Student Name:
Registration no.:
Section:

Org. Chem. 233
First exam
Seat no. 51

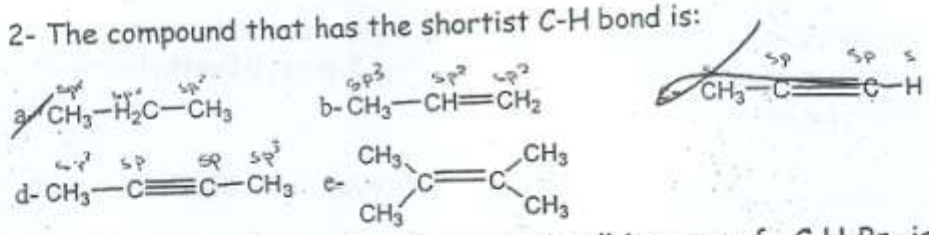
##########

Q1 (10 pt): Circle the correct answer in each of the following:

1- The formal charge of nitrogen (atomic number of N is 7) in

a- -1 b- -2 c- +1 d- 0 e- +2

2- The compound that has the shortist C-H bond is:



3- The number of structural (constitutional) isomers of $C_3H_5Br_3$ is?

a- 2 b- 3 c- 4 d- 5 e- 6

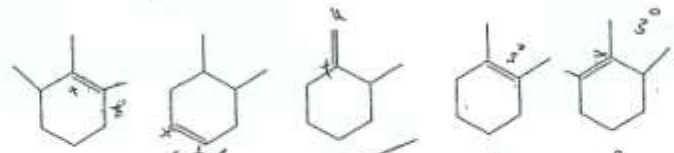
4- The alkene that contain an isolated double bond is

a b c d e

5- Which of the following compounds show *cis-trans* isomerism?

a- 1,1-dimethylcyclopentane b- 2-methyl-1-penetene
c- 1-pentene d- 4-methyl-2-pentene
e- 2-methyl-2-pentene

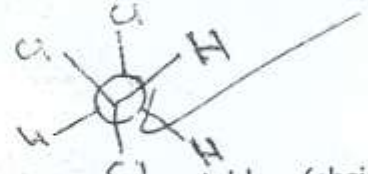
6- Which of the following alkene forms the least stable carbocation intermediate upon reaction with HI



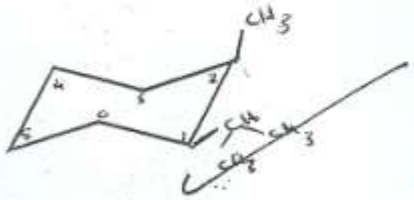
a b c d e

Q2 (14 pt) Draw the structure of each of the following:

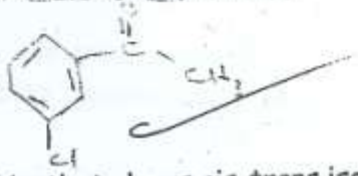
1- The most stable Newman projection of 1,1,2-trichloroethane.



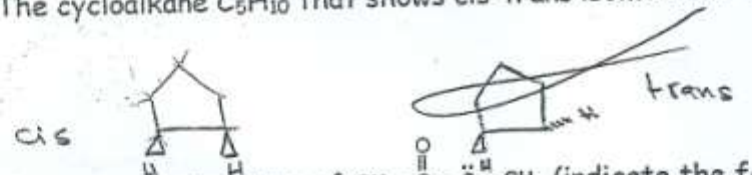
2- The most stable (chair) conformation of *cis*-1-isopropyl-2-methylcyclohexane.



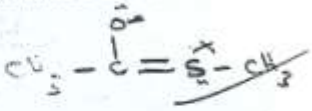
3- The structure of m-chloroacetophenone.



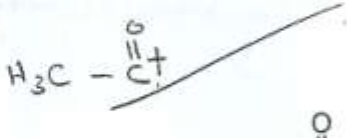
4- The cycloalkane C_5H_{10} that shows cis-trans isomerism.



