00770

The Open University of Sri Lanka

Faculty of Natural Sciences

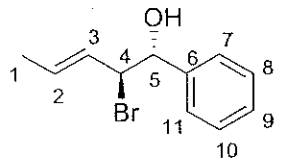
B.Sc./ B. Ed. Degree Programme

Department	: Chemistry
Level	: 4
Name of the Examination	: Final Examination
Course Code and Title	: **CYU4303 – Organic Chemistry 1**
Academic Year	: 2020/2021
Date	: 24 -03-2022
Time	: 9.30 a.m. – 11.30 a.m.
Duration	: 02 hours
Index number	:

General Instructions

1. Read all instructions carefully before answering the questions.
2. This question paper consists of **05** 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) Given below is the structure of a Compound **A**.
(Carbon atoms are labeled for your convenience.)

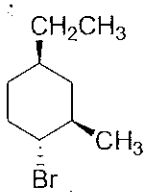


A

i. Calculate the number of stereoisomers possible for **A**.
ii. Draw the structure of the enantiomer of the **A** and label it as **B**.
iii. Draw the structure of the epimer of **B** and label it as **C**.
iv. The compound **D**, which is an isomer of **A**, gives the same ketone as **A** on oxidation with PCC. Draw the structure of **D**.
v. According to Cahn-Ingold-Prelog rules, label the groups in priority order and determine the configurations of stereocenters as E/Z or R/S, in structure **A**.
vi. Label the groups in structure **A** in the priority order and determine the configurations of stereocenters as E/Z or R/S according to Cahn-Ingold-Prelog rules.

(55 Marks)

(b) Consider the following cyclohexane labelled as **E**.



E

i. Draw the two chair conformations of **E**.
ii. Giving reasons identify the most stable chair conformation.

(20 Marks)

(c) Optical rotation $[\alpha]_D$ of a mixture of compound **F** and its enantiomer is -5.1°. Specific rotation of pure **F** is +15.0°.
i. What is the specific rotation of the enantiomer of **F**?
ii. Calculate the enantiomeric excess in the mixture.
iii. Find the percentage of each enantiomer in the mixture.

(25 Marks)

2. (a) Determine the S_N2 reactivity with NaCN in aprotic DMSO (dimethyl sulfoxide) of the alkyl halides:

i. $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}HCH_2CH_3$, $CH_3\underset{\displaystyle Br}{\underset{|}{C}}HCH_2CH_3$, $CH_3\underset{\displaystyle I}{\underset{|}{C}}HCH_2CH_3$

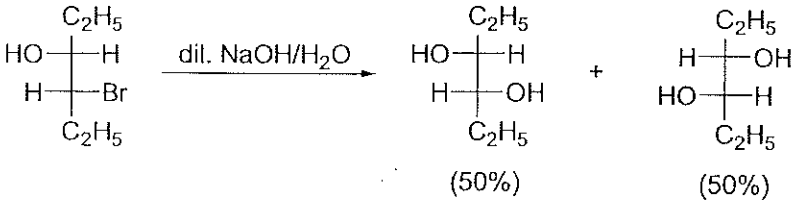
ii. $CH_3\underset{\displaystyle CH_3}{\underset{|}{C}}HCH_2CH_2Cl$, $CH_3\underset{\displaystyle CH_3}{\underset{|}{C}}H-\underset{\displaystyle Cl}{\underset{|}{C}}HCH_3$, $CH_3\underset{\displaystyle Cl}{\underset{|}{C}}(\underset{\displaystyle CH_3}{\underset{|}{C}}H_3)-CH_2CH_3$

(16 Marks)

(b) Briefly explain how the stereochemistry of S_N1 and S_N2 reactions differ.

