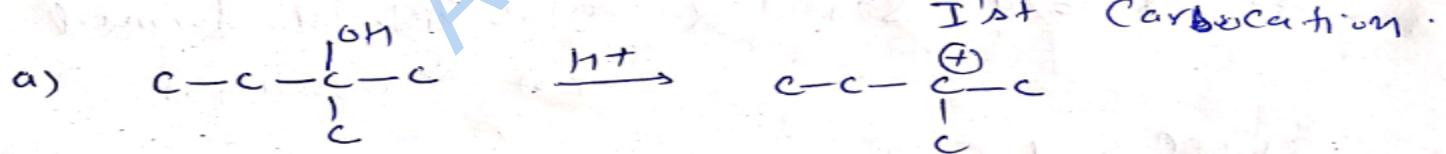


So Rate of Rxn. with HBr will be -



Ans D

24 - Rate of dehydration & Stability of formed Int Carbocation.

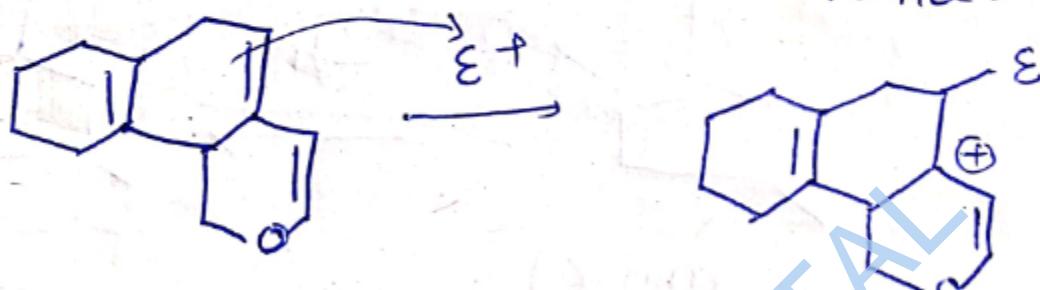


So according to stability of Carbocation

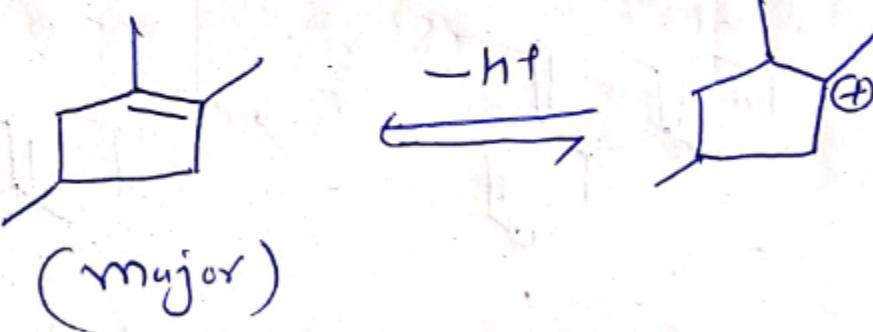
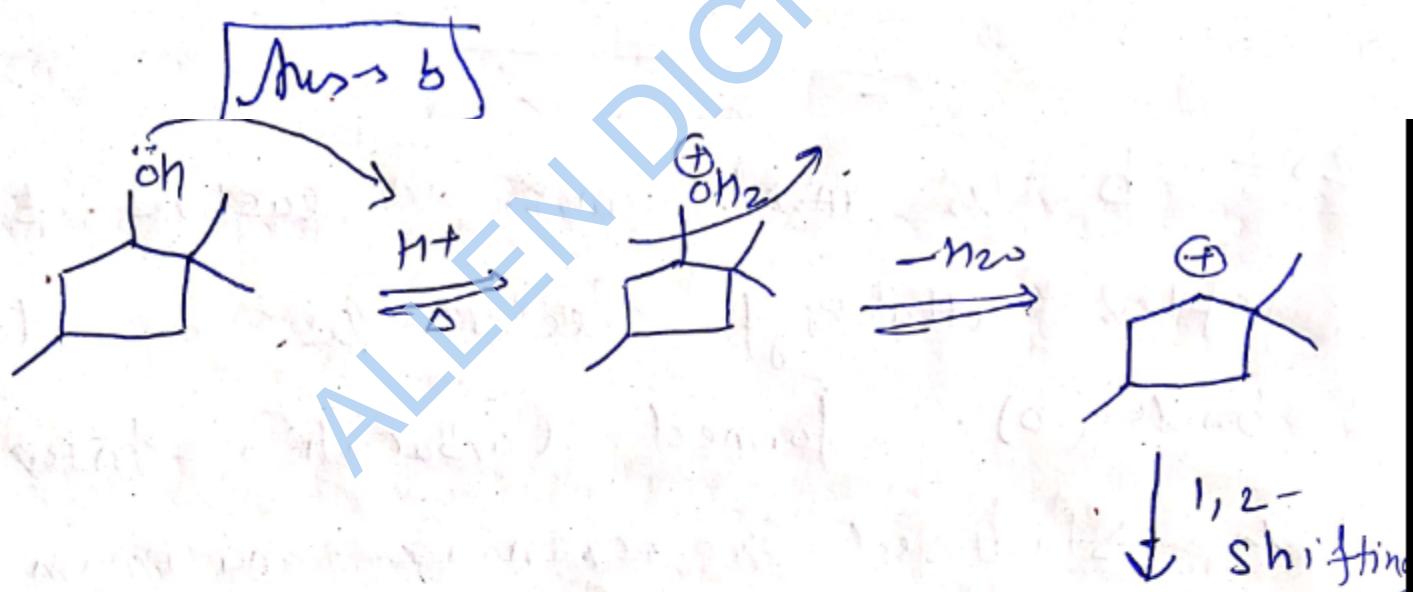
(a) give fastest rate of dehydration reaction.

Ans A

Q5 - "b" is ~~most~~ most reactive, because after attacking of electrophile on double bond (b). formed Carbocation intermediate is stabilised by ~~resonance~~ maximum Reso-



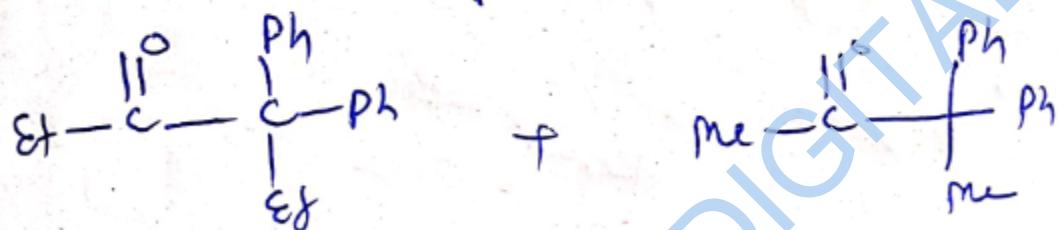
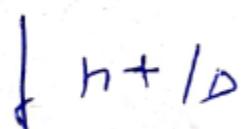
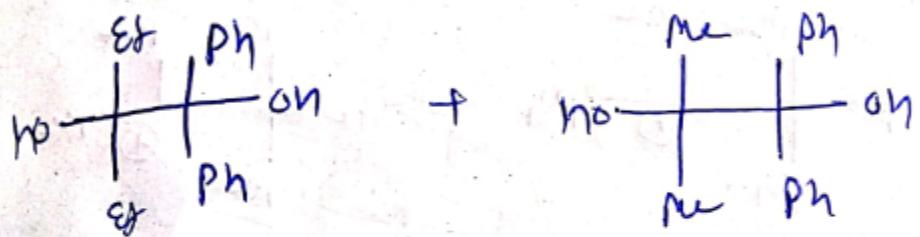
Resonance -



So Ans - C

Q7- Pinacol - Pinacolone Reaction is an example of intramolecular reaction.

So in given reaction only two product(s) are formed.

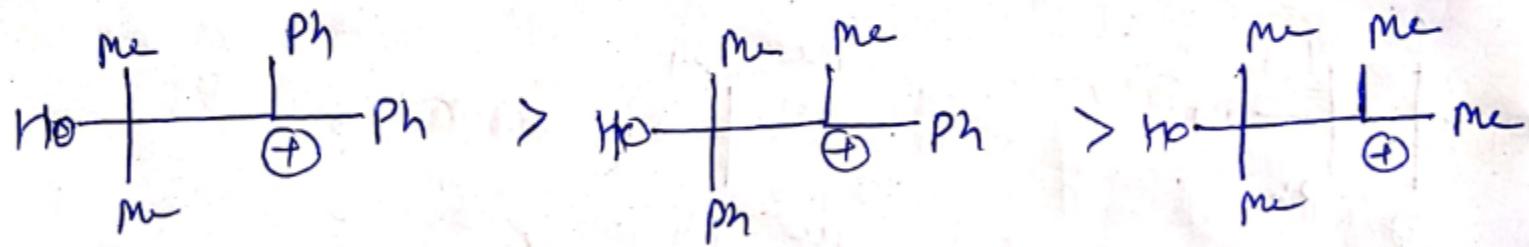


Miss b

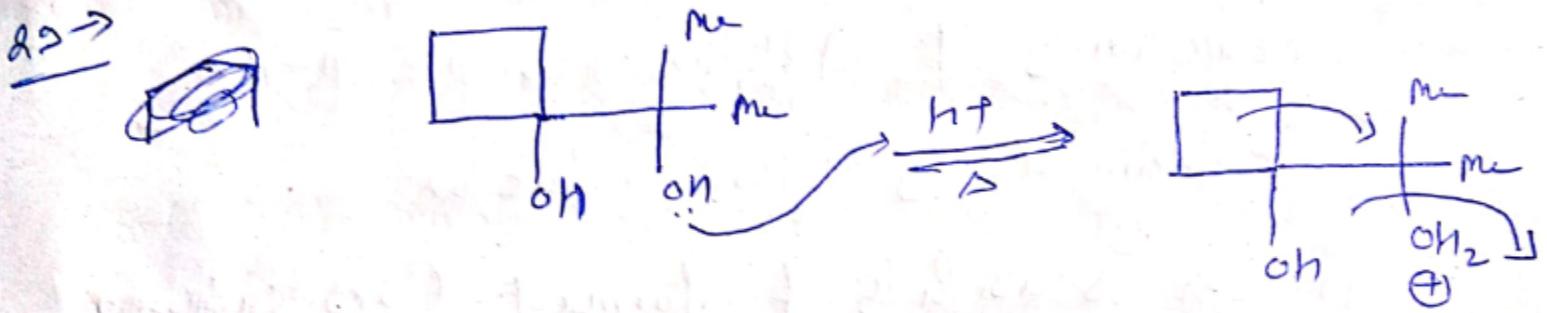
28- Rate of PinaCol-PinaColone or Rearrangement formed

## Carbocation

So Stability of Carbocation ~~is~~ is -



So Ans  $\rightarrow$  C }



30 Reactivity of Alkene with  $H-Br$ .

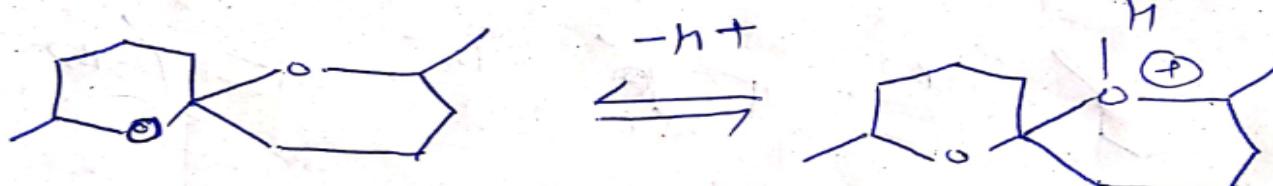
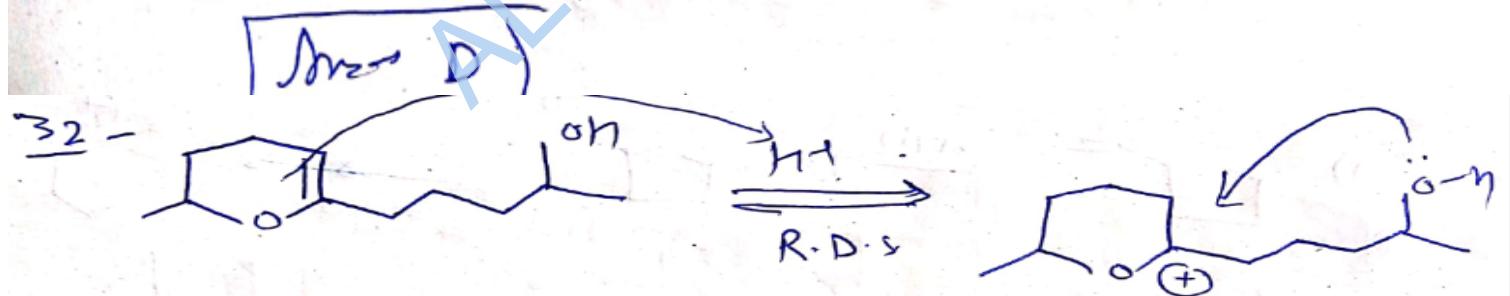
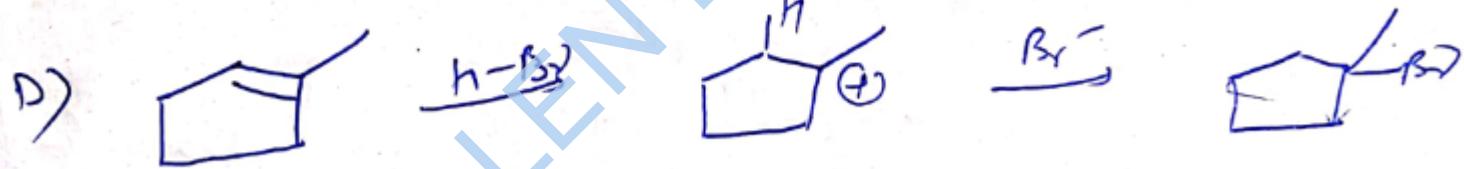
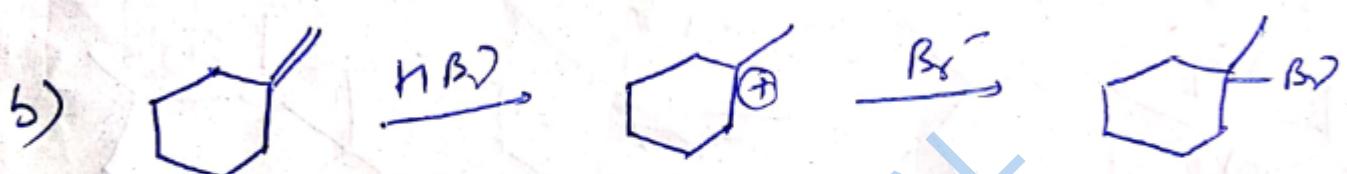
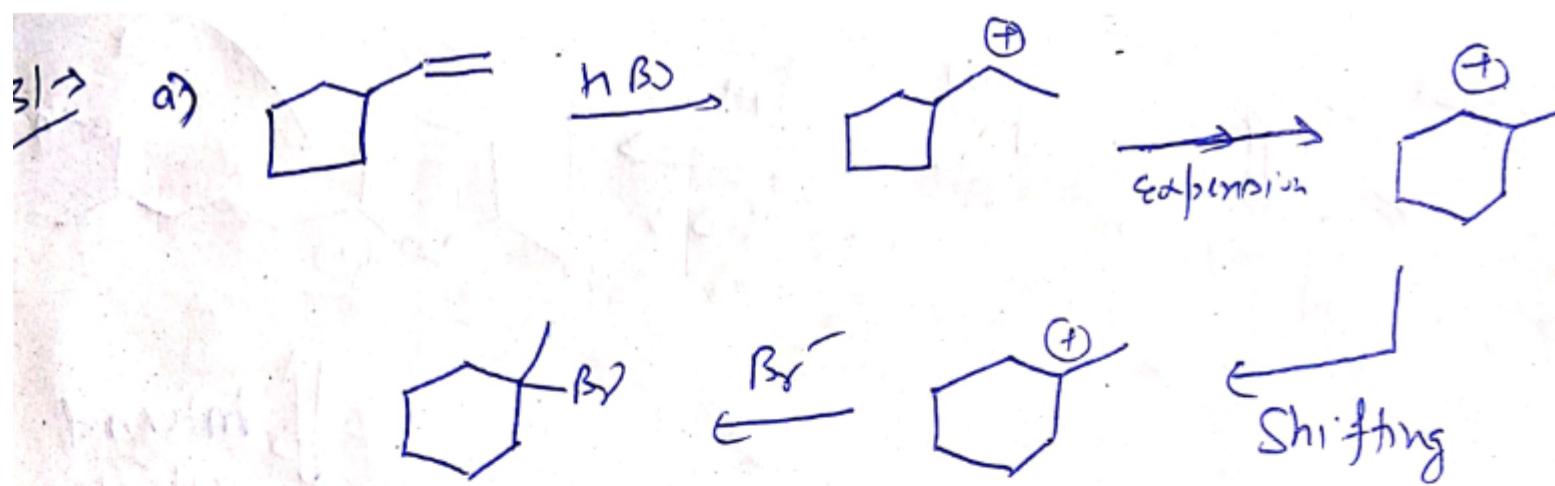
Explained by two factors.

- 1) by stability of formed Carbocation
- 2) by nucleophilicity of Alkene

By both concept reactivity will be -



Ans - b



Ans = 5

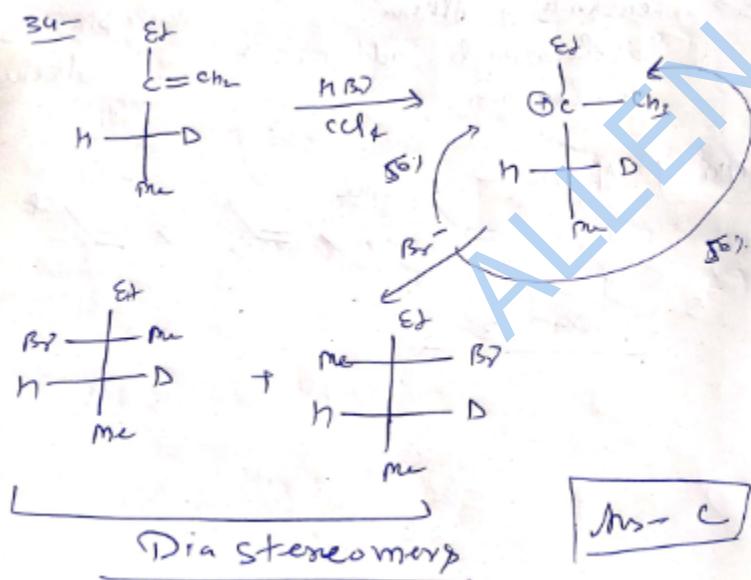
33 → Reactivity of Alkene  
for Electrophilic addition &  
Reaction

Nucleophilicity  
of Alken

Mu<sup>-</sup> of Alkene -

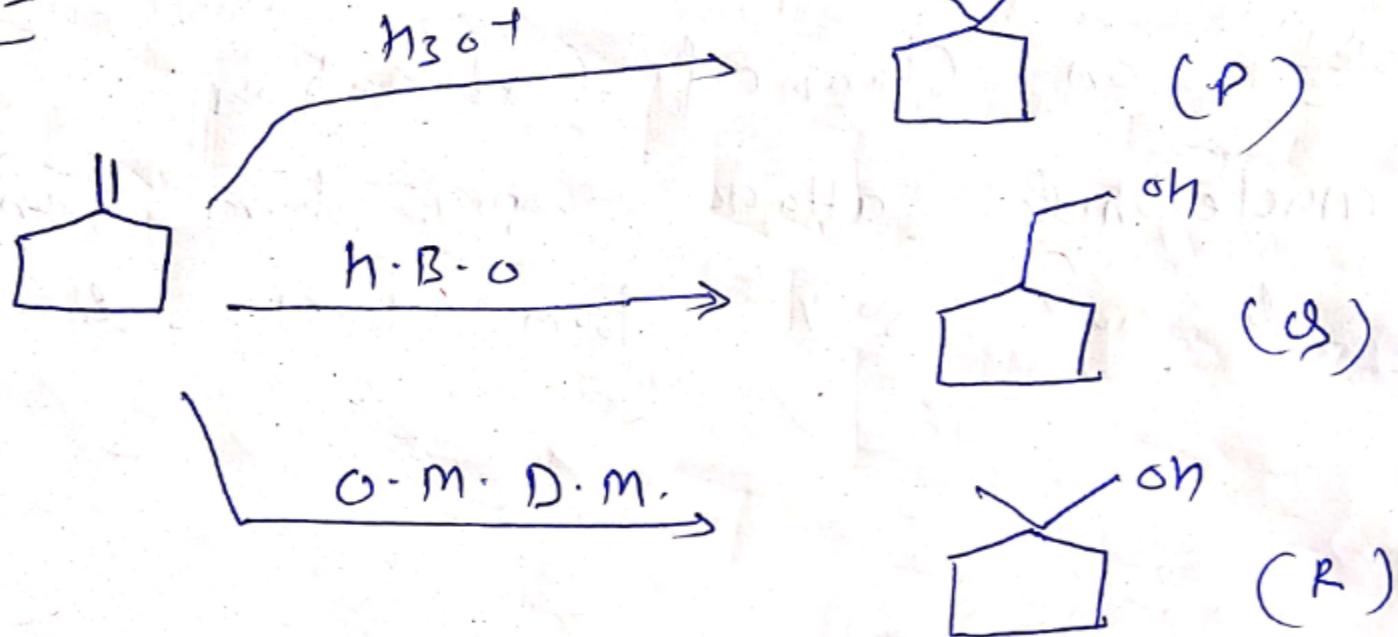


So  $\Delta \mu \rightarrow \delta$



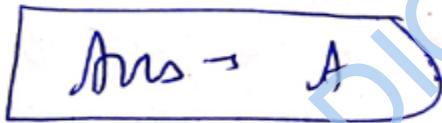
Note:- on Classical Carbocation  
nucleophile attack 50% from front  
side and 50% from back side.

35-

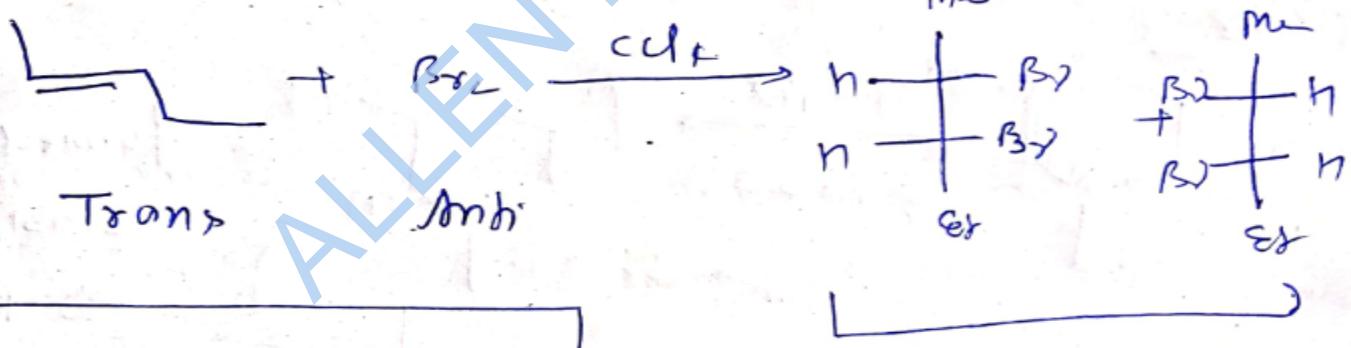


P & R are same

So



36-



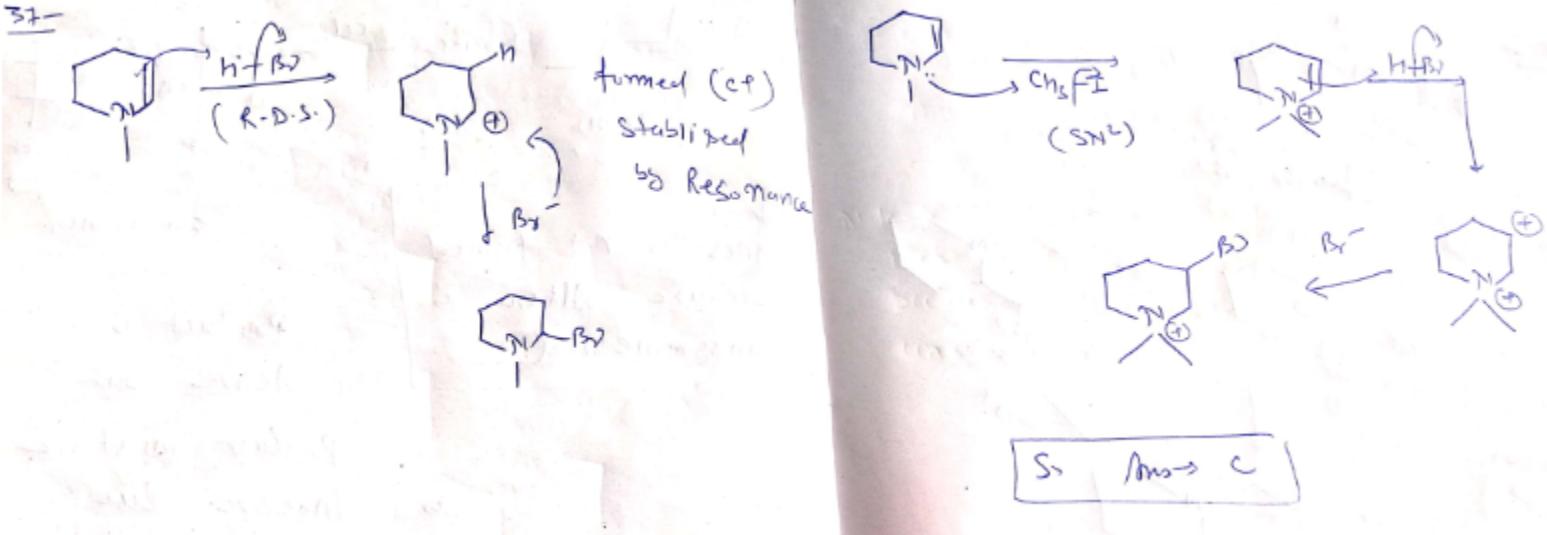
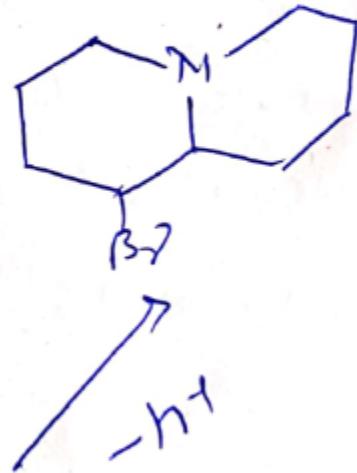
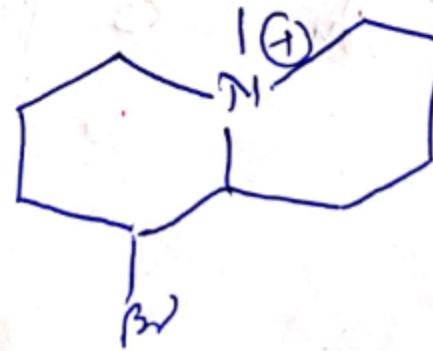
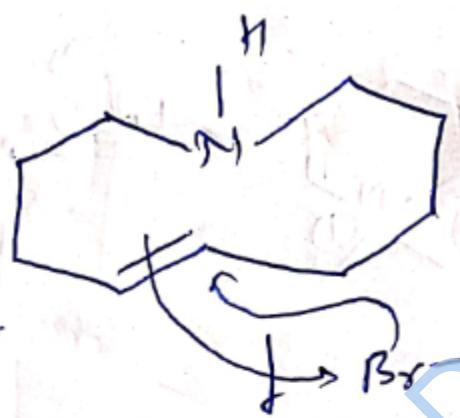
Note →

Meso is not formed because alkene is unsymmetrical.