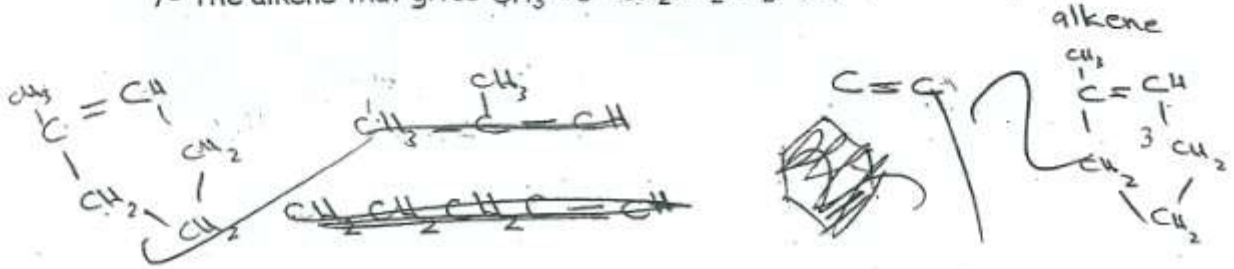
5- A resonance structure of $CH_3-\overset{\overset{O}{\|}}{C}-\ddot{S}-CH_3$ (indicate the formal charge)



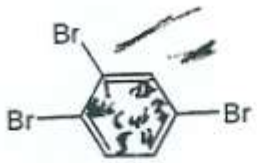
6- The structure of the electrophile formed upon reaction of benzene with $H_3C-\overset{\overset{O}{\|}}{C}-Cl$ in the presence of $AlCl_3$



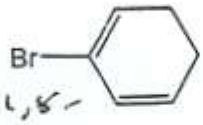
7- The alkene that gives $CH_3-\overset{\overset{O}{\|}}{C}-CH_2CH_2CH_2-\overset{\overset{O}{\|}}{C}H$ upon ozonolysis



Q3 (8 pt) Give the IUPAC Name of each of the following compounds:

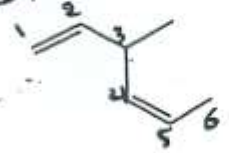


1,3,5-tribromobenzene

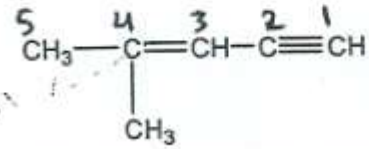


1-Bromo-1,5-hexadiene

Phenol Bromide

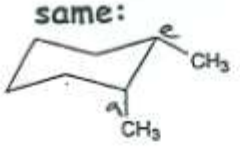


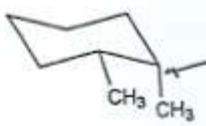
3-methyl-1,4-hexadiene.



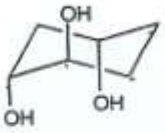
4-methyl-4-Penten-1-yle.

Q4 (8 pt) Classify each of the following pairs of structures as: structural isomers, configurational isomers, conformations or the same:

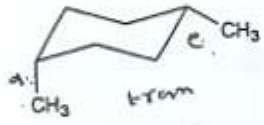


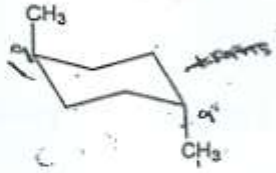


the same

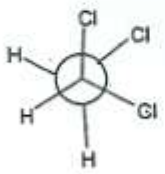


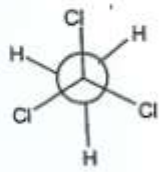
structural isomers.





