Roll No. .....

(01/22-II)

5233

B. Sc. EXAMINATION

(Fifth Semester)

CHEMISTRY

CH-302

Physical Chemistry

Time : Three Hours *Maximum Marks :* 26

Note : Attempt *Five* questions in all, selecting *two* questions from each Section. Q. No. 1 is compulsory.

1. (a) State and explain Hermitian operator.

(b) State and explain eigen function with a suitable example.

(c) Evaluate $\left[\frac{d}{dx}+x\right]^2$.

(d) What are the various factors that contribute to paramagnetism ?

(e) What is meant by ferromagnetics ? Explain.

(f) Discuss the factors that determine the intensity of the spectral lines. $6 \times 1 = 6$

Section A

2. (a) Discuss in detail postulates of quantum mechanics. 3

(b) Show quantum mechanically that position and momentum of a particle can't be predicted simultaneously. 2

3. (a) Obtain an expression for the wave function of a particle moving in a one-dimensional box. 3

(b) Write an explanatory note on Heat Capacity of Solids. 2

4. (a) Define dipole-moment. What information regarding the structure of a molecule can be obtained from the knowledge of dipole moment ? Explain. 2½

(b) What is photoelectric effect ? How classical wave theory failed to explain this effect ? Explain the law in terms of Quantum theory of radiation. 2½

Section B

5. (a) Write an expression for the rotational energy of a diatomic molecule (rigid rotator). Using energy expression and selection rule draw an energy level diagram and spectral transitions for pure rotational spectrum of a rigid atomic rotator. Also discuss briefly. 3½

(b) Discuss the effect of Isotopic substitution on rotational spectra. 1½

6. (a) What do you understand by degree of freedom of the motion of a molecule ? Briefly explain the various types of degree of freedom possesed by linear and non-linear molecules. 3

(b) Define force constant. Discuss qualitatively relation between force constant and bond energies. 2

7. (a) Discuss quantum theory of Raman spectra. 3½

(b) Explain Raman effect on the basis of polarizability of a molecule. 1½