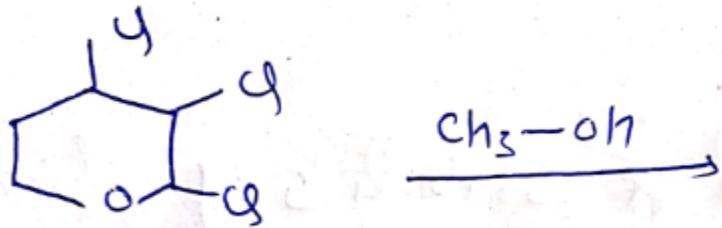
Product is Active but

Product mixture is inactive due to racimisation.

$\text{Ans} \rightarrow \text{A}$

38 $\boxed{\text{Ans} \rightarrow \text{D}}$

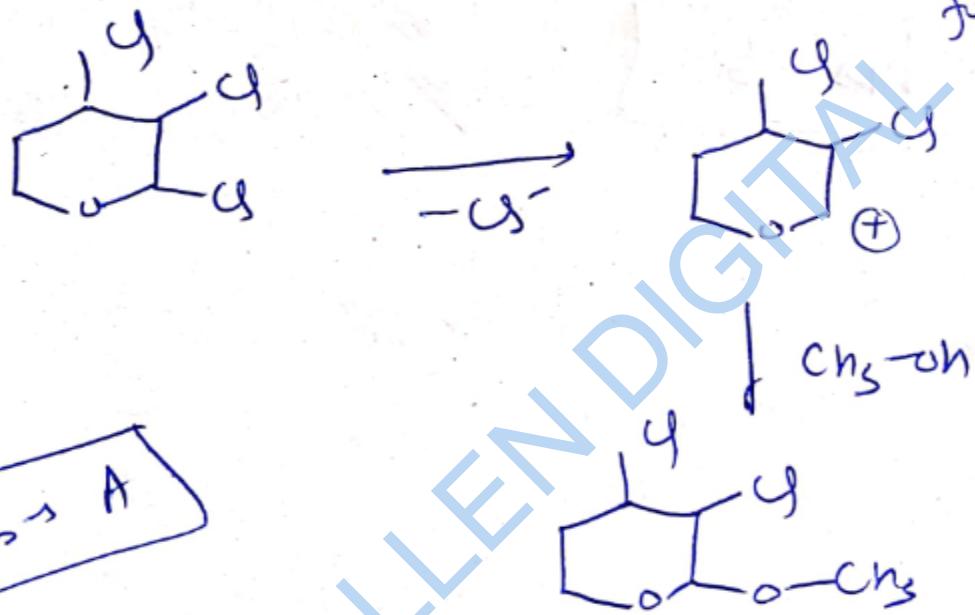
39-



Weak Nucleophile ~~as well as~~ Polar - Protic Solvent ( $\text{CH}_3\text{-OH}$ ) both favor  $\text{S}_{\text{N}}^{\text{I}}$  Rxn.

and  $\text{S}_{\text{N}}^{\text{I}}$  Reaction rate & Stability of

formed Carb - Cation.



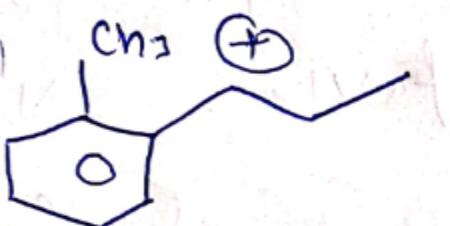
Ans - A

40-

Rate of  $\text{S}_{\text{N}}^{\text{I}}$  & stability of formed Carbocation.

most stable Carb -

Cation.

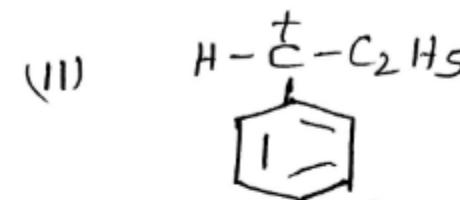


So Ans - b

Q (4) - The reactivity for hydrolysis  $\propto$  Stability of Carbocation.



Only Resonance

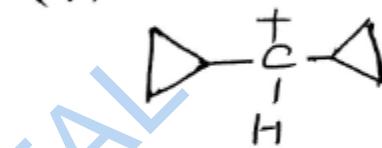


~~Not~~ Stable due to Resonance and Ion and Hyperconjugation



Least Stable

Antiaromatic

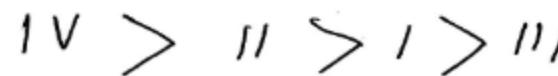


Most Stable  
Due to Delocalization Resonance

So, Decreasing order of Stability  $\approx$



So, Decreasing order of Reactivity



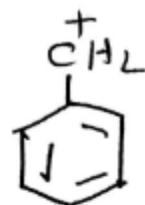
Ans - [B]

Q (42) -

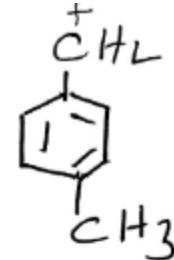
Reactivity towards  $S_N^1 \propto$  Stability of Carbocation

Stability of Carbocation  $\propto +R/+I/-I$

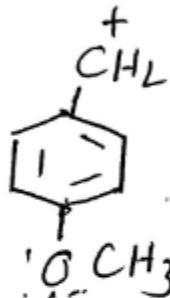
[A]



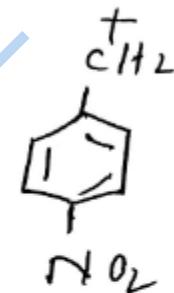
[B]



[C]



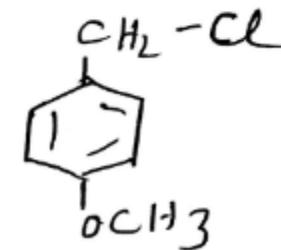
[D]



Most Stable  
due to  $+R$   
of  $\ddot{O}-CH_3$

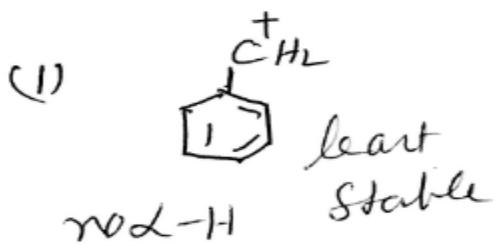
Least Stable  
due to  $-R$   
of  $-NO_2$

So, Most Reactive is

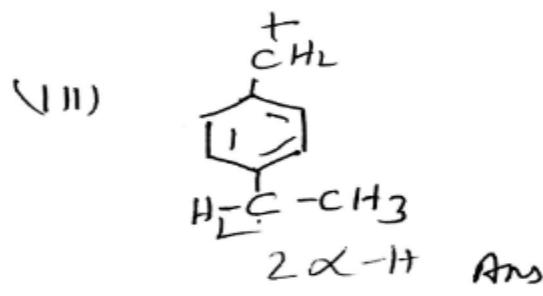
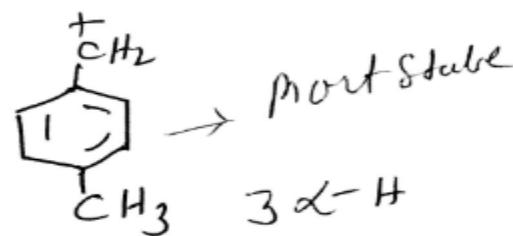


Ans : [C]

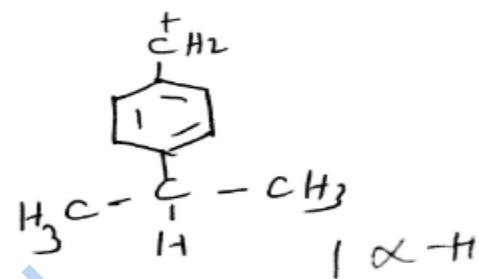
Q (43) - Rate of  $S_N^1$  & stability of Carbocation



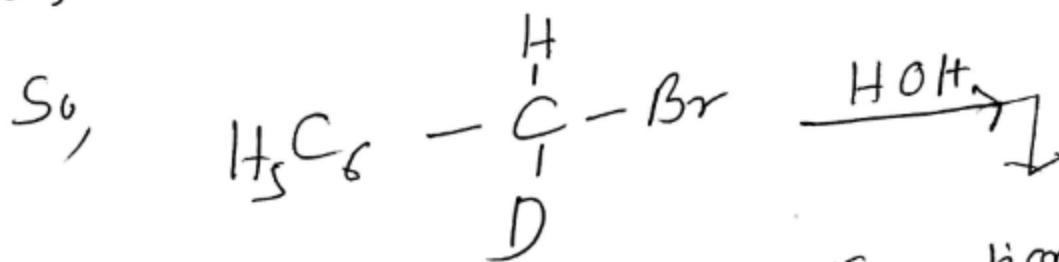
(II)



(IV)



Q (44). Treatment with  $H O H$  proceeds via  $S_N^1$  and ~~Carb~~ Carbocation is formed as intermediate, so the attacking reagent attack over ~~Carb~~ +ive charge (Planer) carbon from both the side ~~eg~~ and gives Enantiomeric Pair is compound has at least one chiral center.

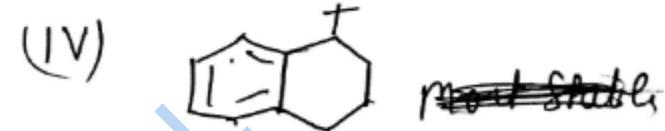
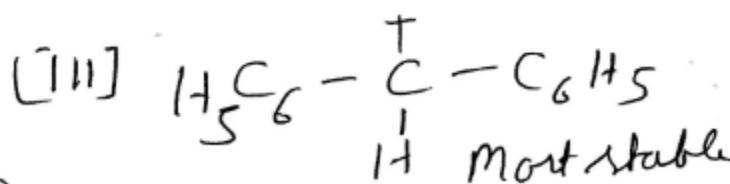
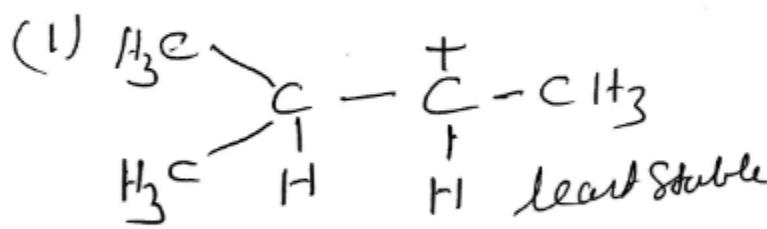


Enantiomeric  
Pair

Ans -  $[-C]$

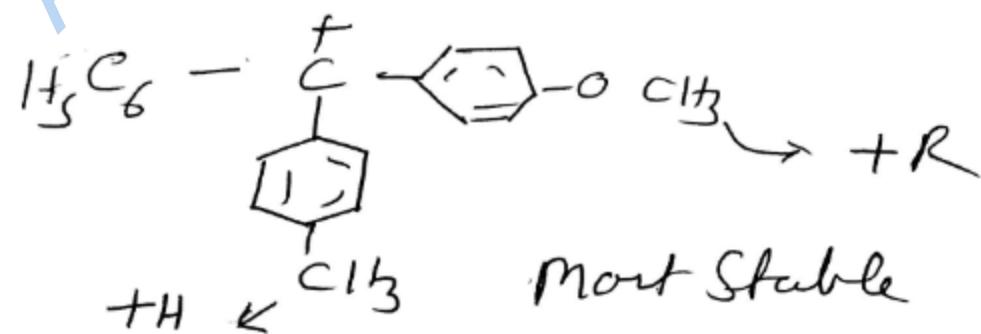
Q [45]

Reactivity towards Solvolysis in aqueous medium & Stability of Carbocation



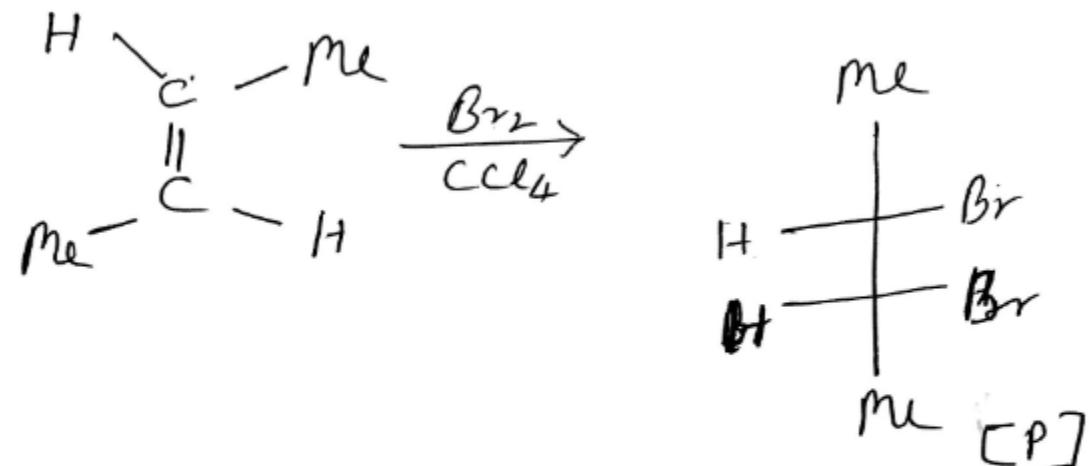
Decreasing order of stability -  $\text{III} > \text{IV} > \text{II} > \text{I}$  [Ans -  $\text{[A}^-\text{]}$ ]

Q  $\Rightarrow$  (46) - Most stable Carbocation gives maximum Racemisation if they have three different valencies.



Ans -  $[\text{C}^-]$

$\Rightarrow$  (47)-



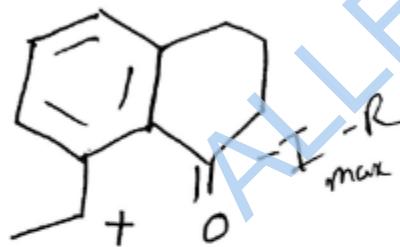
[(P)] have ~~three~~ three optical Isomers.

Ans  $\rightarrow$  [D]

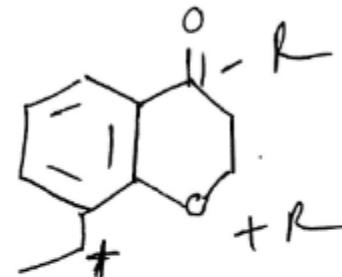
- (i) Meso
- (ii) POS is present

Q(48). Ease of Hydrolysis of Alkyl halide  
*↳ Stability of Carbocation*

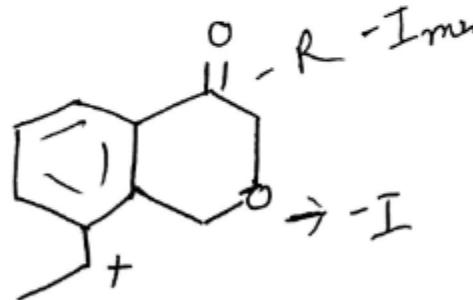
(I)



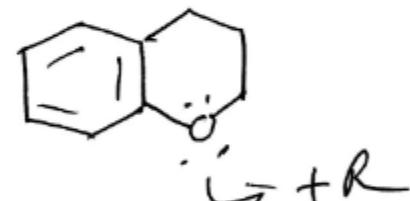
(III)



(III)



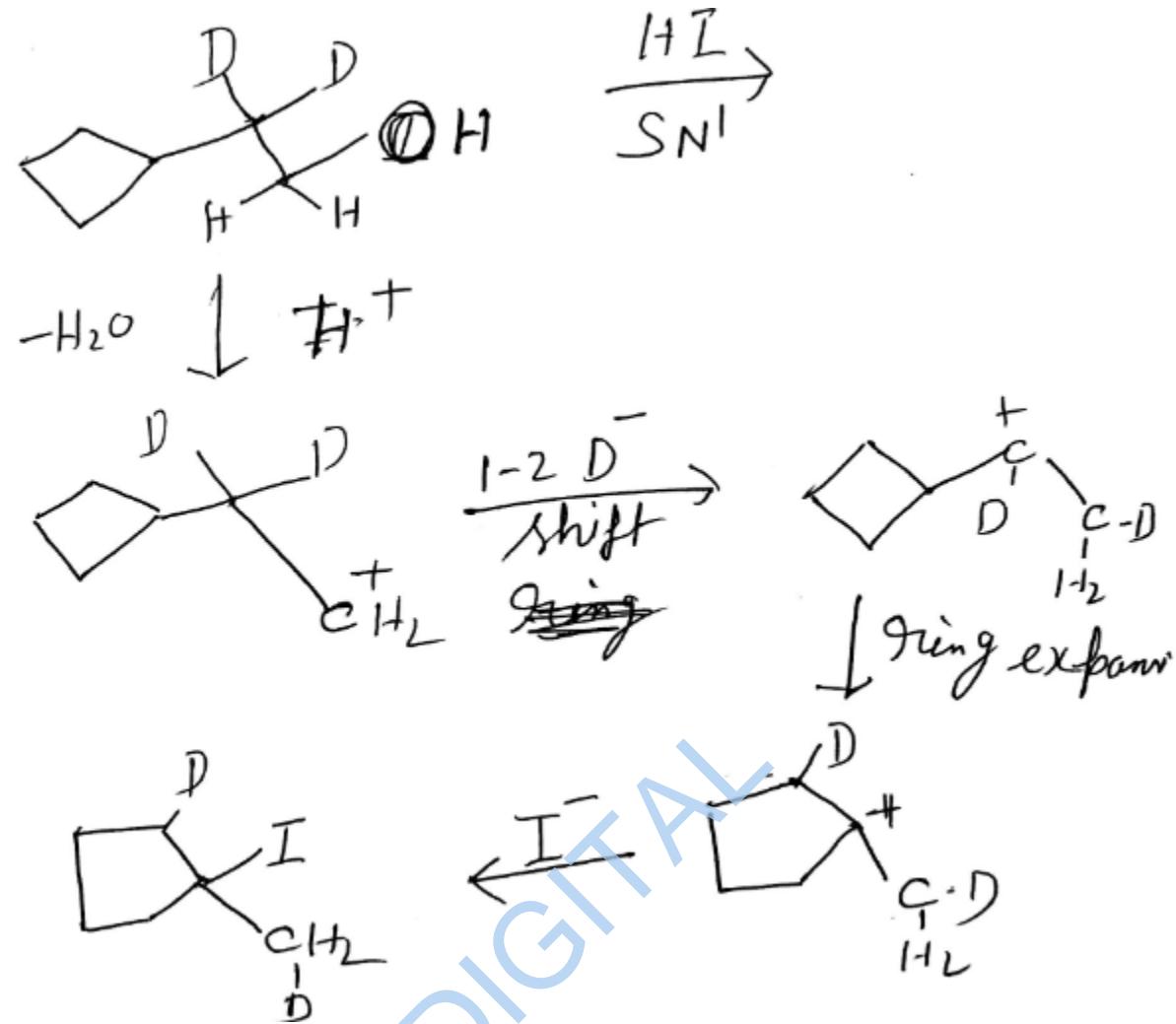
(IV)



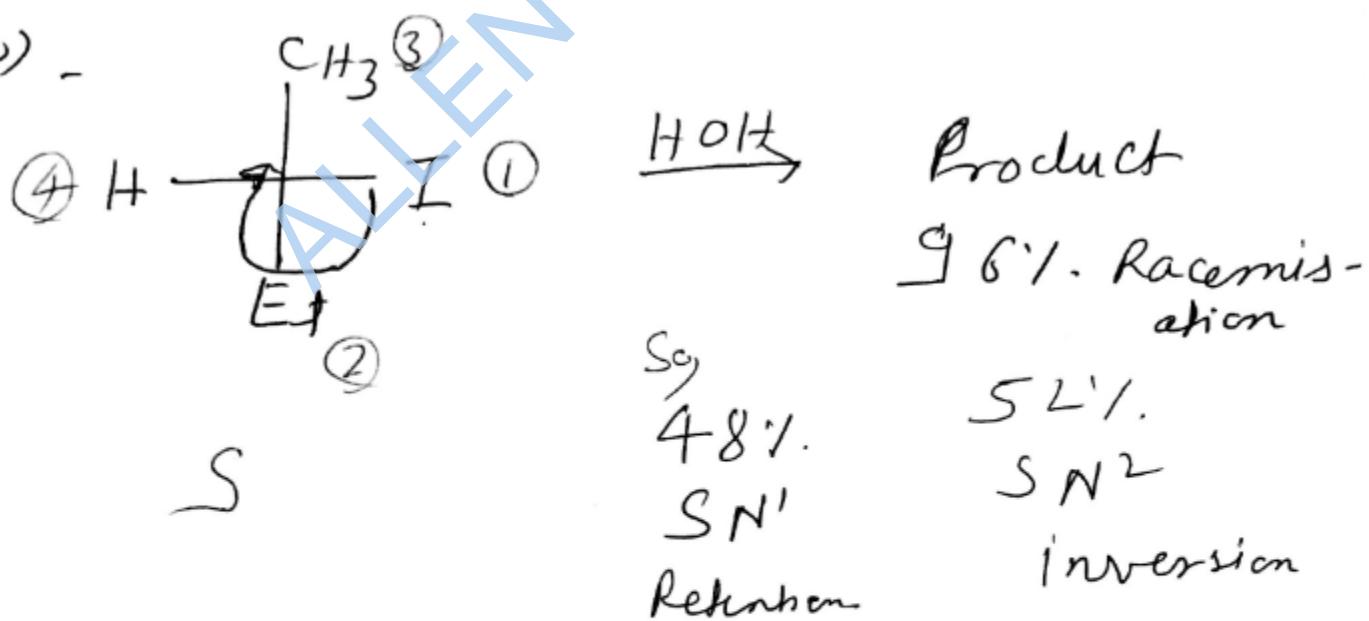
So, IV > II > III > I

Ans - D .

ALL

Q (49) -

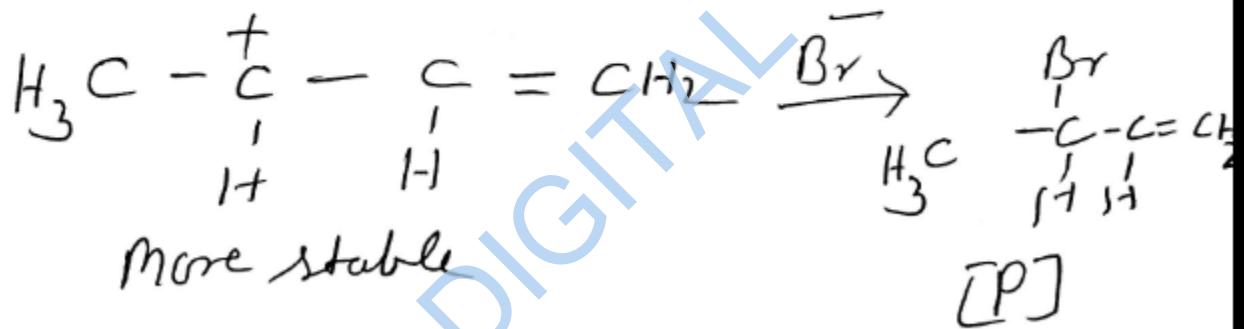
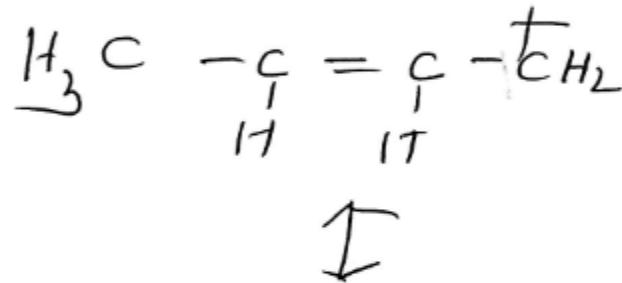
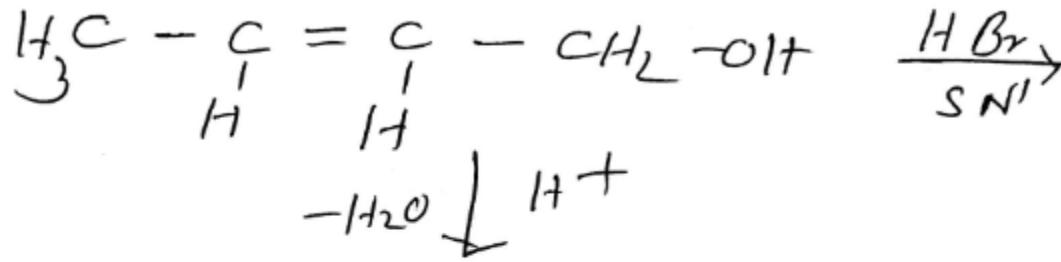
Ans - [B]

Q (50) -

So, Among the Product 48% S configuration and 52% R , ,

Ans - [C]

Q [51].

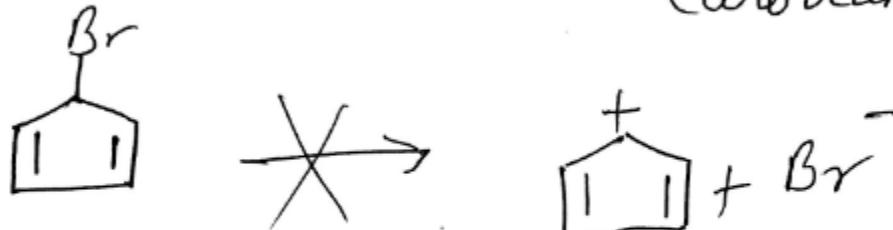


Ans - [B]

1537

# ~~Reactivity towards SN1 & Stability of Carbocation~~

[C]

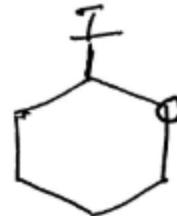


least stable  
(Anti Aromatic)

Ans - [c]

Q - [53] -

(A)



is most reactive  
towards  $S_N^1$

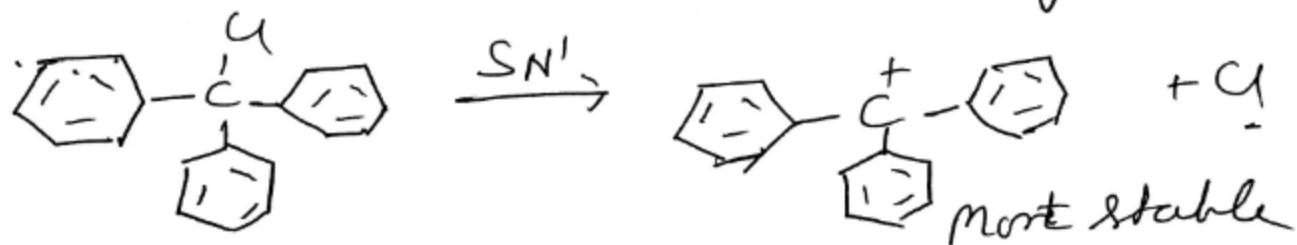
Because  $I^-$  is better leaving group

So easily gives Carbocation and  
that is more stable due  
to resonance ( $\beta\pi-\beta\pi$ )  
or backbonding.

