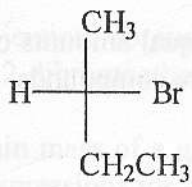
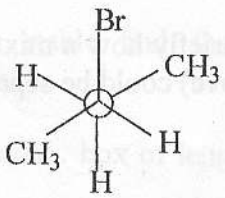
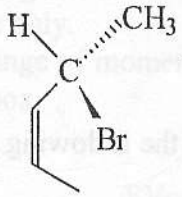
EASTERN UNIVERSITY SRI LANKA
DEPARTMENT OF CHEMISTRY
FIRST YEAR IN SCIENCE
SECOND SEMESTER – 2002/2003
CH 103 STEREOCHEMISTRY AND KINETIC MOLECULAR THEORY

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) 

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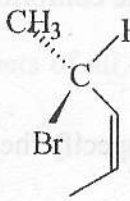
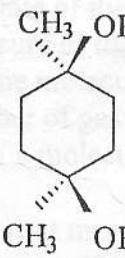


iii) 

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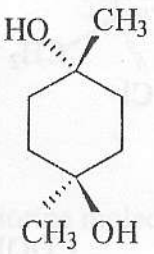
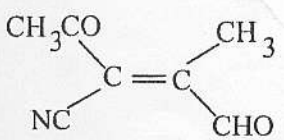
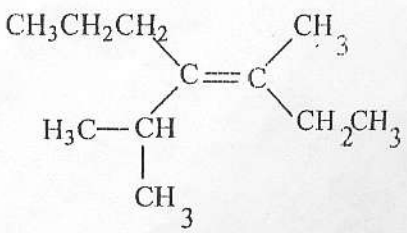
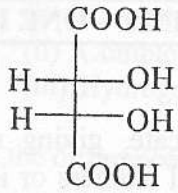


b) Design the configuration of the following by E, Z nomenclature

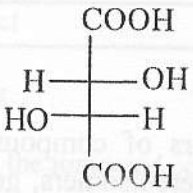
i) 

ii) 

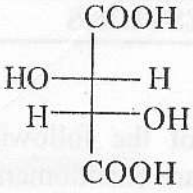
c) i) If the compound **B** has an of $[\alpha]_D^{25}$ +12.0 in aqueous solution, what would be the values of $[\alpha]_D^{25}$ for the compounds **A** & **C**. Calculate the optical rotation at 25°C of a solution containing 0.5g of **A** and 0.5g of **B** in 1:0 ml of water when measured using a tube of path length of 10 cm.



A



B



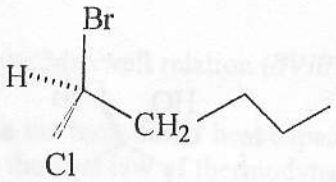
C

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

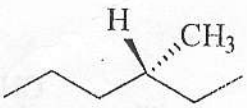
d) Draw the chair conformations of *trans* 1,4 – dimethylcyclohexane indicate, giving reasons, the most stable conformation.

2) a) Giving reasons, specify the configuration of the following molecules as **R** or **S**

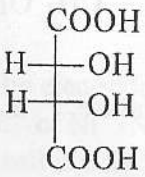
i)



ii)

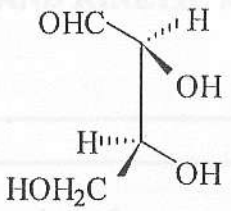


iii)



b) Draw the structures of the following molecules:

i) Fischer projection formula of



ii) Sawhorse formula of erythro 3-bromo-2-butanol.

iii) Fischer projection of 2R, 3S-3-phenyl-2-butanol.

iv) Newman projection formula of the most stable and the least stable conformation 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 to one 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.

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