M.Sc. S.Y. (Physics) (CBCS Pattern) Semester - IV

PSCPHYT15.3 - Core Elective-E2.4 - Paper-XV : Atomic and Molecular Physics-II

P. Pages : 1 **GUG/S/23/11417**

Time : Three Hours * 1 5 6 7 * Max. Marks : 80

Either :-

1. a) Describe significance of time dependence in quantum mechanics. **8**

b) What is Polarizability? Deduce an expression for calculation of polarizability. **8**

OR

e) Explain fluctuation-dissipation theorem in rotational correlation function. **8**

f) Explain Re-orientational spectroscopy of liquids. **8**

Either :-

2. a) Describe the Burning and detection of holes in Doppler broadened two level system. **8**

b) Explain two-photon absorption spectroscopy and write its selection rule. **8**

OR

e) Explain Ramsey fringes in saturation spectroscopy. **8**

f) Explain briefly photo acoustic spectroscopy. **8**

Either :-

3. a) What is stimulated Raman scattering? Explain electromagnetic theory of stimulated Raman Scattering. **8**

b) Explain Quantum mechanical treatment in stimulated Raman scattering. **8**

OR

e) Explain fluorescence spectroscopy using Jablonski diagram. **8**

f) Explain single photon counting technique. **8**

Either :-

4. a) What is matrix isolation? What are the limitations of matrix representation? **8**

b) Explain Fourier transform spectroscopy and explain its experimental setup. **8**

OR

e) Write a note on Reducible and irreducible representation. **8**

f) Explain group theory. Give the application of group theory to molecular vibrations. **8**

5. Attempt **all** the following questions.

a) Derive quantum mechanical expression for emission rate. **4**

b) Describe experimental methods of saturation spectroscopy in laser. **4**

c) State and explain Kasha's rule. **4**

d) Explain Laser cooling. Give its applications? **4**

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