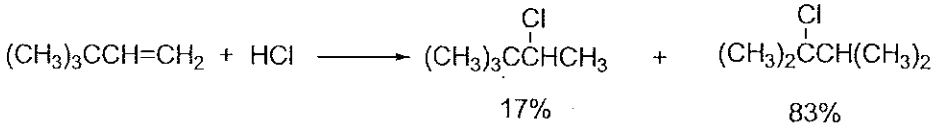
(09 Marks)

(c) Propose a mechanism for the following reaction and explain the product formation of the reaction.



(25 Marks)

(d) Give the mechanisms for the following reactions.



(25 Marks)

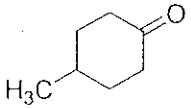
(e) Give the mechanisms for the addition of Br_2 to *cis*-2-butene.

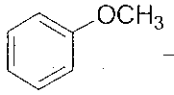
(25 Marks)

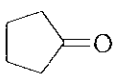
3. (a) Give the structures of the major products (**G - L**) of the following reactions.

i. $CH_3CCH_2CH{=}CHCH_2C{-}OCH_3$ ($\overset{O}{\|}$ and $\overset{O}{\|}$) $\xrightarrow{NaBH_4 \,/\, aq.\ MeOH}$ **G**

ii. $CH_3C{}^{15}NH_2$ ($\overset{O}{\|}$) $\xrightarrow[2.\ NaOH\,/\,Br_2]{1.\ CH_3CH_2CNH_2\ (\overset{O}{\|})}$ **H**

iii.  $\xrightarrow[2.\ LiAlH_4]{1.\ HCN}$ **I**

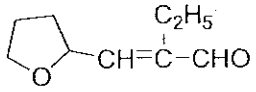
iv.  $\xrightarrow[reflux]{aq.\ HBr}$ **J**

v.  $\xrightarrow[2.\ KOH\,/\,\Delta]{1.\ NaNH_2}$ **K**

vi. $CH_3CH_2CH_2CO_2H$ $\xrightarrow[2.\ H_2O]{1.\ Br_2\,/\,P}$ **L**

(30 Marks)

(b) Outline a synthetic route for the following compound (**M**) via crossed aldol reaction.



M

(20 Marks)

(c) Giving necessary reagents and conditions show how any **two (02)** of the following transformations carried out.

i. 

ii. $CH_3CH_2Br \longrightarrow C_2H_5C(CH_3)=CHCH_3$

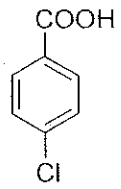
iii. $CH_3CONH_2 \longrightarrow CH_3CH(OCH_3)-OCH_3$

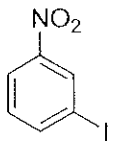
(50 Marks)

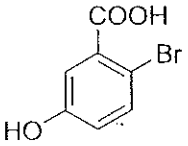
4. (a) Kekule structure describes the structure of benzene with some limitations. State **two (02)** limitations of the Kekule structure of benzene.

(10 Marks)

(b) Name the following benzene derivatives.

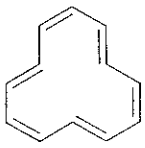
i. 

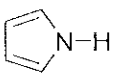
ii. 

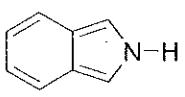
iii. 

(15 Marks)

(c) Classify the following molecules as aromatic, nonaromatic or antiaromatic by applying Hückel rule with the explanation.

i. 

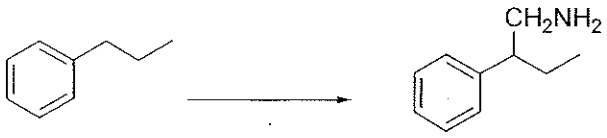
ii 

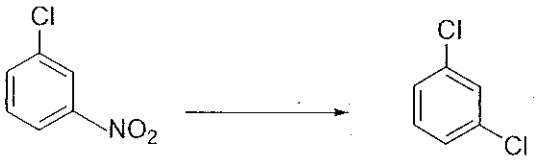
iii 

(15 Marks)

(d) How would you affect the following conversions?

i 

ii. 

iii. 

(45 Marks)

(e) Give the mechanism for the bromination of benzene.

(15 Marks)

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