



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED CHEMISTRY

**ORGANIC CHEMISTRY SBB, SBB PARALLEL, ESH, ESH PARALLEL, EFW,
TXT STUDENTS ONLY**

SCH 1116

First Semester Examination Paper

December 2015

This examination paper consists of 4 pages

Time Allowed: 3 hours
Total Marks: 100
Special Requirements: NONE
Examiner's Name: DR C T PAREKH

INSTRUCTIONS

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.
2. Show mechanism, chemical steps or synthesis by means of curved arrows.

MARK ALLOCATION

QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
5.	20
TOTAL POSSIBLE MARKS	100

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SECTION A :

1. (a) Write structural formulae for the following compounds.

(i) 3-bromo-2-methyl hexane

(ii) trans-1,2-dichlorocyclopentane

(2 Marks)

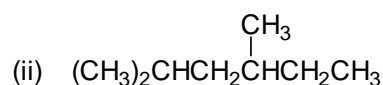
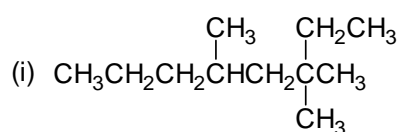
(b) The following names are incorrect. Draw the structure and provide proper IUPAC names.

(i) 4,5-dimethylheptane

(ii) 1,1-dimethylpentane

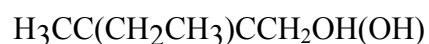
(4 Marks)

(c) Give IUPAC names of the following compounds.



(2 Marks)

(c) Assign E and Z configuration to the following alkene. Indicate priority on the structure.



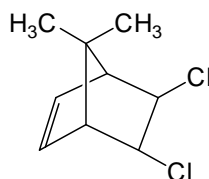
(6 Marks)

(d) Predict the products of the following pericyclic reactions. Use curved arrows.



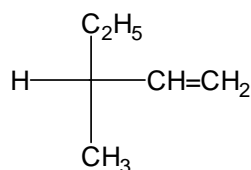
(4 Marks)

(e) Draw the structures of conjugated diene and dienophile to synthesise the following compound.



(2 Marks)

(f) Show the steps to assign R or S configuration to the following compound and also suggest the IUPAC name of the compound..



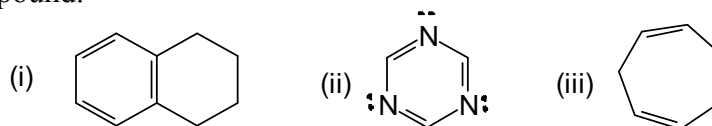
(4 Marks)

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(g) Draw functional isomers and give IUPAC names of the compounds with molecular formula $C_5H_{10}O_2$.
(4 Marks)

(h) State whether the following compounds are aromatic or non-aromatic and also indicate the number of pi electrons present in the compound.



(6 Marks)

(i) Give starting materials which would react under basic conditions to give following ether. What is the name given to this reaction?

Ethyl phenyl ether

(4 marks)

(k) What Grignard reagent and what carbonyl compound might you start with to synthesise 2-methyl pentan-2-ol.

(2 Marks)

SECTION B

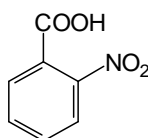
- (a) With the aid of an organic compound of your choice explain the sp hybridisation. Draw orbital diagram, bonded structure and the shape of the molecule.
(10 Marks)

(b) Explain with the aid of chemical structures, why phenol is more acidic than ethanol.
(10 Marks)
- (a) Draw the structure of the product and give IUPAC name for the oxidation of $CH_3CH=CHCH_3$ in presence of alkaline $KMnO_4$. (No mechanism required).
(2 Marks)

(b) The compound can be defined as achiral in three ways. Suggest them with an appropriate example.
(3+6 Marks)

(c) With an appropriate example define α -amino acid.
(3 Marks)

(d) Draw the synthesis of the following compound from benzene. Use reagents of your choice.



(6 Marks)

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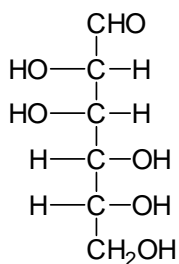
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4. (a) Write reaction mechanisms for S_N1 reactions. Use a compound of your choice. (5 Marks)

(b) What information does the term below give?

$$[\alpha] = \pm 2.0^\circ \quad (4 \text{ Marks})$$

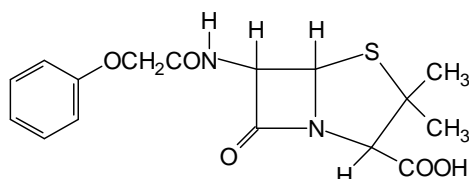
(c) The structure of D-mannose is as follows.



D-mannose

- (i) Draw Fischer projection and Haworth projection for D-glucose. (1+2 Marks)
- (ii) Draw α - and β -anomers of D-glucopyranose. Indicate by circling the anomeric carbon in α - and β -anomers. (6 + 2 Marks)

5. (a) Mark with an asterisk (*) all chiral centers present in the following compounds. (Marks will be deducted for the wrong marking).



penicillin V (antibiotic)

(3 Marks)

(b) You are given the isoelectric point of various amino acids as follows:
With the aid of a labelled diagramme, predict the direction of migration of each amino acid.

Amino acid	Isoelectric point
Leucine	6.0
Arginine	10.8
Proline	6.3

(7 Marks)

(c) Write reaction mechanism for the formation of nitrobenzene from benzene.
What is the name of the reaction? (6 Marks)

(d) What are the functions of the following spectrometers?

- Infra-red spectrometer
 - Ultraviolet/visible spectrometer
 - Proton NMR spectrometer
 - Mass spectrometer
- (4 Marks)

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