RAJARATA UNIVERSITY OF SRI LANKA

FACULTY OF APPLIED SCIENCES

B.Sc. (General) Degree in Applied Sciences

Second Year Semester I Examination– June / July 2022

CHE 2202 – ORGANIC CHEMISTRY II

Answer all FOUR questions. **Time: 02 hours**

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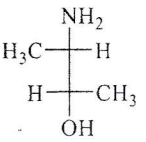
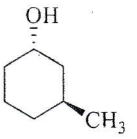
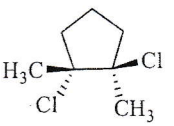
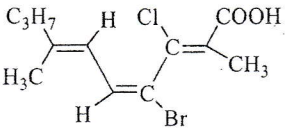
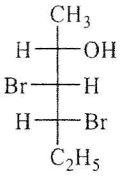
1. a)Name the following compounds using RS or EZ nomenclature. Draw all the necessary steps and write IUPAC names of each compound.

i. 

ii. 

iii. 

iv. 

v. 

(10 marks)

b) For each of the following, draw the most stable and unstable Newman projection, relevant to the bond indicated.

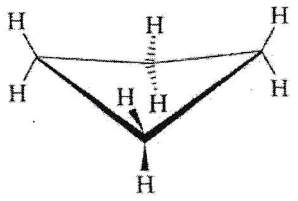
i. Butane, relative to the C2-C3 bond
ii. 1-Chloropropane, relative to the C1-C2 bond

(04 marks)

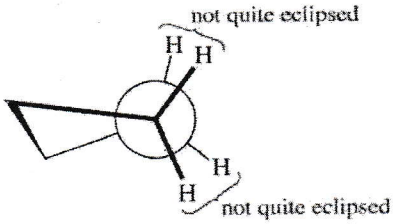
c) Draw the Fischer projection of (2S,3R,4S)-2,4-Dichloro-3-methylhexane

(03 marks)

d) Cyclobutane, cyclopentane and cyclohexane molecules are not plainer. Draw the relevant 3D conformations and Newman projections of cyclopentane and chair conformation of cyclohexane to explain the geometry. 3D conformation and Newman projection of cyclobutane is given below.



slightly folded conformation



Newman projection of one bond

Cyclobutane

(06 marks)

2.

a) Draw the conformations of 2-methylbutane using Newman projection formulae and plot the potential energy vs angle of rotation curve for the rotation of C2 – C3 bond through 360°C

(06 marks)

b) Calculate the strain energy of each position in the above section (a) using the values given in the following table.

Energy Costs for Interactions in Alkane Conformers

Interaction	Cause	Energy cost (kJ/mol)
H ⟷ H eclipsed	Torsional strain	4.0
H ⟷ CH_3 eclipsed	Mostly torsional strain	6.0
CH_3 ⟷ CH_3 eclipsed	Torsional plus steric strain	11
CH_3 ⟷ CH_3 gauche	Steric strain	3.8

(06 marks)

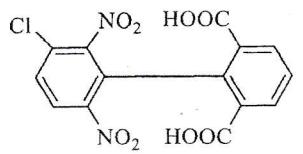
c) The addition of H_2 to C=C normally gives off about 118 kJ/mol. Benzene has three unsaturation sites but gives off only 206 kJ/mol on reacting with 3 H_2 molecules. Discuss the statement.

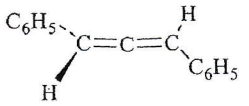
(04 marks)

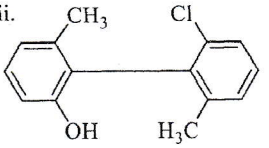
d) List the limitations of Friedel-Crafts alkylation reactions.

(03 marks)

e) State whether the following compounds are optically active or not. Explain your answer.

i. 

ii. 

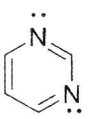
iii. 

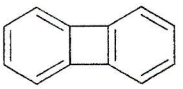
(06 marks)

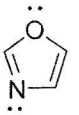
3.

a) Determine whether the following compounds show aromaticity in accordance with the Huckels rule. Explain your answer.

i 

ii 

iii 

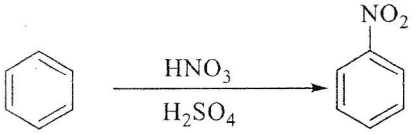
iv 

(06 marks)

b) Briefly explain the acidity of Phenol with necessary resonance structures

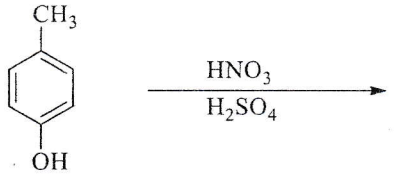
(06 marks)

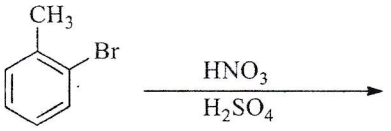
c) Nitration reaction of benzene can be expressed as follows. Write the detailed mechanism of the reaction and discuss the energy diagram of the reaction.



(05 marks)

d) Write all products of the following reaction.

i. 

ii. 

(03 marks)

e) Write the mechanism of synthesis of salicylic acid using phenol by Kolbe carboxylation

(05 marks)

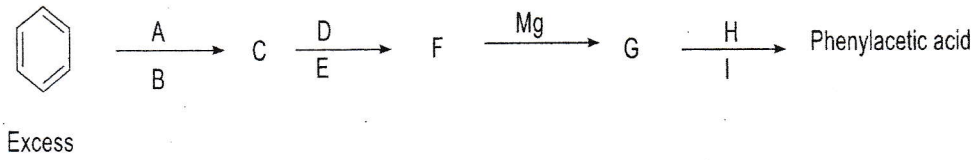
4)

a) Elaborate the synthesis of epoxides,

i. Using halohydrin method, starting from cyclohexene
ii. When cycloheptene treated with a peroxyacid

(04 marks)

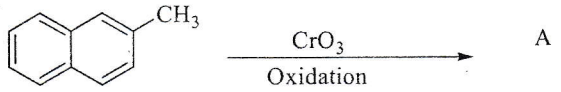
b) Synthesis of phenylacetic acid from benzene is given below. Identify the reactants/products from A to I.



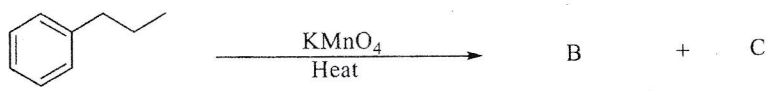
(05 marks)

c) Identify unknown compounds A, B, C, D, E, F, G, H and I and complete the following reactions.

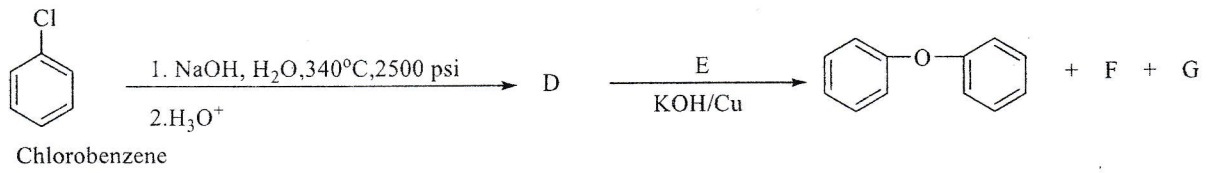
i.



ii.



iii.



iv.

(13 marks)

e)

i. Describe "Colour fastness" and factors that affect color fastness.
ii. Write a short account on "acid dyes" used to color fabrics.

(05 marks)

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END.