



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 2014

This examination paper consists of 5 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

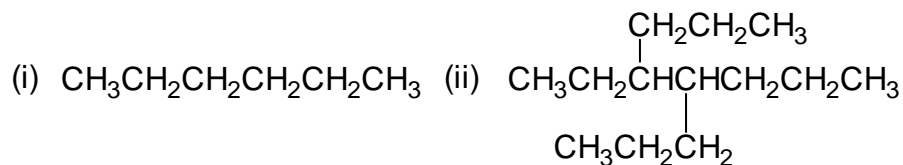
QUESTION	MARKS
1.	40
2.	20
3.	20
4.	20
TOTAL	100

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SECTION A:

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



(b) Draw the structural formulae for the following compounds.

- (i) 3-ethyl- 4,7-dimethyl- non-1-ene
(ii) cis-1,2-dibromocyclohexane (4 Marks)

(c) Draw E or Z configuration for the following alkenes and indicate priority on the structures.

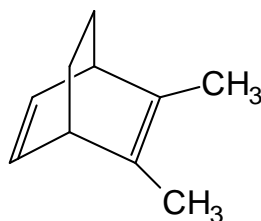


(d) What is plane-polarised light? (4 Marks)

(e) Show the steps to assign either R or S designation to each chiral carbon in the following compound. Indicate priorities on the structure.

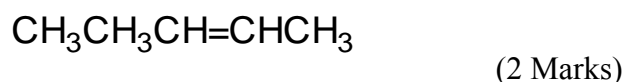


(f) Draw p-orbital structures for diene and dienophile to produce the following compound.

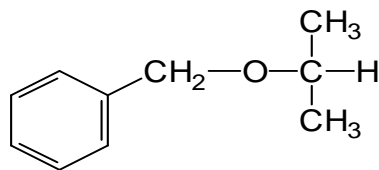


(4 Marks)

(g) What carbonyl compound and what phosphorus ylide might you use to prepare the following alkene?



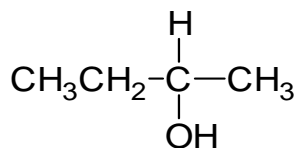
- (h) Write the reaction mechanism for the preparation of the following ether. Use curved arrows to illustrate the reactions.



(6 Marks)

- (i) Draw allylic cation formed by protonation of 1,3-butadiene. (3 Marks)

- (j) What Grignard reagent and carbonyl compound might you start with to synthesise the following alcohol? Write the reaction mechanism for the preparation of the alcohol. Use curved arrows to illustrate the reactions.



(5 Marks)

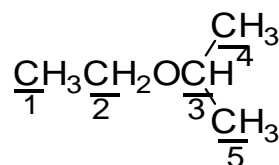
SECTION B:

2. (a) Sketch a potential energy diagram for rotations about the carbon1-carbon2 bond of $\text{BrCH}_2\text{CH}_2\text{CH}_3$.

Draw Newman projections to indicate locations of the various conformations.

(10 Marks)

- (b) Predict the splitting pattern you would expect from the underlined protons indicated in the following molecule.



(5 Marks)

- (c) With appropriate examples indicate whether the following statements are true or false.

- (i) An achiral molecule can have chiral centres.
 (ii) A compound with S configuration is the (-) leavo rotatory molecule.

(5 Marks)