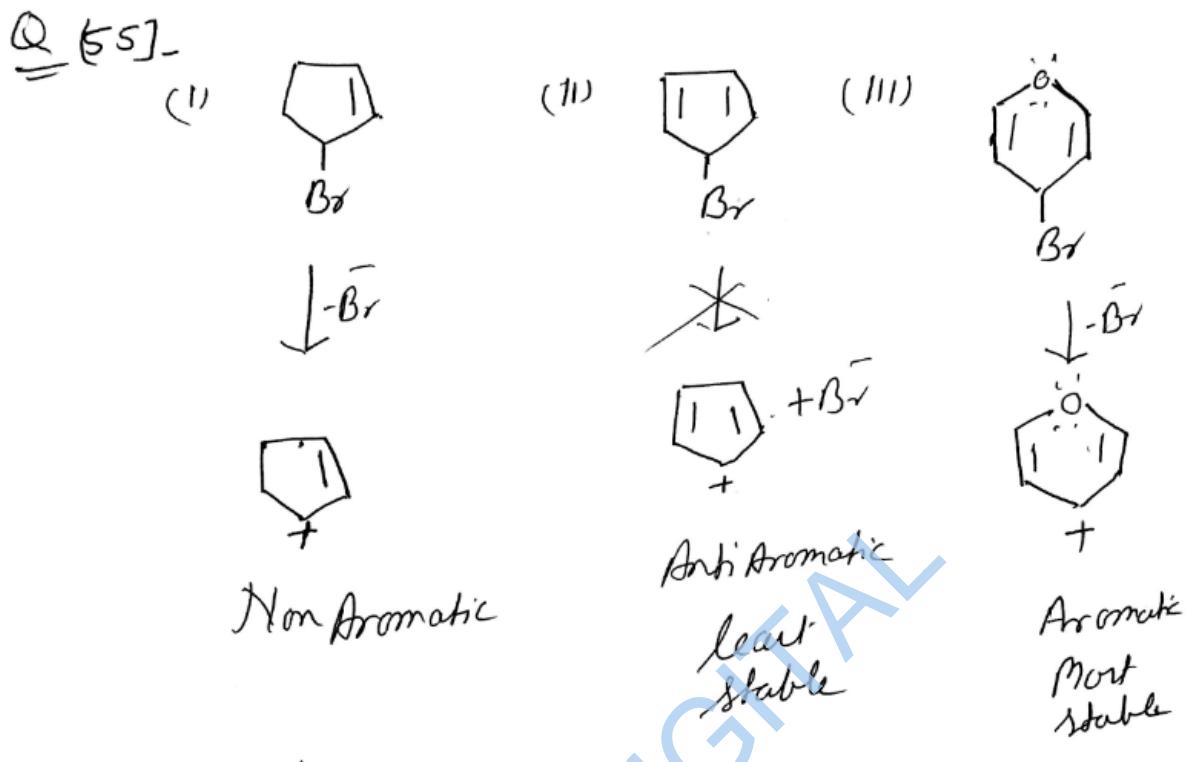


Ans - [A]

Q - [54] - Reactivity towards  $S_N^1$  & Stability  
of Carbocation



Ans - [C]

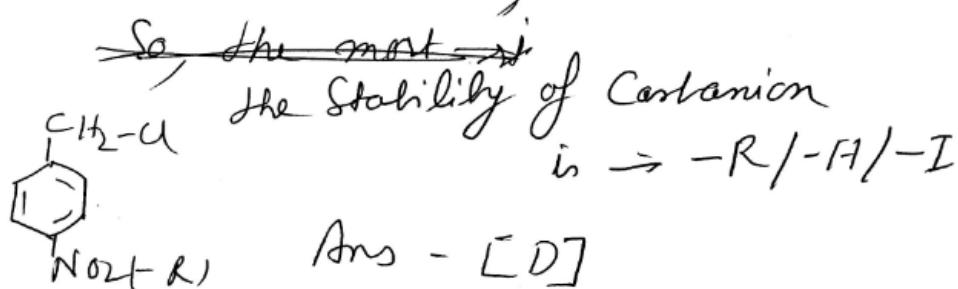


Order of Reactivity towards  $S_N^2$  & Stability of C+



Ans - [A]

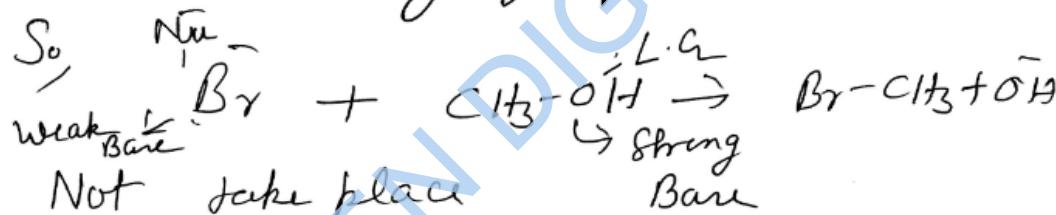
Q-56. In  $S_N^2$  the reaction Intermediate is Transition state, that has partial Carbanion character,



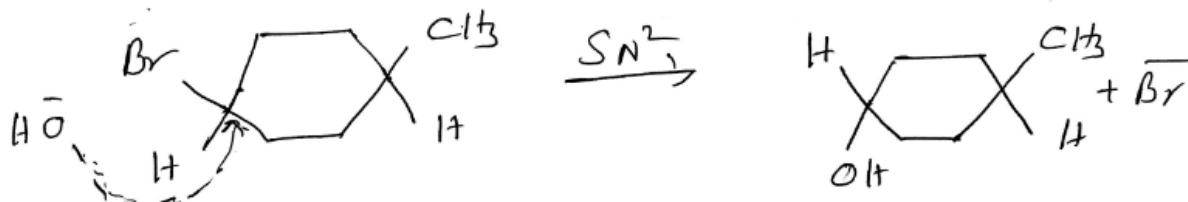
Q(57).Rate of  $\text{S}_{\text{N}}^2$  For  $\text{S}_{\text{N}}^2$ 

$$\text{Rate} = k[\text{CH}_3\text{Br}][\text{OH}^-]$$

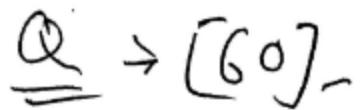
Ans - [C]

Q(58). $\text{S}_{\text{N}}$  reaction takes placewhen Nucleophile is more basic  
than Leaving group.

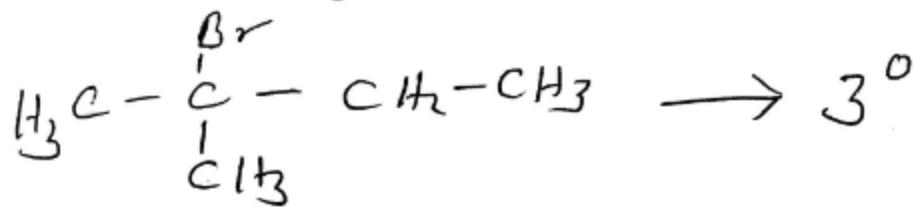
Ans : [B]

Q(59). In  $\text{S}_{\text{N}}^2$  Nucleophile approach  
from the back side over Carbon

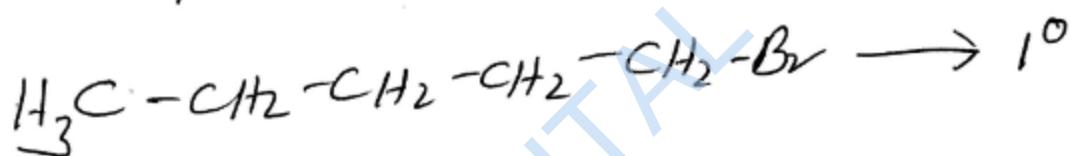
Ans - [B]



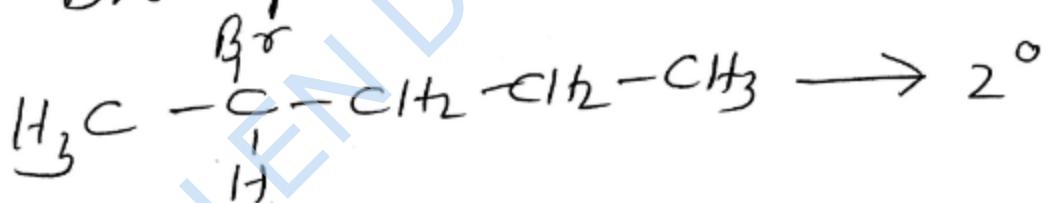
(I) 2-Bromo-2-methyl Butane



(II) 1-Bromopentane-



(III) 2-Bromopentane



Reactivity order of Alkyl halide

towards  $\text{S}N^2 \rightarrow 1^\circ > 2^\circ > 3^\circ$

~~S<sub>N</sub>2~~,  $1^\circ > 2^\circ > 3^\circ$

Ans - [C]

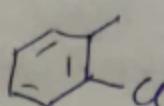
(61)

By  $S_N2$  Mechanism inverted product obtain.  
and  $S_N1$  gives both retention and inversion.

C is correct ans.

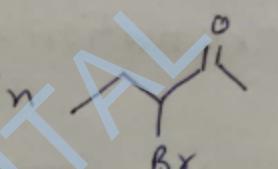
(62)

Due to partial double bond character

Substitution in  is most difficult.

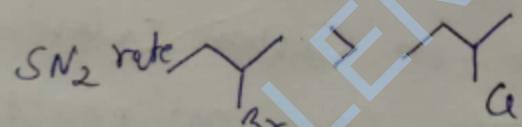
D is correct

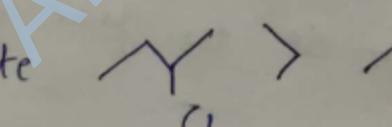
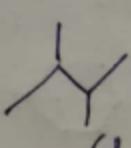
(63)

$S_N2$  rate is maximum in  or

Compare to other option due to most stable

Transition state.

$S_N2$  rate  due to leaving group.

$S_N2$  rate  >  due to Steric factor

A is correct ans.

(64)

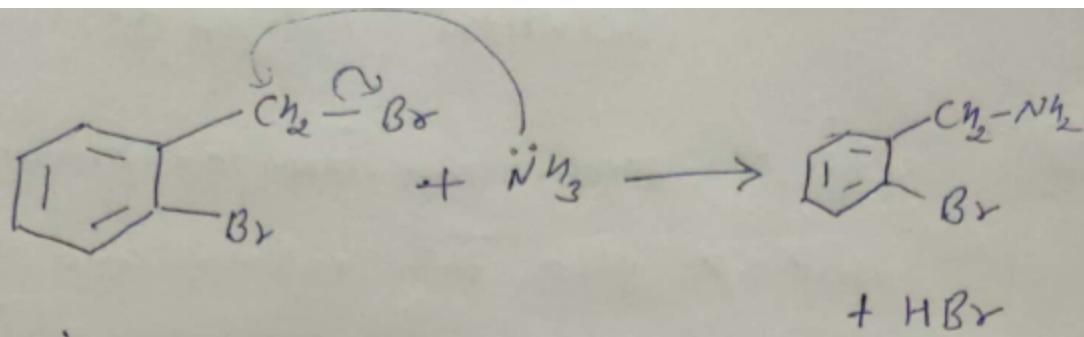
NaI in DMSO follow  $S_N2$  Mechanism

$S_N2$  rate of chloro benzyl is fast

as compare to other option.

B is correct ans.

(65)



(A) is correct Ans.

(66)

$\text{CH}_3-\text{O}-\text{CH}_2-\text{Br}$  can form better cation<sup>(SN1)</sup> or well as better transition state for  $(\text{SN}_2)$ . ~~transition state~~

(C) is correct Ans.

(67)

Chlorobenzene have partial double bond character in carbon chlorine bond. So  $\text{AgNO}_3$  can not react with  $\text{C}_6\text{H}_5\text{Cl}$  to give white ppt.

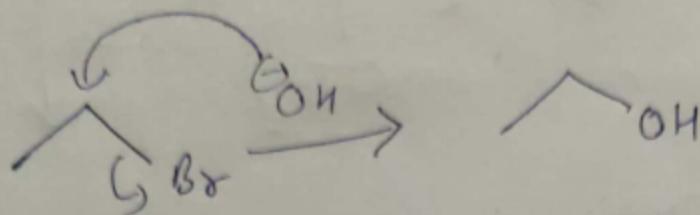
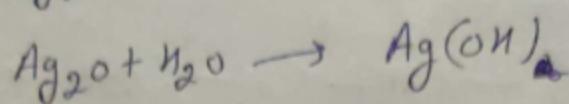
(D) is correct Ans.

(68)

Stability of leaving group is more stable if more delocalization of -ve charge of leaving group.

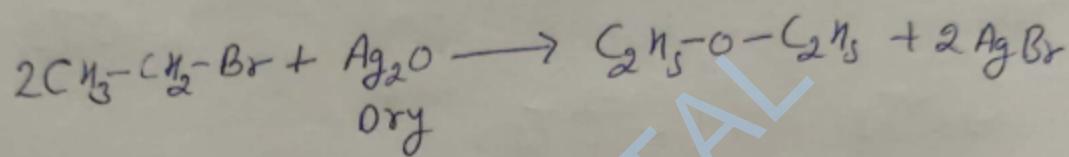
(B) is correct Ans.

(69)

Moist  $\text{Ag}_2\text{O}$  means  $\text{Ag}(\text{OH})$ 

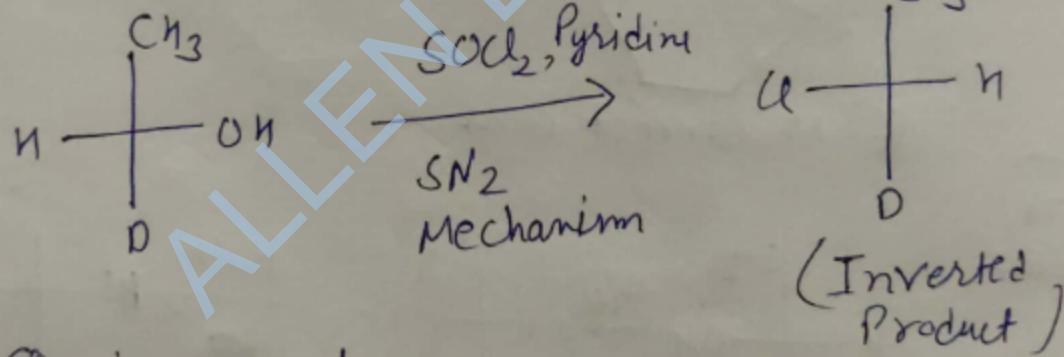
(B) is correct ans.

(70)



(C) is correct ans.

(71)



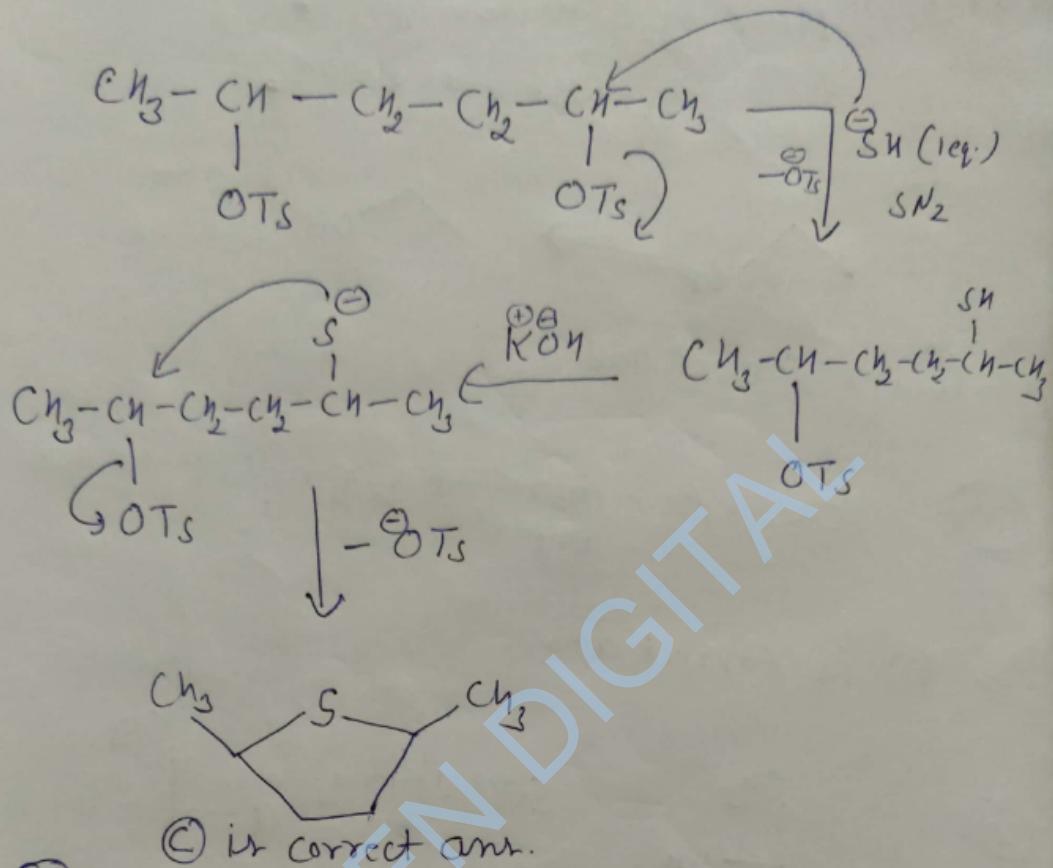
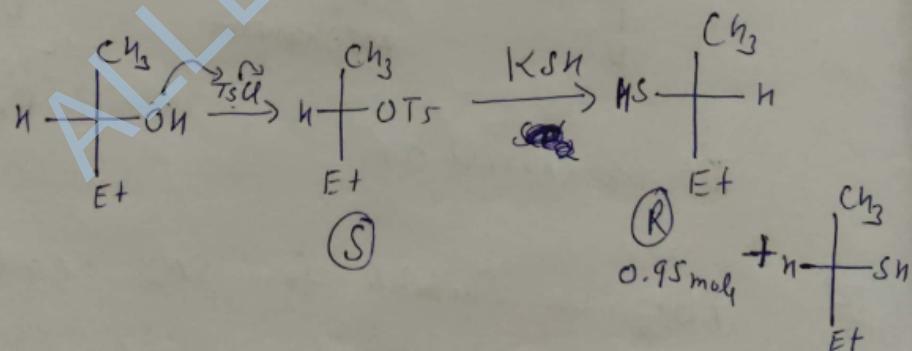
(B) is correct ans.

(72)

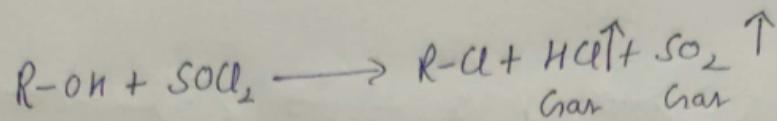
 $\text{PBr}_3$  is suitable for  $\text{S}_{\text{N}}2$  reactionIn given question, inversion ( $\text{S}_{\text{N}}2$ ) take place.

(C) is correct ans.

(73)

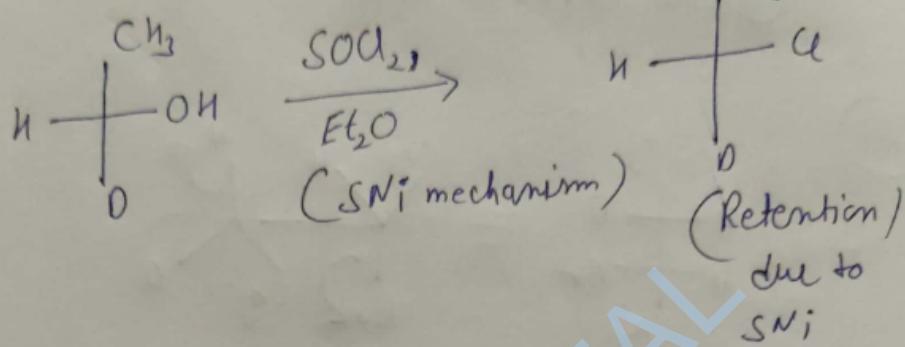
(74)Out of 0.95 mole 0.05 from  $\text{SN}_1$ Mechanism :  $\therefore$  0.90 mole from  $\text{SN}_2$  0.05 moleSo, percentage  $\frac{0.90}{1} \times 100 = 90\%$ . $\textcircled{A}$  is correct ans.

(75)



(B) is correct ans.

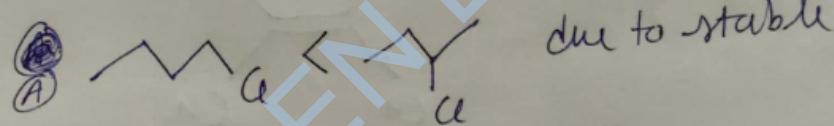
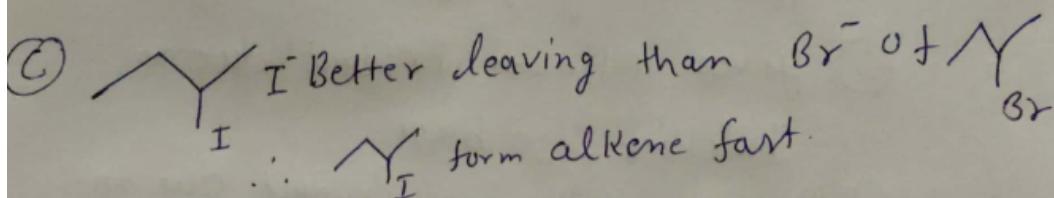
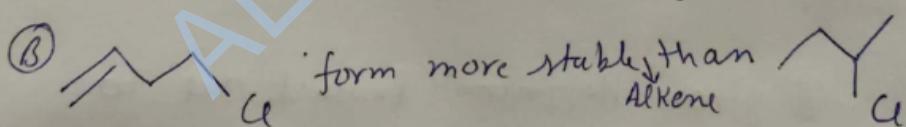
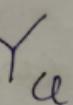
(76)



(A) is correct ans.

(77)

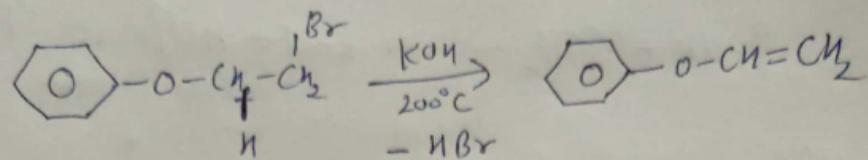
Rate of dehydrohalogenation

Alkene form from 

(D) Due to weak C-H bond than C-D,  $\text{CH}_3-\text{CH}_2-\text{Cl}$  form alkene faster than  $\text{CD}_3-\text{CD}_2-\text{Cl}$ .

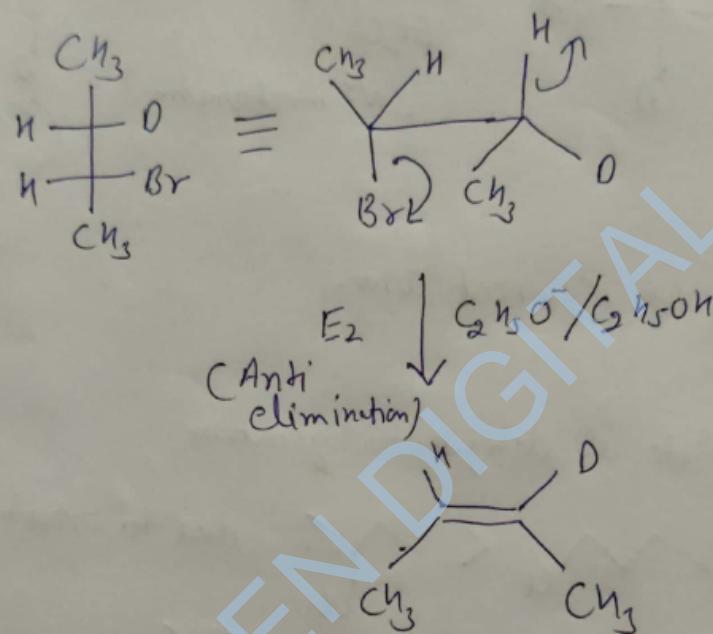
(A) is correct ans.

(78)



① it is correct ans.

(79)



② it is correct ans.

(80)

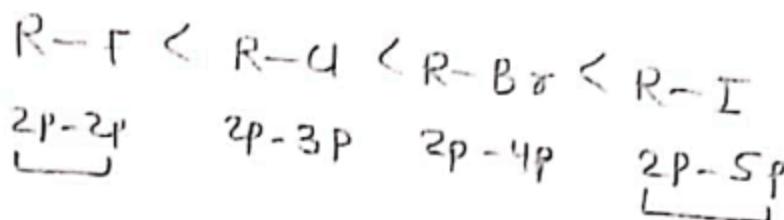
① gives Hoffmann's Product due to poor leaving group

③ gives Hoffmann Product due to bulkier size base.

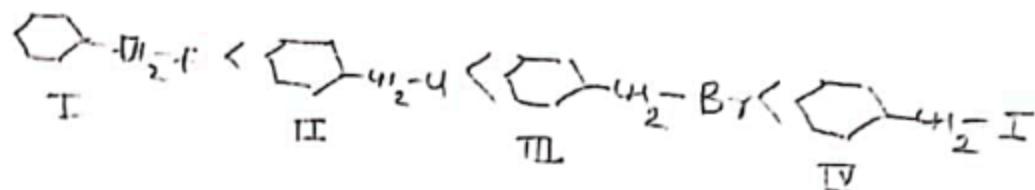
④ gives Hoffmann Product due to Hoffmann elimination reaction.

