

POC-III
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16/10/24

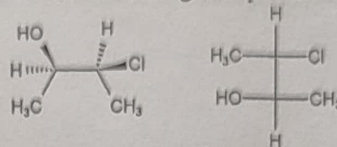
Time: 3 Hours

Total Marks: 75

- N.B.: 1. All Questions are compulsory
2. Figures to right indicate full marks

Q1. Choose the correct option for the following multiple-choice questions: (20 M)

1. What is the relationship between the following compounds?



- a. Diastereomers b. Enantiomers c. Homomers d. Mesomers
2. Which of the following compounds is optically active?
a. 1-Butanol b. 2-Butanol c. 1-Propanol d. Butane
3. A racemic mixture contains:
a. Only one enantiomer in excess
b. A 1:1 mixture of enantiomers
c. A 1:1 mixture of diastereomers
d. A compound that is optically pure
4. What is the significance of presence of plane of symmetry in a molecule?
a. It indicates the molecule is chiral
b. It prevents the molecule from being superimposable on its mirror image
c. It causes the molecule to be optically active
d. It indicates the molecule is achiral
5. Which of the following functional groups has the highest priority according to the Cahn-Ingold-Prelog sequence rules?
a. $-\text{CH}_3$ b. $-\text{OH}$ c. $-\text{COOH}$ d. $-\text{NH}_2$
6. Which of the following pairs are geometrical isomers?
a. 1-butene and 2-butene
b. Propene and 1-butene
c. Ethene and propene
d. Cis-2-butene and trans-2-butene
7. What type of isomerism is exhibited by 2, 3-dichlorobutanoic acid?
a. Geometrical isomerism
b. Optical isomerism
c. Tautomerism
d. Functional group isomerism

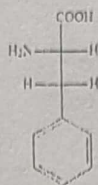
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8. The given amino acid is _____.



- a. 2R-Phenylalanine
c. L-Phenylalanine
- b. 2S-Phenylalanine
d. D-Phenylalanine
9. A meso compound is optically _____ due to _____.
- a. inactive; presence of plane of symmetry
b. active; absence of centre of symmetry
c. inactive; presence of alternating axis of symmetry
d. active; absence of plane of symmetry
10. Restricted rotation about a single bond in a substituted biphenyl system leads to _____.
- a. Geometric isomerism
b. Achirality
c. Atropisomerism
d. Positional isomerism
11. Which of the following is an example of a bicyclic heterocyclic compound?
- a. Imidazole b. Pyridine c. Pyrrole d. Indole
12. Furan is less aromatic than pyrrole and thiophene due to:
- a. The oxygen atom withdrawing electron cloud from the ring
b. The smaller size of the oxygen atom
c. The difficulty of oxygen participating in resonance
d. The electronegativity of nitrogen
13. In nucleophilic substitution reactions, which position of thiazole is most reactive?
- a. 1-position
b. 2-position
c. 4-position
d. 5-position
14. Quinoline can be synthesized through which of the following reactions?
- a) Fischer indole synthesis
b) Debus-Radziszewski synthesis
c) Pictet-Spengler reaction
d) Skraup synthesis
15. Which of the following statements is true about LiAlH_4 compared to NaBH_4 ?
- a) LiAlH_4 is less reactive than NaBH_4
b) LiAlH_4 can reduce esters and carboxylic acids, while NaBH_4 cannot
c) NaBH_4 is more versatile than LiAlH_4
d) LiAlH_4 is selective for aldehydes only

