**DHANALAKSHMI SRINIVASAN COLLEGE
OF ARTS & SCIENCE FOR WOMEN
(AUTONOMOUS)**
(For Candidates admitted from 2019-2020 onwards)
PG DEGREE EXAMINATIONS APRIL - 2021
M.Sc.,-PHYSICS

ATOMIC AND MOLECULAR PHYSICS

Time: 3 Hrs   Max.Marks: 75

PART - A

CHOOSE THE CORRECT ANSWER   (10X1=10)

1. The spacing between the neighbouring energy level of hydrogen atom for high principal quantum number (n) is proportional to_____

   a) $1/n^2$ b) $1/n^3$ c) $1/n$ d) n

2. The possible values of magnetic quantum number for each 'l' value is_____

   a) $2l$ b) $2l - 1$ c) $2l + 1$ d) $l + 1$

3. The splitting of spectral lines into three by applying the magnetic field is called as_____

   a) Stark effect   b) Paschen back effect

   c) Normal Zeeman Effect   d) Anomalous Zeeman effect

4. In a multielectron atom, the total energy depends on

   a) n   b) l c) both l and n   d) m_s

5. The rotational energy levels of a linear molecule is _____

   a) $\varepsilon_J = BJ(J+1)cm^{-1}$ b) $\varepsilon_J = BJ(J-1)cm^{-1}$

   c) $\varepsilon_J = (J+1)cm^{-1}$ d) $\varepsilon_J = (J-1)cm^{-1}$

6. In a rotational spectrum the transitions are only observed between the rotational levels of $\Delta J = $_____

   a) ± 1   b) ± 2   c) ± ½   d) ± 0, ± 1

7. Which of the following is not true with respect to the Raman effect?

   a) absorption of light   b) Scattering of light

   c) Polarisability of light   d) Seperation of charges

8. In a CO_2 molecule, the asymmetric stretching is active in _____

   a) Raman   b) IR   c) Both (a) and (b)   d) None of these

9. The study of transition between magnetic energy levels of nuclei of a molecule is _____

   a) NMR   b) NQR   c) IR   d) Microwave

10. In NMR the energy separation between the adjacent levels of a proton kept in an external magnetic field is ___

    a) $-\mu B$ b) μB c) $1/2 \mu B$ d) $2\mu B$

PART- B

ANSWER ALL THE QUESTIONS (5X7=35)

11. a) Give a note on spin orbit interaction.

(OR)

b) Explain Pauli's Exclusion principle with the wave functions.

12. a) Elucidate the Stark effect in atoms due to external fields.

(OR)

b) Discuss the Emission and Absorption spectra of X- Rays.

13. a) Derive an equation for rotational spectra of Non Rigid Rotor.

(OR)

b) Describe the instrumentation of IR Spectrophotometer.

14. a) Give a note on quantum theory of Raman effect.

(OR)

b) Explain Quadrupole and Zeeman splitting in Mossbauer Spectroscopy.

15. a) Write about Chemical Shift in NMR.

(OR)

b) Give out the basic principles of ESR Spectrometer.

PART-C

ANSWER ANY THREE QUESTIONS (3X10=30)

16. Explain the fine structure of Hydrogen atom.

17. Discuss the various types of broadening of spectral lines.

18. Describe the Rotational spectra of Polyatomic Linear and Symmetric top molecules.

19. Explain the Rotational and vibrational Raman shifts of diatomic molecule.

20. Derive Bloch Equations.