⑤ gives Saytzeff due to Normal  $E_2$  reaction.⑤ is correct

P.81 rate of Wurtz Rxn for  $R-X$  is

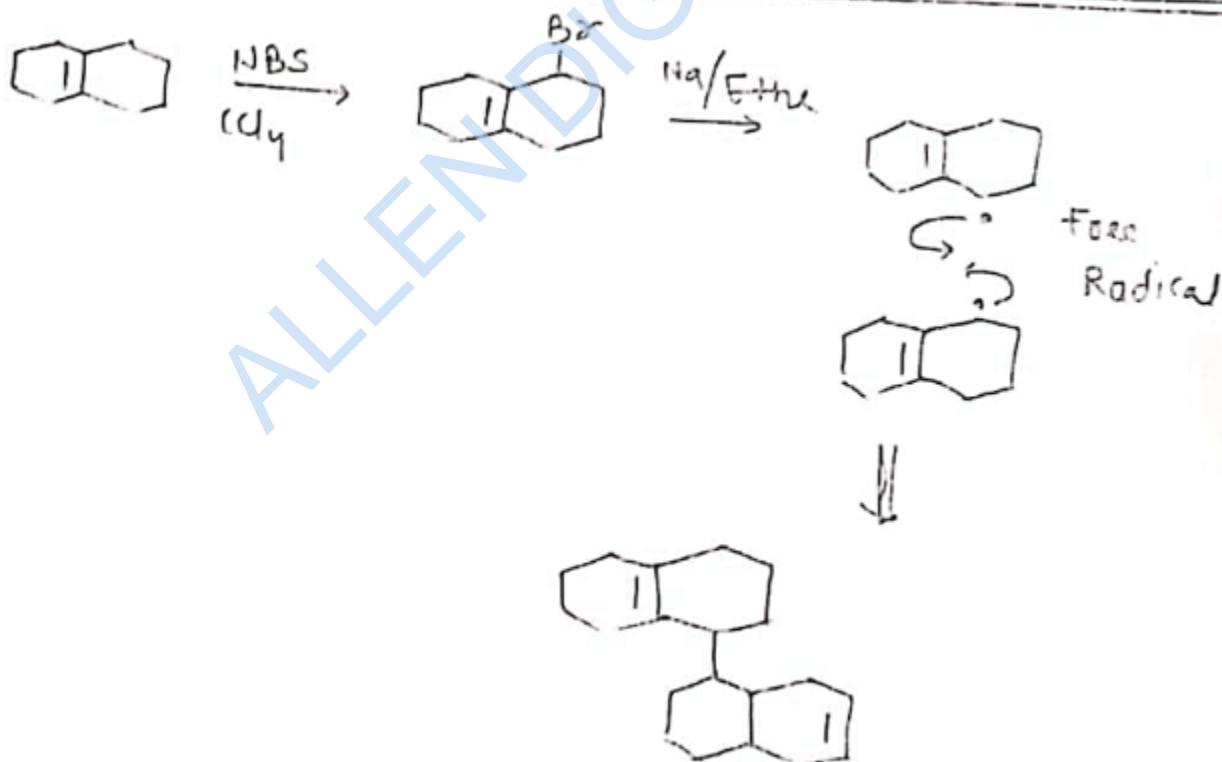


less overlapping



C)  $T_F > T_{Cl} > T_{Br} > T_I$

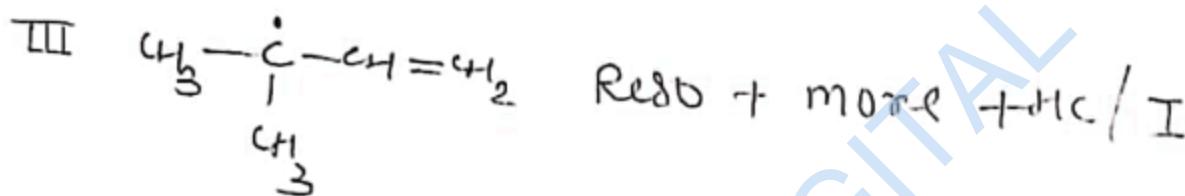
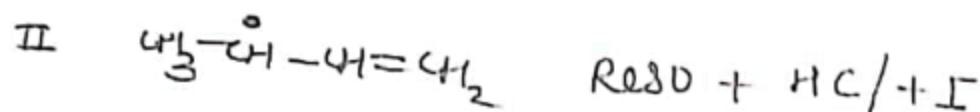
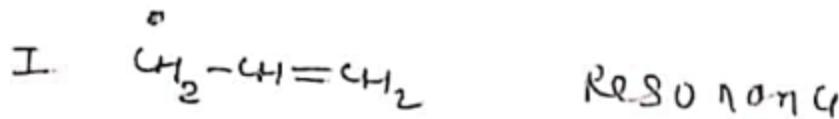
P.82



Q. 83

rate of Free radical substitution  $\propto$  Stability

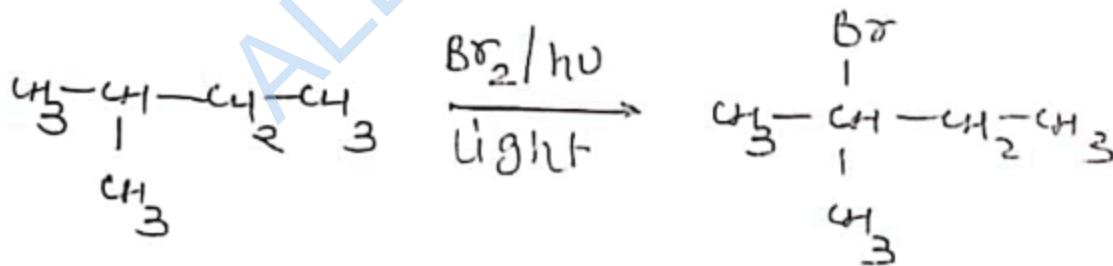
of Free Radical



So order will be III > II > I

(C)

Q. 84

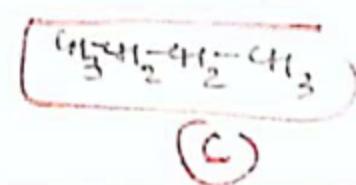
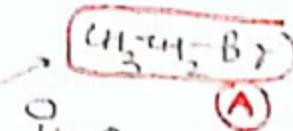
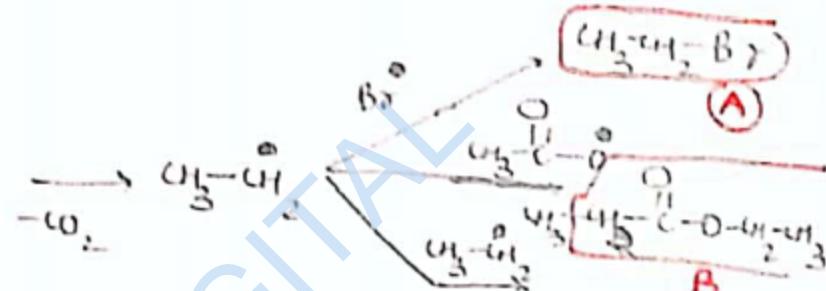
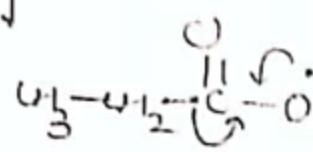
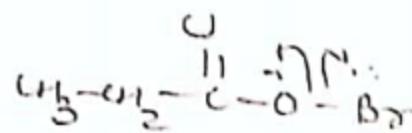
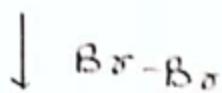
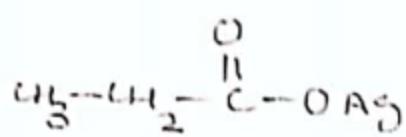


2-Bromo-2-methyl Butane

Bromination Rxn is more selective than  
Chlorination and Fluorination

(B)

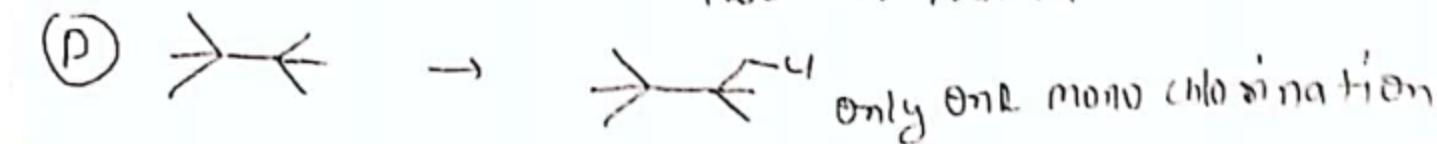
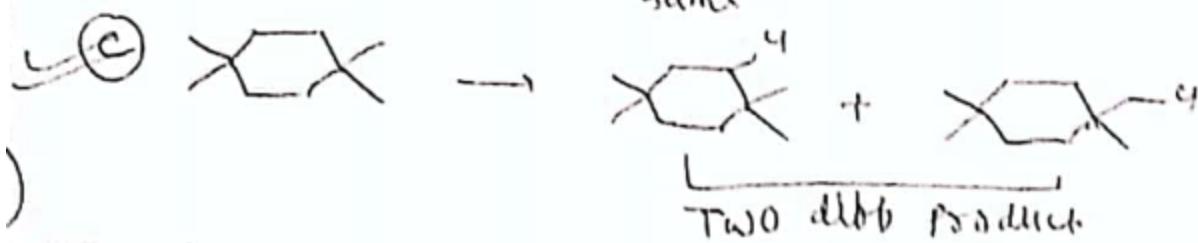
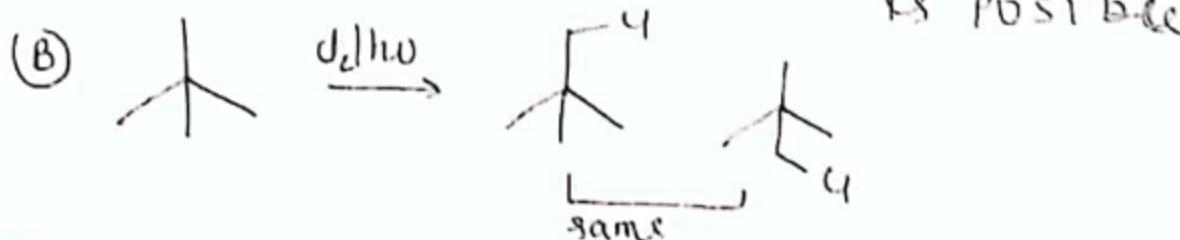
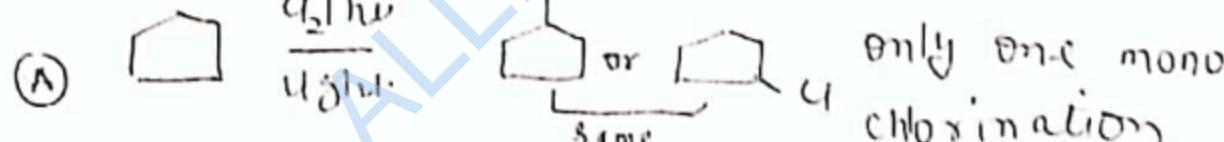
Q.85 It is a Hinsdick's P Free Radical  
Bromination Run



(D)

D formation is possible

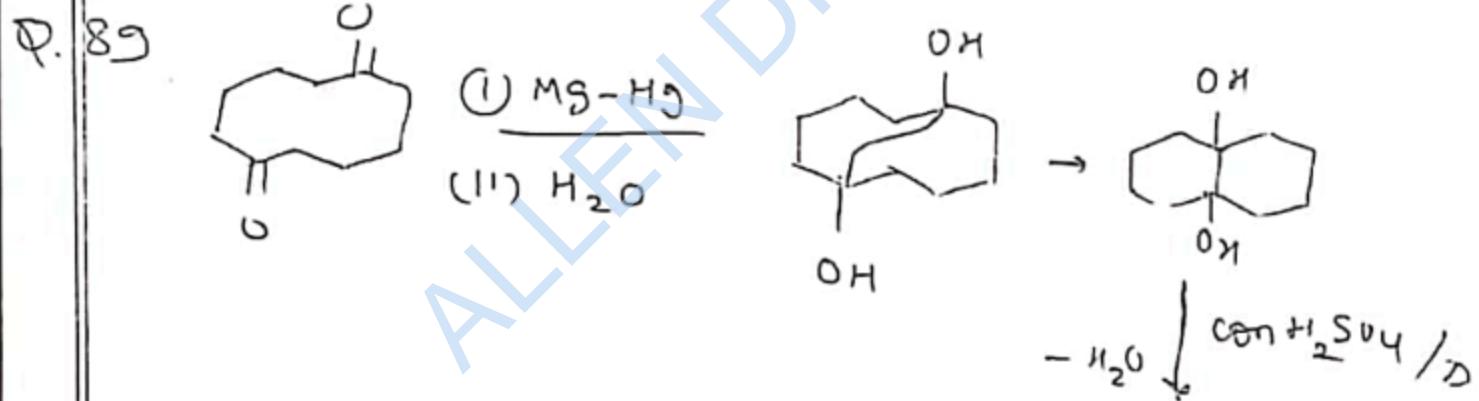
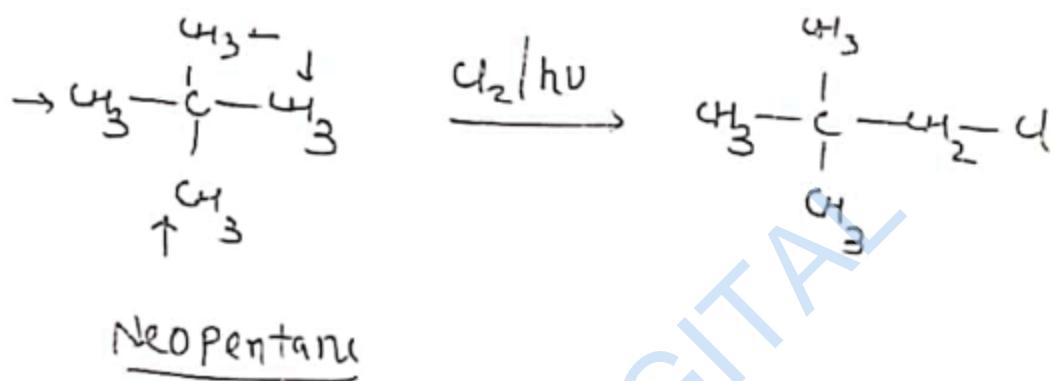
Q.86



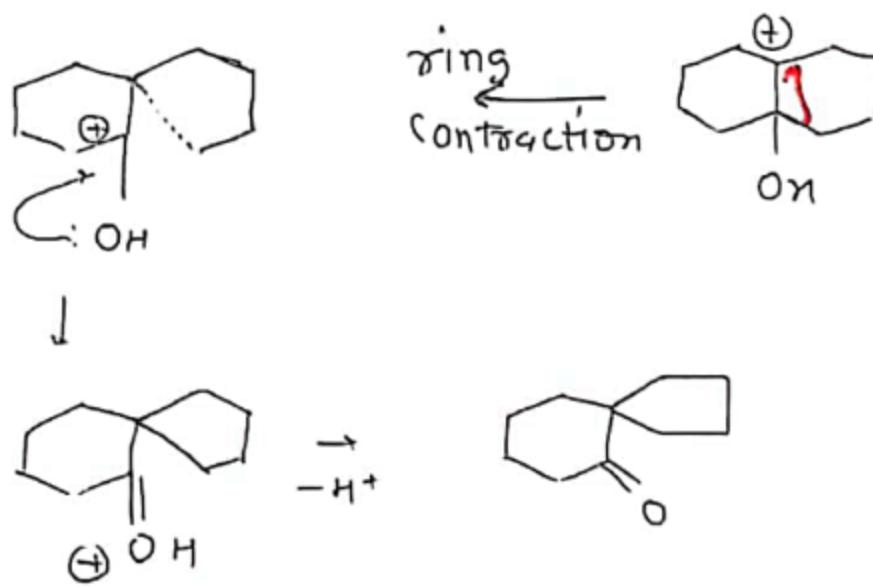
P-87 The structure of free radical species  
is Trigonal planar

(B)

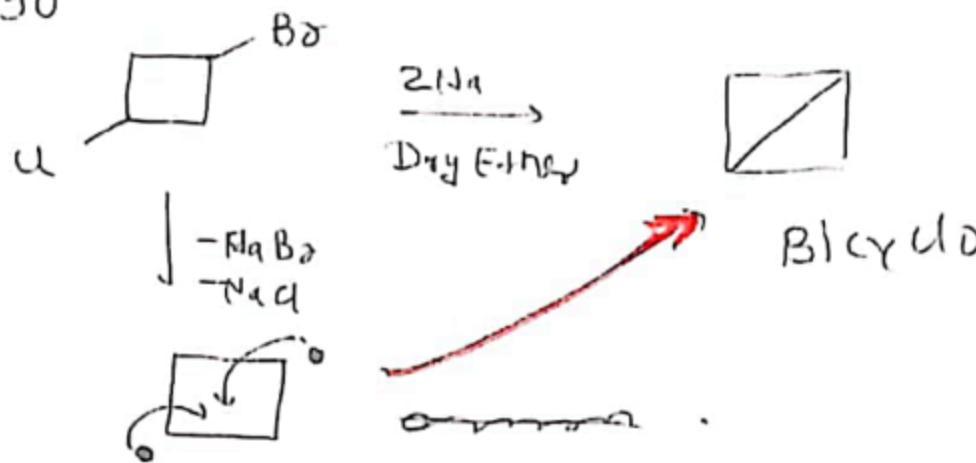
P-88 Neopentane forms only one monochloroalkane  
product



(C)

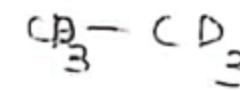
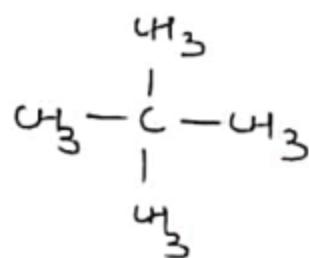


Q.30



Q.31

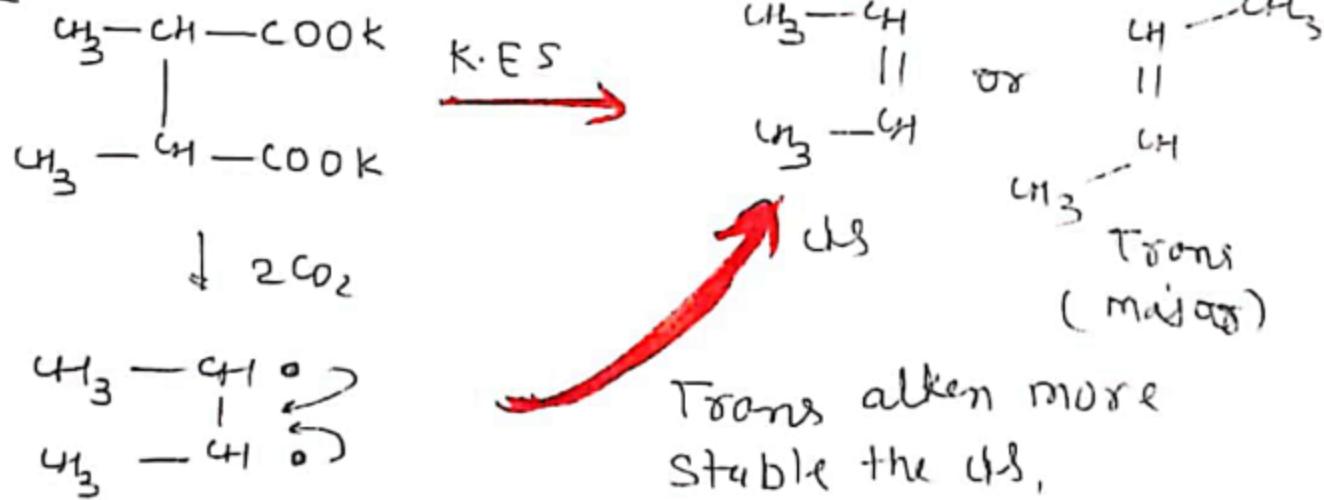
according to selectivity order of chlorination Rate will be



C-D Bond

Stronger than  
C-H Bond

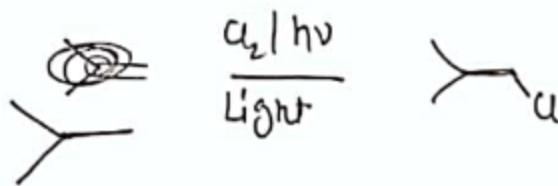
Q.32



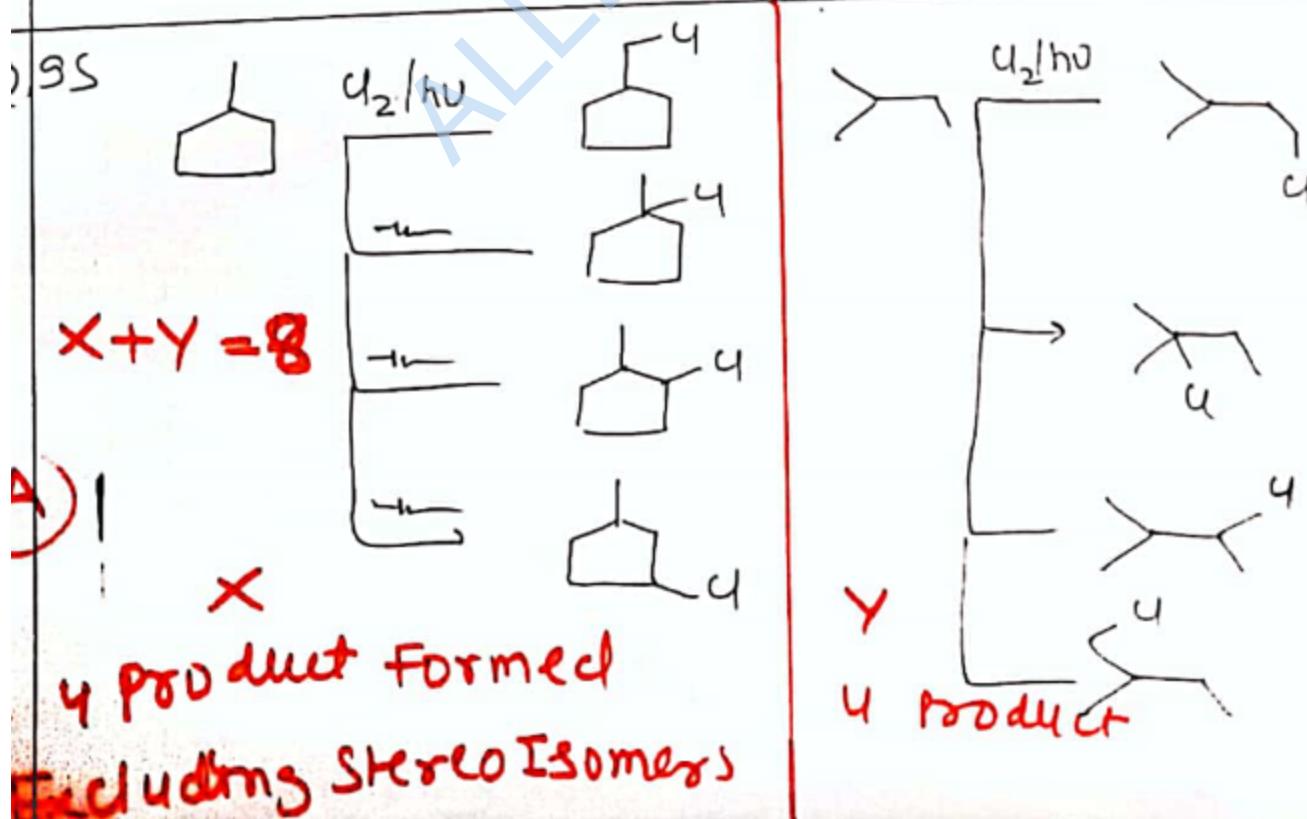
Q.93

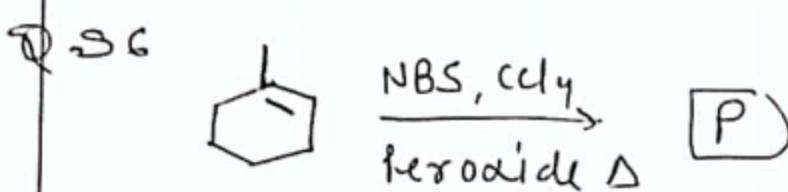
due to formation of  $\text{OH}^-$  pH of the  
Electrolyte increases progressively  
as the reaction proceeds

Q.94 due to selectivity/reactivity order of  
chlorine Isobutyl chloride in major amount

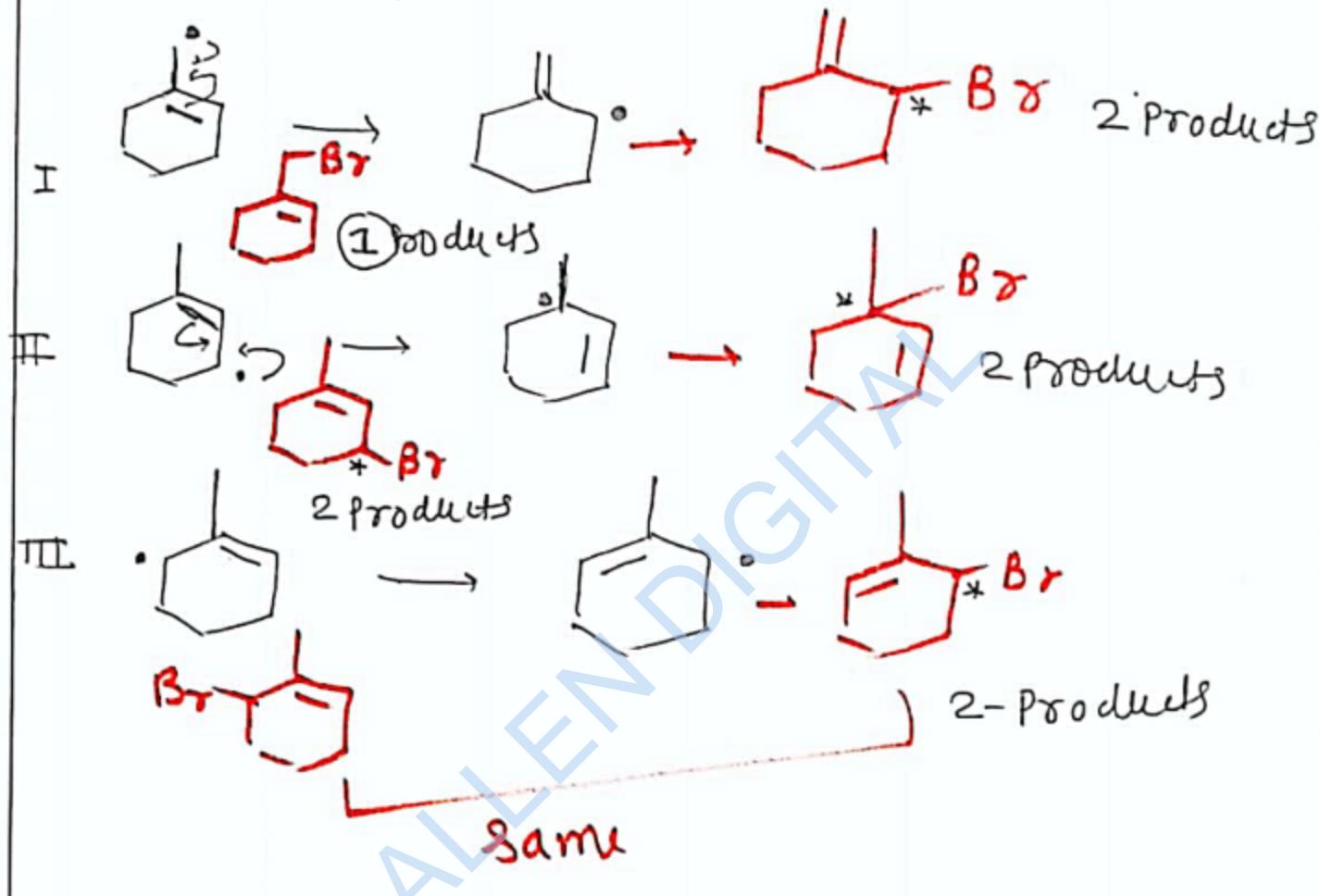


Ans  $\Rightarrow$  (B)

