M.Sc. DEGREE EXAMINATION, NOVEMBER 2017

FIRST SEMESTER

Branch – Physics

Paper II — ATOMIC AND MOLECULAR PHYSICS

(New Syllabus)

Time : 3 Hours

Max. Marks : 70

PART – A

Answer any FOUR questions. All questions carry equal marks.

(Marks : 4 × 5 marks = 20 marks)

1. Discuss the role of quantum numbers in atomic theory.

2. Give an account of equivalent and non equivalent electronic systems.

3. Obtain Lande's g formula in JJ coupling.

4. Distinguish between the Normal-Zeeman Effect and Anomalous-Zeeman effect.

5. Describe the general features of the spectra of alkali elements.

6. Explain the rotational levels of a molecule on the basis of non rigid rotator.

7. Give the significance of Electronic spectra.

8. Discuss briefly the Morse potential energy curve.

PART – B

(Essay Type Questions)

Answer ALL questions. All questions carry equal marks.

(Marks : 4 × $12\frac{1}{2}$ marks = 50 marks)

9. (a) Discuss the principle of Stern-Gerlach experiment.

   (b) Write a brief note on the importance of Stern-Gerlach experiment in atomic spectroscopy.

Or

   (c) Explain the Hund's rule of multiplicity in atomic spectra.

   (d) Discuss the spectra of Hydrogen atom.

[P.T.O.]

10. (a) What is Paschen-Back effect? Give a qualitative explanation of this effect.

   (b) