M.Sc.(Physics) CBCS Pattern Semester-III

PSCPHYT12-1 - Paper-XII (Foundation Course F 1.1)
Fundamentals of Spectroscopy

P. Pages : 2 **GUG/W/23/11304**

Time : Three Hours * 6 3 2 1 * Max. Marks : 80

Either:

1. a) Describe Stern Gerlach experiment. Show how it verifies the principle features of vector atom model. **8**

b) With the help of Schrodinger wave equation discuss the atomic energy levels of hydrogen atom. **8**

OR

e) Define Lande's splitting factor 'g'. Derive an expression for 'g' in case of LS coupling. **8**

f) Explain normal and anomalous Zeeman effect. **8**

Either:

2. a) Explain rotational spectra of rigid diatomic molecules in details. **8**

b) Discuss Born Oppenheimer approximation in detail. **8**

OR

e) Derive an expression for energy eigen states of polyatomic molecule in detail. **8**

f) Explain Fourier transform infrared spectroscopy. **8**

Either:

3. a) Discuss the main features of the vibrational and rotational Raman spectra of diatomic molecules give the necessary theory. **8**

b) Discuss how Raman spectroscopy is used for structure determination of diatomic molecules. **8**

OR

e) How is Raman effect different from Fluorescence spectrum and IR spectrum. **8**

f) How are Raman spectra studied in the laboratory? **8**

Either:

4. a) Discuss the salient features of molecular electronic spectra in details. **8**

b) State and explain Franck-Condon principle in detail. **8**

OR

e) Explain the phenomena of fluorescence and phosphorescence in detail. **8**

f) What is Fortrat parabola explain in detail. **4**

g) What is pre-dissociation energy? **4**

5. Attempt all of the followings.

a) Explain stark effect in one electron system. **4**

b) Discuss the salient features of vibrational rotational spectra. **4**

c) A substance shows Raman line at 4567 Aº when exciting line 4358Aº is used. Discuss the positions of Stoke's and Antistoke's line for the same substance when exciting line 4047Aº is used. **4**

d) Explain dissociation energy of diatomic molecule. **4**

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