PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION MAY 2018
(Second Semester)

Branch – PHYSICS

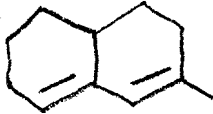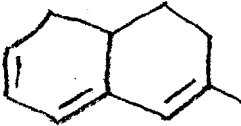## GROUP THEORY & MOLECULAR SPECTROSCOPY

Time : Three Hours   Maximum : 75 Marks

Answer ALL questions
ALL questions carry **EQUAL** marks   (5 x 15 = 75)

1   a   Explain symmetry operations and symmetry elements with suitable examples.   (10)

    b   What is sub group? What are the conditions for forming sub group?

<center>OR</center>

    c   Construct C_{3v} character table on the basis of great orthogonality theorem.   (10)

    d   Discuss the group multiplication table for C_{2v} group.   (5)

2   a   Explain the normal modes of vibration of H_2O and NH_3 molecules.   (7)

    b   Discuss the activity and inactivity of IR and Raman frequencies of XY_2 bent symmetrical and XY_3 pyramidal molecules.   (8)

<center>OR</center>

    c   Construct the character table for XY_2 molecules.   (10)

    d   Sketch and explain the normal modes of vibrations of CO_2 and SO_2 molecules.   (5)

3   a   Outline the instrumentation of single beam IR spectrometry.   (10)

    b   Explain any one sampling method in IR spectra.   (5)

<center>OR</center>

    c   Give a detailed account of FTIR spectroscopy.   (10)

    d   Write a short note on Finger print region.   (5)

4   a   Explain the basic principle of Raman spectroscopy.   (7)

    b   Outline the different steps involved in FG matrix method.   (8)

<center>OR</center>

    c   How will you determine the structure of XY_2 and XY_3 types of molecules using IR and Raman spectra?   (7)

    d   Discuss the construction of G matrix elements.   (8)

5   a   Explain the effects of solvent on conjugated systems.   (5)

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

    c   Calculate λ max for the following compounds :   (5)

<center>OR</center>

    d   Define chemical shift. What are the factors influencing chemical shift?   (5)

    e   Explain spin-spin interaction with a suitable example.   (5)

    f   Write notes on chemical shift reagents.   (5)

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