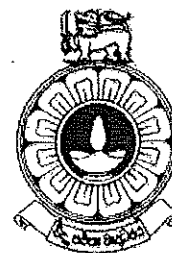


The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc./B. Ed. Degree Programme

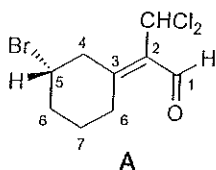


Department	: Chemistry
Level	: 4
Name of the Examination	: Final Examination
Course Code and Title	: CMU2221 – Organic Chemistry I
Academic Year	: 2019/2020
Date	: 02-11-2020
Time	: 9.30 a.m. – 12.30 p.m.
Duration	: 03 hours
Index number	:

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **06** pages containing **04** questions.
3. Answer **all four** questions. All questions carry equal marks.
4. Answer for each question should commence from a new page.
5. Draw fully labelled diagrams where necessary
5. Relevant log tables are provided where necessary.
6. Having any unauthorized documents/ mobile phones in your possession is a punishable offense
7. Use blue or black ink to answer the questions.
8. Circle the number of the questions you answered in the front cover of your answer script.
9. Clearly state your index number in your answer script

1. (a) Consider the compound (A) given below.
(Carbon atoms are numbered for your convenience).



- (i) Determine the configurations of chiral centers as *R* or *S* and double bonds as *E* or *Z* showing the priorities of the groups attached to them according to Cahn-Ingold-Prelog rules.

Note: If priorities of the groups are not clearly shown marks will not be awarded

- (ii) How many stereoisomers are possible for A?
(iii) Draw the structure of the enantiomer of A.
(iv) Draw the structure of a diastereoisomer of A.

(33 Marks)

- (b) $[\alpha]_D$ of a sample containing (+) and (-)-carvone is found to be +55.
 $[\alpha]_D$ of pure (+)-carvone is +62.5.

- (i) Calculate the percent optical purity of (+)-carvone in the sample
(ii) Calculate the enantiomeric excess of (+)-carvone in the sample
(iii) Calculate the percentages of (+)-carvone and (-)-carvone in the sample.

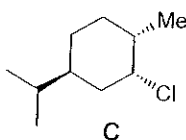
(17 Marks)

- (c) Consider the solvolysis reaction of 2-bromo-2-methylpropane in ethanol.

- (i) Give the mechanism of the reaction
(ii) If EtO^- ions are added to the reaction medium, what would you expect with respect to the rate of reaction in comparison to the reaction in (i) above. Explain your answer.
(iii) If the reaction is carried out in a mixture of acetone and ethanol, what would you expect with respect to the rate of the reaction in comparison to the reaction in (i) above. Explain your answer with the aid of an appropriate energy diagram.

(30 Marks)

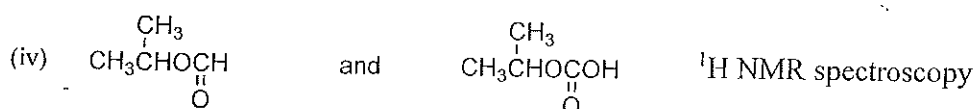
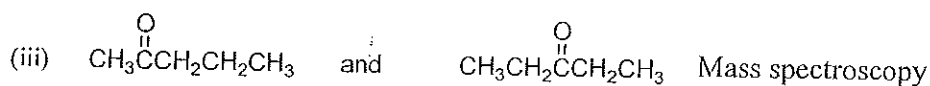
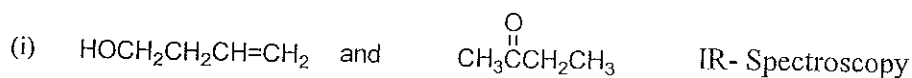
- (d) Consider the reaction of the following compound C with NaOEt/EtOH .



- (i) Giving the mechanism, predict the two products formed from this reaction.
(ii) State which one is the major product formed from this reaction with C.

(20 Marks)

2. (a) State how you would distinguish between the compounds in **any THREE (03)** of the following pairs using the indicated spectroscopic method. Briefly state the reasons for your answers.



(30 Marks)

- (b) Calculate the expected λ_{max} of the compound **E** using Woodward-Fieser rules for α , β -unsaturated ketones given below.

