Eastern University Sri Lanka

First Year ~~First~~ Second Semester Examination in Science

2008/2009 (Oct. / Nov. 2010)

CH103 Stereochemistry and Kinetic Molecular Theory of Gases

(Proper and Repeat)

Answer all questions **Time: One Hour**

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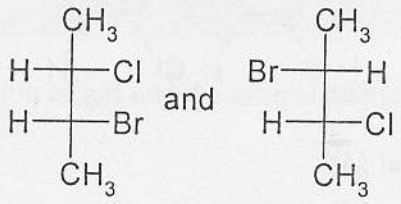
1. (a) Consider the following pair of structures



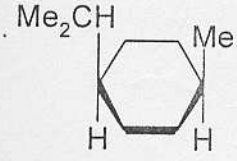
Structure A Structure B

(i) Define the configuration of all the stereogenic centres as R/S **(12 marks)**

(ii) Identify the stereochemical relationship between A and B. **(06 marks)**

(iii) Draw the Sawhorse representation, Newmann Projection formula and the Wedge-Dash representation of **structure A** **(12 marks)**

(b)



Cis-1-isopropyl-4-methylcyclohexane

(i) Draw the two ring flip chair conformations of the above compound. **(10 marks)**

(ii) Give reasons indicate the most stable conformation of the two possible chair forms.(Y answer should include the various destabilising interactions that contribute to the t strain of the each conformation)

(15 mar

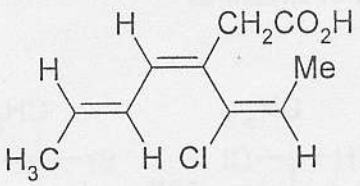
(iii) Calculate the free energy change for the ring flip if the more stable conformat comprises 60% of the equilibrium mixture at 25°C. ($\Delta G = -2.303RT\log K_{eq}$., R = 8. J $K^{-1}mol^{-1}$)

(15 mar

(c) "Cyclopropane C-C bond is weaker than normal C-C sigma bonds in open chain- alkane structure". Explain this with appropriate diagram.

(15 mar

(d) Use the E/Z nomenclature system to assign the stereochemistry of the double bonds in following compound.



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2. (a) (i) What is meant by ideal gas?

(05 mar

(ii) Write the ideal gas equation and explain all the terms involved in it.

(05 mar

(iii) Why do real gases show deviation from ideal behaviour?

(10 mar

(iv) How does the Van der Waals Equation of State taken into account this deviation?

(20 mar

(b) Calculate the pressure of 15.0 mol Ne (neon) at 30°C in a 12.0 litre vessel using

(i) ideal gas equation

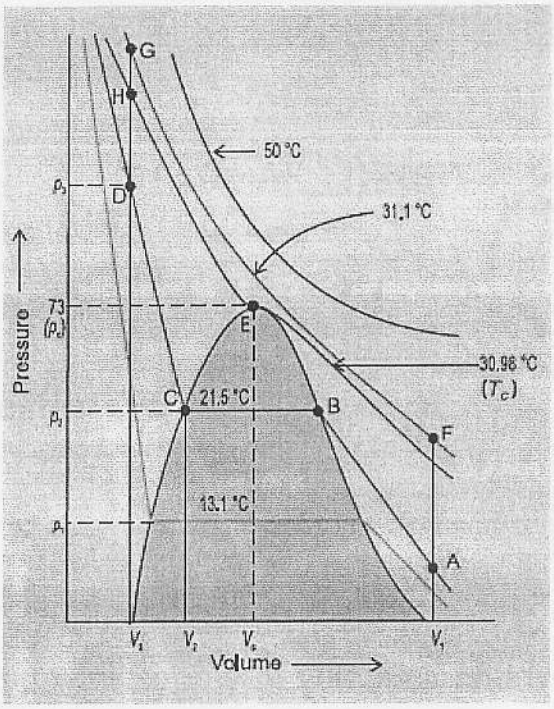
(15 ma

(ii) the Van der Waals equation

(15 ma

(Van der Waals constants $a = 0.2107\ l^2.atm.mol^{-1}$ and $b = 0.0171\ l.mol^{-1}$; R = 0.0821 *l*.atm.m $^{1}.K^{-1}$)

(c) Consider the Andrews isotherm (P-V curve) of carbon dioxide



Explain the term liquefaction of gas and the critical phenomenon using the above curve

(30 marks)