PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2018
(Second Semester)

Branch - PHYSICS

GROUP THEORY & MOLECULAR SPECTROSCOPY

Time: Three Hours   Maximum: 75 Marks
Answer **ALL** questions
ALL questions carry **EQUAL** marks   **(5 x 1 5** = 75)

1 a Explain the different types of symmetry operations with suitable
   examples.   (10)

   b Write the symmetry elements present in the following molecules :
      (i) H_2O (ii) NH_3 (5)
                              OR
   c Construct the C_{iu} character table on the basis of great orthogonality
      theorem.   (10)

   d Define sub groups and class of a groups with an example.   (5)

2 a Discuss the activity and inactivity of IR and Raman frequencies of XY_2
      bent symmetrical molecule.   (10)

   b Explain the normal modes of vibration in XY_3 molecule.   (5)
                              OR
   c Construct the character table for XY_2 bent symmetrical type of
      molecule.   (10)

   d Discuss the activity and inactivity of IR frequencies of in XY_3
      pyramidal molecule.   (5)

3 a   Outline the Instrumentation (single beam) of IR spectrometer. (10)

   b   Discuss the sample methods in IR spectra.   (5)
                              OR
   c   Give a detailed account of FTIR spectroscopy .   (10)

   d   Write a short notes on IR spectrum of functional groups of vibrations. (5)

4 a Discuss the salient features of surface enhanced Raman spectroscopy. (10)

   b Explain the basic principle and theory of Raman spectra.   (5)
                              OR
   c   Give a detailed account of construction of G matrix elements. (10)

   d Explain the applications of IR and Raman spectra in the molecular
      structural determination of XY_3 type molecule.   (5)

5 a Explain the term'Transition probability'.   (3)

   b Discuss the different types of electronic transitions.   (5)

   c Outline the Instrumentation of UV - visible spectrometer.   (7)
                              OR
   d   Define chemical shift and what are the factors influencing it. (5)