

UNIVERSITY OF JAFFNA
BACHELOR OF PHARMACY
SECOND YEAR FIRST SEMESTER EXAMINATION – JANUARY 2016
PHACH 2124 PHARMACEUTICAL CHEMISTRY II

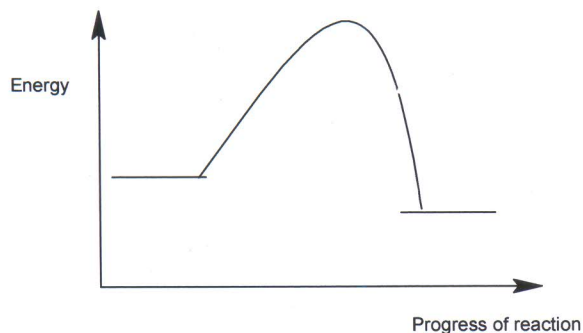
Date: 28.1.2016.

Time: 03 Hours

Answer all six questions



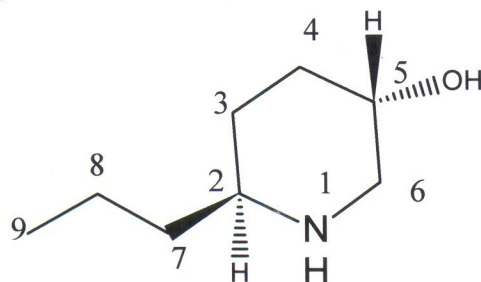
1. An energy profile for the following nucleophilic substitution reaction is sketched below.



- 1.1 Label your diagram to show the species at the appropriate place. (15 marks)
 1.2 Put 'TS' in the correct place in the diagram for the transition state and predict the structure of 'TS' (15 marks)
 1.3 Suggest a mechanism for the given reaction, explaining why it is called a nucleophilic substitution reaction (30 marks)
 1.4 Discuss the factors affecting the $\text{S}_{\text{N}}2$ reaction. (40 marks)

2.

- 2.1 2.1.1 Given below is the structure of (+)-pseudoconhydrine (A). As follows its $[\alpha]_{\text{D}} = +11^\circ$ (Numbering of the atoms in the molecule is shown for your convenience)



(A)

- 2.1.2 How many stereocenters are there in this molecule? Indicate the centers by it's numbers. (10 marks)
 2.1.3 Determine the configuration of each of those stereocenters? (10 marks)
 2.1.4 Draw the structure of (-) - pseudoconhydrine? (10 marks)

2.1.5 What is the $[\alpha]_D$ value of (-)-pseudoconhydrine in 1:1 mixture of (+), (-)-pseudoconhydrine? (10 marks)

2.1.6 Oxidation of (+)-pseudoconhydrine (A) with Pyridinium chlorochromate (PCC) produce a compound C. Give the structure of Compound C. (10 marks)

2.2 2.2.1 Draw the structures of 2-methyl-1,3-cyclopentanediol and label them as (A), (B), (C),..... (30 marks)

2.2.2 Identify optically active isomers, pairs of enantiomers and mesomers among the above structures mentioned in 2.2.1 (20 marks)

3.

3.1 What do you mean by specific rotation? (25 marks)

3.2 Define the term "Racemic mixtures"? (10 marks)

3.3 During a synthesis of (s)-(-)-mandelic acid, a sample of mandelic acid was obtained with specific rotation of -134° . $[\alpha]_D$ of the compound is -158° .

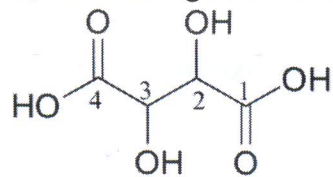
3.3.1 Calculate the percentage of optical purity of (s)-(-)- mandelic acid in this sample. (25 marks)

3.3.2 Calculate the enantiomeric excess of (s)-(-)- mandelic acid in the sample. (20 marks)

3.3.3 Calculate the percentage of (s)-(-)- mandelic acid and (R)-(+)- mandelic acid in the sample. (20 marks)

4.