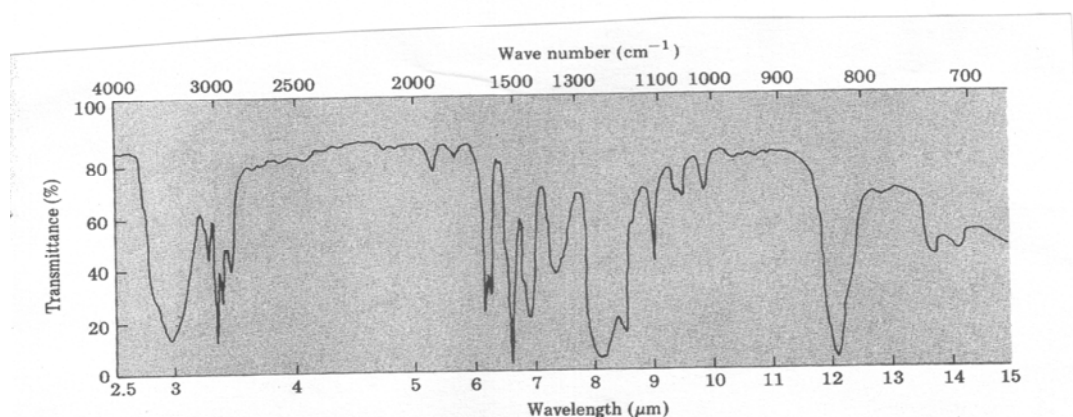
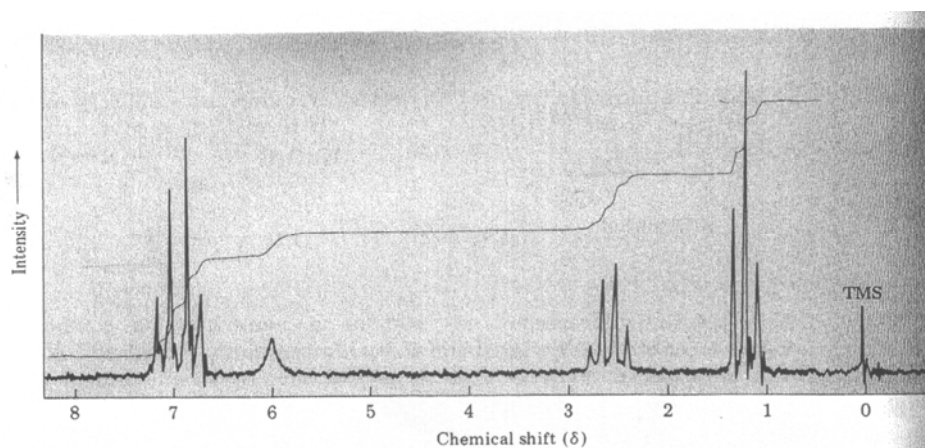
3. (a) Write the reaction mechanism for the reaction between but-2-ene and bromine(Br_2). The product is optically active. Draw all possible Fischer projections for stereoisomers. Indicate the relationship between them such as enationmers, diastereoisomers and meso compounds. (10 Marks)

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(b) Write reaction mechanisms for SN^1 and SN^2 reactions. (Use organic compounds of your choice). (10 Marks)

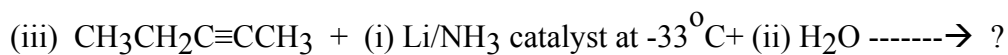
4. (a) Compound A, $\text{C}_8\text{H}_{10}\text{O}$, has the infrared and ^1H NMR spectra shown below. Propose a structure for A consistent with the observed spectral properties. Assign each peak in the NMR spectrum. Note that the $6.0\ \delta$ disappears when D_2O is added.



(10 Marks)

- (b) Write the reaction mechanism of acid catalysed dehydration of 1-methylcyclohexanol. Draw the structures of all possible products. With a good reason explain which product will be predominant. (10 Marks)

5. (a) Predict the product(s) for the following reactions and provide the correct IUPAC names for the products. (No mechanism required).



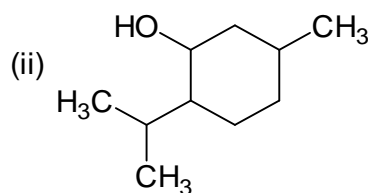
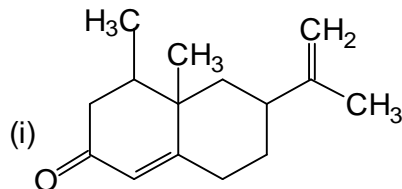
(10 Marks)

(b) What is the function of each spectroscopy given below?

- (i) infra-red spectroscopy
- (ii) ultraviolet/visible spectroscopy
- (iii) proton NMR spectroscopy
- (iv) mass spectroscopy

(4 marks)

(c) Indicate with an asterisk (*) all chiral carbons present in the following compounds. (Marks will be deducted for the wrong marking).



(6 Marks)

End of Question Paper!!!

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