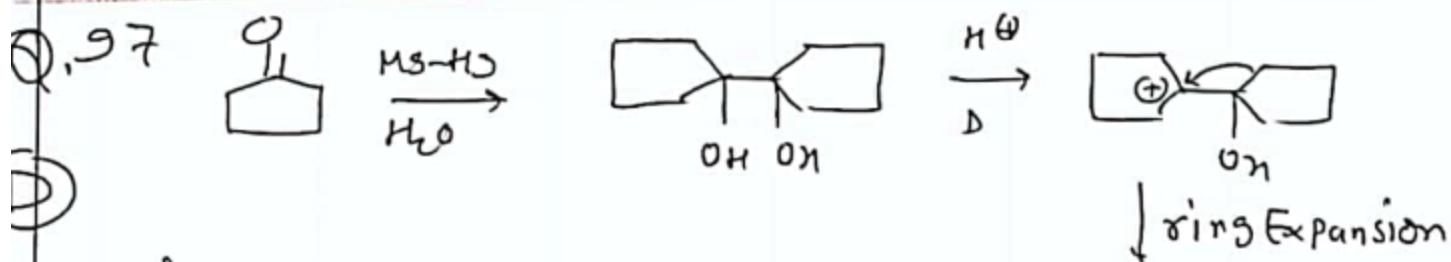




in which allylic substitution take place

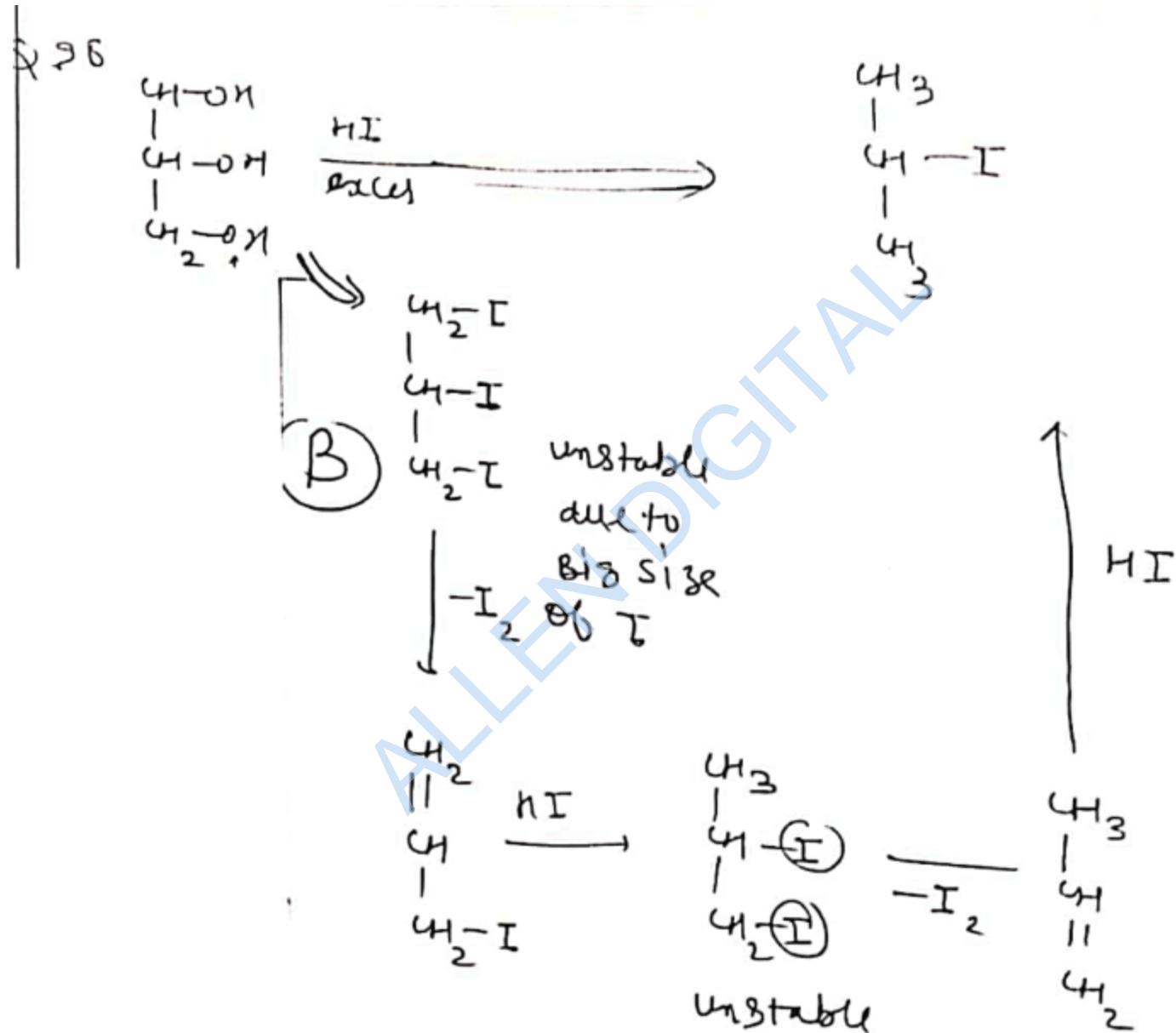


Total = 9 products formed

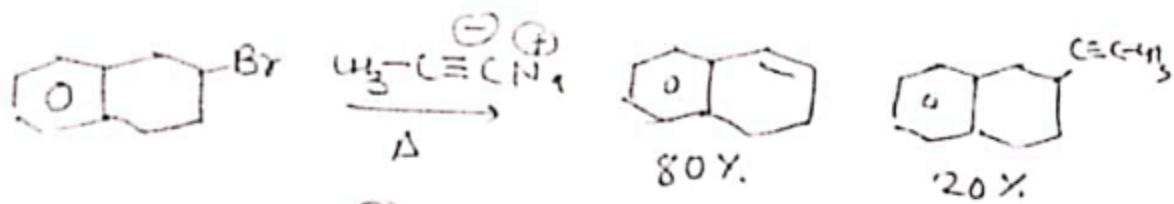


- (1) Spiro
- (2) Keton
- (3) can show total movement
- (4) dH = 3





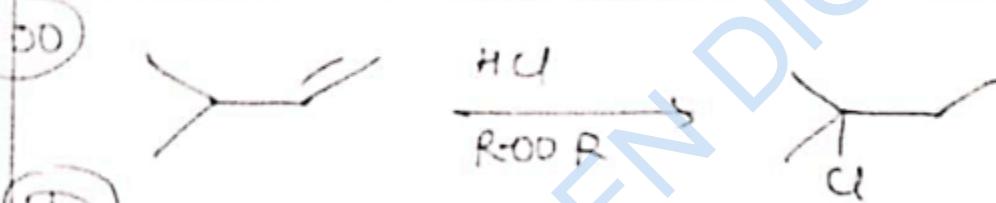
Q.95



In which  $\text{Li}-\text{C}\equiv\text{C}^-$  will act as Base

and  $\text{NH}_3^-$  both do  $\text{S}_{\text{N}}^2$  &  $\text{E}^2$  both

(B) Reaction possible But in case of  
high Temp Elimination product will be  
major



In which addition  $\text{HCl}$  will be proceed  
according to ~~not~~ Markonikov Rule, Bcoz  
peroxide cannot affect bond length of  
 $\text{HCl}$

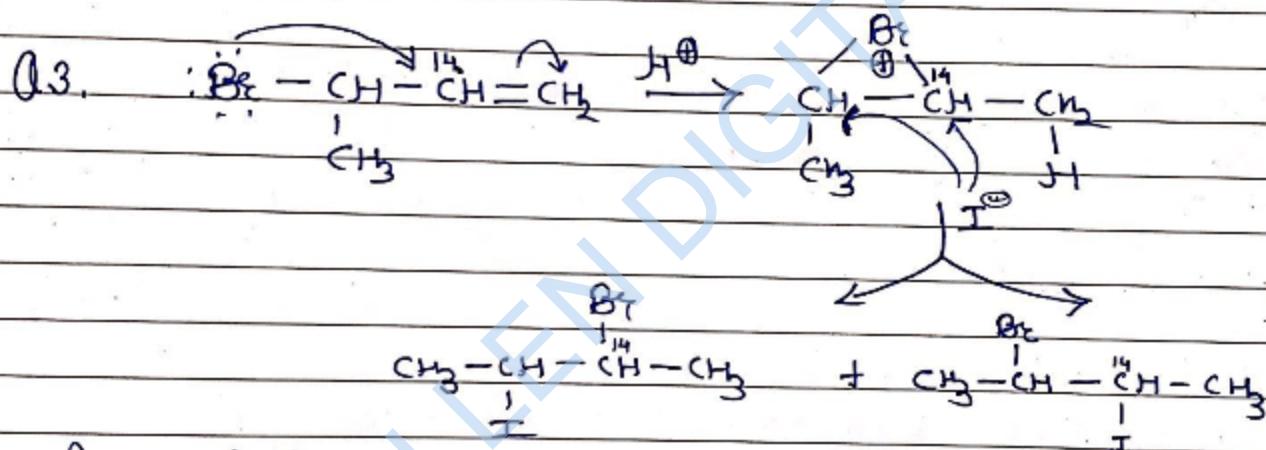
## Halogen derivatives · Solutions for Ex-TI A

Q1.  $S_N^2$  is Bimolecular Nucleophilic substitution reaction  
 It's rate depends on Concentration of Nucleophile as well as concentration of Substrate also  
 It also depends on Leaving group nature and Solvent nature.

Ans → A, B, C, D.

Q2.  $S_N^2$  reaction is negligible in vinylic and aryllic halides. and also difficult on bridgehead C-X bond.

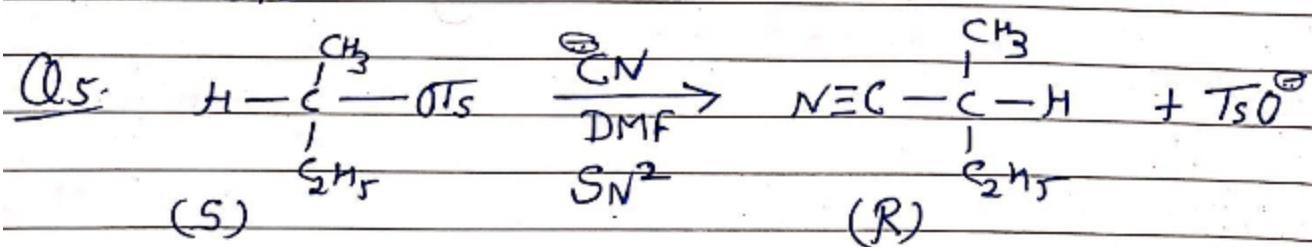
Ans → A, B, C



Ans → A, B

Q4. (B) Less crowded C-Cl bond in I than II  
 (D) Less crowded C-Cl bond in I than II

Ans → B, D.



Ans → B, D

Q6. (A) I is less crowded than II

(C) I is less crowded than II

Ans. A, C

Q7. (B) Alkyl Iodides on exposure to sunlight gradually darken due to poor strength of C—I bond.

(C) Photo iodination is irreversible in presence of oxidising agents like  $\text{HNO}_3$  /  $\text{HIO}_3$

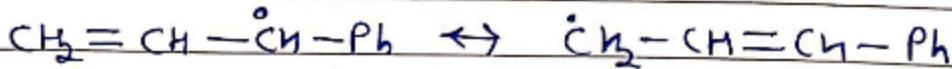
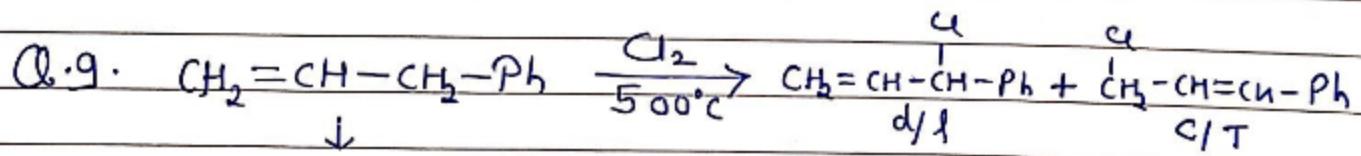
These Two are Correct statements.

- (A) Tertiary alkyl halides readily undergoes  $\text{S}_{\text{N}}^1$   
 (D) Alkyl iodides readily undergoes  $\text{S}_{\text{N}}$  reactions among alkyl halides.

Ans  $\rightarrow$  A, D

Q8. Arylic and Vinylic halides are unreactive in  $\text{S}_{\text{N}}^1$  and  $\text{S}_{\text{N}}^2$  reaction.

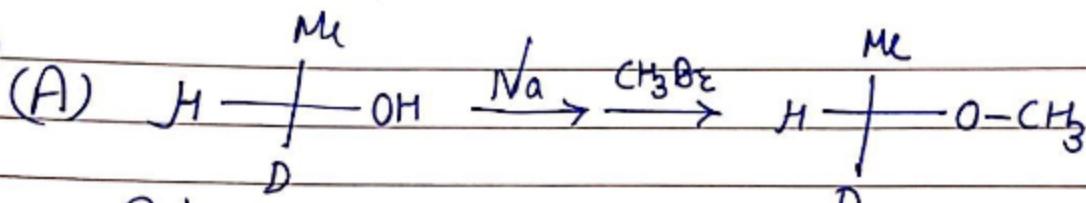
Ans  $\rightarrow$  A, C.



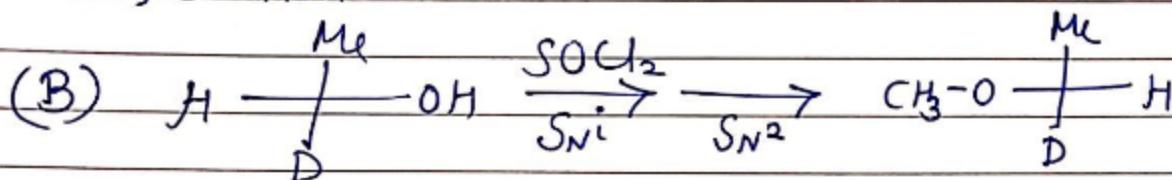
Total four Products.

Ans  $\rightarrow$  A, B, D.

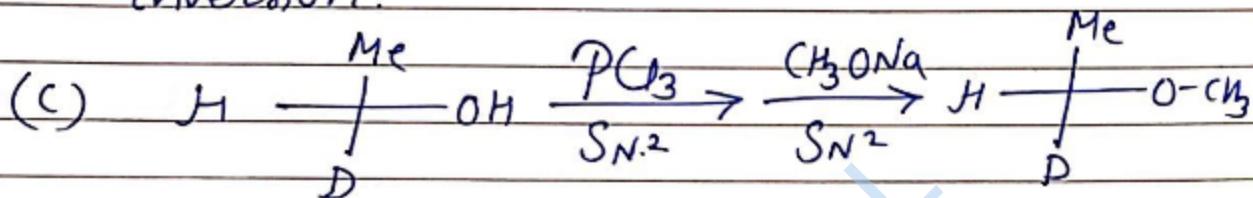
Q.10



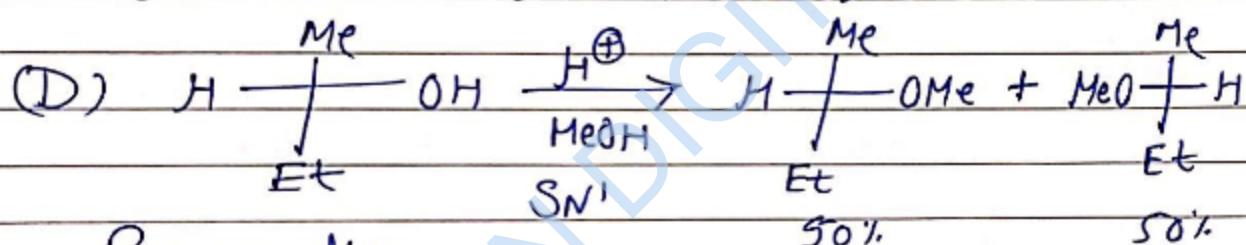
Retention.



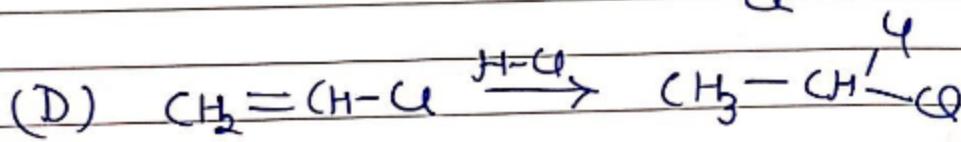
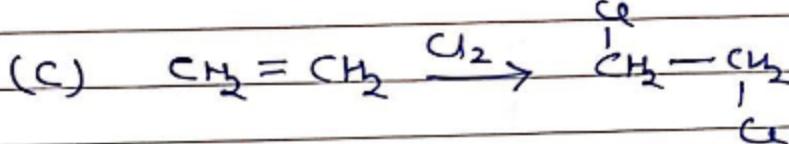
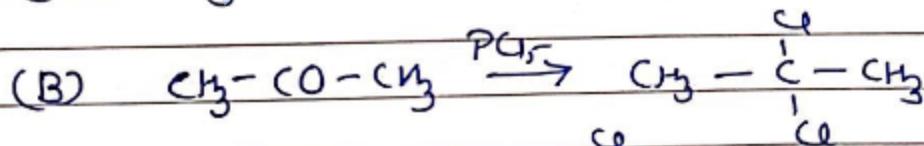
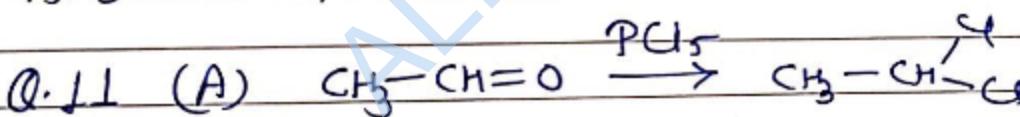
inversion.



Two inversions will leads to retention.



Racemization

Ans  $\rightarrow$  A, CAns  $\rightarrow$  A, B, D.

Page - 1

Q.12.

(A) Major Product is  $\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_3$  Characters of E<sub>1cB</sub>.

(B) Major Product is  $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$  E<sub>2</sub>

(C) Major Product is  $\text{CH}_3=\text{CH}-\text{CH}_2-\text{CH}_3$  E<sub>i</sub>

(D) Major Product is  $\text{CH}_2=\text{CH}-\text{CH}_2-\text{CH}_3$  E<sub>i</sub>

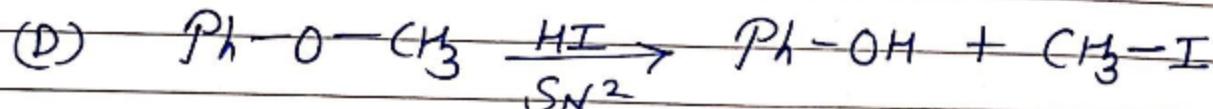
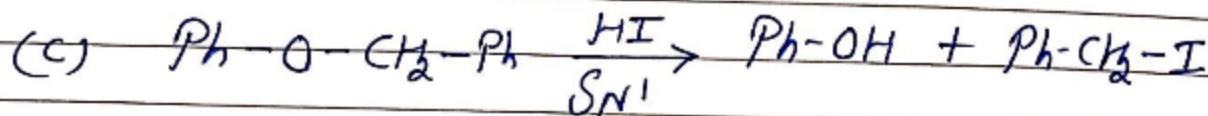
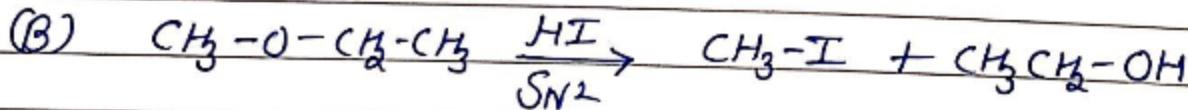
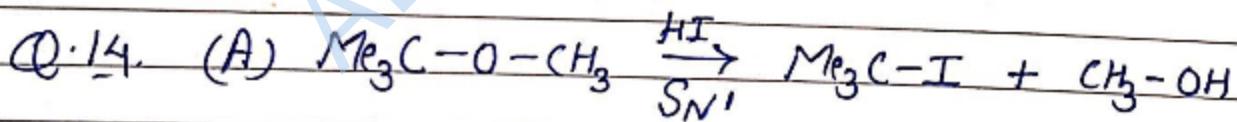
Ans → A, C, D.

Q.13.



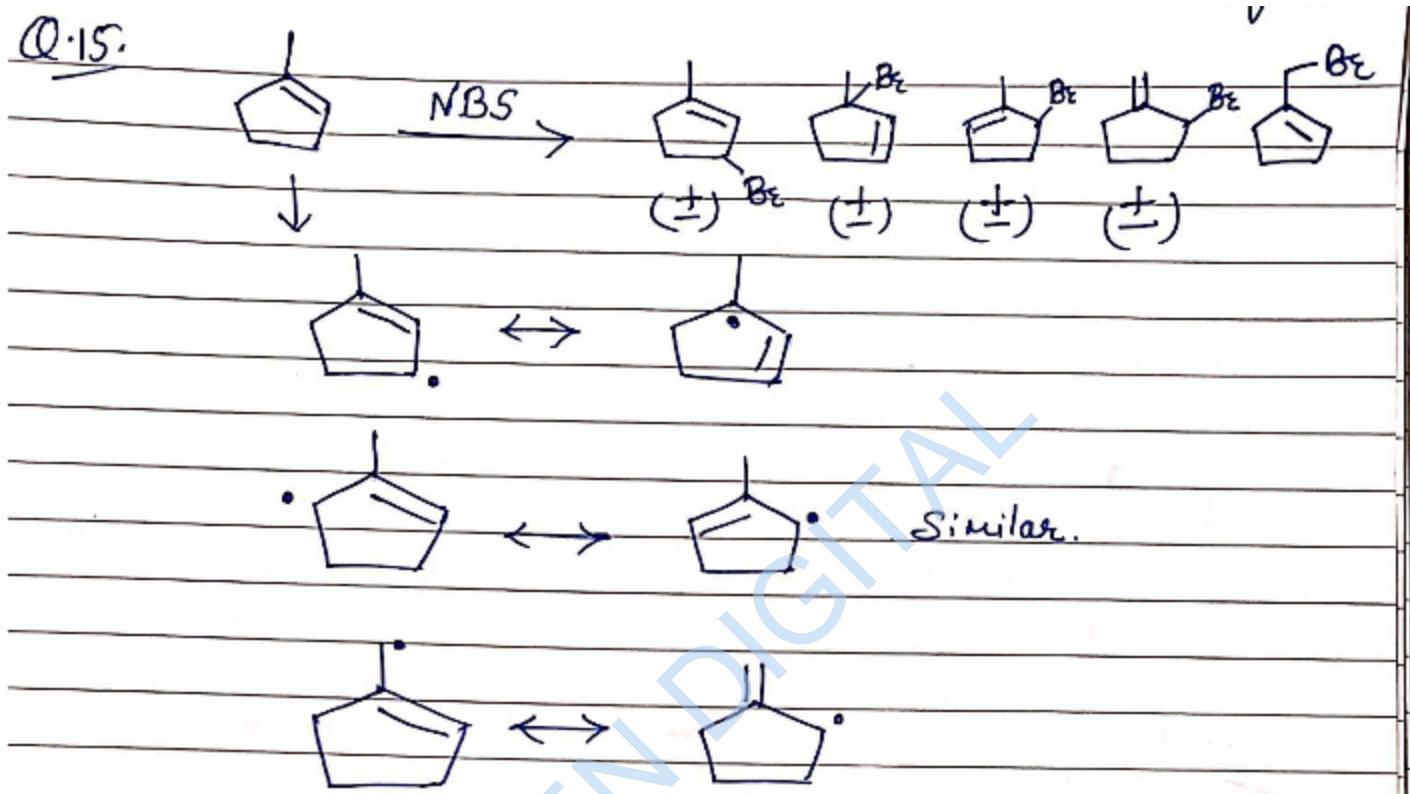
It is Pyrolysis of Quaternary Ammonium hydroxide follows E<sub>2</sub> Mechanism with character of E<sub>1cB</sub> so Hoffmann's Alkene is major product.

Ans → A, C, D.



Ans → A, B, C.

Q.15.



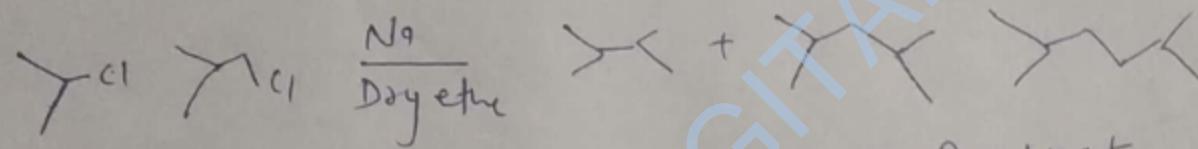
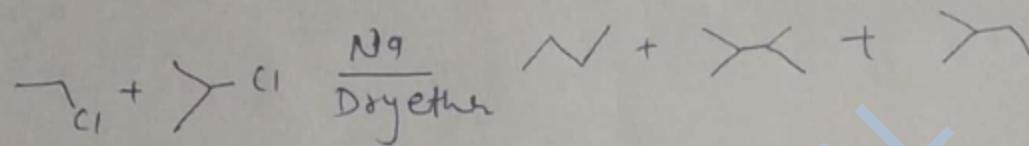
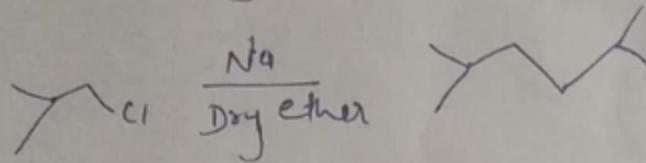
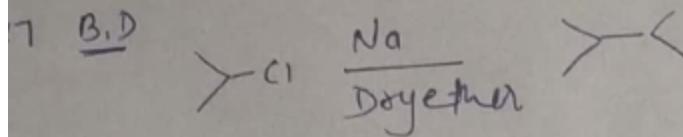
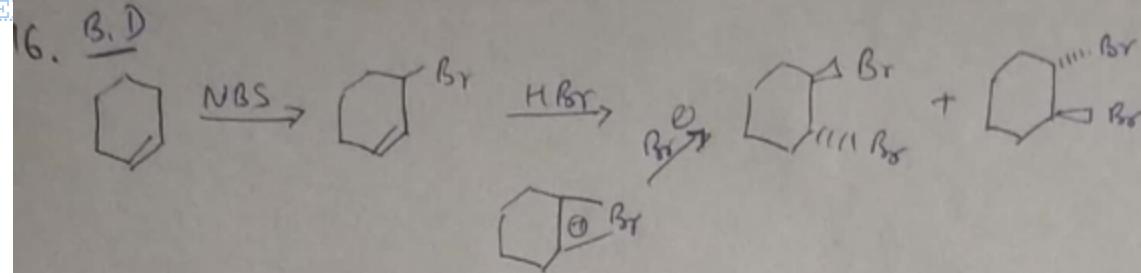
Total Brominated Products - 9.

out of which four enantiomeric pairs

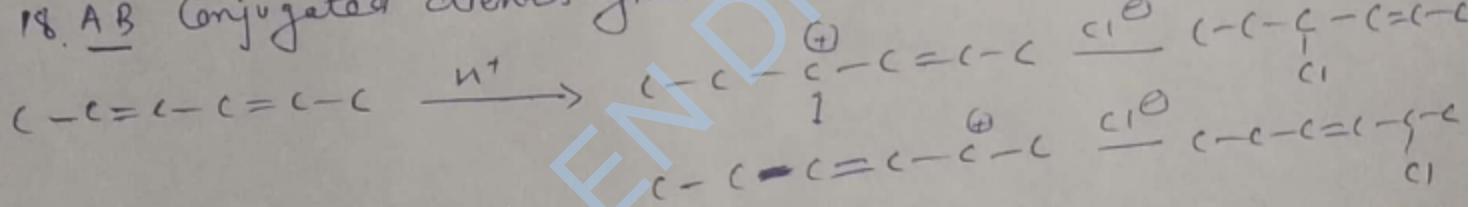
Total 5 fractions are obtained on fractional distillation of Product mixture.

Ans → A, C, D.