16. The Wolff-Kishner reduction is particularly useful for the conversion of:
- Aldehydes to alcohols
 - Carboxylic acids to alcohols
 - Carbonyl carbon of aldehyde and ketones to methylene
 - Aromatic compounds to alkenes
17. Which of the following is a key reagent used in the Oppenauer oxidation?
- Aluminium isopropoxide
 - Sodium borohydride (NaBH_4)
 - Potassium permanganate
 - Lithium aluminium hydride (LiAlH_4)
18. Which of the following reactions involves the formation of a β -hydroxy ketone or β -hydroxy aldehyde?
- Claisen-Schmidt condensation
 - Oppenauer oxidation
 - Beckmann rearrangement
 - Dakin reaction
19. Bromination of Indole gives...
- 5-Bromoindole
 - 4-Bromoindole
 - 3-Bromoindole
 - 2-Bromoindole
20. Catalytic reduction of thiophene using Raney nickel gives _____.
- Butane and NiS
 - Sulfur dioxide
 - 2,3-Dihydrothiophene
 - 2,5-Dihydrothiophene

QII. Attempt any two of the following questions: (20M)

- Enlist the methods for resolution of racemic mixtures. Discuss the advantages and disadvantages of the same.
 - Define and explain the stereospecific and stereoselective reactions. Explain anyone with a suitable example.
- Predict the most favourable position of electrophilic substitution reaction in furan. Justify your answer.
 - Arrange following heterocycles in decreasing order of basicity with justification. oxazole, imidazole and pyrazole.
 - Draw resonating structures of thiazole and pyridine.
 - Discuss the aromaticity and reactivity of pyrrole, furan and thiophene.

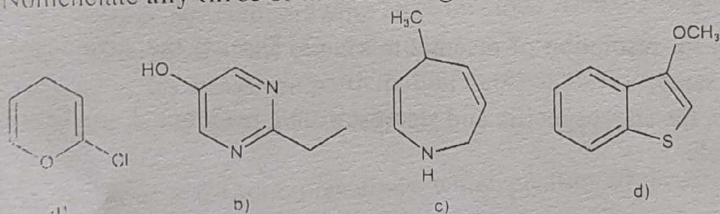
3. Discuss the mechanism for any two of the following:

- i. Birch reduction
- ii. Dakin oxidation
- iii. Fischer indole synthesis
- iv. Hantzsch synthesis of pyridine

(35M)

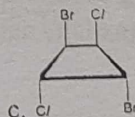
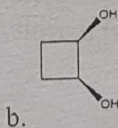
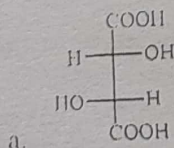
QIII. Answer any seven questions from the following:

1. Define asymmetric synthesis and explain its importance in organic chemistry. Explain methods of asymmetric synthesis.
2. Depict synthesis with reaction mechanism of the following:
 - i. Bischler-Napieralski synthesis of isoquinoline
 - ii. Radziszewski imidazole synthesis
3. Discuss the conformational isomers of cyclohexane with energy profile diagram.
4. Discuss oxidation and reduction of quinoline using various reagents.
5. Attempt the following conversions:
 - i. Furan to 2-Bromofuran
 - ii. 2-Chlorothiazole to 2-methoxythiazole
 - iii. Pyrazole to 4-pyrazolesulfonic acid
 - iv. Acridine to 9-aminoacridine
 - v. Pyridine to pyridine-N-oxide
6. Nomenclature any three of the following molecules using the Hantzsch-Widman rules:

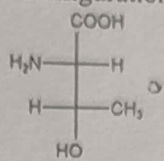


Write medicinal uses of celecoxib and sulphathiazole.

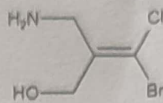
7. Determine whether the given molecules are chiral or achiral (any two). Justify your answer. Mark the asymmetric carbon.



8. Represent 3-Amino-3-chloro-2-methylpentanal using Fischer and Newmann projection formula. Assign R/S or E/Z configuration of the following:



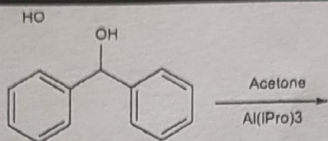
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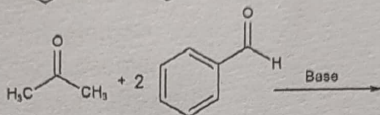
b)

9. Complete the following reactions

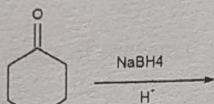
ii)



iii)



iv)



v)