Base value for α , β -unsaturated ketone = 215 nm

Increments for

Double bond extending conjugation = + 30 nm

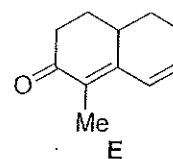
Alkyl group or ring residue at α = + 10 nm

β = + 12 nm

γ and higher = + 18 nm

Exocyclic double bond position = + 05 nm

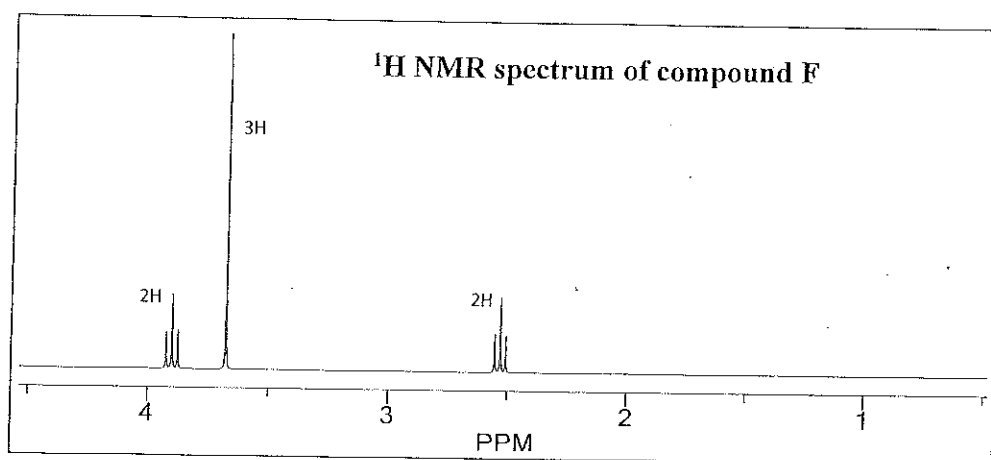
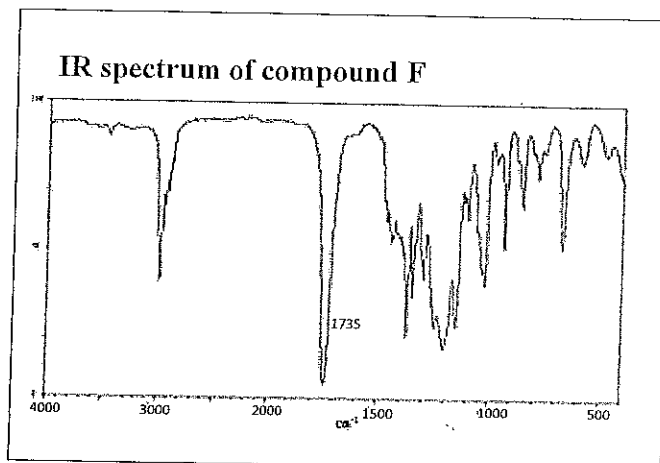
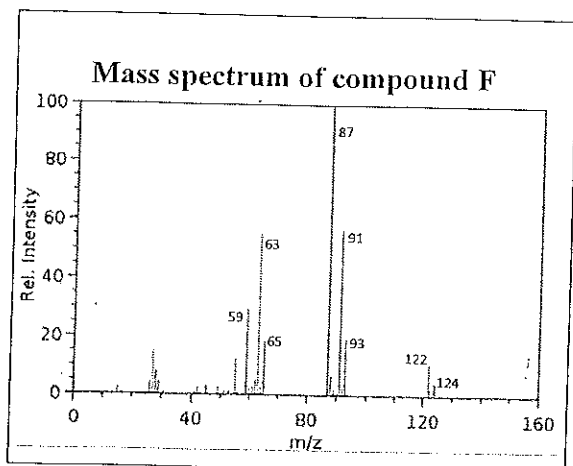
Homoannular diene component = + 39 nm



(20 Marks)

- (c) Compound **F** is a monohalogenated organic compound containing 4 C atoms. Mass spectrum, IR spectrum and the ^1H NMR spectrum of compound **F** are given below.

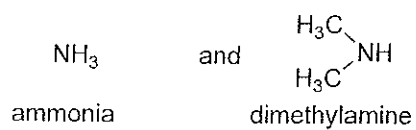
- Giving reasons identify the halogen present in **F**.
- Giving reasons identify the possible functional group/s present in **F**.
- Elucidate the structure of **F** and assign the ^1H NMR signals to your proposed structure.
- Give the structures of fragment ions at m/z 91/93, 87, 63/65 and 59 of the mass spectrum of **F**.



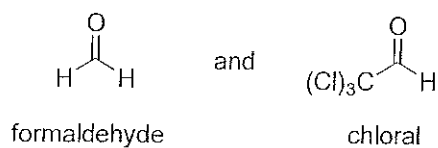
(50 Marks)

3. (a) Giving reasons select the correct compound from the following pairs.

(i) Compound which is more basic.

