2025/12

SET A

M.Sc. CHEMISTRY
FIRST SEMESTER
ORGANIC CHEMISTRY-I
MSC – 101

[USE OMR FOR OBJECTIVE PART]

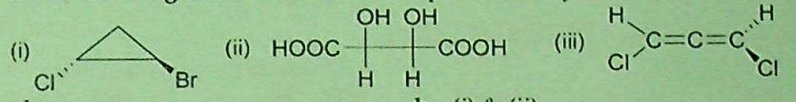
Duration: 3 hrs. **Full Marks: 70**

Objective

Time: 30 min. **Marks: 20**

Choose the correct answer from the following: ***1×20=20***

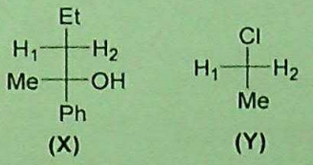
1. Which of the following molecules will show optical activity?



   a. (i) only
   b. (i) & (ii)
   c. (i) & (iii)
   d. (ii) & (iii)

2. Bridge-head hydrogen of the conformers of trans-decalin is positioned as
   a. a, a
   b. e, e
   c. a, e
   d. both a, a and e, e

3. Stereochemical descriptors for the atoms labelled H_1 and H_2 in the structures respectively are

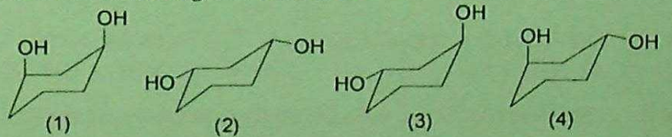


(X)

(Y)

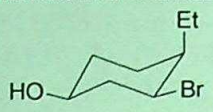
   a. X-homotopic, Y-diasterotopic,
   b. X -diasterotopic, Y-enantiotopic,
   c. X-diasterotopic, Y-homotopic,
   d. X- enantiotopic, Y- diasterotopic

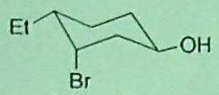
4. Stability order of the following conformers is

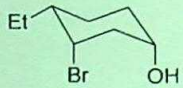


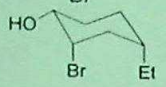
   a. 1>2>3>4
   b. 2>1>3=4
   c. 1>2>3=4
   d. 2>1>4>3

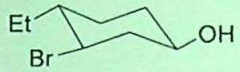
5. Ring flipping of the following conformation will lead to



a. 

b. 

c. 

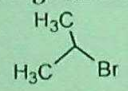
d. 

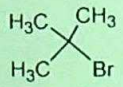
6. An example of a hard nucleophile is
   a. F^- b. I^-
   c. RSH d. RS^-

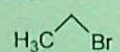
7. Which of the following is not a nucleophile
   a. H_2O b. NH_3
   c. RSH d. BF_3

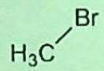
8. The S_N1 reactivity of alkyl halides will follow the order:
   a. 1°-halides > 2°-halides > 3°-halides b. 2°-halides > 3°-halides > 1°-halides
   c. 3°-halides > 2°-halides > 1°-halides d. 3°-halides > 1°-halides > 2°-halides

9. Which of the following alkyl bromides shows complete stereochemical inversion during S_N2 reaction?

a. 

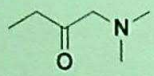
b. 

c. 

d. 

10. Benzyne mechanism is also known as
    a. Addition-elimination b. Elimination-addition
    c. Electrophilic aromatic substitution d. Radical substitution

11. Which of the following reactant combinations could undergo the Mannich reaction to form the product shown below?



    a. $CH_3CH_2CHO + CH_2O + NH(CH_3)_2$ b. $C_6H_5COCH_3 + NH_3 + C_6H_5CHO$
    c. $CH_2O + C_6H_5NH_2 + C_6H_5CHO$ d. $CH_3COCH_3 + CH_3NH_2$ only

12. Which of the following reaction routes correctly demonstrates the Arndt–Eistert homologation, transforming **–COOH** into **–CH_2COOH**?
    a. $CH_3COOH \rightarrow CH_3COCl \rightarrow CH_3CON_2 \rightarrow CH_3CH_2COOH$
    b. $CH_3COOH \rightarrow CH_3CH_2OH \rightarrow CH_3CH_2COOH$
    c. $CH_3COOH \rightarrow CH_3CHO \rightarrow CH_3CH_2OH$
    d. $CH_3COOH \rightarrow CH_3COCl \rightarrow CH_3COCH_3$

