RAMAKRISHNA MISSION VIDYAMANDIRA

(Residential Autonomous College under University of Calcutta)

FIRST YEAR

B.A./B.SC. SECOND SEMESTER (January – June), 2012

Mid-Semester Examination, March 2012

Date : 20/03/2012 **CHEMISTRY (General)**

Time : 11 am – 12 noon Paper : II Full Marks : 25

[Use separate Answer Books for each group]

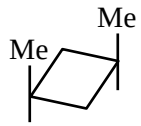
Group – A

(Answer **any one** question)

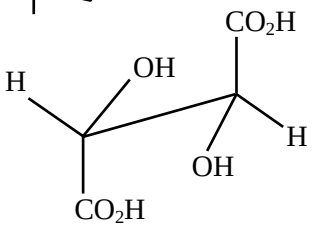
1. a) Write the structure of three stereoisomers of tartaric acid in Fischer projection formula. Indicate the relationship between them. [2]

   b) Indicate the symmetry elements present in the following molecules : [2]

i)



ii)



   c) Write down the mechanism of chlorination of methane. [2]

   d) On ozonolysis followed by reduction C_6H_{12} (A) gives an aldehyde, $C_{12}H_4O$ (B) and a ketone, C_4H_8O (C). Identify the compounds A, B & C. [2]

2. a) Synthesize following compounds according to direction : [2×2]

   i) $Me_3C-CH_2CH_2CH_2CH_3$ (from halides not more than four carbon atoms)

   ii) $Me_3C-\underset{\underset{HO}{|}}{C}H-CH_3$ from 3, 3-dimethylbut-1-ene

   b) Define with an example : [2×2]

   i) Plane of symmetry

   ii) Centre of symmetry

Group – B

(Answer **any one** question)

3. a) Define super acids with example. [2]

   b) Successive electron affinity is endothermic— explain. [2]

   c) Calculate Pauling's electronegativity of chlorine from the following data :
   Bond energies (K.cal.mol^{-1}) : H_2 (104), Cl_2 (57), HCl (102) and Pauling's electronegativity of hydrogen – 2·1. [3]

   d) First ionisation energy of Be is greater than B, but second ionisation energy of B is greater than Be. —Explain [2]

4. a) Nitrogen is a diatomic gaseous molecule but phosphorous is a tetratomic solid. —Explain [2]

   b) Why does nitrogen behave like an inert gas in many cases? —Explain [2]

c) Why is a little amount of glue or gelatine added in the preparation of hydrazine? [2]

d) Arrange (in order of increasing) and explain the Lewis basicity of the hydrides of group VA. [3]

Group – C

(Answer **any one** question)

5. a) Establish PV = RT for an ideal gas starting from kinetic theory of gas. [2]

b) State law of equipartition of energy and calculate the kinetic energy of H_2O molecule. [2]

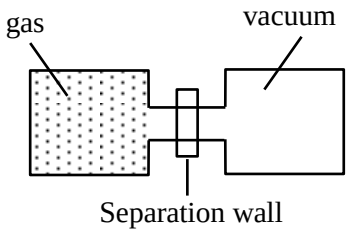
c) A system is divided into 'n' subsystems (i = 1, 2, ... n) certain property x is measured for each of these subsystems x_i is the value of the ith system.
Similarly the value of the same property comes out to be 'X' when measurement is done over the entire system. It is found that $X = \sum_i x_i$. Explain whether the property X is intensive or extensive. [2]

d) Starting from the mathematical expression of 1st law show that the work done is independent of path under adiabatic condition. [2]

6. a) Compare the Maxwell's distribution of speed curve (3D) of a gas at two different temperatures. ($T_1 > T_2$). Comment on the area or curve. [2]

b) Show that $C_{mp} = \sqrt{\frac{2RT}{M}}$ [2]

c)



Consider the above arrangement.
Suddenly the separation wall is removed. The gas will immediately expand and would finally fill up both the chambers uniformly.
If the process was adiabatic calculate the internal energy change for the over all process. [2]

d) 3 mole of an ideal gas is isothermally and reversibly expanded from a volume 1 litre to 2 litre at a temperature 27°C.
Calculate the work done. [2]