



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

FACULTY OF APPLIED SCIENCE

DEPARTMENT OF APPLIED CHEMISTRY

ORGANIC CHEMISTRY I FOR SCH STUDENTS ONLY

SCH 1102

First Semester Examination Paper

December 2015

This examination paper consists of 4 pages

Time Allowed: 3 hours

Total Marks: 100

Special Requirements: Graph Paper (on request)

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

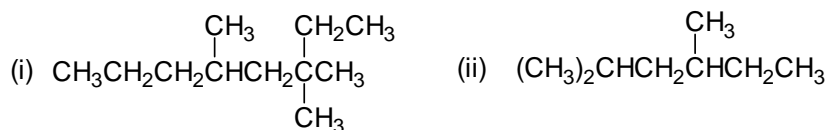
QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
5.	20
TOTAL POSSIBLE MARKS	100

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SECTION A:

1. (a) Give IUPAC names for the following compounds.



(2 Marks)

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

(i) 1,1-dimethylpentane

(ii) 5-heptyne

(4 Marks)

(c) Write structural formulae for the following compounds.

(i) 3-hydroxy butanal

(ii) 2,6-dichlorophenylamine

(iii) cis-1,3-dichlorocyclohexane

(3 Marks)

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



(6 Marks)

(e) Draw p-orbital diagram for diene and dienophile for the formation of the following pericyclic product.

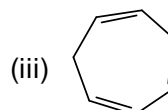
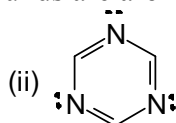
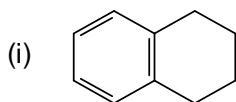


(6 Marks)

(f) State Huckel's rule in your words.

(4 Marks)

(g) State whether the following compounds are aromatic or non-aromatic.



(3 Marks)

(h) What information does the term below give?

$$[\alpha] = +1.8^\circ$$

(4 Marks)

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- (i) Draw functional isomers and give IUPAC names of the compounds with molecular formula $C_5H_{10}O_2$. (4 Marks)
- (j) What Grignard reagent and carbonyl compound might you start with to synthesise 2-methyl pentan-2-ol? (2 Marks)
- (k) What metal alkoxides and halides might you start with to synthesise ethyl phenyl ether? (2 Marks)

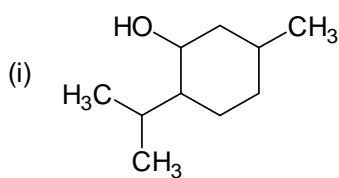
SECTION B:

2. (a) Write a reaction mechanism of acid catalysed dehydration of 2-methyl-butan-2-ol. Draw the structures of all possible products. With a good reason explain which product will be predominant. (8 Marks)
- (b) The rates of SN^1 and SN^2 reactions depend on certain factors. Suggest those factors that are involved in rate determining steps. (No mechanism or structures required) (8 Marks)
- (c) What are the functions of the following spectrometers? (4 Marks)
- (i) Infra-red spectrometer
 - (ii) Ultraviolet/visible spectrometer
 - (iii) Proton (1H) NMR spectrometer
 - (iv) Mass spectrometer
3. (a) The reaction between but-2-ene and alkaline $KMnO_4$ produces dihydroxybutane. The product is an optically active compound. Use Fischer projections to draw as many stereoisomers of the product as possible and label them as enantiomers, diastereoisomers and meso compound. (10 Marks)
- (b) What is the major monosubstitution product that you would expect to obtain from the Friedel-Crafts reaction of benzene and chloropropane in the presence of aluminium chloride catalyst? Write reaction mechanism and explain the reason for the major product. (10 Marks)

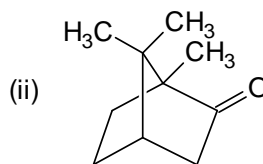
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4. (a) Hydrogenation of (S)-3-amino hex-1-yne gives optically active 3-hexylamine of opposite configuration (R) to that of the original substance. With the aid of Fischer projections, explain this observation. (5 Marks)
- (b) Discuss SP hybridisation with an appropriate organic compound of your choice. Draw orbital as well as bonded structures and indicate the shape of the molecule. (8 Marks)
- (c) You are given but-1-yne, chloroethane, base such as sodium amide and a catalyst. Write reaction mechanism for the synthesis of cis-hex-3-ene. Suggest the name of the catalyst you will use. (7Marks)
5. (a) Predict the product(s) of the following reactions and provide IUPAC names for the product(s). (No mechanism required)
- (ii) Oxidation of hept-3-ene with ozone and Zn/CH₃COOH. (4 Marks)
- (b) Dehydrohalogenation of 2-bromobutane (alkyl halide) with potassium hydroxide in ethanol yields a mixture of products.
- (iv) Write reaction mechanism for the reaction.
- (v) State with good reason which product you would expect to be the major product. (5 Marks)
- (c) Mark with an asterisk (*) all chiral centres present in the following compounds. (Marks will be deducted for the wrong marking).



Menthol



Camphor

(5 Marks)

- (d) Achiral compound can be defined in three ways. List them with appropriate examples.

(3+3 Marks)

END OF QUESTION PAPER

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