4.1 4.1.1 Draw the expected conformation that can arise due to the rotation of C_2-C_3 bond through 360° of meso-tartaric acid.



tartaric acid

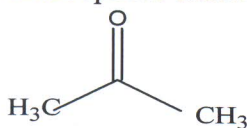
(25 marks)

4.1.2 Sketch the potential energy curve for the rotation against the angle of rotation. (0° , 60° , 120° , 180° , 240° , 300° , 360°) (15 marks)

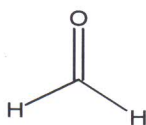
4.2 Arrange the following compounds in increasing order of their acidities with reasons.

(A) H-OH (B) H-NH₂ (C) H-F (D) H-CH₃ (30 marks)

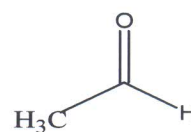
4.3 Arrange the carbonyl compounds in the order of increasing reactivity towards nucleophilic addition reaction. Explain the basis of your answer.



(A)



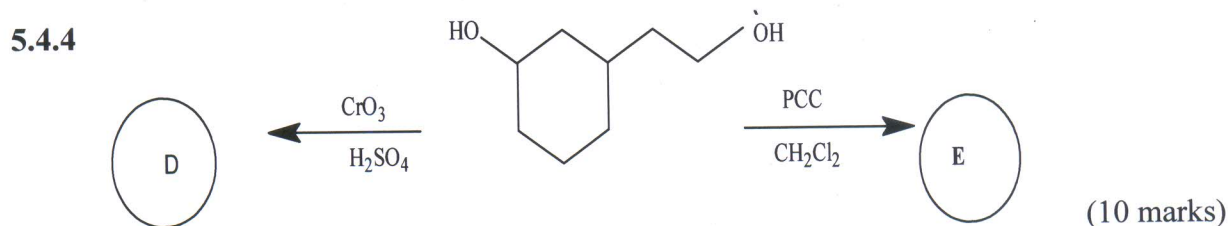
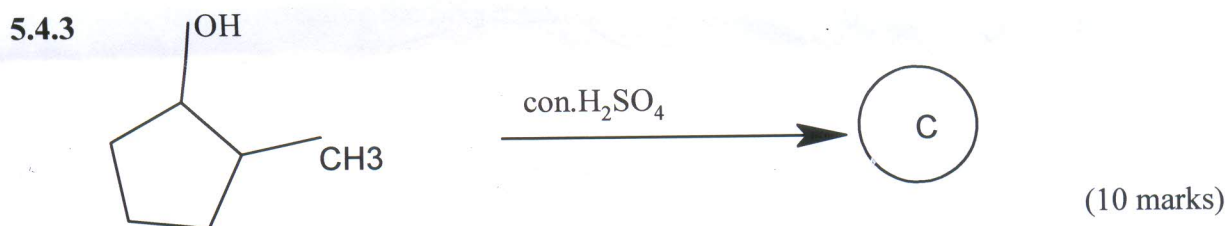
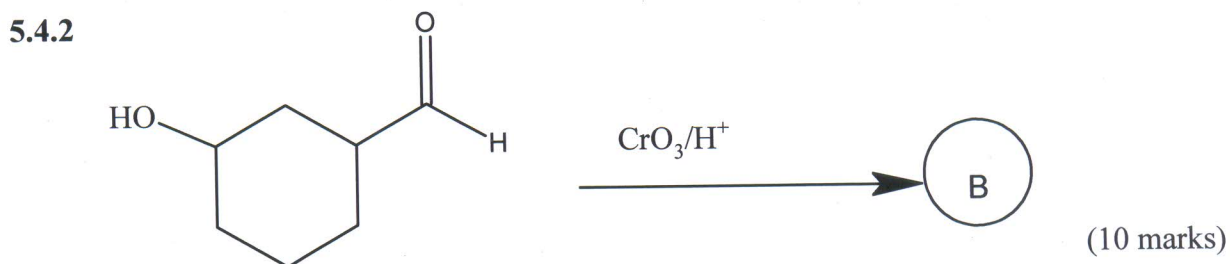
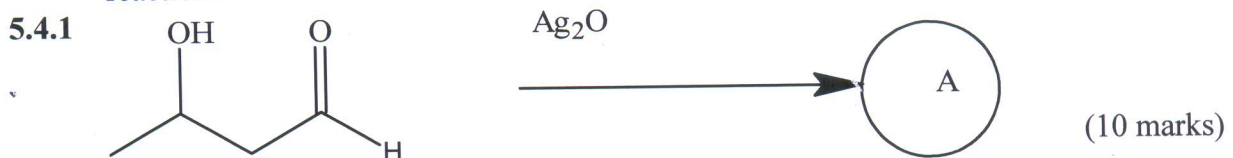
(B)