13. In the Beckmann rearrangement of methyl phenyl ketoxime, which group migrates to the nitrogen atom during the rearrangement?
    a. Methyl group
    b. Phenyl group
    c. Hydroxyl group
    d. Hydrogen atom

14. In Vilsmeier-Haack reaction used to convert electron rich aromatic ring to ..... *Fill the blank*
    a. aryl alcohol
    b. aryl aldehyde
    c. aryl acid
    d. aryl amide

15. Curtius rearrangement transform a carboxylic acid to an....., which is next converted to a free or protected amine.
    a. Isocyanate
    b. Cyanate
    c. Benzoate
    d. Acyl chloride

16. Which of the following is antiaromatic?
    a. Cyclobutadiene
    b. Benzene
    c. Naphthalene
    d. Cyclopentadienyl anion

17. The Wittig reagent ($Ph_3P{=}CH_2$) reacts with acetone to form:
    a. Ethylene
    b. Propene
    c. Butene
    d. 2-Methylpropene

18. Which of the following factors stabilizes a carbanion?
    a. Electron-donating groups
    b. Electron-withdrawing groups
    c. Steric crowding
    d. Resonance absence

19. Which of the following statements about benzyne is incorrect?
    a. It can act as an electrophile
    b. It has a linear structure
    c. It can be trapped by dienes in the Diels–Alder reaction
    d. It is formed via elimination of HX

20. The Wittig reaction is an example of:
    a. Nucleophilic substitution
    b. Nucleophilic addition followed by elimination
    c. Free radical substitution
    d. Electrophilic substitution

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Descriptive

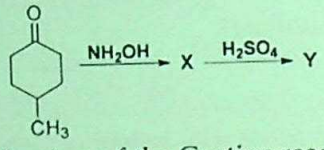
Time : 2 hrs. 30 mins. **Marks : 50**

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

1. **a.** Calculate the enantiomeric excess from the following data: specific rotation of the compound = 40° and the opt rotation of the enantiomeric mixture = (+) 32°. Also find the % of both the enantiomers. **2+2+3+3 =10**

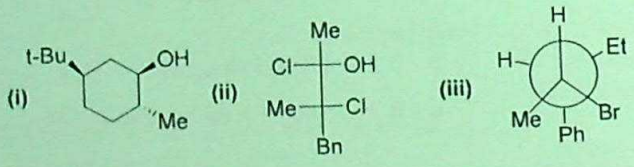
   b. What are ambident nucleophiles? Explain with examples.

   c. Write down the intermediate X and product Y of the following reaction. What is name of the reaction?

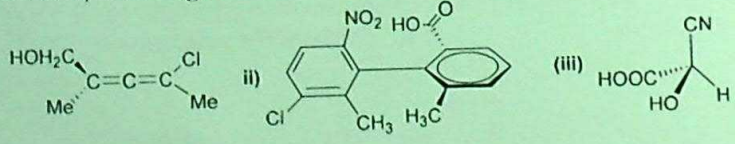


   d. Write down the mechanism of the Curtius reaction.

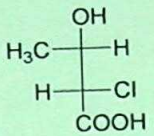
2. **a.** Draw Chair conformation for (i), Newman's projection for (ii) and Fisher projection for (iii). **3+3+2+2 =10**



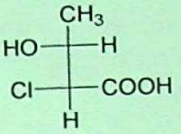
   b. Give R/S configurations for the following molecules



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



A

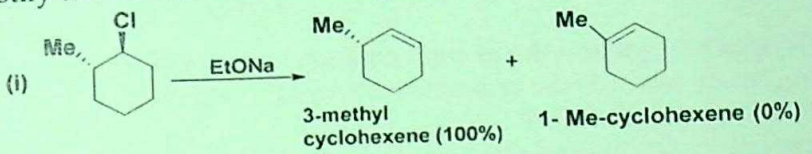


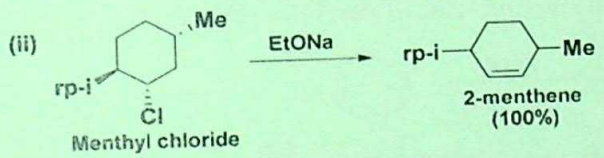
B

d. Explain why axial-methyl cyclohexane is less stable than equatorial-methyl cyclohexane?

3. a. Justify the result in the following scheme of react

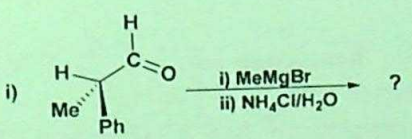
4+2+4 =10

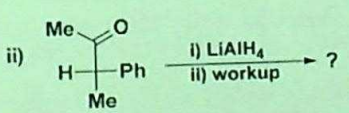




b. Explain what you mean by Stereo selective and stereo specific reactions. Explain with appropriate examples.

