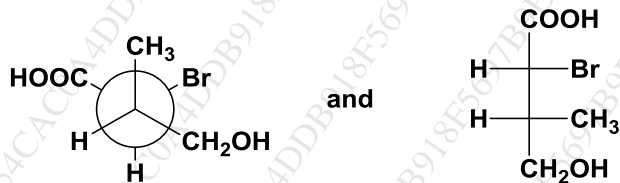


Time: 3 Hrs

Marks: 75

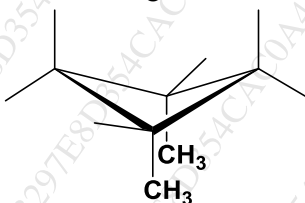
Q1. Choose the correct option for the following multiple choice questions: (20)

1. Predict the relationship between the given pair of molecules:

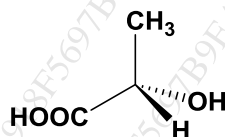


- a. Diastereomers b. Enantiomers c. Homomers d. Mesomers

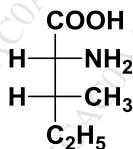
2. Choose the appropriate statement to describe the given molecule:



- a. The given molecule is chiral since it has asymmetric carbons.
 b. The given molecule is achiral since it has alternating axis of symmetry.
 c. The given molecule is achiral since it has a plane of symmetry.
 d. The given molecule is achiral since it possesses a centre of symmetry.
3. Choose the correct name of the given molecule:

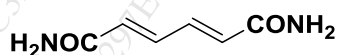


- a. 2(R)-Hydroxypropanoic acid. b. 2(S)- Hydroxypropanoic acid.
 c. (±)-Hydroxypropanoic acid. d. 2(R)- 2-Carboxyethanol.
4. The given amino acid is



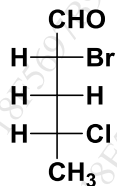
- a. 2R,3S-Isoleucine b. 2S,3R-Isoleucine c. 2R,3R-Isoleucine d. D-Isoleucine

5. Assign R/S or E/Z notation (whichever relevant) to the given molecule:



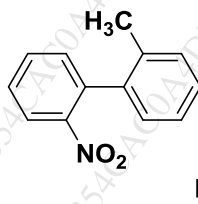
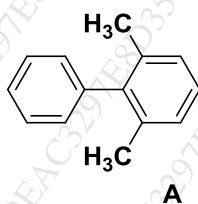
- a. 2E,4E b. 2E,4Z c. 2Z,4E d. 2R,4S

6. Assign R/S notation to the asymmetric carbons:



- a. 2S,3R,4R b. 2R,4R c. 2R,3S,4S d. 2S,4S

7. Choose the most appropriate option for the given pair of molecules:



- a. Compounds A and B are optically active.
 b. Compound A is optically active, while B is optically inactive.
 c. Compounds A and B are diastereoisomers.
 d. Compound A is optically inactive, while B is optically active.

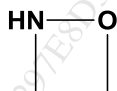
8. Strategies to resolve racemic mixtures exclude:

- a. Use of physical methods of separation
 b. Chiral chromatography
 c. Separation of diastereomeric salts of the racemic molecule
 d. Separation of racemates by distillation

9. Butane gauche interactions are observed in _____ while 1,4-flagpole interactions are present in _____.

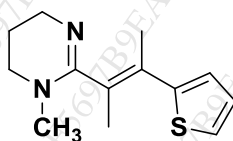
- a. 1,3-Disubstituted cyclohexane, twist boat conformer
 b. 1,2-Disubstituted cyclohexane, boat conformer
 c. 1,4-Disubstituted cyclohexane, half chair conformer
 d. 1,1-disubstituted cyclohexane, planar cyclohexane

10. The name of the given molecule as per Hantzsch Widman rules is:



- a. 1,2-Oxazetidine b. Indole c. 1,2,5-Oxadiazole d. Perhydroazine

11. Identify the heterocycle/s in the given drug moiety:



- a. Thiophene
 b. Pyrrole
 c. Thiophene and 5,6-dihydro-4H-pyrimidine
 d. Furan and N-Methyldiazabenzene

12. Structure _____ represents the molecule 5H-1,2,3-Oxathiazole



13. The indole containing drug indomethacin is used as a/an _____ agent therapeutically.

- a. Analgesic
 b. Antihypertensive agent
 c. Anti-inflammatory
 d. Antilipidemic

14. The correct order of basicity in the given heterocycles is:

- a. Pyrrole < Pyridine < Imidazole
 b. Imidazole > Pyrrole < Pyridine
 c. Pyridine < Pyrrole < Imidazole
 d. Pyridine < Imidazole < Pyrrole

15. The correct order of aromaticity is:

- a. Imidazole < Thiazole < Oxazole
 b. Thiazole < Oxazole < Imidazole
 c. Oxazole < Imidazole < Thiazole
 d. Thiazole < Imidazole < Oxazole

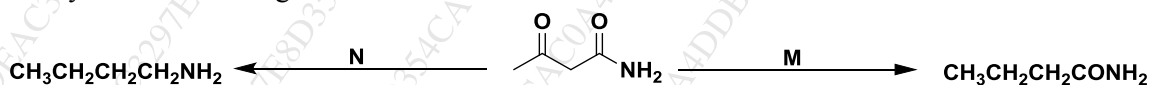
16. Isoquinoline undergoes the Chichibabin reaction to give:

- a. 2-Aminoisoquinoline
 b. 1-Aminoisoquinoline
 c. 4-Aminoisoquinoline
 d. 8-Aminoisoquinoline

17. Electrophilic aromatic substitution in furan takes place at position:

- a. 3
 b. 1
 c. 2/5
 d. 3 and 4

18. Identify N and M in the given reaction:



- a. N=LiAlH₄, M=NH₂NH₂
 b. N=NaBH₄, M=Zn/Hg, HCl
 c. N=Sn, HCl, M= Na, liquid NH₃
 d. N=LiAlH₄, M= Zn, AcOH

19. Salicylaldehyde can be converted to catechol by

- a. Using H₂O₂, NaOH via Dakin's oxidation
 b. Using KOH, alcohol via Claisen Schmidt condensation
 c. Using NaNH₂ via Birch reduction
 d. Using Aluminium isopropoxide via Oppenauer oxidation

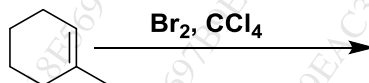
20. 5,6-Diaminopyrimidine, on reaction with formic acid yield

- a. Azepine
 b. Quinoline
 c. Purine
 d. Pyrazole

QII. Attempt **any two** of the following questions:

(20)

1 i. Predict the product of the following reaction:



Comment on whether the reaction is stereoselective and/or stereospecific. Give a detailed mechanism to justify the formation of the proposed product.

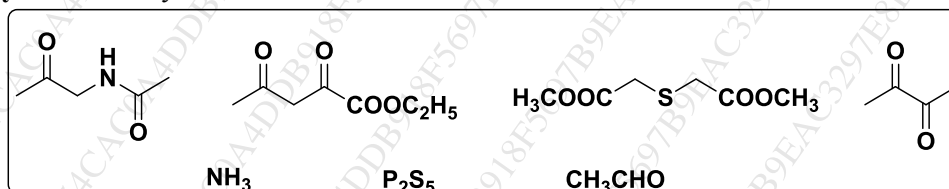
1 ii. Arrange the following in increasing order of reactivity and justify the same: Furan, thiophene, benzene, pyrrole. Depict the resonating structures for imidazole.

2 i. Predict the product/s of the following reaction:



Answer the following questions with respect to this reaction:

- Assign R/S configuration to the chiral carbon in the substrate.
 - How many chiral carbons will the reduced product possess?
 - What will be the relation between the product/s formed? (in case if more than one product formed)?
 - Suggest a suitable technique/method of separating the isomeric products formed.
- 2 ii. Choose appropriate combinations of the molecules given in the figure below to propose concise schemes for synthesis of the stated heterocycles. Give the detailed mechanism for **any one** of the synthetic schemes.

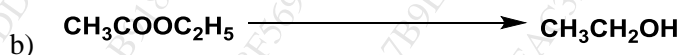
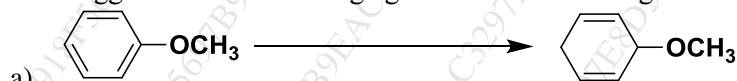


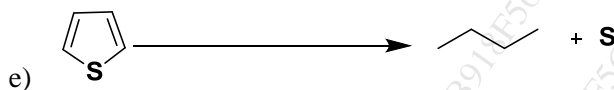
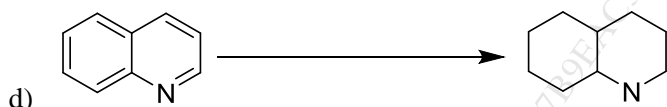
- A substituted thiophene
- A substituted thiazole
- A substituted pyridine

3 i. Discuss the mechanism for the following:

- Schmidt rearrangement
- Oppenauer oxidation

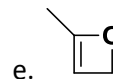
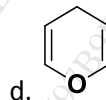
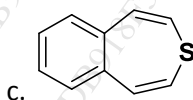
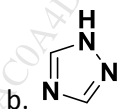
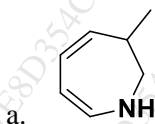
3 ii. Suggest suitable reducing agents for the following reactions:





QIII. Answer **any seven** questions from the following: (35)

- With the help of an energy profile diagram, depict the conformers of n-butane. Draw the most stable and the least stable conformer of cyclohexane.
- Represent 2R, 3S-Dihydroxybutanedioic acid using the various projection formulae. Comment on whether the molecule is chiral or achiral with suitable justification.
- What is asymmetric synthesis? Discuss any two methods of the same.
- Explain the term atropisomerism. What are the conditions required for substituted biphenyls to be optically active?
- Attempt **any two** of the following conversions (Give detailed mechanism):
 - Acetaldehyde to 2-Propenal
 - 4-Hydroxybenzaldehyde to hydroquinone.
 - Pyrimidine to pyrazole
 - Pyrrole to 3-Chloropyridine
- Use different reagents/ reaction conditions to discuss:
 - Bromination of pyridine
 - Reduction of isoquinoline
 - Nitration of quinoline
- Discuss the detailed mechanism of synthesis of any one N containing bicyclic heterocycle. Give the product/s of sulphonation and oxidation of quinoline.
- Nomenclature **any three** of the following molecules using the Hantzsch-Widman rules:



What is the therapeutic use of ranitidine and atorvastatin?

- Give the products of the following reactions (**any five**):