Conformations / configs

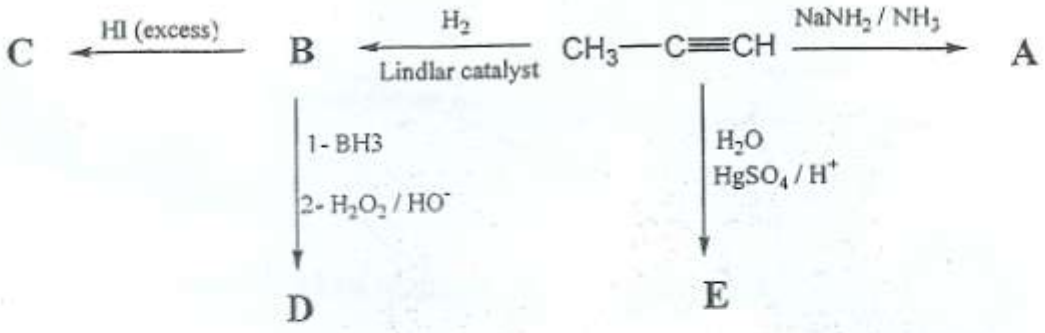




structural isomers.

4

Q5 (10 pt) Draw the missing structure (A-G)



A ....

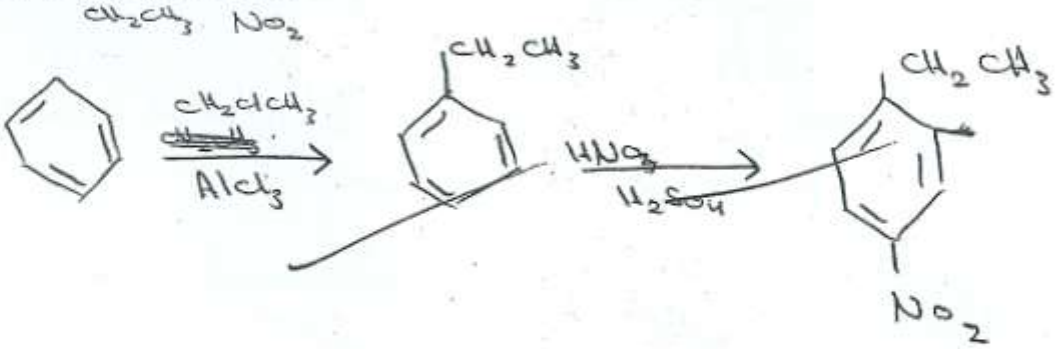
B ....

C ....

D ....

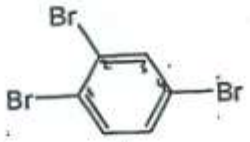
E ....

Q7 (Bonus 4pt) Starting from benzene show how you can synthesize p-ethylnitrobenzene?

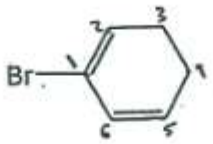


10

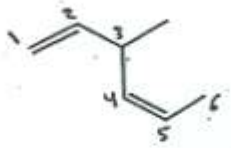
Q3 (8 pt) Give the IUPAC Name of each of the following compounds:



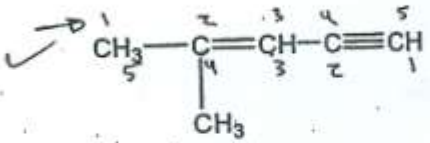
1,2,4-tribromo ~~cyclo hex~~ benzene



1-bromo-1,5-~~cyclo~~ hexadiene

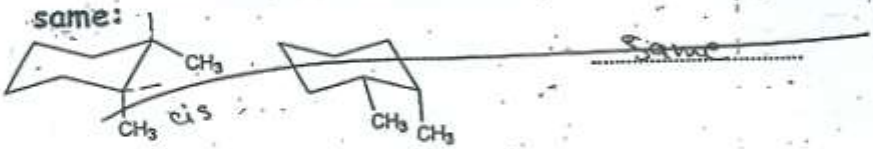


3-methyl-~~1,4~~-hexadiene

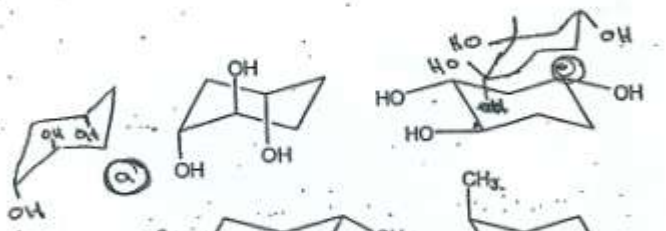


2-methyl-2-pentene-4-yne

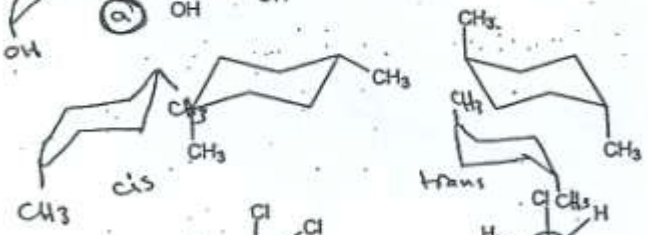
Q4 (8 pt) Classify each of the following pairs of structures as: structural isomers, configurational isomers, conformations or the same:



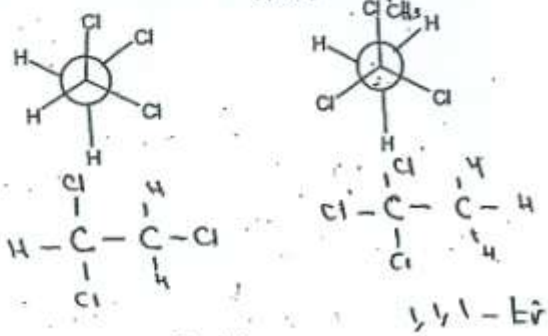
same



Conformations



Configurational isomers (cis-trans)



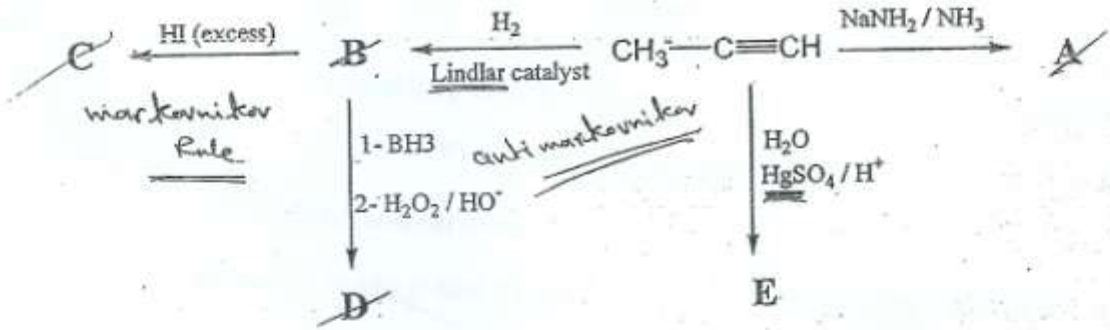
structural isomers

1,1,3-tri.

1,1,1-tri.

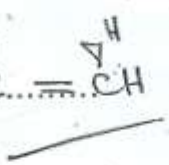
10

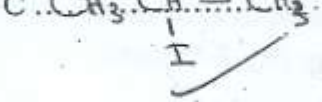
Q5 (10 pt) Draw the missing structure (A-G)

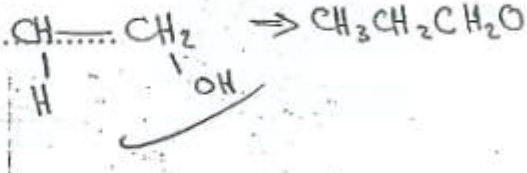


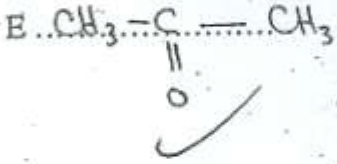
A $CH_3-C\equiv C:^{\ominus}/Na^+$

$CH_3-C\equiv CNa + NH_3$

B  (same side)

