EASTERN UNIVERSITY, SRI LANKA
EXTERNAL DEGREE IN SCIENCE
FIRST YEAR EXAMINATION IN SCIENCE
SECOND SEMESTER (March-May-2016)
EXTCH 103: STEREOCHEMISTRY AND KINETIC MOLECULAR THEORY
(Repeat)

Answer all questions **Time allowed: ONE Hour**

You may find the following data useful

Avogadro constant (N_A): 6.023×10^{23} mol^{-1}

Electron charge (e): 1.602×10^{-19} C

Faraday constant (F): 9.648×10^{4} $Cmol^{-1}$

Gas constant (R): 8.314 $JK^{-1}mol^{-1}$

Planck's constant (h): 6.626×10^{-34} Js

Rest mass of electron (m_e): 9.1×10^{-31} kg

Velocity of light (c): 3×10^{8} ms^{-1}

The use of a (non –programmable) calculator is permitted

1. a) i) Draw the structure of the following compounds and point out their R,S specifications (where present).

a) (R)-2-chloro-propanol

b) (S)-1,2-dibromopentane

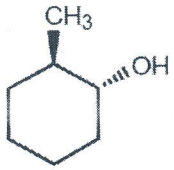
c) (2R,3S)-2-iodo-3-butanol

(30 m

ii) Write Sawhorse and Newmann projections for all conformations of 2,3-dibromobutane and draw the potential energy versus dihedral angle diagram for the conformations.

(20 m

b) i) Give reasons and indicate the most stable conformation of the two possible chair of the following compound (your answer should include the various destab interactions that contribute to the total strain of each conformation).



(20 m

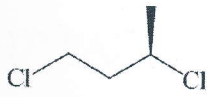
c) A solution of 2.0 g of (+)-glyceraldehyde in 20.0 mL of water was placed in a polarimeter tube. Using the sodium D line, a rotation of 1.6° was observed at Calculate the specific rotation of (+)-glyceraldehyde.

(30

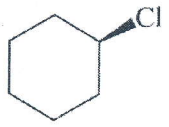
Contd.

2. a) Find out the chiral center(s) of the following compounds are R or S.

a)

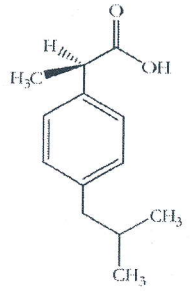


b)



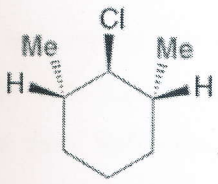
c)

d)

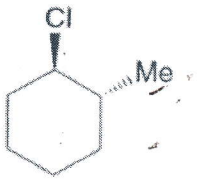


(20 marks)

b) Explain why E_2 elimination of B gives product while the E_2 elimination of A does not give any product.



A



B

(20 marks)

c) Considering a certain mass of a gas enclosed in a cubic box of length l at a fixed temperature. Derive expressions for,

i. The total change of momentum per second on **one** face of the box due to **one** molecule only.

(15 marks)

ii. The total change of momentum due to impacts of **all** the molecules on **all** faces of the box.

(15 marks)

iii. Show that

$$PV = \frac{1}{3} mN\overline{C}^2$$

Where,
V- volume of the cube
P- pressure of the gas
m- mass of one molecule
N- total number of gas molecules
C- velocity of a molecule.

(15 marks)

iv. Calculate the root mean square velocity of an He molecule at 30 ^{0}C and 76 cm Hg pressure (76 cm Hg = 1 atm = 10^5 Pa; 1 Pa =1 Nm^{-1}; He = 4).

(15 marks)