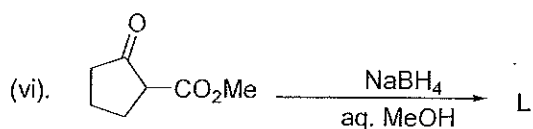
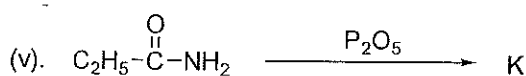
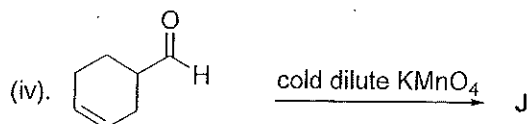
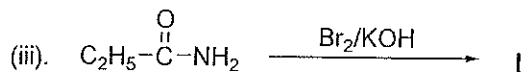
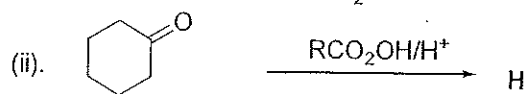
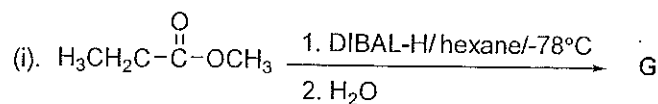


(ii) Compound which forms the more stable hydrate.



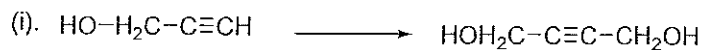
(20 marks)

(b) Give the structures of the major products (G - L) of the following reactions.



(30 marks)

(d) Show how **any TWO (02)** of the following transformations can be carried out.



(50 marks)

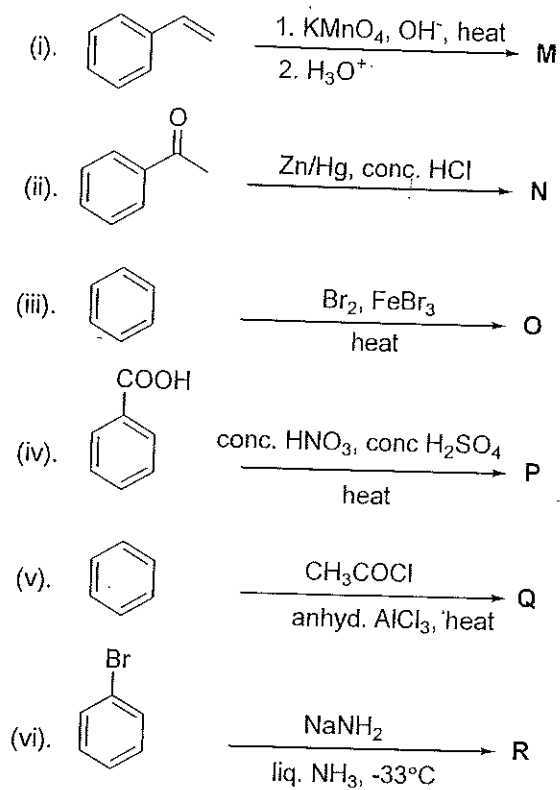
4. (a) Give reasons for the following.

(i) pK_a value of 2,4-dinitrophenol is lower than that of 4-nitrophenol.

(ii) In electrophilic substitution reactions of substituted benzene, the $-\text{NH}_2$ group act as a stronger activator than $-\text{NHCOCH}_3$ group.

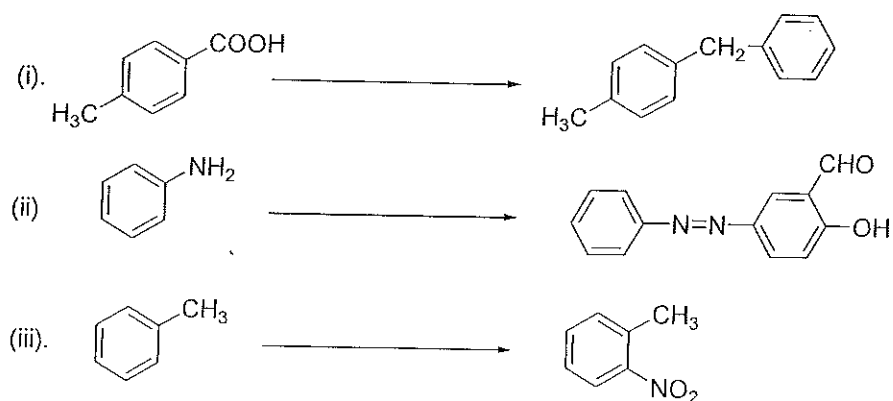
(20 marks)

(b) Give the structures of the major products (M - R) of the following reactions.



(30 marks)

(c) Show how any **TWO** (02) of the following transformations can be affected.



(50 marks)

--- The END ---