

M.Sc. CHEMISTRY  
FIRST SEMESTER  
ORGANIC CHEMISTRY-I  
MSC -101 [SPECIAL REPEAT]  
[USE OMR FOR OBJECTIVE PART]

**SET  
A**

Duration: 3 hrs.

Full Marks: 70

Time: 30 min.

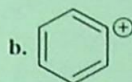
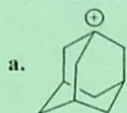
[ Objective ]

Marks: 20

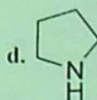
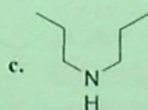
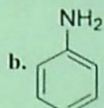
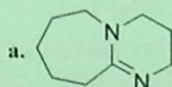
Choose the correct answer from the following:

1 × 20 = 20

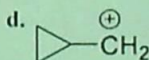
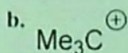
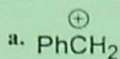
1. Which one of the following is the example of a non-classical carbocation?



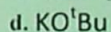
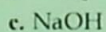
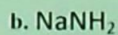
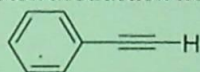
2. Which one among the followings is an example of non-nucleophilic base?



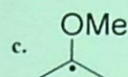
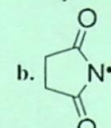
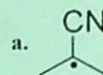
3. The most stable carbocation is



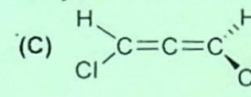
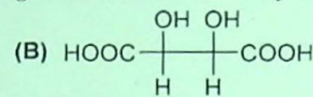
4. The most suitable base for the proton abstraction from the following molecule is



5. Which of the following is an example of a nucleophilic radical?



6. Which of the following molecules will show optical activity?



a. A only  
c. A & C

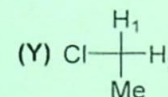
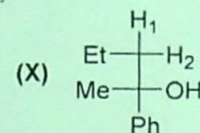
b. A & B  
d. B & C

7. Bridge-head hydrogen of the conformers of **trans-decalin** is positioned as

a. a, a  
c. a, e

b. e, e  
d. pseudo-a, pseudo-e

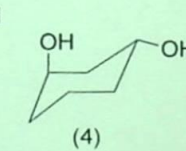
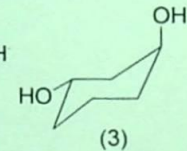
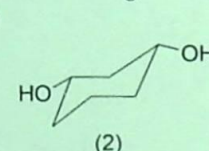
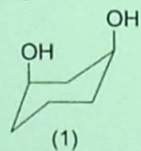
8. Stereochemical descriptors for the atoms labelled H<sub>1</sub> and H<sub>2</sub> in the structures respectively are



a. X -diastereotopic, Y-enantiotopic  
c. X-diastereotopic, Y-homotopic

b. X-homotopic, Y-diastereotopic  
d. X-enantiotopic, Y-homotopic

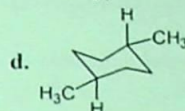
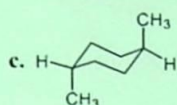
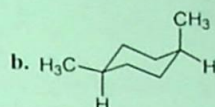
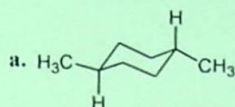
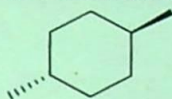
9. Stability order of the following conformers is



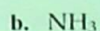
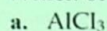
a. 1>2>3>4  
c. 1>2>3=4

b. 2>1>3=4  
d. 2>1>4>3

10. Which structure is different from the following?



11. Which of the following is not a nucleophile



12. Which of the following is not true about nucleophiles?

a. nucleophiles are Lewis's acids

b. all molecules or ions with a free pair of electrons

c. donates an electron pair to an

d. a nucleophile becomes attracted to a positive charge.

