



EASTERN UNIVERSITY, SRI LANKA

FIRST YEAR EXAMINATION IN SCIENCE

SECOND SEMESTER (2019) -Old Syllabus

CH 103 STEREOCHEMISTRY AND KINETIC MOLECULAR THEORY
(Repeat)

Answer all questions

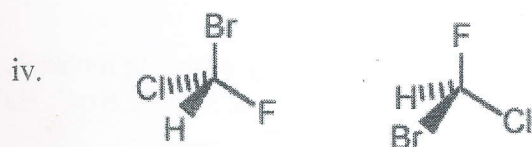
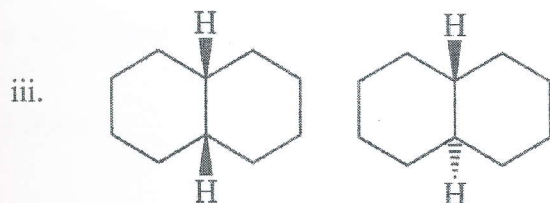
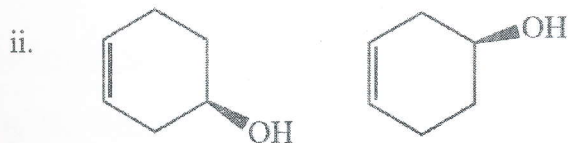
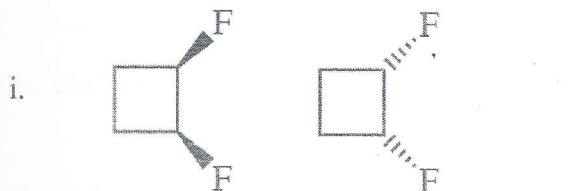
Time allowed: ONE Hour

1. a) For the following compounds, draw projection formulae for all stereoisomers and point out their R,S specifications.

- i. (S)-1,2-dibromopentane
- ii. (2R,3S)-2-iodo-3-butanol

(25 marks)

- b) Identify whether the following pairs are enantiomers, diastereomers, conformers or the same molecule.



(20 marks)
Contd...

c) A solution prepared by mixing 10 mL of 0.1M of R-enantiomer of 1-phenylethylamine and 30 mL of 0.1M solution of S-enantiomer was found to have an observed specific rotation of $+4.8^\circ$. (the literature value to be -40.3 for the pure R-enantiomer)

i) Calculate the percentage optical purity of the sample.

$$\left(\text{optical purity} = \frac{\text{observed specific rotation}}{\text{specific rotation of the pure enantiomer}} \right)$$

ii) Determine the percentage of (S) and (R) 1-phenylethylamine in the sample.

(25 marks)

d) Describe a method to resolve a racemic mixture of 2-chloro-propanoic acid by salt formation with (+) 1-phenylethylamine.

(30 marks)

2. a) *cis*-1,4-disubstituted cyclohexane gives equal amount of two conformations while *trans*-1,4-disubstituted cyclohexane does not. Explain this experimental observation by drawing chair conformations of the above isomers.

(40 marks)

b) 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

$$PV = \frac{1}{3} mNC^2$$

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°C and 76 cm Hg pressure ($76\text{ cm Hg} = 1\text{ atm} = 10^5\text{ Pa}$; $1\text{ Pa} = 1\text{ Nm}^{-2}$; He = 4).

(15 marks)