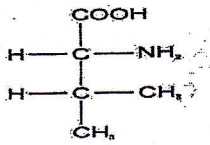
S.Y. B. Pha
Sem - IV
06/05/25

Time: 3 Hours **Total Marks: 75**

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

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

1. The given molecule is:

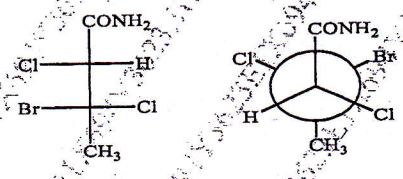


a. L-Valine b. D-Valine c. R-Valine d. S-Valine

2. Identify the chiral centers in 3,5-dihydroxy-4-methylheptanedioic acid.

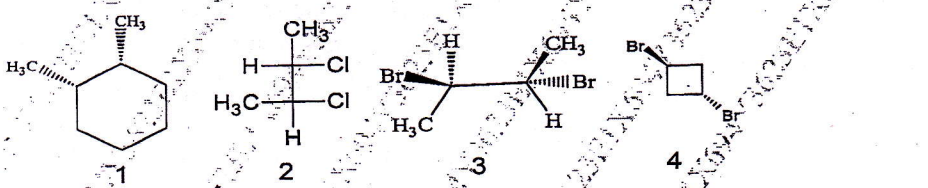
a. 1 b. 2 c. 3 d. 4

3. Identify the relationship present in the following molecules:



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

4. Which of the following compound is not a meso compound?



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

5. All bonds are staggered in _____ conformation of cyclohexane.

a. Boat b. Twist boat c. Half chair d. Chair

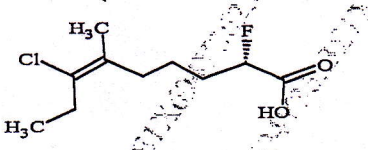
6. The aim of asymmetric synthesis is

a. To break down chiral molecules into achiral components
b. To enhance the yield of a reaction without affecting stereochemistry
c. To produce selectively one enantiomer over the other.
d. To generate a racemic mixture of enantiomers

7. Which of the following compounds does not show geometric isomerism?

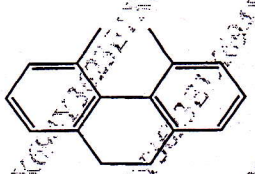
a. 2-bromo-2-pentene b. 1-butene c. 3-hexene d. 2-methyl-2-pentene

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

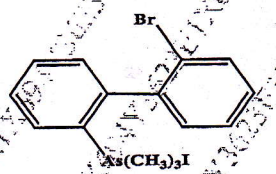


a. 2R, 6E b. 2S, 6E c. 2R, 6Z d. 2S, 6Z

9. Tick the correct options related to atropisomerism of following compounds:



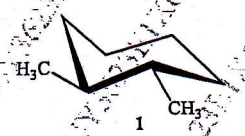
I



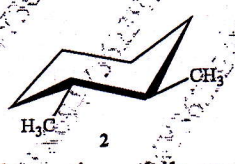
II

a. Both I and II exhibit atropisomerism
b. Only compound I exhibits atropisomerism
c. Only compound II exhibits atropisomerism
d. Both compounds do not exhibit atropisomerism

10. Which of the following statements about the stereochemistry of the compounds is true?



1



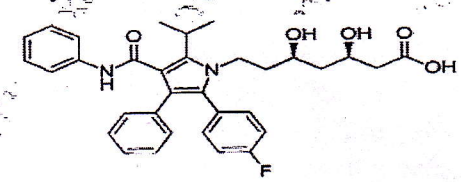
2

a. Compound 1 is the chair conformation while compound 2 is boat conformation.
b. Compound 1 is cis 1,2-Dimethylcyclohexane while compound 2 is trans 1,2-Dimethylcyclohexane.
c. Compound 1 and 2 are enantiomers.
d. Compound 1 on flipping, yields compound 2.

