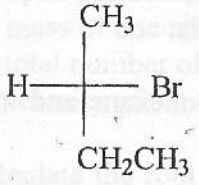
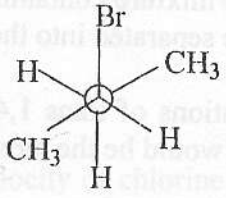
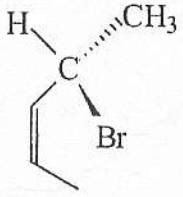
EASTERN UNIVERSITY SRI LANKA
DEPARTMENT OF CHEMISTRY
FIRST YEAR IN SCIENCE
SECOND SEMESTER – 2002/2003 - (REPEAT)
CH 103 STEREOCHEMISTRY AND KINETIC MOLECULAR THEORY

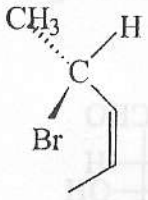
ANSWER ALL QUESTIONS **TIME – ONE HOUR**

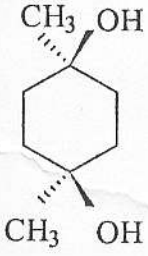
1) a) For each of the following pairs of compounds, indicate, giving reasons, whether they are enantiomers, diastereoisomers, geometrical isomers or identical compounds.

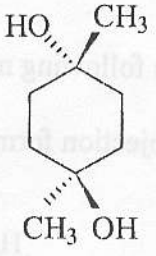
i) 

and


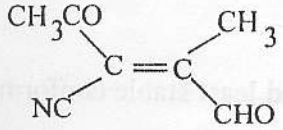
ii) 

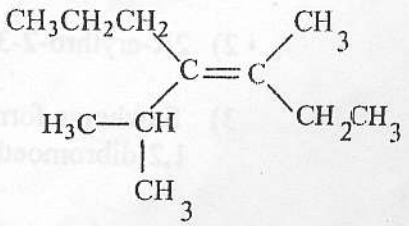
and


iii) 

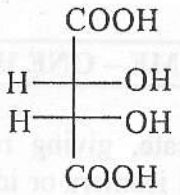
and


b) Design the configuration of the following by E, Z nomenclature

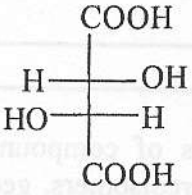
i) 

ii) 

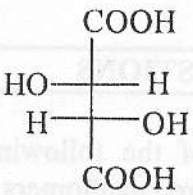
c) i) If the compound **B** has an of $[\alpha]_D^{25}$ +12.0 in aqueous solution, what would be the values of $[\alpha]_D^{25}$ for the compounds **A** & **C**. Calculate the optical rotation at 25°C of a solution containing 0.5g of **A** and 0.5g of **B** in 1.0 ml of water when measured using a tube of path length of 10 cm.



A



B

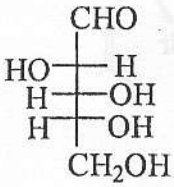


C

ii) Explain briefly how a mixture containing equal amounts of the compounds **B** and **C** (given above) could be separated into the pure compounds.

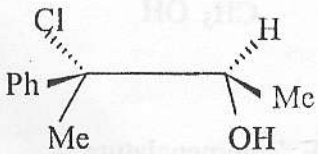
d) Draw the chair conformations of trans 1,4 – dimethylcyclohexane and indicate with reasons which conformation would be the most stable.

2) a) Giving reasons specify the configurations as **R** or **S** of the chiral centers in the following molecule.



b) Give the structures of the following molecules.

1) Fischer projection formula of



2) 2R-erythro-2-3-dibromopentanoic acid.

3) Sawhorse formula of the most stable and least stable conformations of 1,2-dibromoethane.

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 tone molecule only.

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

iii) Show that

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

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

ii) Calculate the root mean square velocity of chlorine molecule at 12^0C and 78 cm Hg pressure (76cm Hg = 1 atm = 10^5 Pa).