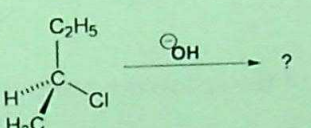
c. Use Cram's rule to predict the major product in the following reactions:





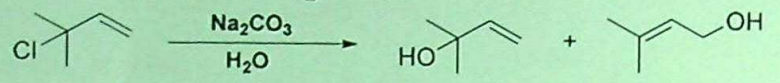
4. a. Complete the following reaction and discuss its probable mechanism.

4+3+3 =10



(S)-2-Chlorobutane

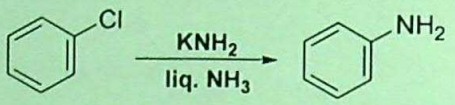
b. What is nucleophilic substitution at an allylic carbon? Give the mechanism of the following reaction.



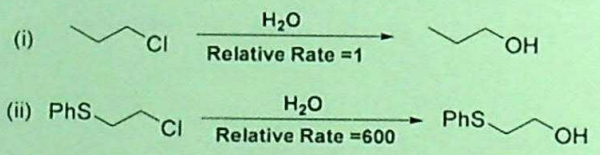
c. What is cine substitution product? If o-bromo nitrobenzene is treated with KNH_2 in presence of liq. NH_3 then what are the different possible products formed? Write the reaction and identify the cine substitution product from them.

5. a. If NO_2 group is present at ortho or para position of chlorobenzene then its reactivity towards the aromatic nucleophilic substitution increases. Justify the statement. 3+3+4 =10

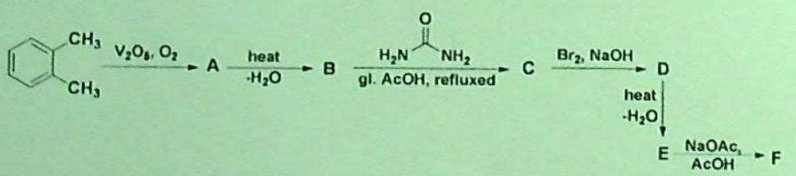
b. What is benzyne? Give the mechanism of the following reaction.



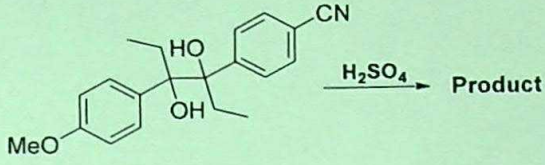
c. Define neighboring group participation reaction. What is anchimeric assistance? Give the justification of the relative rates of the following reactions.



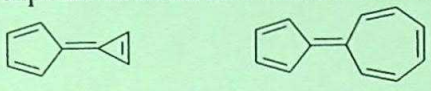
6. a. Write the structures of compounds A, B, C, D, E, and F formed in the following reaction sequence. Also, identify the name reaction involved. 6+4=10



b. Write down the product of the following reaction with mechanism.



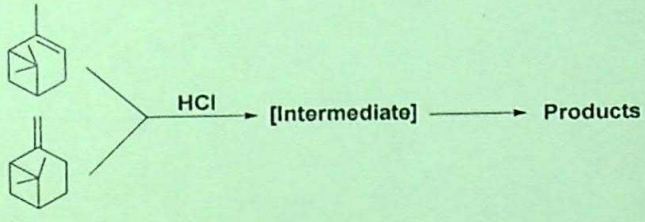
7. **a.** Draw the dipolar structures for the following compounds 3+4+3 =10



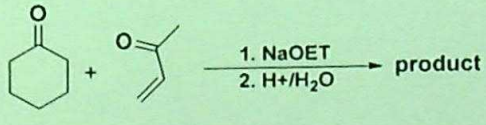
b. Addition of singlet carbene to alkene is stereospecific, while addition of triplet is not – Explain.

c. Arrange ortho, meta, and para-nitrophenol according to their acidity and explain.

8. **a.** Write the structure of intermediate and products of the following reaction 3+2+2+3 =10

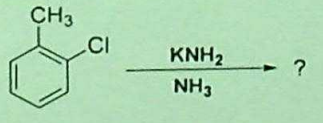


b. Write down the product of the following reaction with proper mechanism.



c. Why is cyclopentadiene mildly acidic in nature?

d. Write down the product(s) of the following reaction with mechanism



= = *** = =