11. Arrange the following compounds in increasing order of aromaticity.

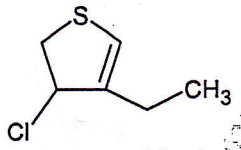
a. Benzene <Thiophene<Furan<Pyrrole
b. Furan<Thiophene<Pyrrole<Benzene
c. Pyrrole<Furan<Benzene<Thiophene
d. Furan<Pyrrole<Thiophene<Benzene

12. Identify the heterocycle in the given drug molecule:



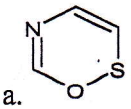
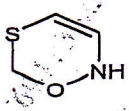
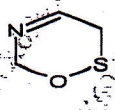
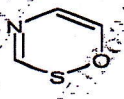
a. Furan b. Pyridine c. Pyrrole d. Indole

13. The nomenclature of following molecule is .....



a. 3-Chloro-4-ethyl-3-hydrothiophene
b. 3-Chloro-4-ethyl-2,3-dihydrothiophene
c. 3-Chloro-4-ethyl-thiazole
d. 4-Chloro-3-ethyl-thiophene

14. Identify the correct structure for the 1,2,5-Oxathiazine.

a. 
b. 
c. 
d. 

15. Acetaldehyde, on reaction with tosylmethyl isocyanide, in presence of a base gives _____.

a. 5-Methylthiazole b. 5-Methylpyrazole c. 5-Methyloxazole d. 5-Methylimidazole

16. Pyrimidine on reaction with boiling hydrazine produce _____

a. 2-amidopyrimidine b. 2-aminopyrimidine c. Pyrazole d. Pyridine

17. Electrophilic aromatic substitution in imidazole is most favored at _____ position.

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

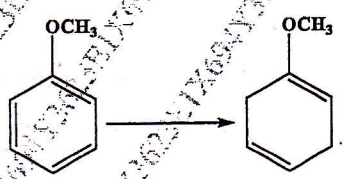
18. Benzene and ethoxycarbonylnitrene produces an intermediate, which on heating in presence of alkali forms _____

a. Azepine b. Purine c. Acridine d. Quinoline

19. Which of the following is a typical reagent used in Claisen-Schmidt condensation?

a. HCl b. NaOH c. $FeCl_3$ d. H_2SO_4

20. Select appropriate reagent to carry out following conversion:



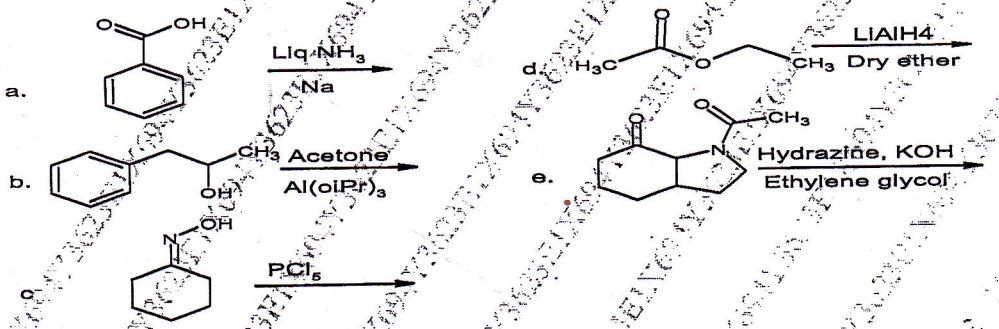
a. $NaBH_4$ b. $LiAlH_4$ c. Na, Liq. Ammonia and alcohol d. NH_2NH_2, KOH