ALLEN



18. A,B Conjugated dienes give KCP & TCE Product

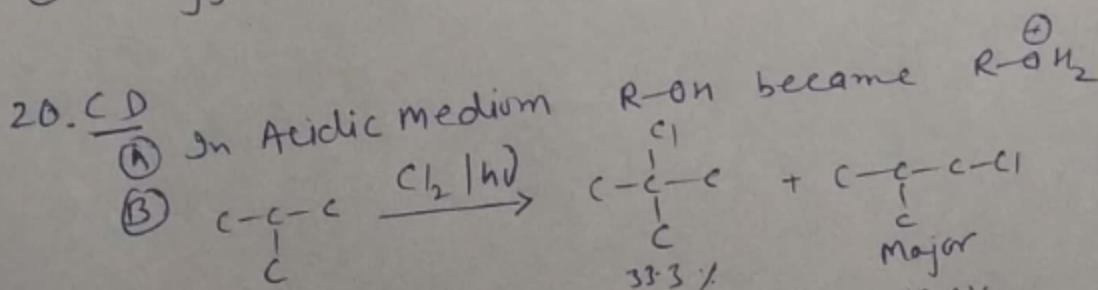


19 ABC.

(A) due to easier removal of  $\text{Br}^\ominus$  in presence of  $\text{Ag}_2\text{O}$

(B)  $\text{Ag}_2\text{O} \rightarrow \text{H}_2\text{O} + \text{Ag}_2\text{O} \rightarrow 2\text{Ag}^\oplus$

(C) Oxygen is a free radical consumer.

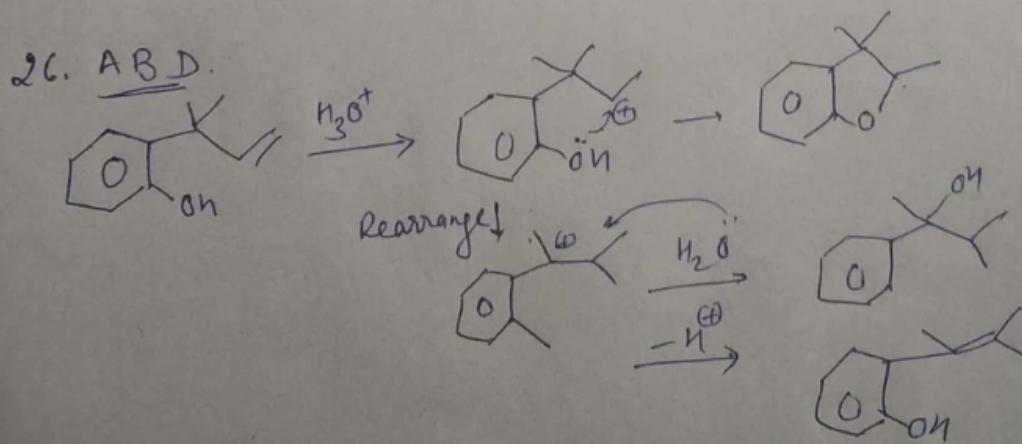
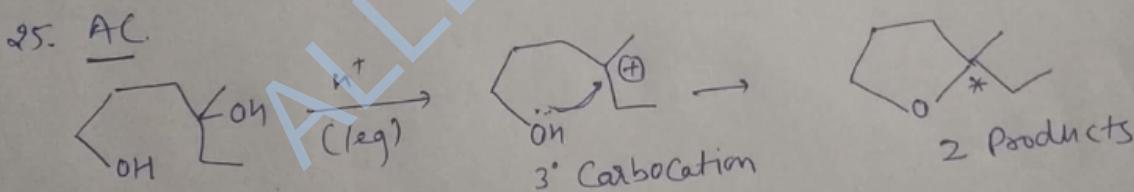
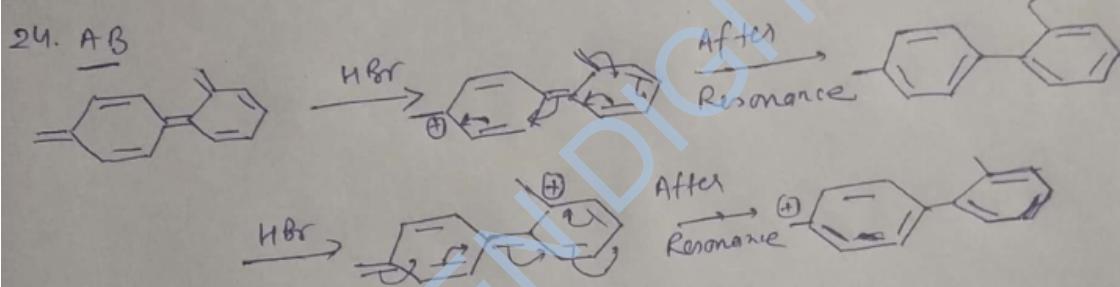
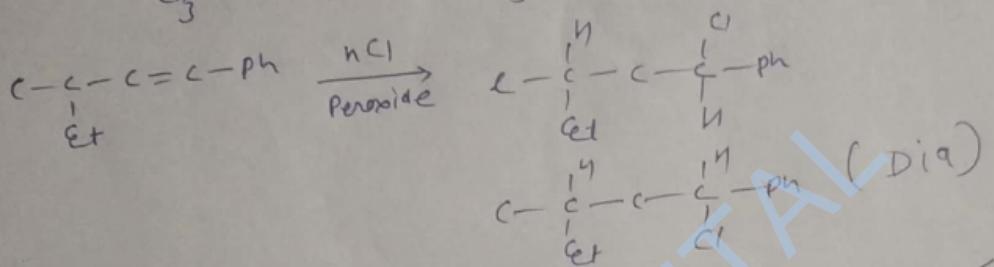
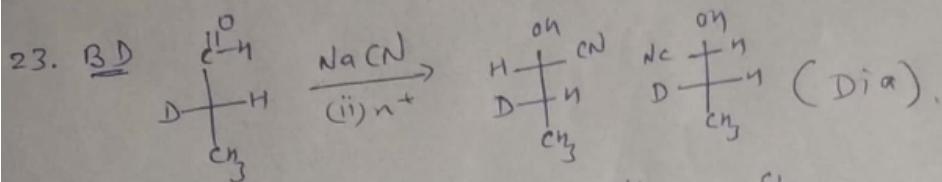


(C) Elimination is prefer at high temp

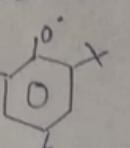
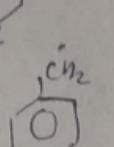
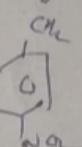
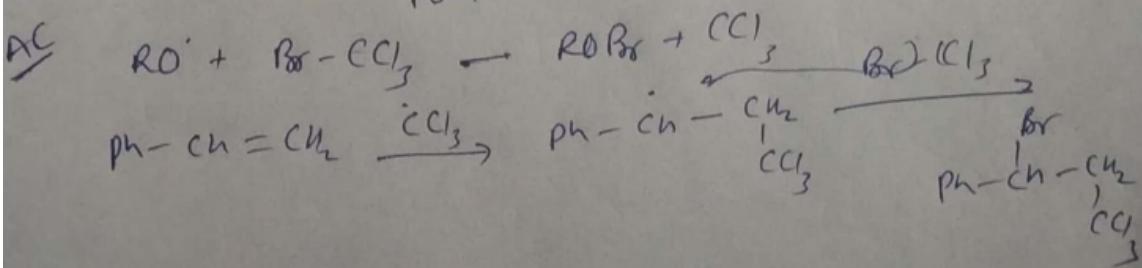
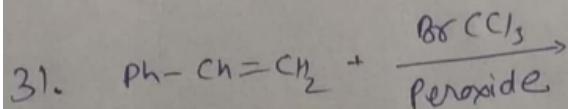
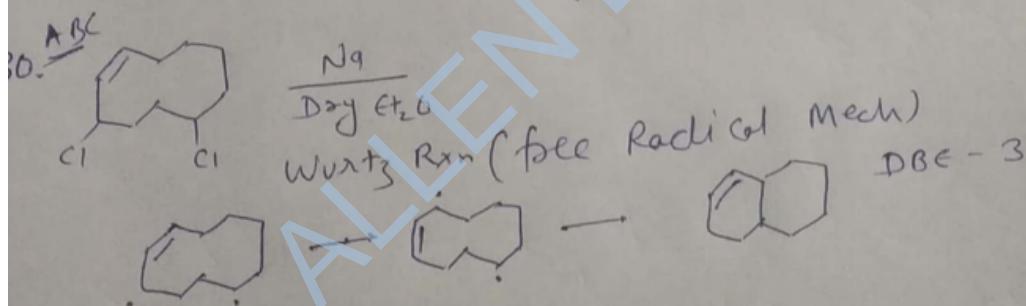
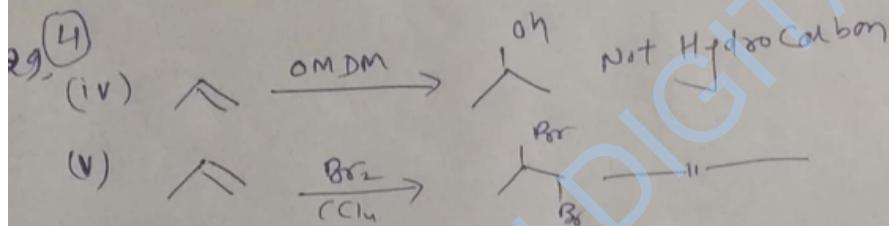
(D) Triphenyl chloromethane easily hydrolysed by  $\text{Sn}^\oplus$

21. CD  
gt is common naming system

22. BCD  
① due to amine flipping



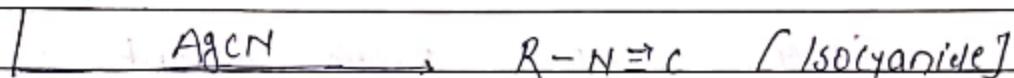
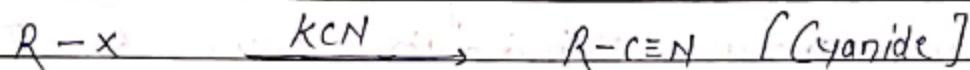
27 ABCD

A Cyclopropane can react with  $\text{Br}_2/\text{H}_2\text{O}$  at room tempB  $\text{Br}^+$  is more stable than  $\text{Cl}^+$  so bromination is more selectiveC.  Can not dimerise due to crowding.D.  is more stable than 28. ABCD.  
good leaving support  $\text{S}^{\text{N}}_1$ ,  $\text{S}^{\text{N}}_2$ ,  $\text{E}^1$ ,  $\text{E}^2$  mech.

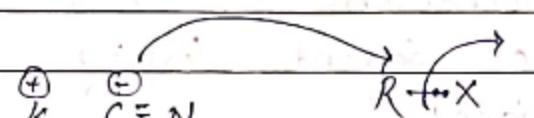
## Exercise - S1

Date \_\_\_\_\_  
Page \_\_\_\_\_

Paragraph 0.1 & 2



Reason:

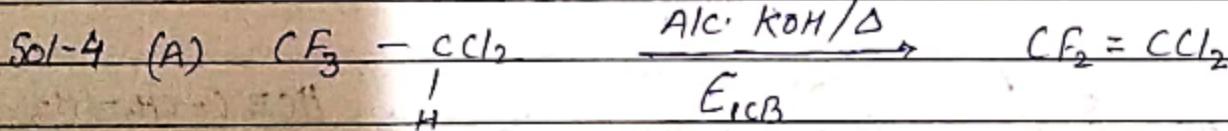
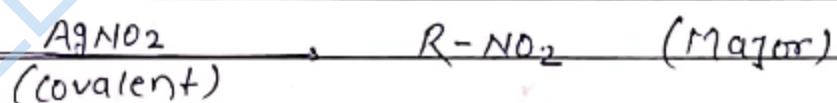
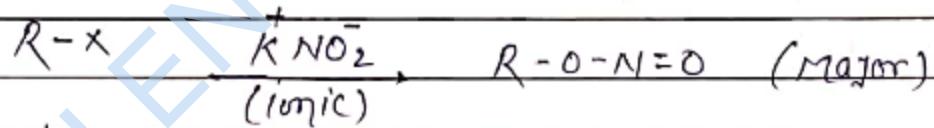


Ionic



Covalent

Similarly



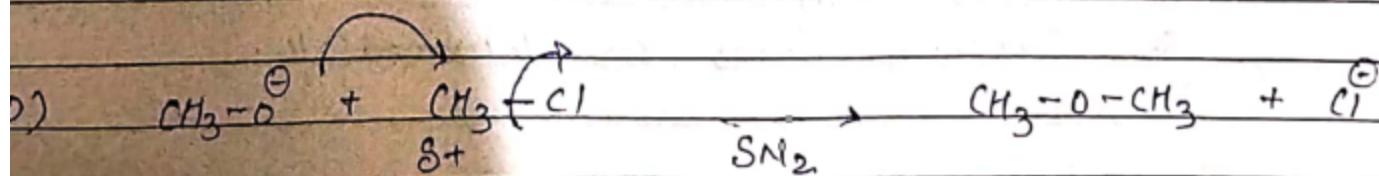
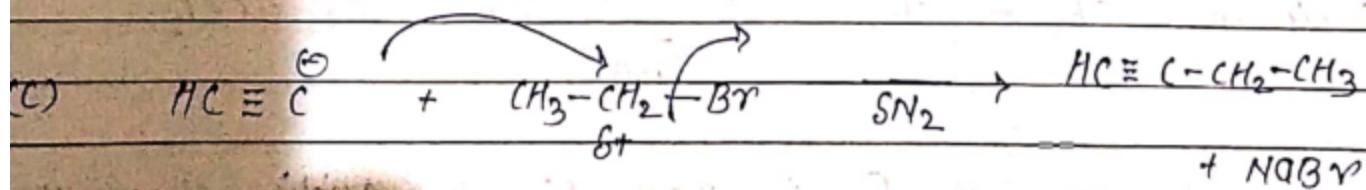
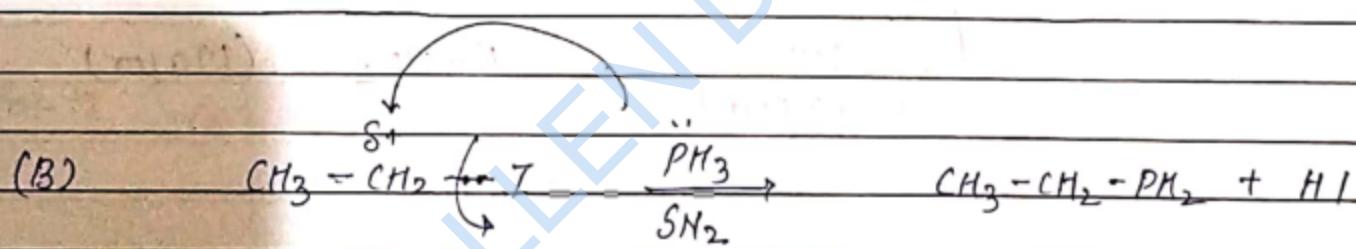
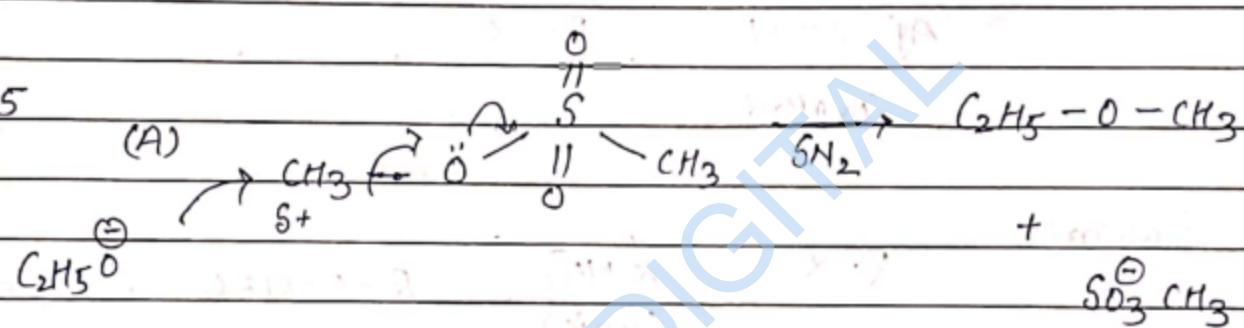
Reason:  $\rightarrow$  F is poor LG & acidic character  
of H increased due to FNG Cl.

So Carbanion forms as intermediate.

(C)  $\text{Br}$  is good  $\text{Lc}$  & along with  $\text{Alc-KOH}$  is characteristic reagent for  $E_2$ ; where Simantaneous elimination occur by  $\text{TS}$ .

(D)  $\text{EtOH}$  is polar protic Solvant so  $E_1$  mechanism ; where  $\text{Br}^-$  is snatched with help of Solvent leaving Carbocation as intermediate.

Sol-5

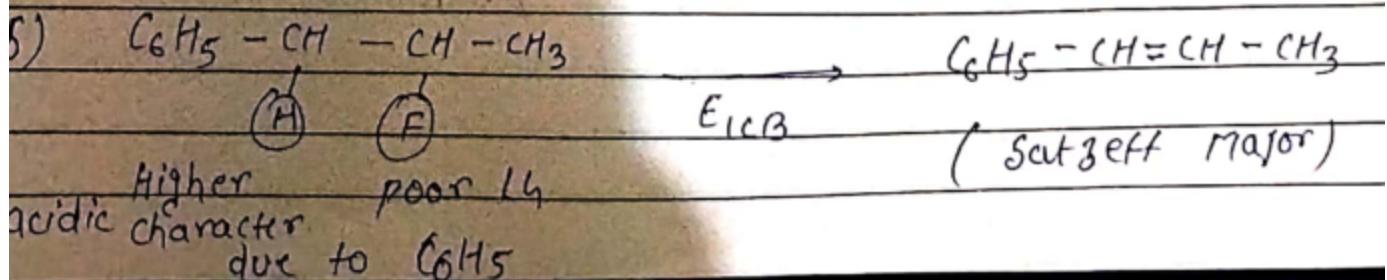
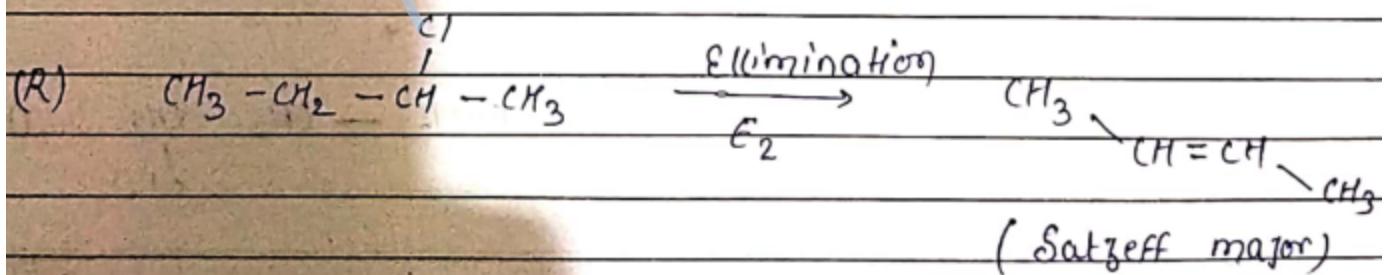
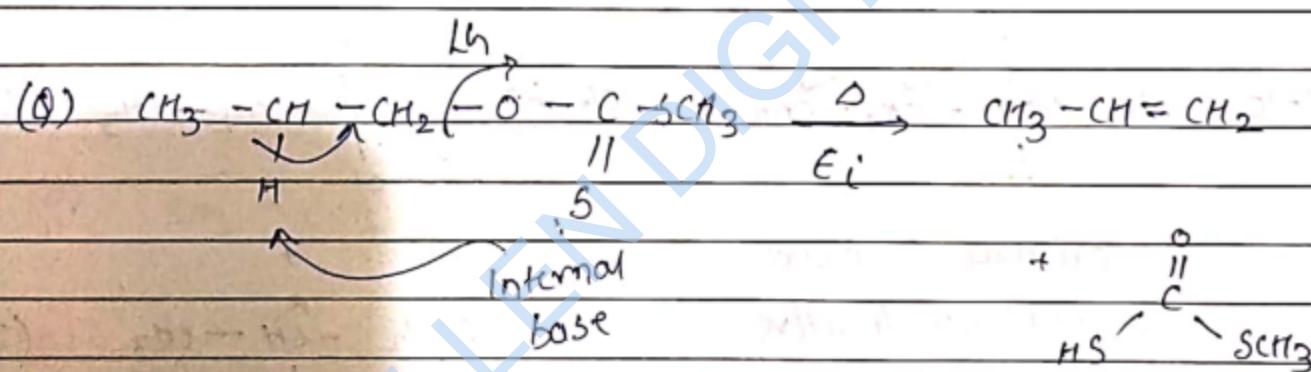
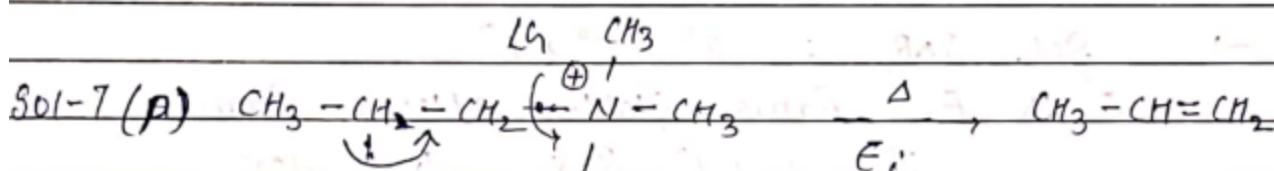


SDI-6

 $SN_2$  ROR  $\alpha'$ 

Crowding

More crowded "Z" will be ; lower will be data of relative reactivity of  $SN_2$ .



Sol-9 a)  $\rightarrow$  Concerted means single step reaction where all process happens simultaneously.

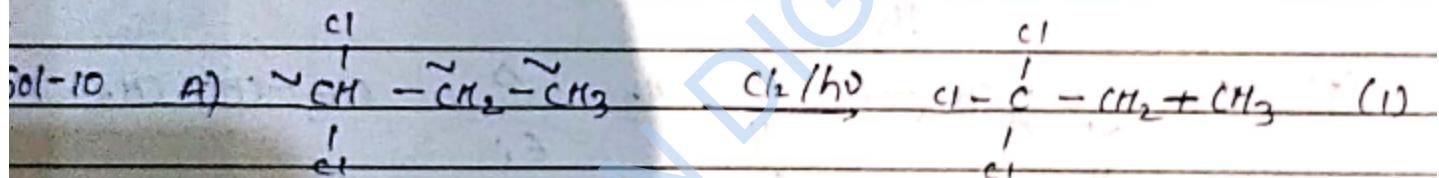
Ex-  $SN_2$ ,  $E_2$ .

b)  $\rightarrow$   $CH_3X$  doesn't form stable  $C^{\oplus}$ ; so  $SN_1$ , not possible. no  $\beta$  carbon. So Elimination can't take place (neither  $E_1$  nor  $E_2$ )

c)  $\rightarrow$   $SN_1$ , ROR :  $3^\circ > 2^\circ > 1^\circ$

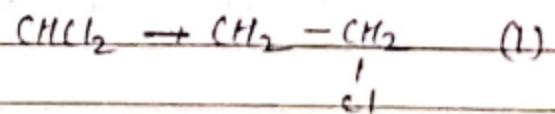
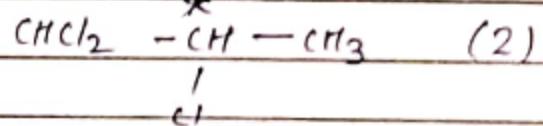
$E_1$  &  $E_2$  forms stable alkene from  $3^\circ > 2^\circ > 1^\circ R-X$  in order.

d)  $\rightarrow$  better & faster ROR for all  $SN_1$ ,  $SN_2$ ,  $E_1$ ,  $E_2$ .

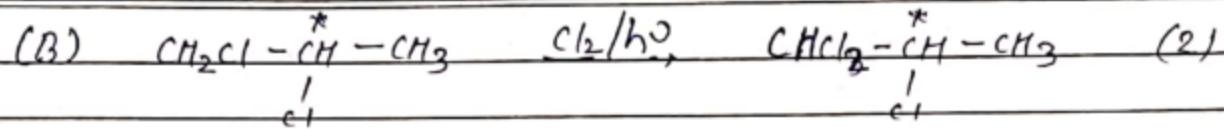


original compound

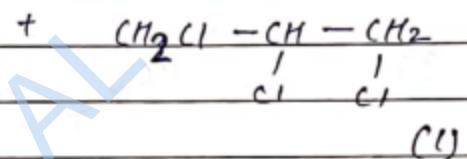
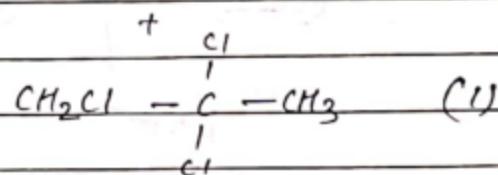
is optically inactive



Total trichloro = 4  
product(s)

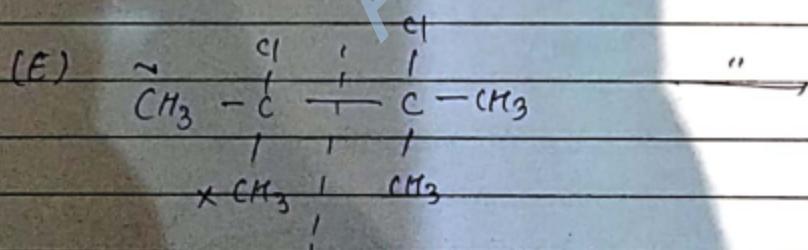
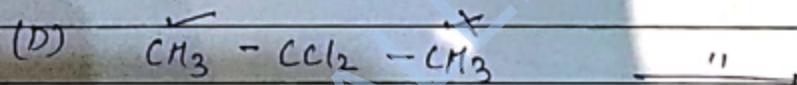
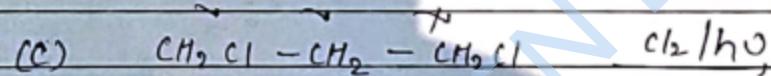


optically active



Total trichloro = 4  
product (3)

Similary check for C, D, F



Sol-11 (P) In Kolbe's Electrolysis :  $\text{C}_2$  forms  
[Corctet Incomplete]

(4) In Blum's reaction :  $R^{\cdot}$  forms  
(Octet incomplete)

Mech-2  $R^{\oplus}$  forms  
(Octet Complete)

