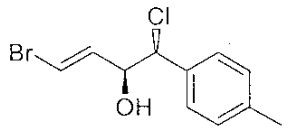
The Open University of Sri Lanka
Faculty of Natural Sciences
B.Sc. Degree Programme

Department	: Chemistry
Level	: 4
Name of the Examination	: Final Examination
Course Code and Title	**: CYU4303 Organic Chemistry I**
Academic Year	: 2024/2025
Date	: 27.05.2025
Time	: 1.30 p.m.- 03.30 p.m.
Duration	: 2 hours
Index number	:

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **Four** questions in **six** pages.
3. **Answer All FOUR (04) questions. All questions carry equal marks.**
4. **Answer for each question should commence from a new page.**
5. Draw fully labelled diagrams 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) Structure of compound A is given below.

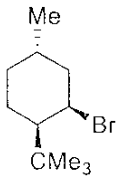


A

(i) Calculate the number of stereoisomers possible for **A**.
(ii) Draw the enantiomer of **A** and label it as **B**.
(iii) Determine the configurations of stereocenters of **A** as E/Z or R/S using Cahn-Inglod-Prelog rules. Make sure to label the groups in priority order.

(30 marks)

b) The following compound **C** undergoes E2 elimination with alcoholic KOH.



C

(i) Draw the two-chair confirmation of **C**, and indicate which one is more stable.
(ii) Which chair conformation will undergo the E2 elimination? briefly explain your choice.

(30 marks)

c) During the synthesis of (*s*)-(-)-mandelic acid, a sample of mandelic acid was obtained with specific rotation of -134°, ($[\alpha]_D$ of (*s*)-(-)-mandelic acid = -158°)

(i) Calculate the percent optical purity of (*s*)-(-)-mandelic acid in this sample.
(ii) Calculate the enantiomeric excess (ee) of (*s*)-(-)-mandelic acid in this sample.
(iii) Calculate the percentage of (*s*)-(-)-mandelic acid and (*R*)-(-)-mandelic acid in the sample.

(40 marks)

2. a) (i) State which of the following reactions proceed without formation of any intermediate product.

(i) $CH_3Br + OH^- \longrightarrow CH_3OH + Br^-$

(ii) $(CH_3)_3CBr + OH^- \longrightarrow C(CH_3)_3OH + Br^-$

(ii) Draw the free energy diagram for the reaction you stated above.

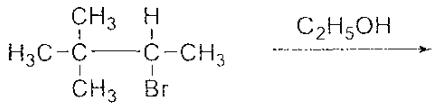
Represent any maxima or minima in your diagram by means of chemical formulae.

(25 marks)

b) Arrange the halide ions (fluoride to iodide) in terms of nucleophilicity in
(i) a protic solvent like ethanol
(ii) an aprotic solvent like dimethylsulfoxide, CH_3SOCH_3.

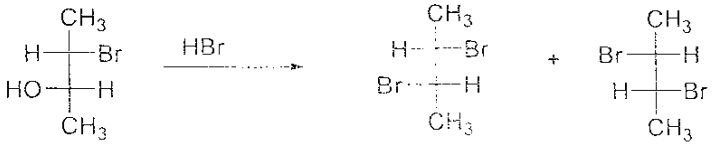
(25 marks)

c) Predict the product/s of the following reaction. Give the mechanism for the formation of product/s.



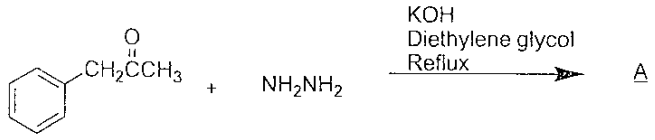
(25 marks)

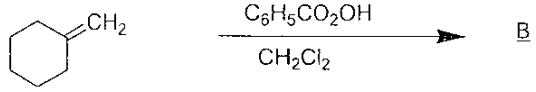
d) Give the mechanism and explain the product formation of the following reaction.

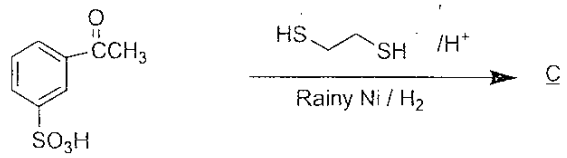


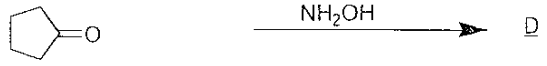
(25 marks)

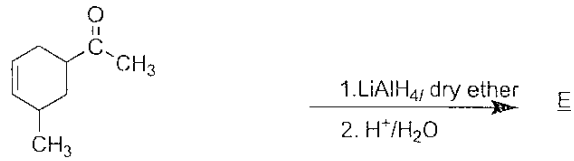
3. a) Give the structures of the major product/s (A-F) of the following reactions.

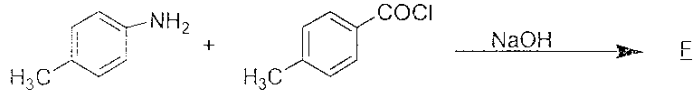
(i) 

(ii) 

(iii) 

(iv) 

(v) 

(vi) 

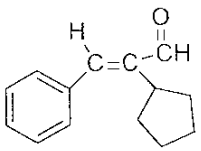
(30 marks)

b) (i) Briefly explain the reason for the following variation of the acidity of the carboxylic acids given below.

$$FCH_2COOH > BrCH_2COOH > ClCH_2COOH > CH_3COOH$$

(10 marks)

(ii) Outline a synthetic route for the following compound via crossed aldol reaction. (You need to mention the starting compounds and the final reaction.) (10 marks)

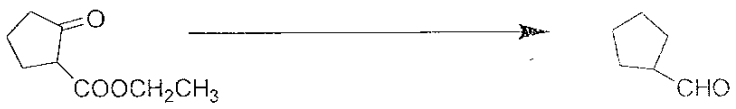


c) Giving necessary reagents and conditions show how any **two (02)** of the following transformations are carried out **using less than 4 steps**.

(i) $CH_3CH_2\overset{O}{\overset{\|}{C}}NH_2 \longrightarrow CH_3\underset{Br}{CH}COOH$

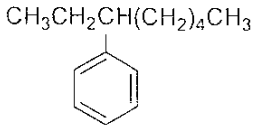
(ii)

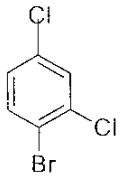
(iii)

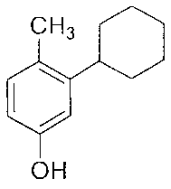


(50 marks)

4. a) (i) Give the IUPAC name of the following compounds.







(ii) Draw the Frost Musulin diagram of cyclopentadienyl anion and deduce the Molecular orbital (MO) diagram.

(iii) Predict the aromaticity of cyclopentadienyl anion.

(30 marks)

b) Benzene can be nitrated by using a mixture of conc. HNO_3 and conc. H_2SO_4 at 55°C.

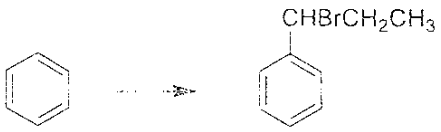
(i) Identify the electrophile in this reaction and show how this electrophile was created in the reaction.

(ii) Give the reaction mechanism for the nitration of benzene.

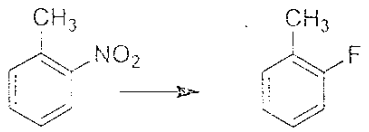
(35 marks)

c) Giving necessary reagents and reaction conditions show how the following transformations are carried out using **less than 5 steps.**

i)



ii)



(35 marks)