

NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

END OF FIRST SEMESTER EXAMINATIONS – DECEMBER 2001

ORGANIC CHEMISTRY – SCH 1116

(FOR BIO. AND ENV. SCI. STUDENTS)

TIME – 3 HOURS

LIBRARY USE ONLY

INSTRUCTIONS TO CANDIDATES

1. ANSWER **ALL** QUESTIONS FROM SECTION A AND **ANY THREE** FROM SECTION B. SECTION A CARRIES 40 MARKS AND EACH QUESTION IN SECTION B CARRIES 20 MARKS.

GRAPH PAPER WILL BE PROVIDED ON REQUEST.

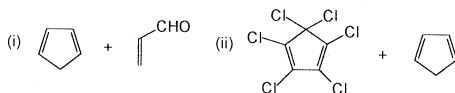
2. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.

TOTAL MARKS = 100

THIS QUESTION PAPER CONSISTS OF **FIVE PRINTED PAGES** (ON ONE SIDE ONLY) INCLUDING THE TOP PAGE WITH THE INSTRUCTIONS.

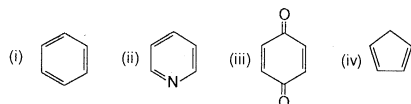
SECTION A:

1. (a) Write the structural formulae for the following compounds.
(i) 3-ethyl-2,5-dimethyl heptane
(ii) 1-chloro-3-ethyl-2-methyl cyclopentane (2 Marks)
- (b) What is plane-polarised light? (4 Marks)
- (c) Draw E and Z configurations for the following compounds. (4 Marks)
- (i) $\text{HOOC}(\text{CHO})\text{C}(\text{CN})(\text{CCH})$
(ii) $\text{CH}_3\text{CH}(\text{CH}_2\text{OH})\text{CH}_3$ (6 Marks)
- (d) Draw and label the reaction energy diagram for one step exothermic chemical reaction. (4 Marks)
- (e) Draw the products of the following Pericyclic reactions. (4 Marks)



(2 Marks)

- (f) With an appropriate example explain what an α -amino acid is. (3 Marks)
- (g) Explain Huckel's rule in your own words. (4 Marks)
- (h) State whether the following compounds are aromatic or non-aromatic. (4 Marks)



(4 Marks)

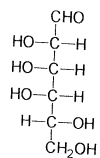
- (i) Draw the general formula for cellulose and starch. How do they differ from each other. (4 Marks)
- (j) Name the six possible tripeptides that contain valine, tyrosine and glycine. Use three letter shorthand notation for each amino acid. (3 Marks)

- (k) the following names are incorrect. Draw structures and provide correct IUPAC names.
- 2,2-Dimethyl-6-ethyl heptane.
 - 4-Ethyl-5,5-dimethyl pentane.

(4 Marks)

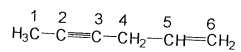
SECTION B:

2. (a) The structure of D-Talose is as follows.



D - TALOSE

- Draw Fischer and Haworth projections for D-Talose. (4 Marks)
 - Draw α and β -anomers of D-Talopyranose. (4 Marks)
 - Explain with the aid of chair conformation, which isomer is more stable. (4 Marks)
- (b) State whether the following statements are true or false. Draw appropriate structures and explain your answer. (6 Marks)
- Achiral molecule can have a chiral center.
 - An optically active substance must be made up of a chiral molecule.
3. (a) In the following molecule, indicate the kind of hybridisation you might expect for each carbon atom. (6 Marks)



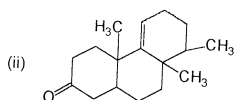
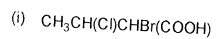
- (b) Select any one carbon of your choice from the above compound (indicate which one) and explain in detail the hybridisation. (3 Marks)

(7 Marks)

(c) In the reaction of 1-chloropropane with hydroxide ion (HO^-), 1-propanol is formed. 1-propanol does not normally react with chloride ion (Cl^-) but does so in the presence of an acid. With the aid of reaction mechanism explain all the reactions taking place in full. Do these reactions follow $\text{S}_{\text{N}}1$ or $\text{S}_{\text{N}}2$ mechanism.

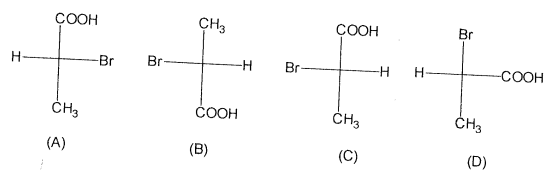
4. (a) Define (i) Geometrical isomers (10 Marks)
(ii) Optical isomers

(b) Mark with an asterisk (*) all chiral centers present in the following compounds. How many (i) stereoisomers and (ii) optical isomers do you expect from each compound. (4 Marks)



(6 Marks)

(c) Assign R or S designation to the following Fischer projections (show your workings). Comment on the relationship between them.



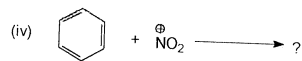
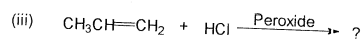
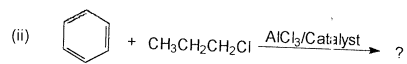
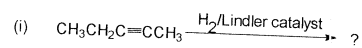
(10 Marks)

5. (a) With an appropriate example, explain what is a "Zwitter ion". (4 Marks)

(b) You are given the Isoelectric point of various amino acids as follows. With the aid of a labelled diagram, predict the direction of migration of each acid and the relative rate of migration at pH 6.0.

<u>Amino acid</u>	<u>Isoelectric point</u>
Phenyl alanine	5.5
Proline	6.3
Asperic acid	3.0
Argine	10.8
Leicine	6.0

(c) Draw the structures and give IUPAC names of the following reactions (no mechanism required). (6 Marks)



(10 Marks)
