2/16

2111E733

Candidate's Seat No :_____

M.Sc Sem-3 Examination

502

Chemistry (Physical)

November-2024

Time : 2-30 Hours] **[Max. Marks : 70**

Answer the following questions :

Que.1 (a) Derive the equation for the thermal conductivity of gases on the basis of kinetic theory of gases. 07

OR

(a) Explain deriving equations molecular collisions and the mean free path in terms of collision frequency, binary collisions and the mean free path in terms of the gas pressure. 07

(b) What are transport properties? Explain how molecular diameter and Avogadro number can be determined from viscosity measurements of gases. 07

OR

(b) Explain deriving equation how the intermolecular attraction and the space occupied by the molecules can be corrected in the real gas van der Waals equation of state. 07

Que.2 (a) Why x-rays are used to determine structure of crystals? Explain Bragg's law of x-ray diffraction. 07

OR

(a) Explain briefly the diffraction of x-ray from crystals. Explain the Debye Scherrer method used for the x-ray crystallography. 07

(b) Explain indexing and determination of lattice parameters of a unit cell. 07

OR

(b) Explain how the number of molecules in a cubic crystal of NaCl can be determined. 07

Que.3 (a) Explain deriving equation, the Lambert's Beer law. 07

OR

(a) State and illustrate with suitable potential energy curve the Franck-Condon principle in the vibronic spectrum of a diatomic molecule. 07

(b) What is meant by regression and regression coefficient? Explain the least square method to find the best straight line by regression. 07

OR

(b) Write a note on Ringbom plot. 07

Que.4 (a) Explain briefly quantum yield? How quantum yield can be determined experimentally? 07

OR

(a) Explain action spectrum. Explain briefly greenhouse effect and and the formation of O_3. 07

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(b) Explain the laws of photochemistry. Give reasons for low and high quantum yields. 07

OR

(b) Explain the harmful effects and its prevention of photochemical Smog. 07

Que.5 Answer the following (Any seven – each two marks) 14

(i) Explain briefly the deviations of real gases from ideal behavior at very low pressure and at high temperature.

(ii) What are thermal reactions?

(iii) State the first law of photochemistry

(iv) Explain how mean free path is related with collision diameter.

(v) The dry air contains 2.5×10^{19} molecules cm^{-1} of only nitrogen. Calculate collision frequency of nitrogen at 1 atm and 298 K. (The average speed of nitrogen is 4.8×10^{-2} ms^{-1} and the collision diameter of nitrogen is 3.75×10^{-8} cm).

(vi) How photochemical reactions are different from thermal reactions?

(vii) What are the requirements of Beer's law for the analysis of mixtures?

(viii) What is the advantage of plotting logA rather than the absorbance(A) against wavelength?

(ix) Why x-rays are used in the determination of crystal structure?

(x) What are the limitations of Beer's law?