QII. Attempt <u>any two</u> from the following questions: **(20)**

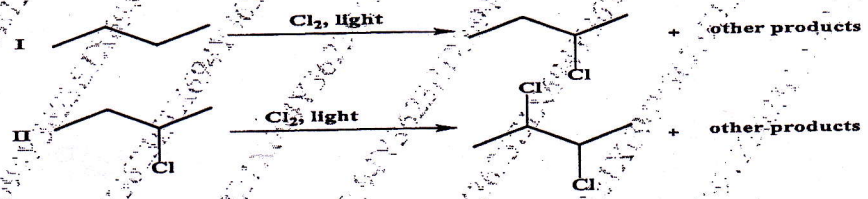
1. a. Depict the mechanism for **any two** of the following:
   i) Synthesis of pyrimidine from malonic ester
   ii) Oxazole to imidazole
   iii) Synthesis of quinoline from aniline
   b. Predict the product/s of reaction of bromine to cis-2-butene. Discuss the mechanism of addition and comment on whether the reaction is stereoselective and/or stereospecific.

2. a. Discuss in detail, the mechanism for Schmidt rearrangement and Dakin oxidation.

   b. Give the products for the following reactions:



3. a. Analyze the following reactions and answer the question given below:



   i. In reaction I, comment on the chirality of the reactant and the product.
   ii. In reaction II, assuming the starting material to be (S)-2-Butyl chloride, predict whether the product obtained will be an optically pure isomer/ an enantiomeric pair/ mesomer/ diastereomer. Justify your answer.

   b. Arrange pyrrole, pyridine and imidazole in increasing order of basicity and justify. With the help of resonating structures, predict the most favorable position for attack of an electrophile on pyridine.

QIII. Attempt <u>any seven</u> questions from the following: **(35)**

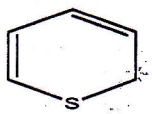
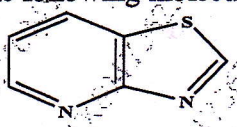
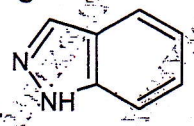
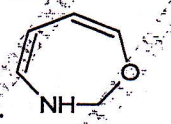
1. Discuss different methods involved in asymmetric synthesis.
2. Enlist the different methods of resolution of racemic mixture. Discuss any one method in detail.
3. Write a note on atropisomerism using suitable examples.
4. Draw the various conformers of cyclohexane. Discuss the various types of strains existing in these conformers.
5. Identify suitable reagent/s and give the structures of the products of the following reactions:

(20)

a. Nitration of furan
b. Bromination of pyrrole
c. Oxidation of isoquinoline
d. Sulphonation of thiazole
e. Reduction of quinolone

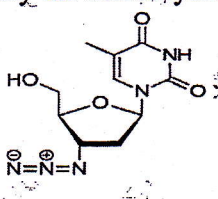
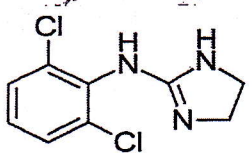
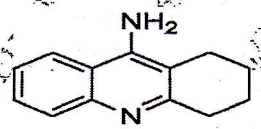
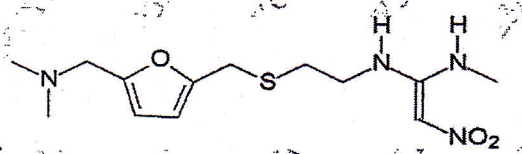
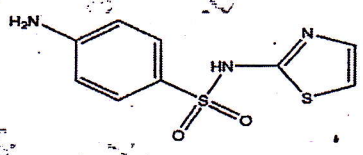
6. Give the detailed mechanism for the following reactions **(any two)**
   i. Radziszewski synthesis for imidazole
   ii. Hantzsch synthesis of pyridine
   iii. Madelung synthesis of indole

7. i. Nomenclate **any three** of the following molecules using Hantzsch-Widman rules.

a. 
b. 
c. 
d. 

   ii. Depict resonance in thiophene.

8. Identify the heterocyclic compound present in following drugs.

a. 
b. 
c. 
d. 
e. 

9. Discuss any one method of preparation of each of the following compounds: Purine and pyrazole. Arrange furan, thiophene and pyrrole in increasing order of aromaticity and justify the order in short.