electrophile to form a chemical bond

13. In  $\text{S}_{\text{N}}2$  reactions, the reactivity order of alkyl halides is:

a.  $3^\circ$  alkyl halides  $\gg$   $2^\circ$  alkyl halides

b.  $1^\circ$  alkyl halides  $>$  methyl halides  $>$

$>1^\circ$  alkyl halides  $>$  methyl halides

$3^\circ$  alkyl halides  $\gg$   $2^\circ$  alkyl halides

c.  $2^\circ$  alkyl halides  $>$   $1^\circ$  alkyl halides  $>$   $3^\circ$

methyl halides  $>$   $1^\circ$  alkyl halides  $>$

alkyl halides  $\gg$  methyl halides

$2^\circ$  alkyl halides  $\gg$   $3^\circ$  alkyl halides

14. When (S)-1-phenylethanol is treated with  $\text{SOCl}_2$  in presence of pyridine the product obtained is with the -----of configuration

a. Inversion

b. retention

c. both retention and inversion

d. none of the above

15. When o-bromo anisole is treated with  $\text{KNH}_2$  in liq.  $\text{NH}_3$  the product obtained is preferably cine product. This product is

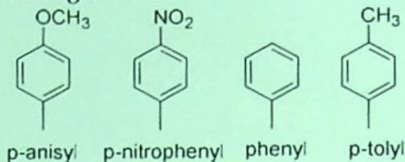
a. o-anisidine

b. m-anisidine

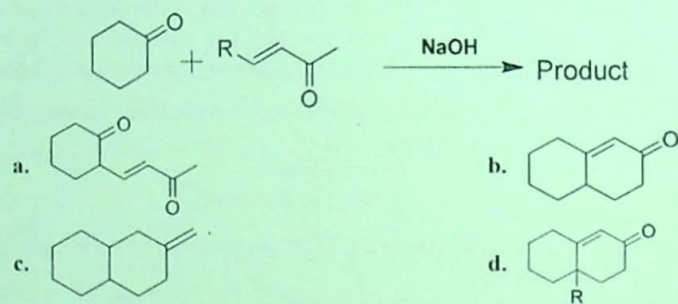
c. p-anisidine

d. none of these

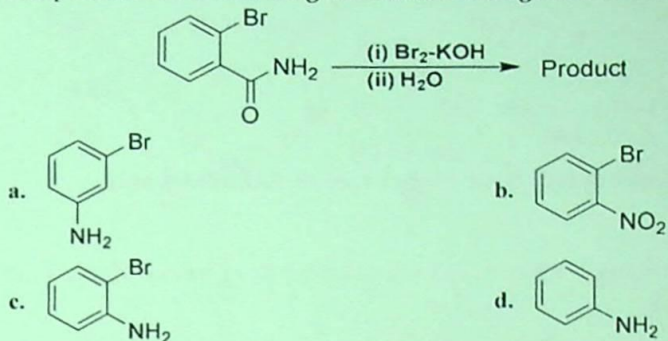
16. The correct order of migratory aptitude of the following moiety in pinacol-pinacolone rearrangement is



- a. *p*-anisyl > *p*-nitrophenyl > phenyl > *p*-tolyl  
 b. *p*-anisyl > *p*-tolyl > phenyl > *p*-nitrophenyl  
 c. *p*-tolyl > *p*-nitrophenyl > phenyl > *p*-anisyl  
 d. *p*-anisyl > phenyl > *p*-nitrophenyl > *p*-tolyl
17. 'The.....reaction uses catalytic acid and hydrazoic acid (HN<sub>3</sub>) to convert carboxylic acids, aldehydes, ketones, olefins, and 3° alcohols to amines, nitriles, amides, and imines respectively'. Fill the blank
- a. Schmidt  
 b. Lossen  
 c. Curtius  
 d. Wagner-Meerwin
18. The catalyst used in Mukaiyama aldol reaction is
- a. TiCl<sub>4</sub>  
 b. MnCl<sub>2</sub>  
 c. ZnCl<sub>2</sub>  
 d. TiO<sub>2</sub>
19. Choose the correct final product of the following reaction



20. The product of the following Hofmann rearrangement reaction is



-----

**( Descriptive )**

Time : 2 hrs. 30 min.