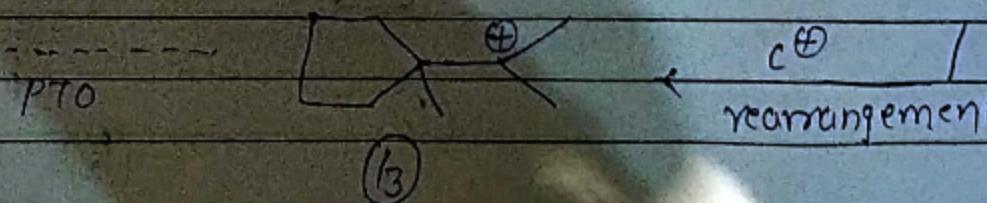
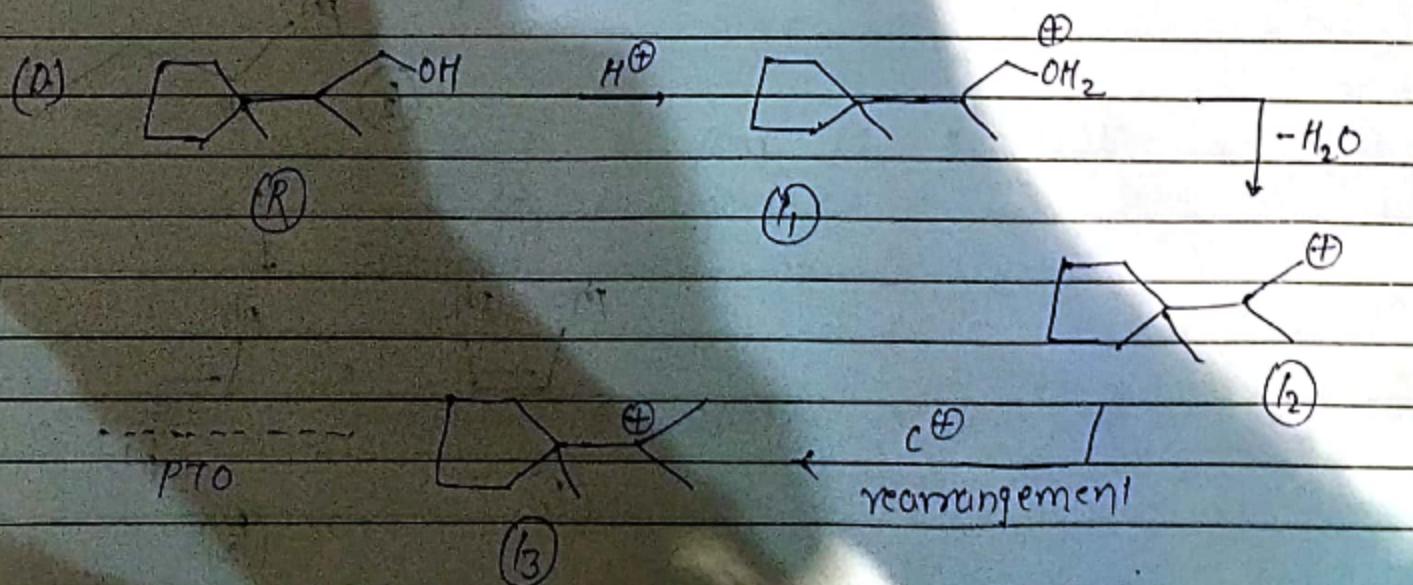
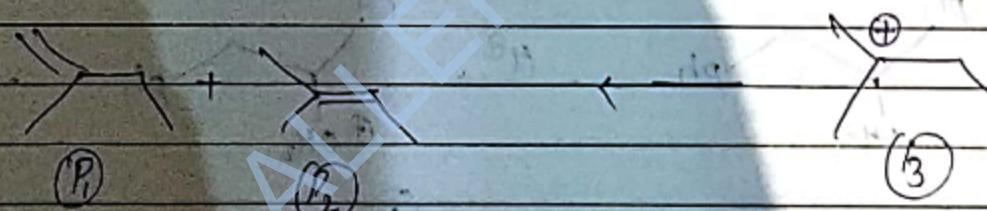
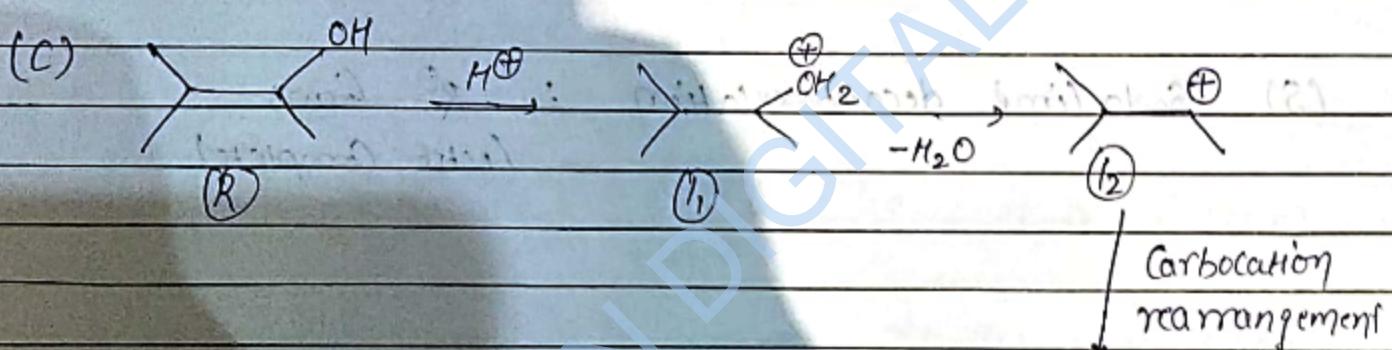
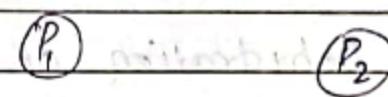
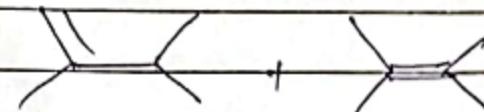
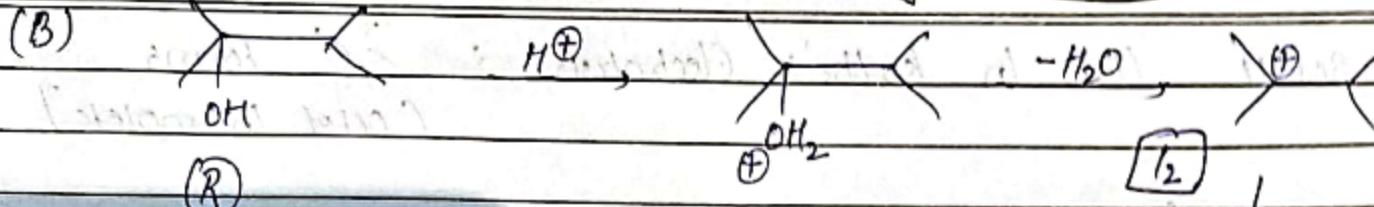
(R) Dehydration of Alcohol :  $\text{C}^{\oplus}$  forms  
(octet incomplete)

(S) Soda lime decarboxylation  $\therefore R^\ominus$  forms  
(acetate complete)

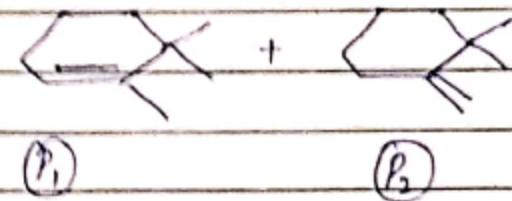
Sol-12

(A)  $\text{Ph}-\text{CH}_2-\text{OH} + \text{H}^{\oplus} \rightarrow \text{Ph}-\text{CH}_2^{\oplus}+\text{H}_2\text{O}$

$\text{R}$        $I_1$        $I_2$        $P_1$        $P_2$



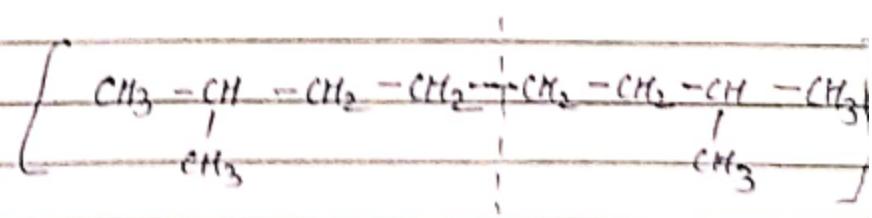
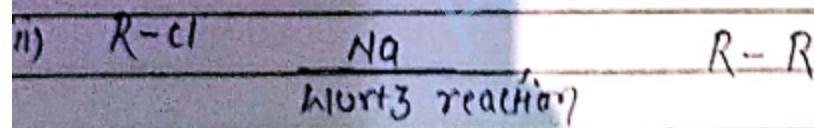
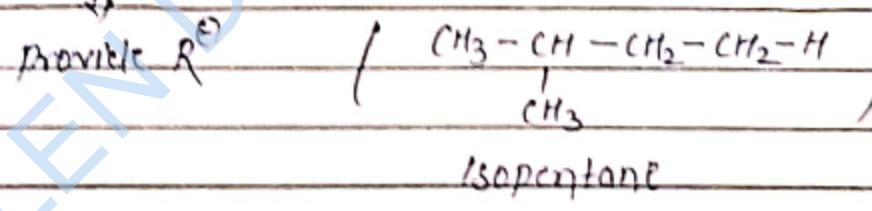
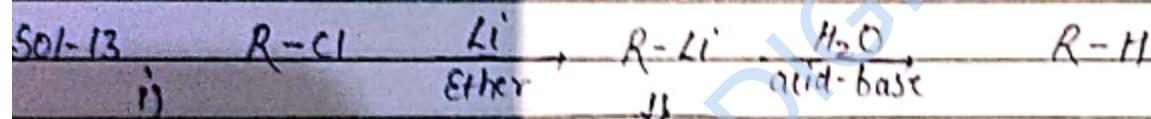
ring expansion



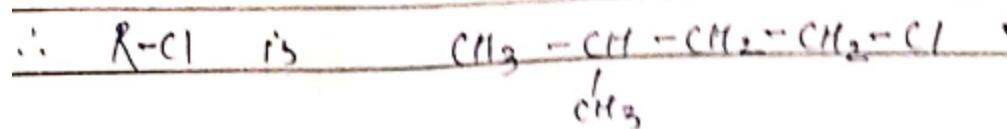
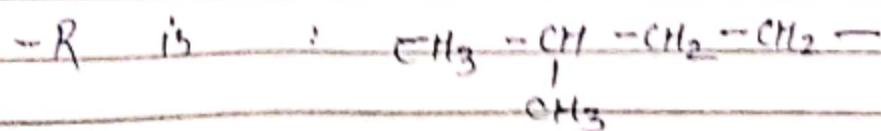
R : Reactant

P : Product(s)

I : Intermediate

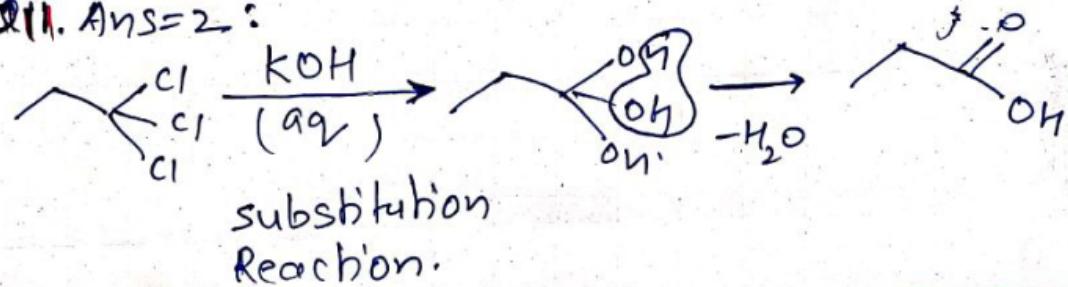


by (i) &amp; (ii)



## Halogen derivative Ex-J-Mains:

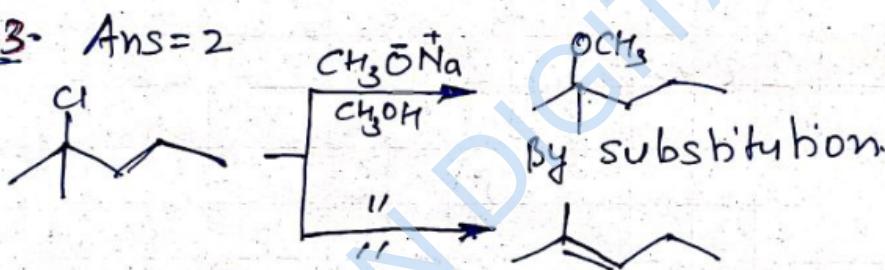
Q11. Ans = 2 :



substitution  
Reaction.

Q12. Ans: 2 [Swart Reaction]

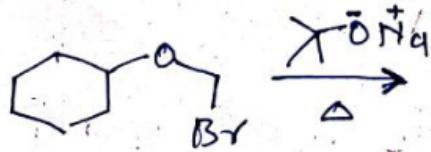
Q13. Ans = 2



Note:  $\text{CH}_3\ddot{\text{O}}\text{Na}$  is  
Nucleophile as well as base

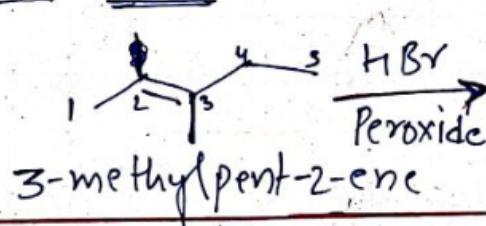
Q17. Ans = 1 [Note: Alkene and Alkyne]

Decolorise  $\text{Br}_2/\text{H}_2\text{O}$



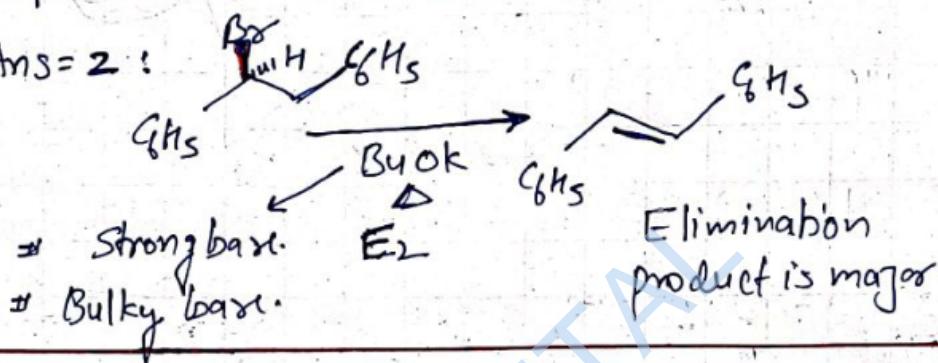
But compound 2/3/4 react to form alkene-

Q18 - Ans: 4 : →

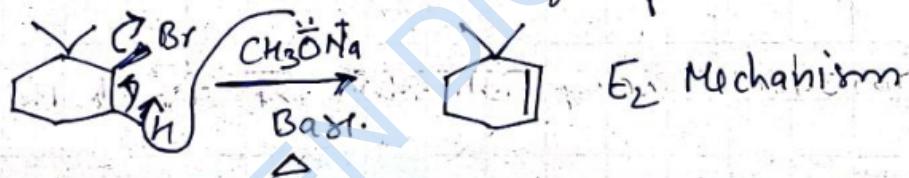


Antimarkovnikov reaction.

Q19 - Ans = 2 :



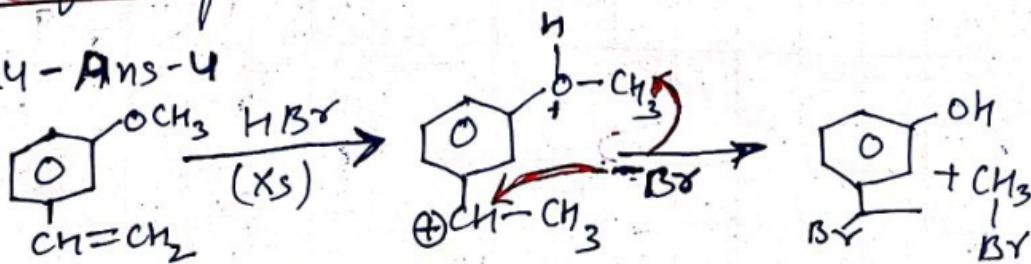
Q20 - Ans = 1 : It is an Example of E<sub>2</sub> Reaction.



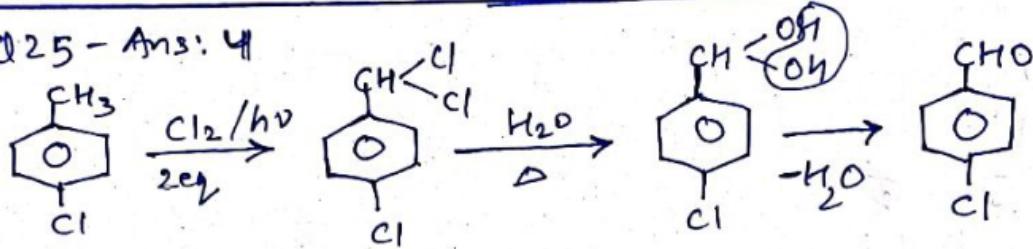
Q23 - Ans:- 2 It is an example of Nucleophilic substitution Re. In which, Rate of Reaction depend on Nucleophilicity of Nitrogen present in different molecule.

# Nucleophilicity  $\propto$   $\frac{1}{\text{Resonance}}$   $\propto$   $\frac{1}{\text{steric hindrance}}$

Q24 - Ans - 4

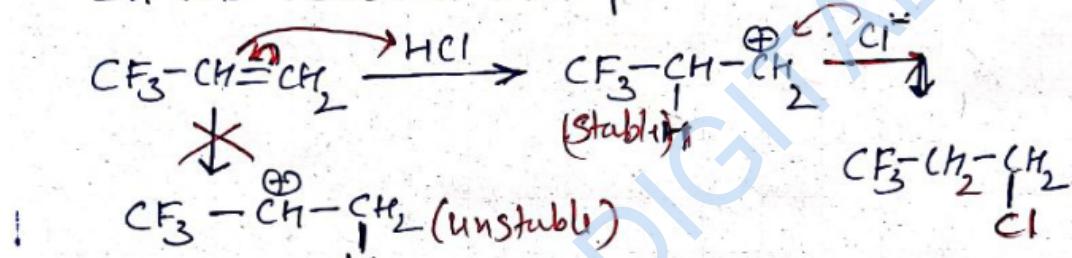


Q25 - Ans: 4

Photohalogenation.

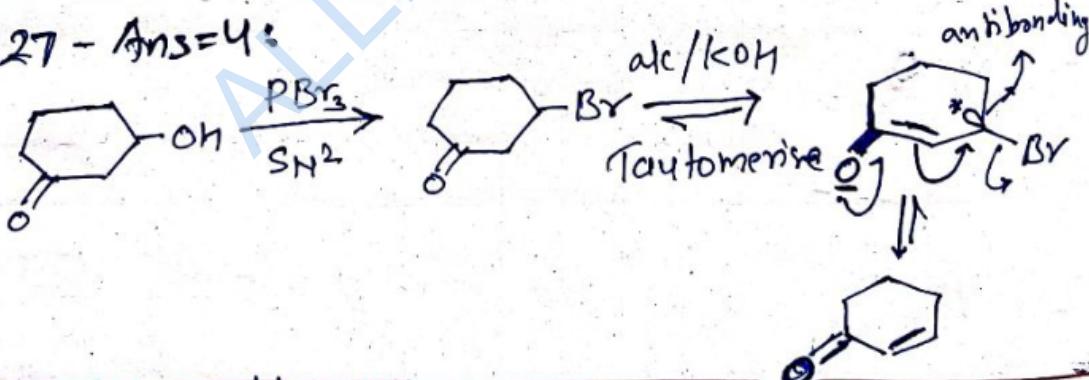
Q26 - Ans = 1 :  $\text{CF}_3-\text{CH}=\text{CH}_2$  on reaction with HCl gives Antimarkovnikov product

In this reaction HCl follows ionic mechanism

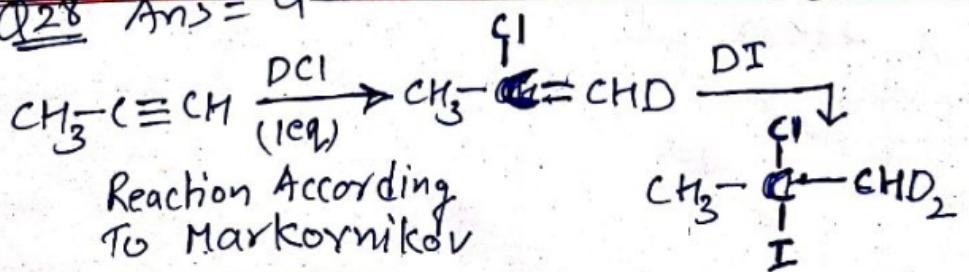


-I effect of  $-\text{CF}_3$  is high that's why Carbocation is not formed near to  $\text{CF}_3$

Q27 - Ans = 4 :



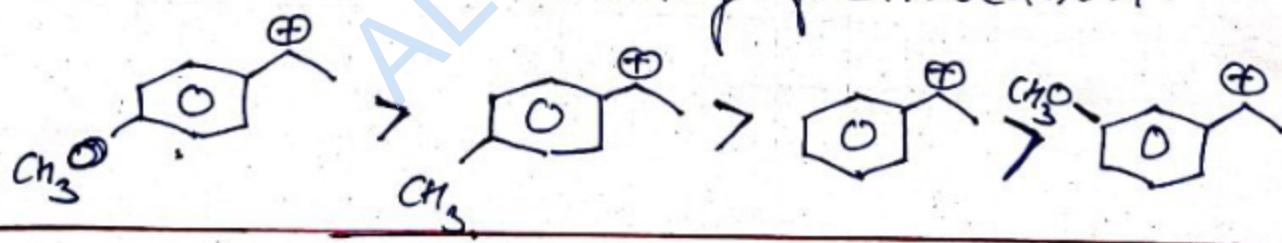
Q28 Ans = 4



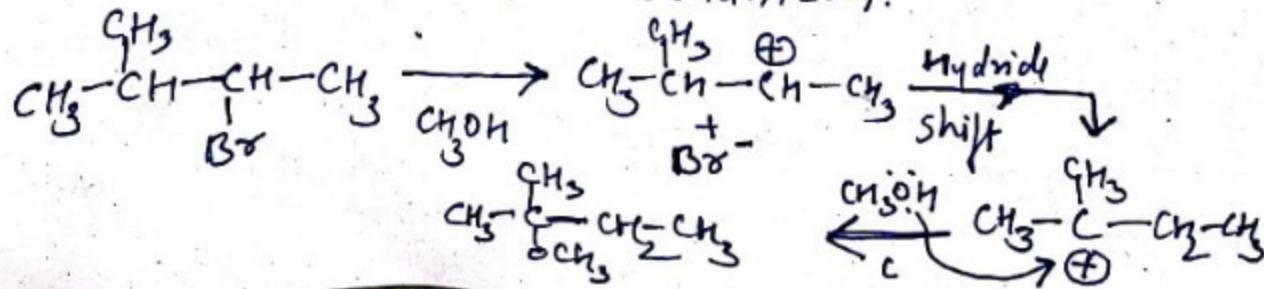
Q29-Ans:3 : Rate of  $S_N1$  reaction depend upon the stability of cation

Q30 :- Ans : 4 :  $S_N^1$  reaction involve 2 step mechanism in which step 1st is R.D.S (formation of cation) - 2 step reaction that's why two peak / or maxima is observed 1st step is slow and endothermic that's why P.E of 1st step is high.

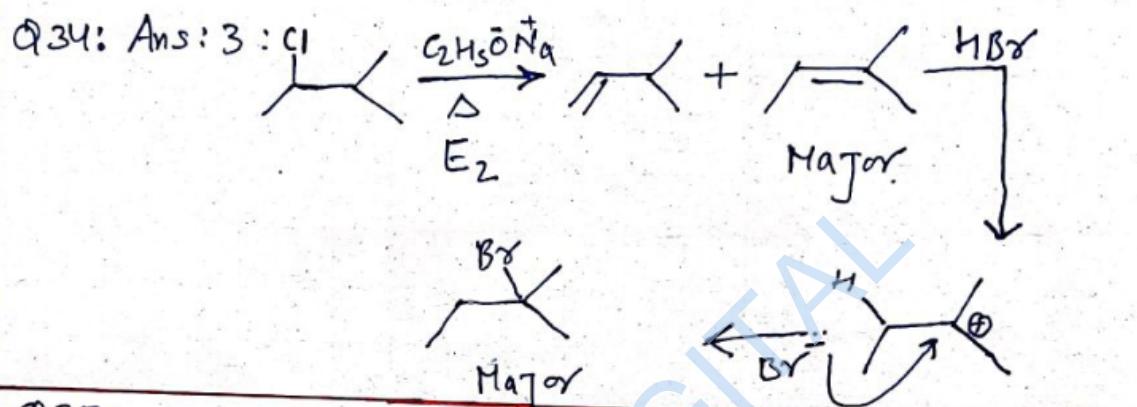
Q 31- Ans-3: Rate of  $S_N1$  Reaction depends on Stability of Carbocation.



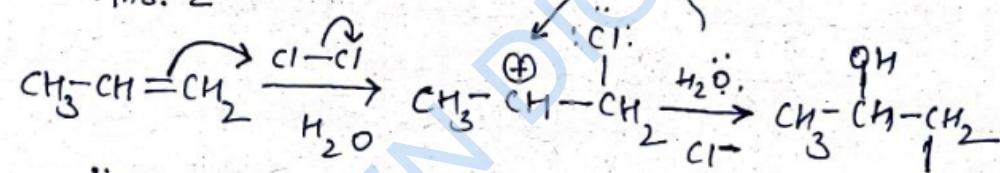
Q32- Ans: 3  $\text{CH}_3\text{OH}$  is polar protic / and Weak Nucleophile so this reaction follow  $\text{S}_{\text{N}}1$  Mechanism.



Q33: Ans: 1 Nucleophilicity is depend on  $e^-$  density of attacking species and negative charge species is more reactivity than neutral.

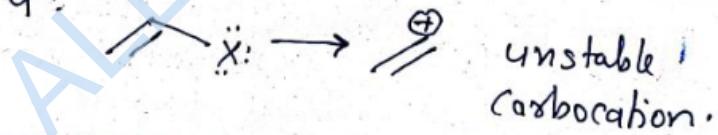


Q35: Ans: 2

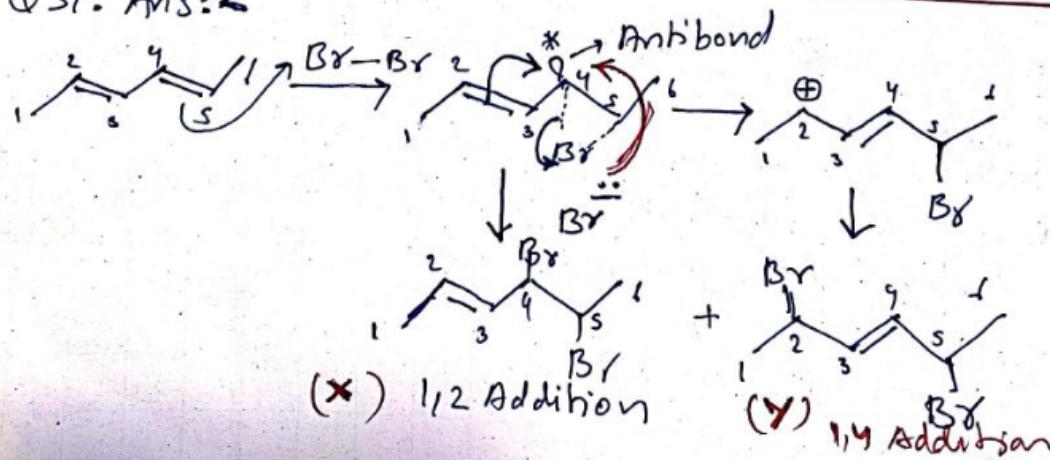


\*  $\text{Cl}^-$  is solvated by  $\text{H}_2\ddot{\text{O}}$  : hence  $\text{H}_2\ddot{\text{O}}$  attack;

Q36: Ans: 4 :

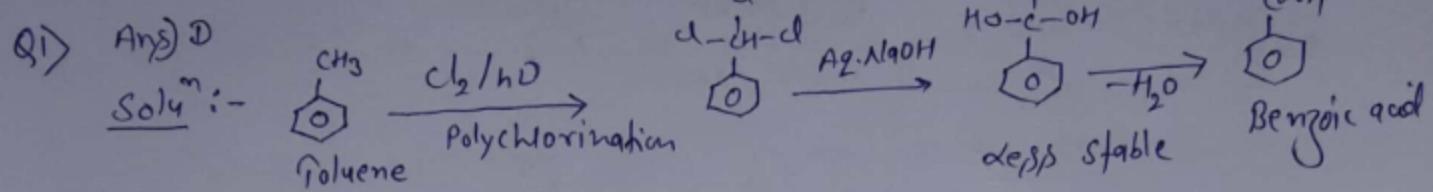


Q37: Ans: 2

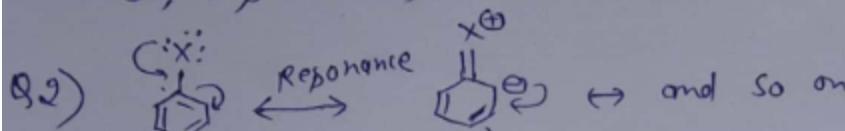


Halogen-Derivatives

(Ex-IV T-Advanced objective)



So, Ans is (D)

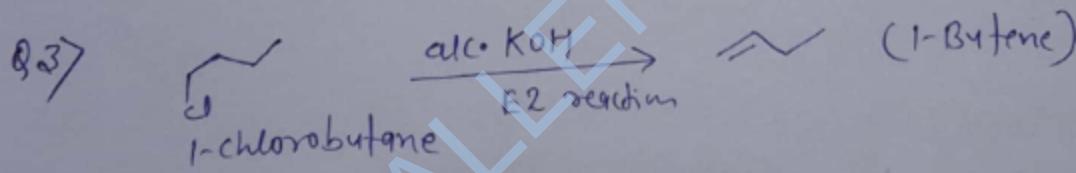


Aryl halide

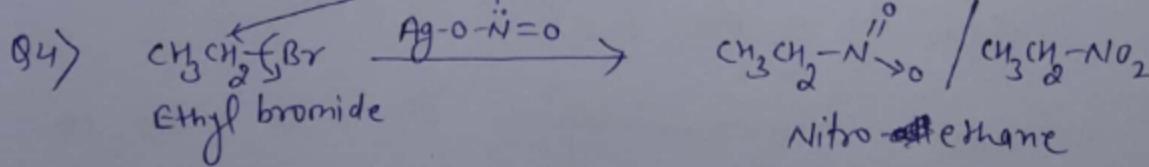
\* Due to Resonance partial double bond character is present in C-X bond, so it is difficult to break of C-X bond cleavage

\* Halogen is participate in resonance because carbon of benzene is  $sp^2$  hybridized.

