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**GIET UNIVERSITY, GUNUPUR - 765022**  
**M. Sc. (First Semester) Regular Examinations, February - 2024**  
**22CHPC104 - Molecular Spectroscopy-I**  
**(Chemistry)**

Time: 3 hrs

Maximum: 70 Marks

(The figures in the right hand margin indicate marks.)

**PART - A****(2 x 10 = 20 Marks)**

Q.1. Answer <i>ALL</i> questions	CO #	Blooms Level
a. What is emission and absorption spectra.	CO2	K1
b. Give a brief account on isotopic substitution	CO1	K2
c. Write down the applications of electronic spectroscopy.	CO2	K2
d. Write the formula for finding wave length of emitted photon.	CO1	K1
e. Write note on Mutual exclusion principle.	CO1	K1
f. Define Hooke's law.	CO3	K2
g. Write down the applications of electronic spectroscopy.	CO3	K1
h. What is Raman scattering?	CO2	K2
i. Define Stark Effect.	CO4	K1
j. What is photoelectric effect? Explain with suitable diagram.	CO4	K1

**PART - B****(10 x 5=50 Marks)**Answer *ANY FIVE* questions

	Marks	CO #	Blooms Level
2. a. Draw and explain the spectra of hydrogen atom.	6	CO2	K2
b. Find the shortest and longest wave length of Balmer series for Hydrogen atom.	4	CO1	K1
3.a. Determine the ground state term symbol for Mn <sup>2+</sup> , V <sup>3+</sup> , and Fe <sup>2+</sup> .	6	CO2	K2
b. Write note on Frank Condon Principle.	4	CO2	K1
4. a. What is Raman spectroscopy and describe the structure illustration by Raman spectroscopy	4	CO3	K1
b. Derive the expression of transition energy for fundamental band.	6	CO2	K2
5.a. What is IR spectroscopy? Describe vibrational spectra of diatomic molecule.	4	CO1	K1
b. What are symmetric and asymmetric vibrations? Explain with the example of H <sub>2</sub> O molecule.	6	CO2	K2
6. a. Derive the expression of rotational energy of rigid diatomic molecule.	6	CO1	K1
b. Write about the auger Electron spectroscopy.	4	CO3	K2
7.a. Derive the expression of rotational energy of rigid diatomic molecule.	6	CO2	K1
b. Describe the basic principle of UPES and XPES.	4	CO3	K1
8. a. Describe the basic principle of ESR spectroscopy.	6	CO4	K2
b. Write is the basic principle of Mossbauer spectroscopy.	4	CO4	K1