Marks : 50

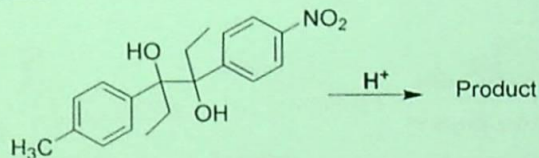
*[ Answer question no.1 & any four (4) from the rest ]*

1. a. Arrange the following compounds according to the decreasing order of acetolysis rate with justification

3+3+2+  
2=10



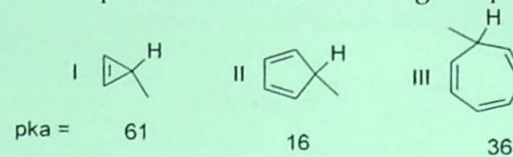
- b. Write down the product of the following reaction? Describe the mechanism



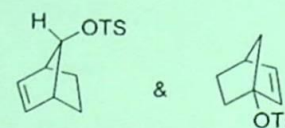
- c. Calculate the enantiomeric excess from the following data: specific rotation of the compound =  $20^\circ$  and the opt rotation of the enantiomeric mixture =  $(+16^\circ)$ . Also find the % of both the enantiomers.
- d. How does the structure of substrate molecule affect the reactivity of the nucleophilic substitution reactions? Explain.

2. a. Explain the pKa values of the following compounds

3+2+3+  
2=10



b. Which of the following will have higher rate of Acetolysis and why?



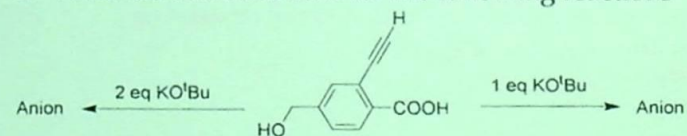
c. Discuss about the basic strength of the following bases in aqueous medium [Given: pKa of H<sub>2</sub>O = 16, <sup>t</sup>BuOH = 19, NH<sub>3</sub> = 33].

Bases: (i) KOH      (ii) KO<sup>t</sup>Bu      (iii) KNH<sub>2</sub>

d. What is proton sponge? Give example.

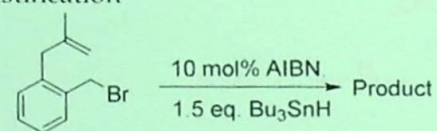
3. a. Write the correct anions for the following reactions

2



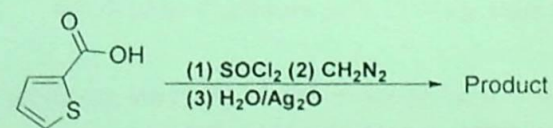
b. Write the major product of the following reaction with justification

3

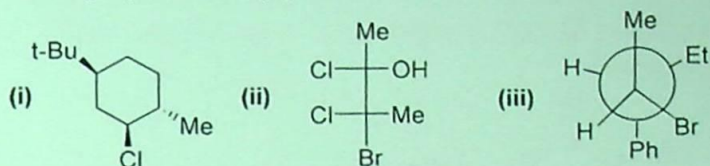


c. What is the product of the following reaction. Write the name of the following reaction? Deduce the mechanism

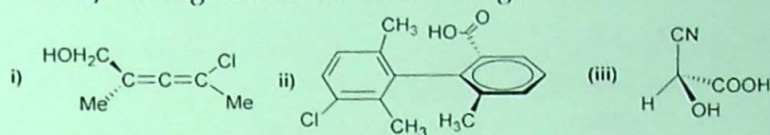
1+1+3



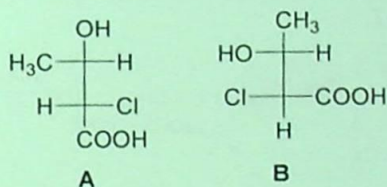
4. a. Draw Chair conformation for (i), Newman's projection for (ii) and Fisher projection for (iii). 3+3+2+  
2=10