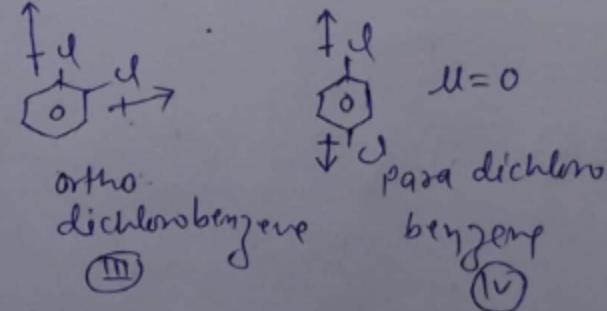
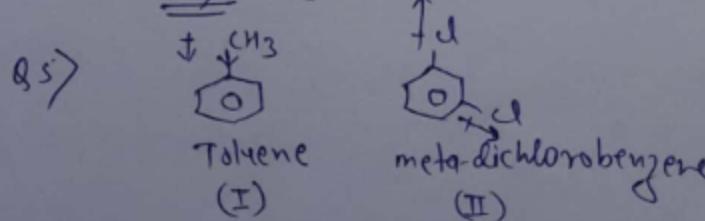
So, Ans is (B,D)



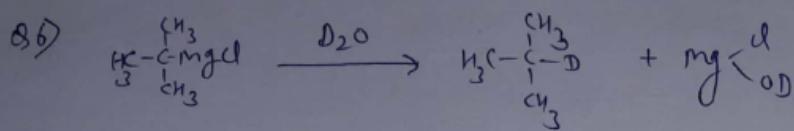
Ans is (A)



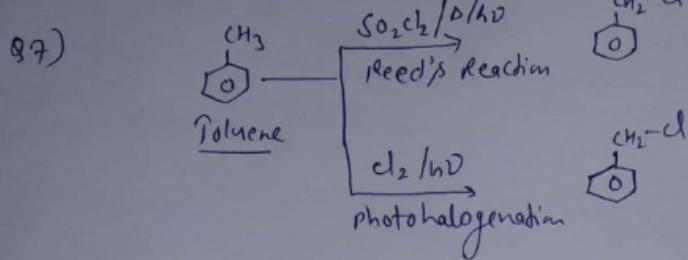
Ans is (C)



So, order of dipole moment is  $\text{IV} < \text{I} < \text{II} < \text{III}$   
 Ans - (B)

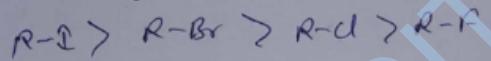


Ans is (A)



So, Ans is (A &amp; C)

Q8) Order of reactivity of R-X for  $\text{S}_{\text{N}}^2$  reaction is -

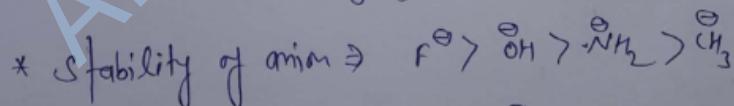


because Rate of  $\text{S}_{\text{N}}^2 \propto$  leaving group tendency

and Leaving group tendency  $\Rightarrow \text{-I} > \text{-Br} > \text{-Cl} > \text{-F}$

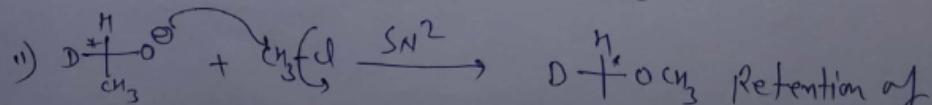
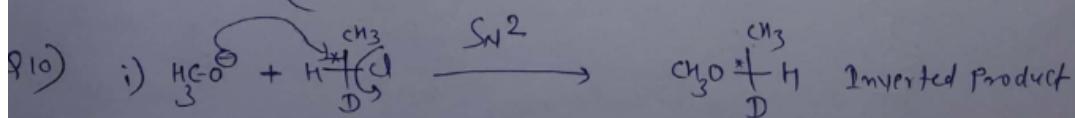
So, Ans is (D)

Q9) Nucleophilicity  $\propto \frac{1}{\text{Stability of anion}}$

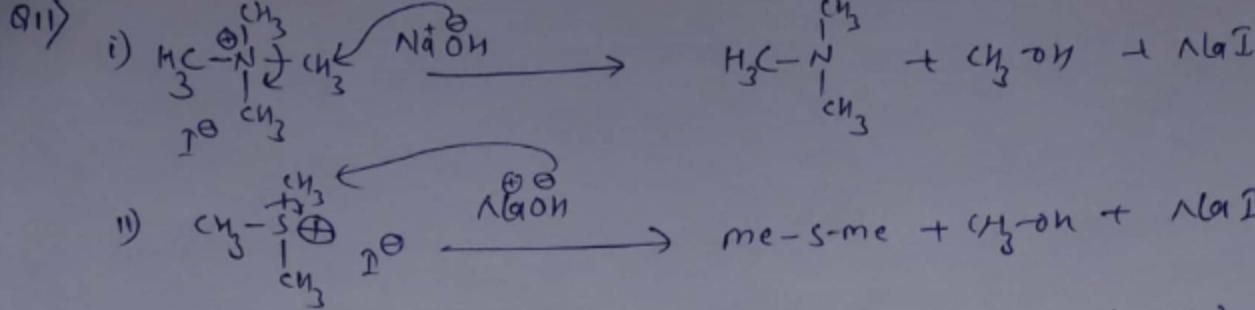


# Order of Nucleophilicity  $\Rightarrow \text{CH}_3^- > \text{NH}_2^- > \text{OH}^- > \text{F}^-$

Ans is (C)

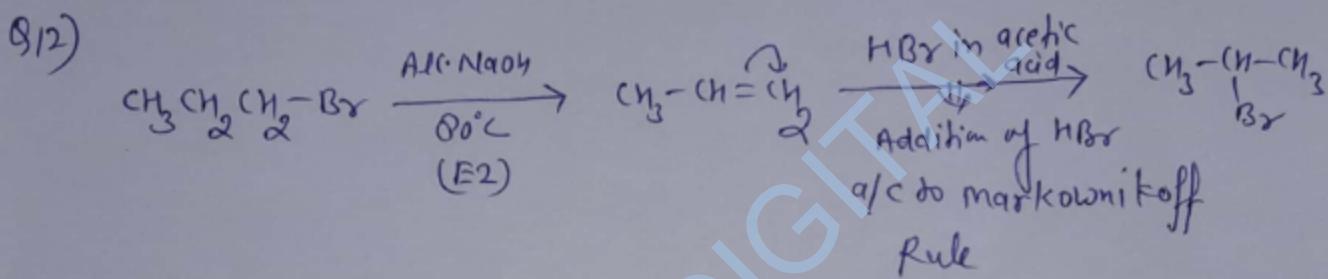


\* So, we can say Always Inverted product is not formed in  $\text{S}_{\text{N}}^2$  mechanism but Single stereoisomer is formed if reagent is chiral.

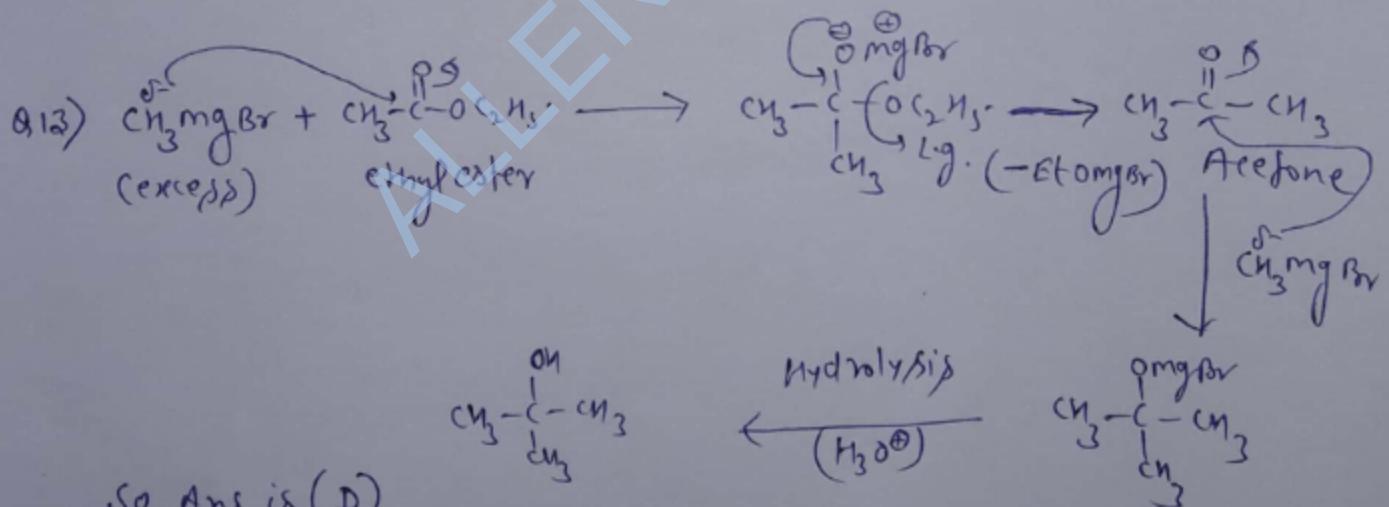


Both can form  $\text{CH}_3\text{OH}$  But I (first) is best reagent due to more polar ~~and~~ C-N bond compare to C-S bond.

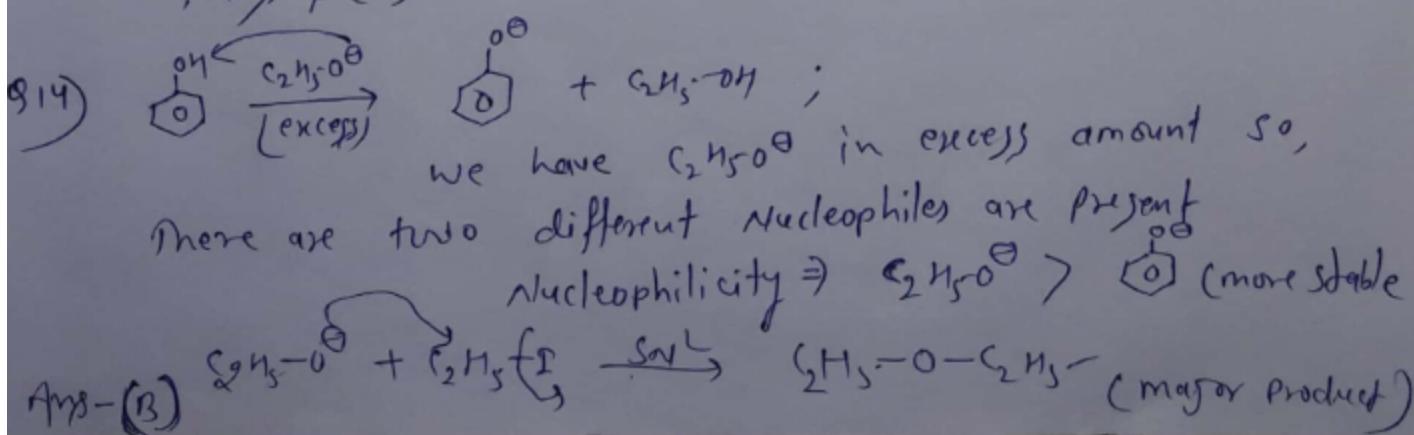
So, Ans is (A)



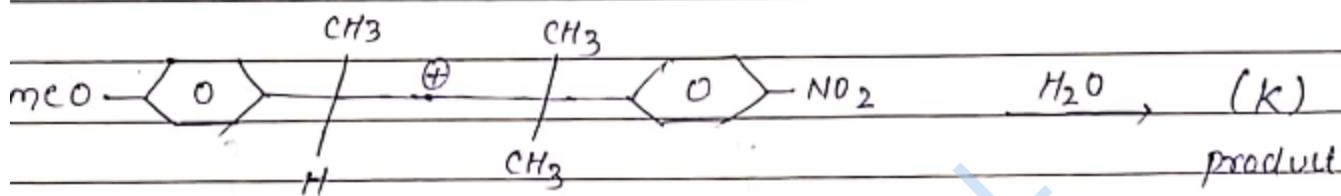
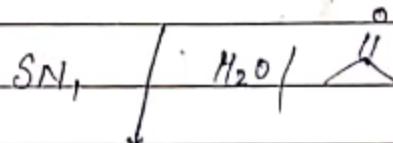
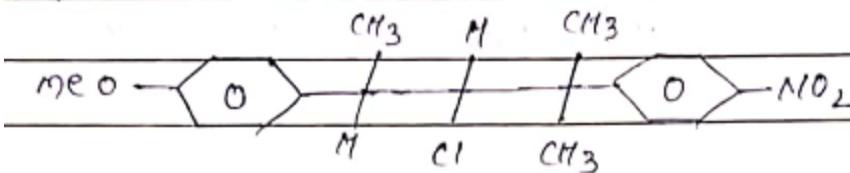
So, ~~Ans~~ Ans is (B)



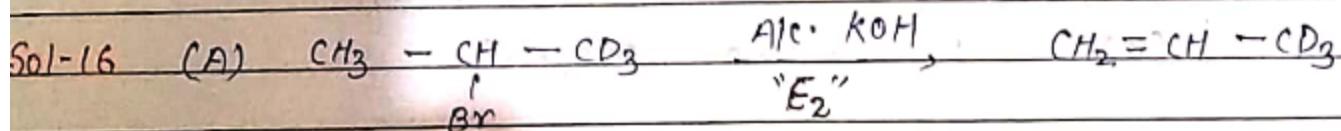
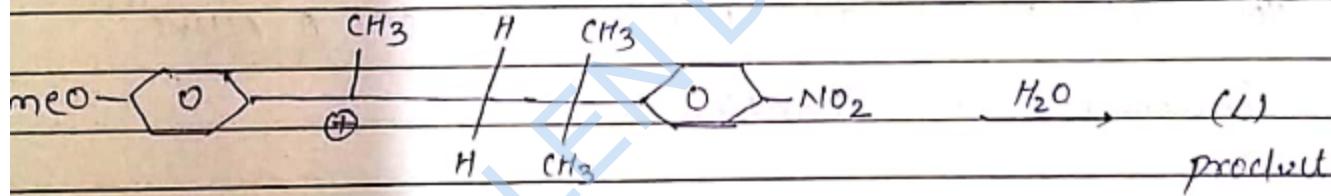
So, Ans is (D)



Sol-15

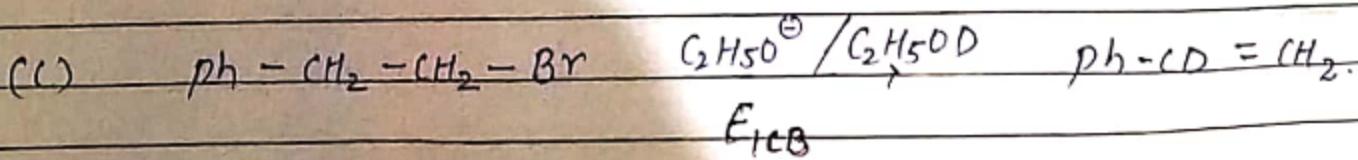


(H-shift)     $\downarrow$     Rearrange to most  
stable C<sup>+</sup>



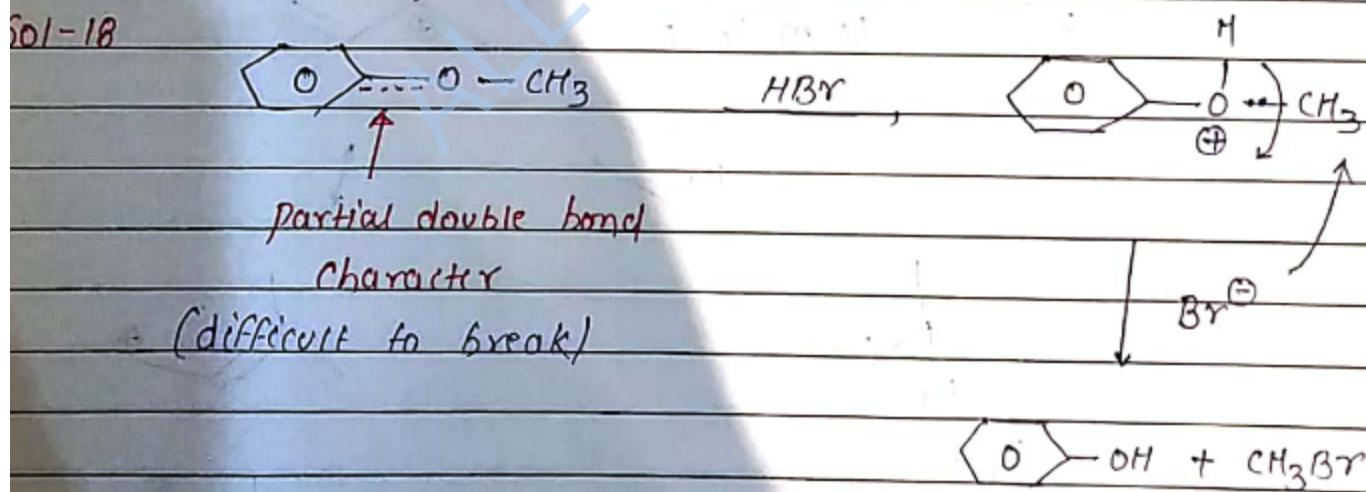
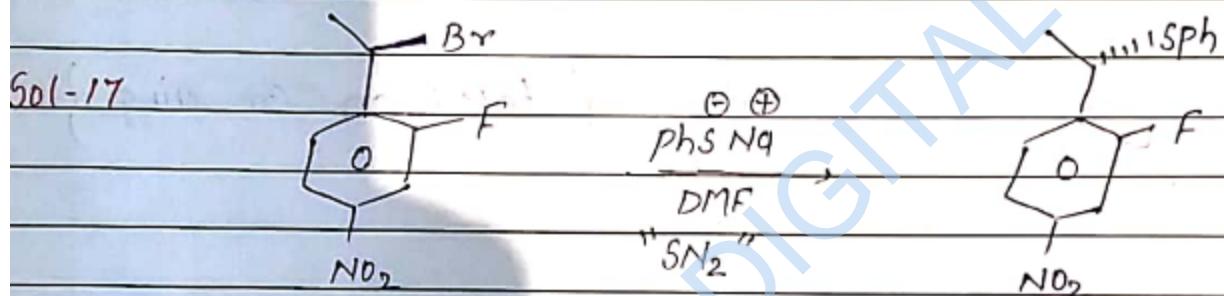
"H" is easily removed in E<sub>2</sub>, Compare to "D"

(B) Some concept as in (A); F<sub>2</sub>

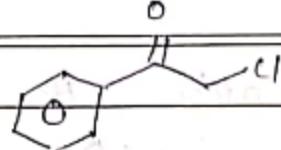


During elimination H replaced by D with help of  $C_2H_5OD$  proves formation of anion as intermediate. So  $E_{1CB}$ .

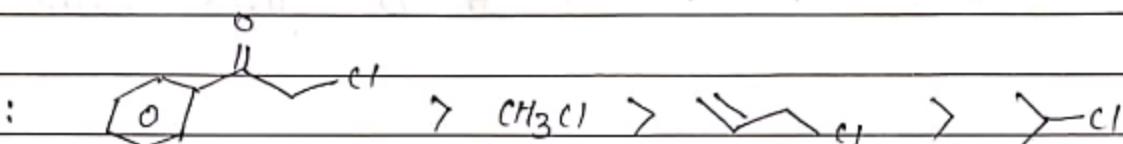
(D) In E<sub>1</sub> mechanism RDS step is removal of leaving group. In second step abstraction of H or D gives same RDR.



Sol-19

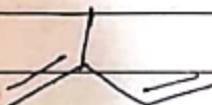
 $SN_2$  ROR : $> CH_3Cl > Cl > Cl$ 

$\{ -C^{\prime\prime} -$  present at adjacent position exceptionally  $\uparrow SN_2$ .  
ROR by stabilization of TS }

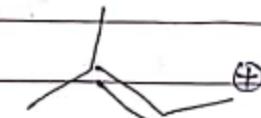
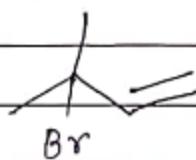
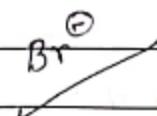


$\{$  based on crowding  $\}$

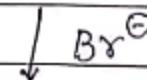
Sol-20



$HBr$  (reqd.)  
Room Temp



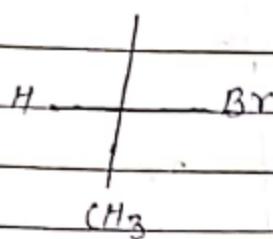
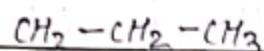
[KCP]



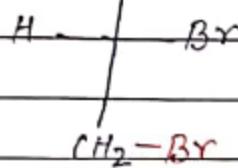
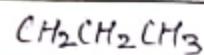
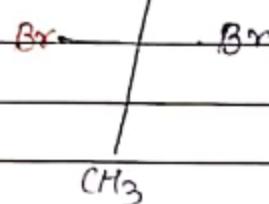
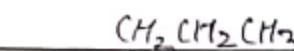
[TCP]

$\rightarrow$  At room temp. TCP will be  
major product.

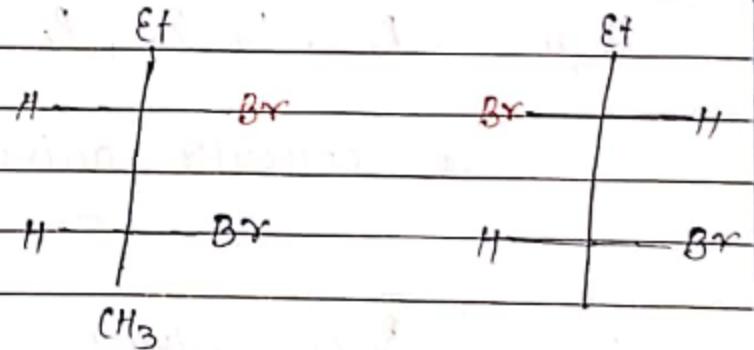
Sol-21

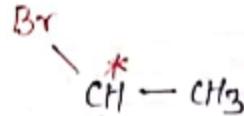
 $\text{Br}_2 / 300^\circ\text{C}$ 

(mono-bromination)

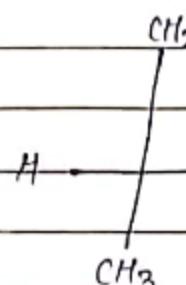
 $(P_1)$  $(P_2)$ 

Pos ↗

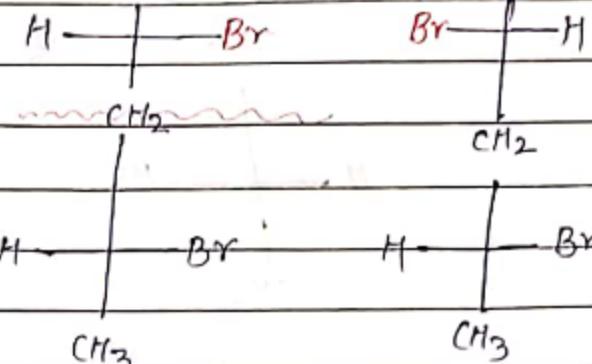
 $(P_3)$  $(P_4)$



Date \_\_\_\_\_  
Page \_\_\_\_\_



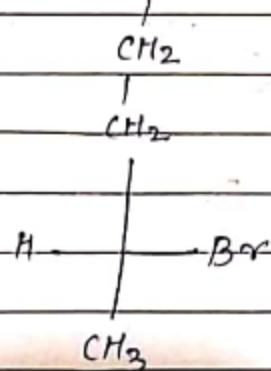
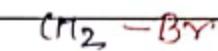
Two Possible  
Orientation



(P<sub>5</sub>)

(P<sub>6</sub>)

Pos ✓



(P<sub>7</sub>)

Product P<sub>1</sub>, P<sub>3</sub>, P<sub>4</sub>, P<sub>6</sub>, P<sub>7</sub> have no Pos & Cos

So optically active (chiral product)

21-22

Refer solution in Ans key.

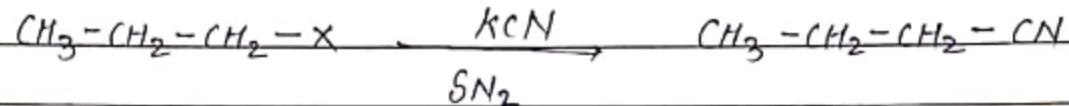
(Subjective)

JEE-Advance

Date \_\_\_\_\_  
 Page \_\_\_\_\_

Sol-1 (a)

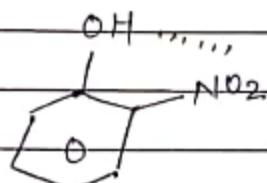
Alc.



X : Halogen

Butane-nitrile

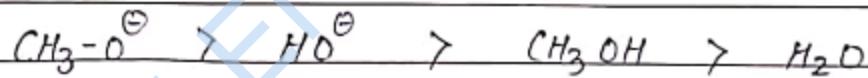
(b)



o-nitro phenol

; is least in  $\text{H}_2\text{O}$  as  
already engaged in  
Intra molecular H-bonding.

Sol-2 (i) Basicity :



{ anion are better donner than  
neutral species.

$\rightarrow$   $\text{CH}_3$  by +I effect increase  
donating tendency }

(ii) ROR for SN reaction



{ better  $\text{L}_\text{b}$ , faster will be ROR }