(4-1)

5233

B. Sc. EXAMINATION .

(Fifth Semester)

CHEMISTRY

CH-302

Physical Chemistry

e : Three Hours *Maximum Marks :* 26

e : Attempt *five* questions in all. Q. No. **1** is compulsory selecting maximum *two* from Section A and Section B.

(i) Explain Eigen value and Eigen function.

(ii) Define Induced Dipole Moment.

(iii) Role of Operators in Quantum Mechanics.

(iv) Define Force Constant.

(v) Explain wave No. Separation.

(vi) Advantages of Raman Spectra over I.R. Spectra. $6 \times 1 = 6$

Section A

2. (a) Write Postulates of Quantum Mechanics. 2

(b) Derive Schrödinger wave equation for particle in one-dimensional box. How can this equation be solved for Ψ and E ? 3

3. (a) State Planck's radiation law and derive an equation of it. 3

(b) Write notes on the following : 2

(i) Heat Capacity of Solids

(ii) Resolving Power.

4. (a) Derive Clausius-Mossotti equation. Give its significance. 3

(b) A solution of certain optically active substance in water containing 1.56 gm in 100 ml rotated polarized light 4.91° in a polarimeter which had a cell 20 cm long. The D line of sodium was used as a light source. Calculate the specific rotation. 2

Section B

5. (a) Discuss the intensity of rotational spectra with reference to the degeneracy factor and Boltzman Exponential Factor. 2

(b) What is Isotopic effect on Vibrational-Rotation Spectrum ? Explain with a suitable example. 2

(c) What do you mean by Zero Point Energy ? 1

6. (a) Discuss the experimental setup of Raman Spectroscopy. 2

(b) What do you understand by normal modes of vibration of a Polyatomic molecule ? Show diagrammatically the different normal modes of vibration of CO_2 and H_2O. 2

(c) How are infrared spectra helpful in the identification of organic compounds ? 1

7. (a) Why should a diatomic molecule be considered as an anharmonic oscillator ? Write Morse equation for the energy of the vibrational levels of an anharmonic oscillator. Also draw its potentional energy curve. 2

of freedom are expected for the following molecules ? 3

(i) CO_2

(ii) H_2O

(iii) SO_2

(iv) CH_4

(v) C_2F_2

(vi) C_6H_6