- b. Give R/S configurations for the following molecules



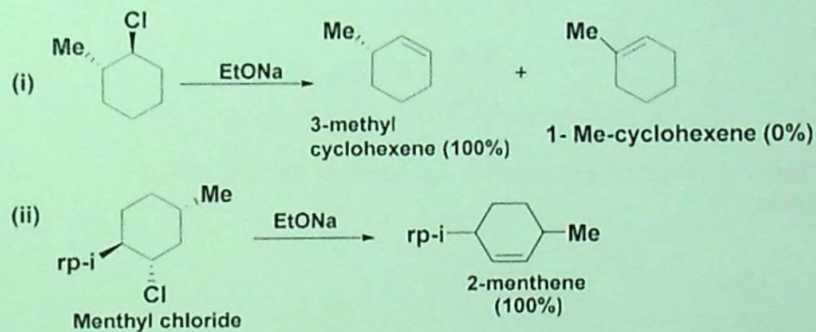
- c. Following two stereo isomers, A and B, are homomers, enantiomers or diastereomers. Justify your answer.



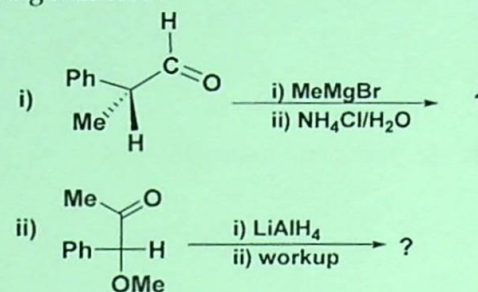
- d. Explain why cis-1-4 di-t-butyl cyclohexane exist in boat conformation?

5. a. Justify the result in the following scheme of reactions:

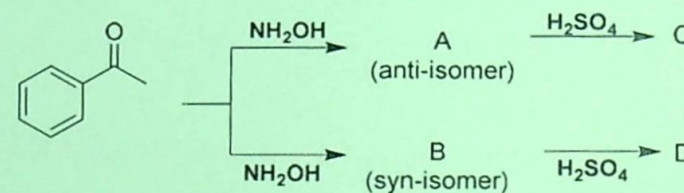
4+2+4=  
10



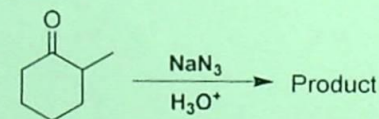
- b. Explain what you mean by Stereo selective and stereo specific reactions. Explain with appropriate examples.
- c. Use Cram's/anti Cram's rule to predict the major product in the following reactions:



6. a. Write down the product A, B, C, and D. Which product C or D will form faster rate? Show the detailed mechanism for the formation of product D. 6+4=10



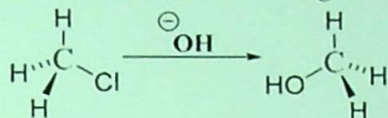
- b. Write down the product of the following reaction. Deduce the detailed mechanism?



7. a. Explain the properties of a solvent that affect the rate of  $S_N1$  reaction. 3+4+3=10



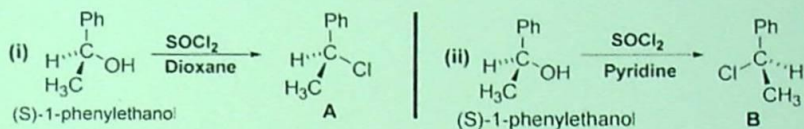
- b. Give the distinction between  $S_N1$  and  $S_N2$  reactions. Discuss the mechanism of the following reaction. Give reason why the mechanism of this reaction is designated as  $S_N2$ ?



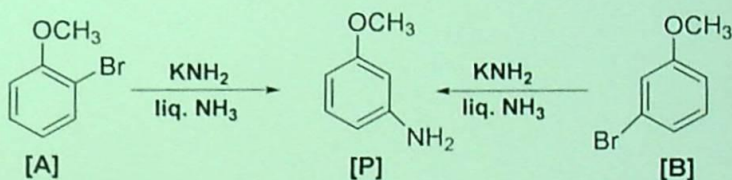
- c. What is allylic rearrangement? Explain with example.

8. a. Name the products A and B in the following two reactions and justify the formation of the two products with mechanism.

4+3+3  
=10



- b. What is benzyne? With benzyne mechanism explain the formation of the same product [P] from two different reactants [A] and [B].



- c. What is cine substitution? Explain with suitable example.

== \*\*\* ==