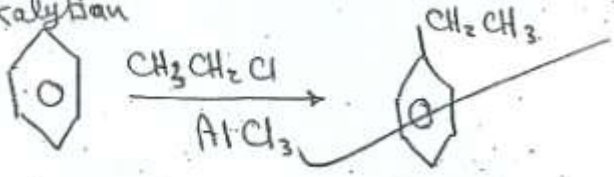
C 

D 

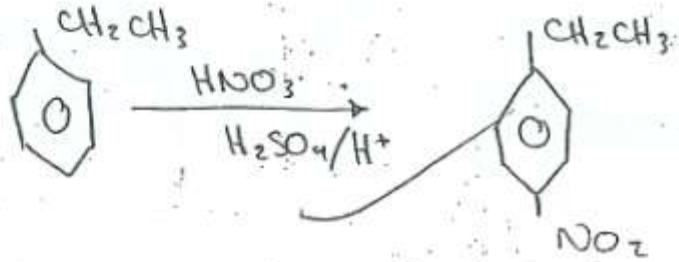
E 

Q7 (Bonus 4pt) Starting from benzene show how you can synthesize p-ethylnitrobenzene?

① Alkalytion



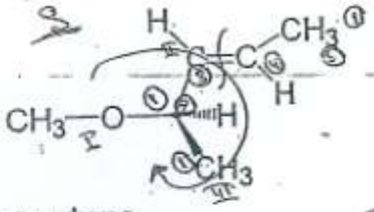
Nitration ②



4

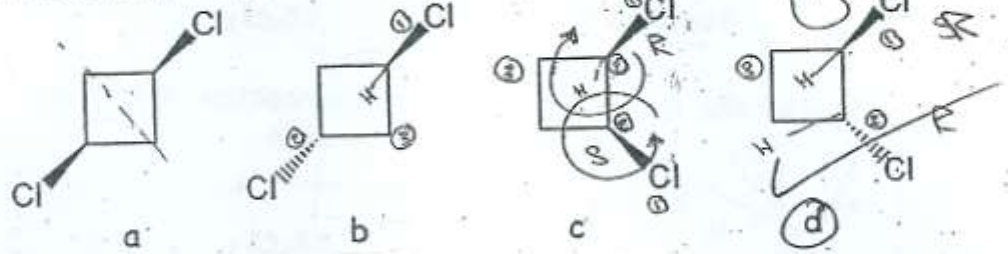
E

E2 2-pentene-4-methoxy

7- The correct name for  is:

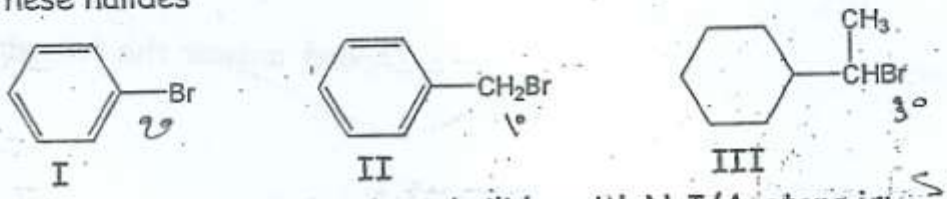
a- (2Z, 4R)-4-methoxy-2-pentene
b- (2E, 4R)-4-methoxy-2-pentene
c- (3E, 2S)-2-methoxy-3-pentene
d- (3E, 2R)-2-methoxy-3-pentene