(C)

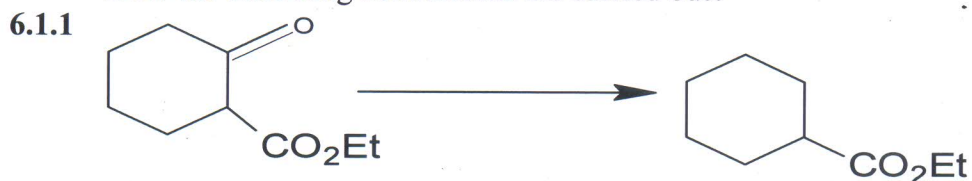
(30 marks)

- 5.
- 5.1 Explain the following terms. (10 marks)
- 5.1.1 Asymmetric carbon (10 marks)
- 5.1.2 Optical activity (10 marks)
- 5.1.3 Enantiomers (10 marks)
- 5.2 Draw chair conformation of cis- and trans-1,4-dimethylcyclohexane. (10 marks)
- 5.3 Explain the followings. (10 marks)
- 5.3.1 p-Hydroxy benzaldehyde has higher boiling point than o-Hydroxy benzaldehyde. (10 marks)
- 5.3.2 Nitriles ($R-C\equiv N$) has less basicity than the corresponding amines ($R-NH_2$). (10 marks)
- 5.4 Predict the major products (A, B, C, D, and E) of the following reactions.



6.

6.1 How the following conversions are carried out?

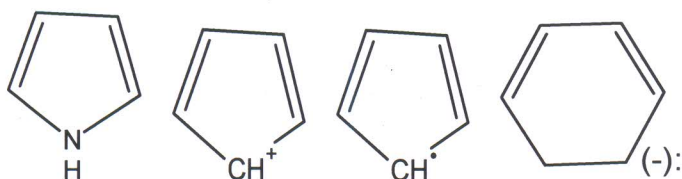


6.1.2 From bromocyclohexane to 2-cyclohexylethanol. (15 marks)

6.1.3 From Benzaldehyde to Benzamide. (15 marks)

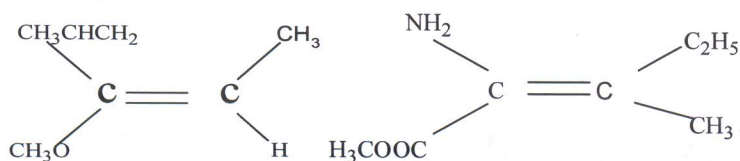
6.1.4 From Popanal to 3-hydroxy-2-methylpentan-1-ol. (15 marks)

6.2 Categorize the following compounds as aromatic or antiaromatic by using Huckell rule.



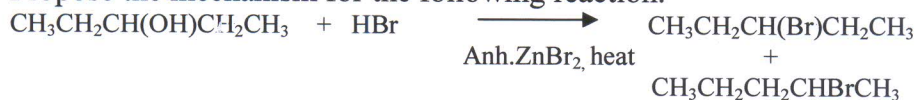
(20 marks)

6.3 Indicating the priorities of the groups according to cahn-ingold –prelog rules, determine the configuration of the double bonds(as E or Z) of the following alkenes.



(10 marks)

6.4 Propose the mechanism for the following reaction.



(10 marks)

XXXXXXXXXXXXXX