

**RAMAKRISHNA MISSION VIDYAMANDIRA**  
(Residential Autonomous College affiliated to University of Calcutta)

FIRST YEAR [2019-22]  
B.A./B.Sc. FIRST SEMESTER (July – December) 2019  
Mid-Semester Examination, September 2019

Date : 16/09/2019  
Time : 1 pm - 2 pm

**CHEMISTRY (Honours)**  
**Paper : II [CC 2]**

Full Marks : 25

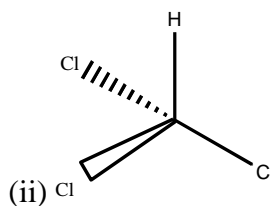
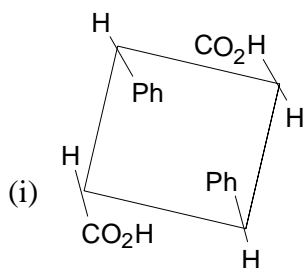
**(Use a separate Answer Book for each group)**

**Group - A**

**Answer any one question from the followings :**

[1×9]

1. a) Assign R/S configurational description at the chiral centres of the following compounds. [2]  
(i) L-phenylalanine ; (ii) L-(-)glucose (only C-5)
- b) Indicate the symmetry element present in the following compounds: [3]

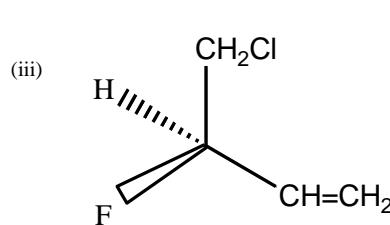
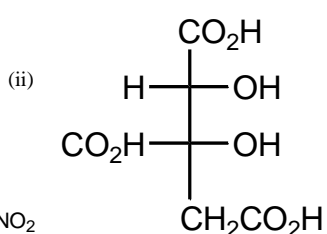
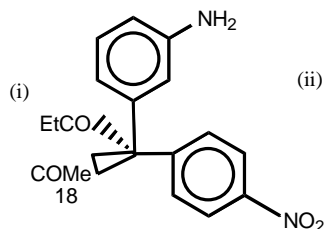


- c) Justify or Criticise :

[2×2]

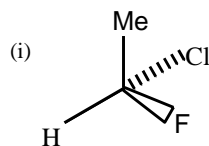
- i)  $C_2$  of (Z)-2-butene is a stereogenic centre.
- ii) Meso tartaric acid is optically inactive due to presence of plane of symmetry.

2. a) Assign R/S configurational descriptor at the chiral centres of the following molecules. [4]

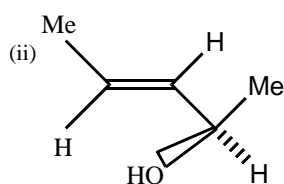
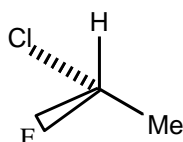


- b) Label the following molecules as homomers, Enantiomers or diastereomers:

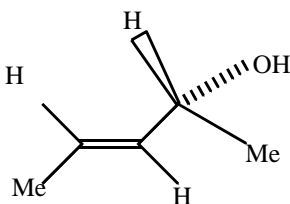
[3]



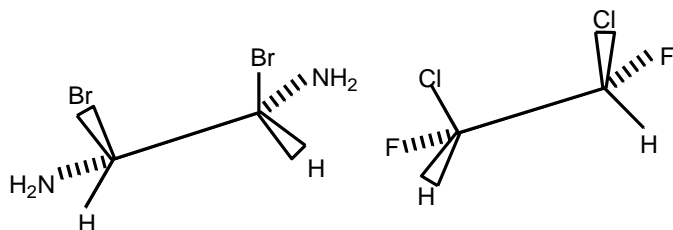
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and



- c) Determine whether each of the following molecules is chiral or achiral, Justify your answer. [2]



### Group -B

**Answer any two questions from the followings:**

[2×8]

3. a) A 2L flask contains two non-reacting gases A and B at constant temperature 300 K and pressure 1 atm. The diameter of A and B are  $2 \text{ \AA}$  and  $3 \text{ \AA}$  and no. of moles of gases are 2 and 3, respectively. Calculate the total no. of binary collision per  $\text{cm}^3$  per sec. ( $M_A = 4 \text{ gm mol}^{-1}$ ,  $M_B = 28 \text{ gm mol}^{-1}$ ) [3]
- b) Consider a mixture of  $\text{NH}_3$  and  $\text{N}_2$  gases (real). What are the different types of forces interacting here? Explain. [3]
- c) Comment on reversibility (reversible or irreversible) for the following: [2]
  - i) Vaporisation of water at  $100^\circ\text{C}$  and 1 atm.
  - ii) Diffusion of gas into another gas at constant T and P.
  - iii) An ideal gas expands against a constant P.
  - iv) Vaporisation of water at  $100^\circ\text{C}$  and 1 atm in a closed vessel.
4. a) Draw a family of Z vs P curves for a real gas at different temp. (below, at and above Boyle temp.) [3]
- b) State the Euler's theorem on homogeneous function. Apply the theory to show that volume of an ideal gas is a homogeneous function of zeroth degree in P and T. [1+2]
- c) At STP, the viscosity coefficient of oxygen is 0.2 mPoise. Find out the collision diameter of oxygen. [2]
5. a) What does mean free path signify? Discuss the effect of T and P on the mean free path of a gas. [1+2]
- b) Consider an ideal gas system at  $(P_2, V_1)$  state which is changed to  $(P_1, V_2)$  state (with  $P_2 > P_1$  and  $V_2 > V_1$ ) on the same isotherm T in two different paths ?
 

Path A – 1<sup>st</sup> keeping P constant and then keeping V constant.

Path B – 1<sup>st</sup> keeping V constant and then keeping P constant.

  - i) Give an indicator plot in P vs V axes.
  - ii) Change in T in these two paths are different. Show it.
  - iii) What are the amount of heat involved in these two paths? [1+1+1]
- c) Arrive at the reduced equation of state for a van der Waals gas equation. [2]

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