8- Which of the following compouns is an optically active compound



a b c d

9- Consider these halides

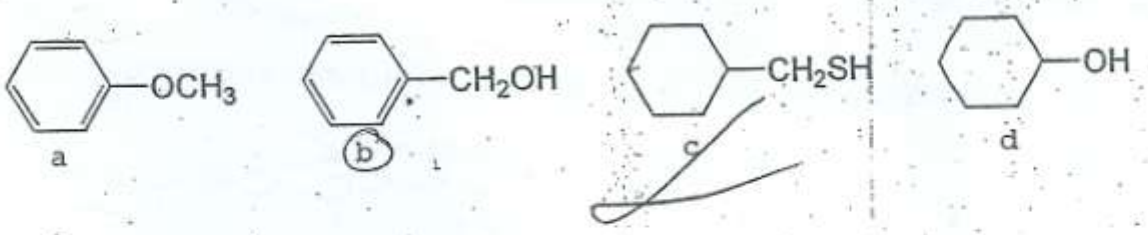


I II III

The order of reactivity of the above hailides with NaI/Acetone is:

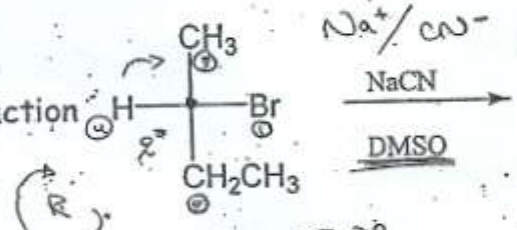
a- II, III, I b- III, II, I c- I, II, III d- II, I, III

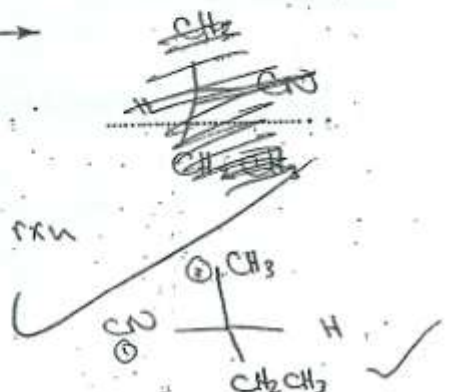
10- Which of the following will react with sodium hydroxide?



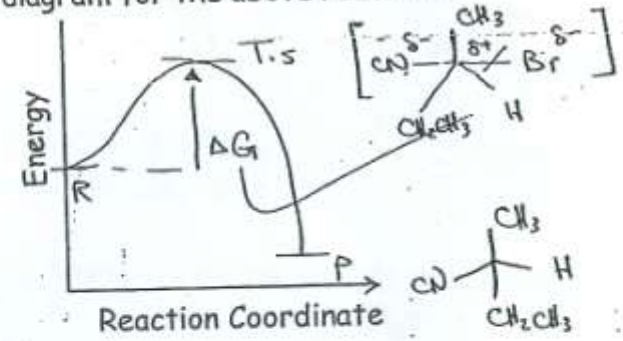
a b c d

Q2 (6 pts) Answer each of the following

a- Complete the reaction 

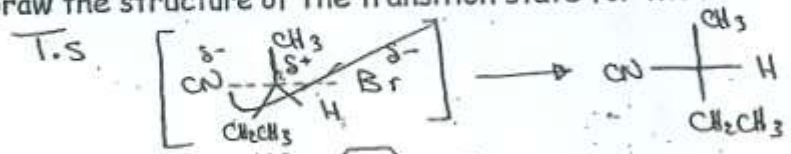


b- Draw the energy diagram for the above reaction.

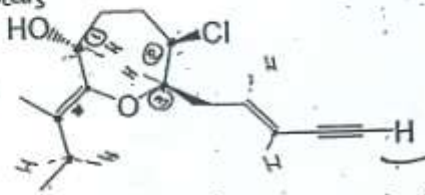


Exothermic Rxn.

c- Draw the structure of the transition state for the reaction in part a.



