



NATIONAL UNIVERSITY OF SCIENCE AND TECHNOLOGY

DEPARTMENT OF APPLIED CHEMISTRY

FIRST SEMESTER EXAMINATIONS – APRIL/MAY 2009

ORGANIC CHEMISTRY I– SCH 1102

(FOR APPLIED CHEMISTRY STUDENTS ONLY)

TIME – 3 HOURS

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.

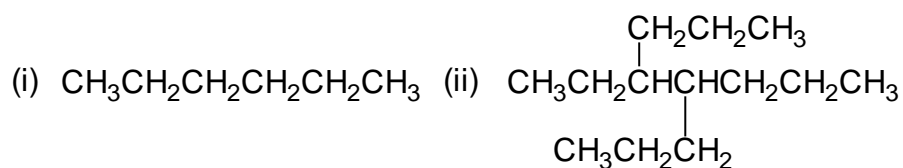
2. SHOW MECHANISM, CHEMICAL STEPS OR SYNTHESIS BY MEANS OF CURVED ARROWS.

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) Give IUPAC names for the following compounds.



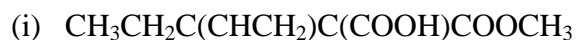
(b) The following names are incorrect. Draw structures and provide correct IUPAC names.

(i) 3-propyl-4,7-dimethyl nonane

(ii) cis-1,2-dimethylcyclopentane

(4 Marks)

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

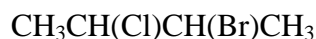


(4 Marks)

(d) What is plane-polarised light?

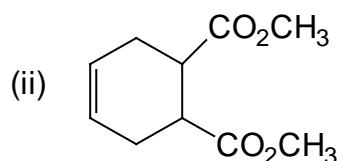
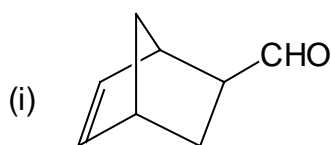
(4 Marks)

(e) Show the steps to assign either R or S designation to each chiral centre in the following compounds.



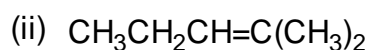
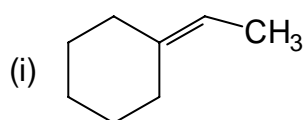
(6 Marks)

(f) Draw dienes and dienophiles to prepare the following products.



(4 Marks)

(g) What carbonyl compounds and what phosphorus ylids might you use to prepare the following compounds?



(4 Marks)

(h) Give starting materials which would react under basic conditions to give following ethers.

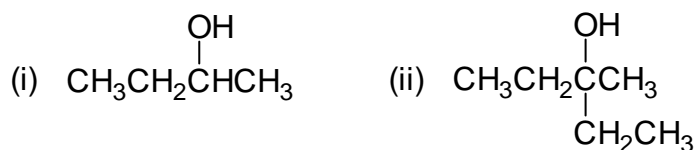
(i) Ethyl phenyl ether (ii) Diethyl ether

(4 Marks)

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

(3 Marks)

(j) What Grignard reagents and what carbonyl compounds might you start with to synthesise the following alcohols. (Draw the chemical structures of the compounds).



(4 Marks)

SECTION B:

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

Draw Newman projections to indicate locations of the various conformations.

(10 Marks)

(b) Use Fischer projections for the following compounds and identify them as chiral or achiral.

- (i) 2-chloro-2-methyl pentane
(ii) 3-bromo-2-methyl pentane.

(4 Marks)

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

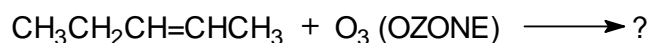
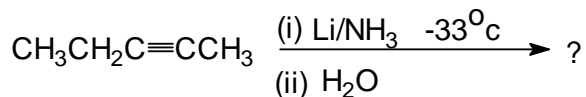
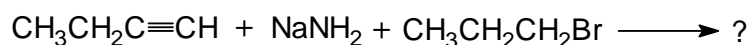
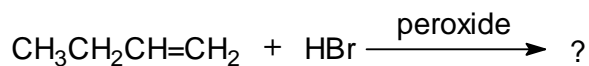
- (i) An achiral molecule can have chiral centres.
(ii) A compound with S configuration is the (-) leavo rotatory molecule.
(iii) An optically inactive substance may be made up of a chiral molecules.

(6 Marks)

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

(10 Marks)

- (b) Write reaction mechanism for S_N^1 and S_N^2 reactions. (Use organic compounds of your choice). Explain the mechanism wherever possible. (10 Marks)
4. (a) Write reaction mechanism for the addition of one mole of Cl_2 to 2-methyl-1,3-butadiene. Which product would you expect to be predominate and why? (10 Marks)
- (b) Write the reaction mechanism of acid catalysed dehydration of 2-methyl-2-butanol. 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) Radical chlorination of pentane is a poor way to prepare 1-chloropentane but radical chlorination of neopentane; $(CH_3)_4C$; is a good way to prepare neopentyl chloride, $(CH_3)_3CCH_2Cl$. Write reaction mechanism for both reactions and explain the differences.

(10 Marks)

***** END OF QUESTION PAPER *****