* Consider this structure



and answer the following questions

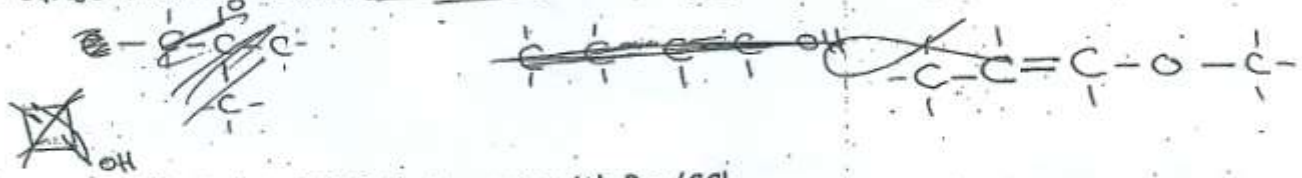
d- How many chiral centers in this compound? ..... 3 .....

e- The maximum number of possible stereoisomers for this compound is $2^3 = 8$

Q3 (6 Pt) Draw the structure of each of the following

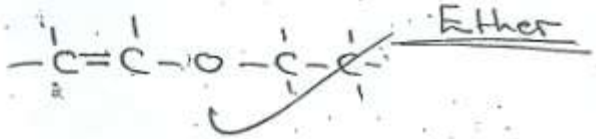
Alcohol / ether

a- C_4H_8O that reacts with sodium metal but does not react with Jone's reagents.



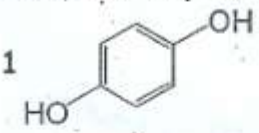
b- An optically active C_4H_8O that reacts with Br_2/CCl_4

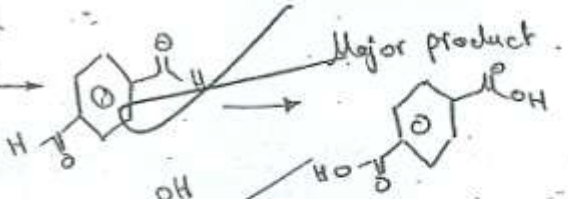
c- C_4H_8O that does not form H-bonding



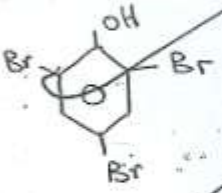
Ether

Q4 (18 points): Complete the following equations by writing the major product(s) (show stereochemistry of reaction 5):

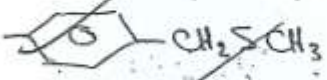
1 

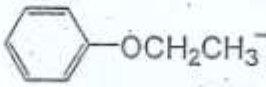
$\xrightarrow[H_2SO_4]{Na_2Cr_2O_7}$ 

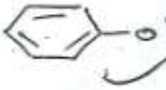
2 

$\xrightarrow[H_2O]{Br_2\ (excess)}$ 

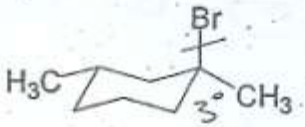
3 

$\xrightarrow[\text{Acetone}]{CH_3SNa}$ CH_3S 

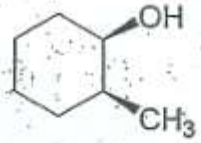
4 

$\xrightarrow[2\text{-}H_2O]{1\text{-}BBr_3}$ 

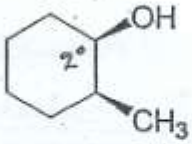
$+ CH_3CH_2Br$

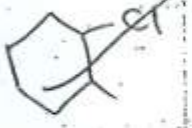
5 

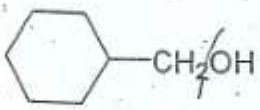
$\xrightarrow[\text{weak Nu as Solvent}]{CH_3OH}$ Major Product E1 only

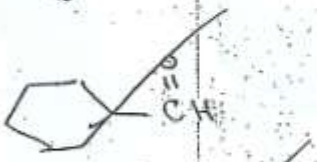
6 

$\xrightarrow{\text{concentrated } H_2SO_4 \text{ /heat}}$ 

7 

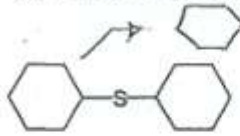
$\xrightarrow{SOCl_2}$ 

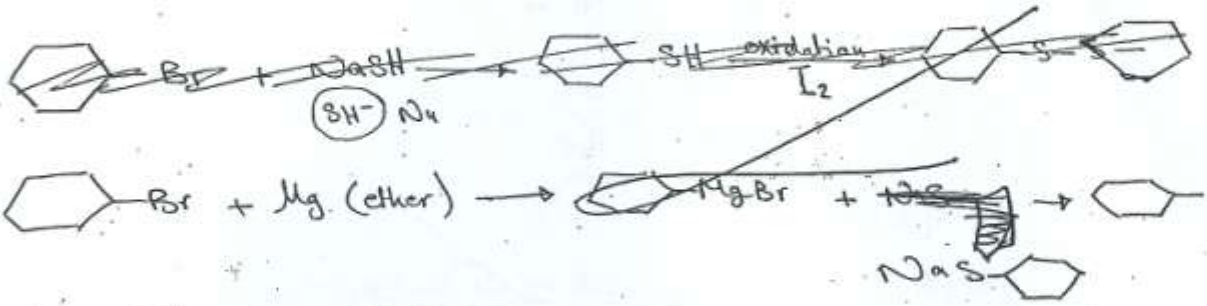
8 

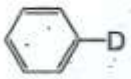
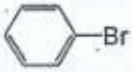
$\xrightarrow{PCC}$ 

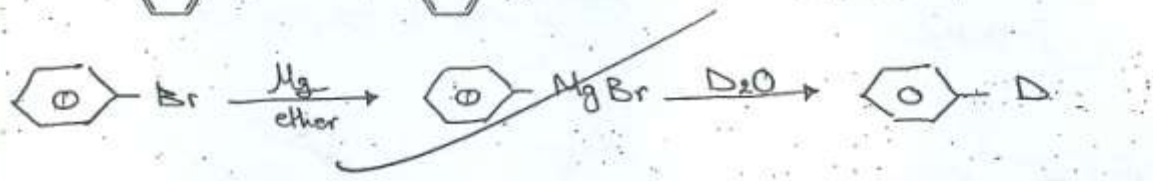
9 $CH_3-C\equiv CNa$ $\xrightarrow[CH_3CH_2^+ / Br^-]{CH_3CH_2Br}$ $CH_3C\equiv C-CH_2CH_3$

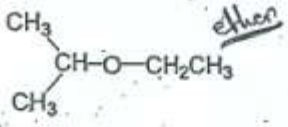
Q5 (9 pt) Show the synthesis of each of the following

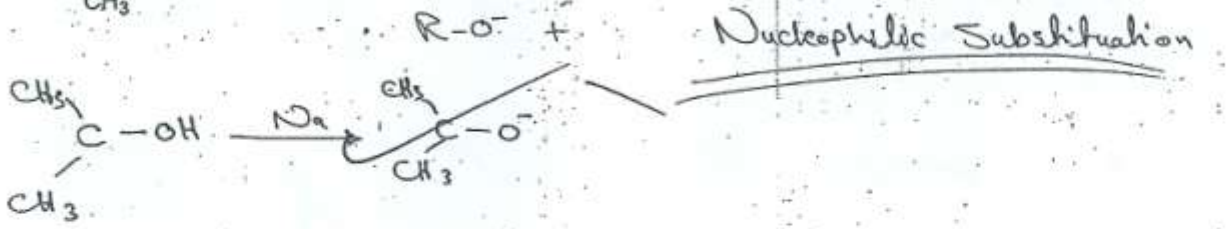
1-  from  and any other reagents you need



2-  from  and any other reagents you need



3-  from the corresponding alcohols (using Williamson's method)



then

G o o d L u c k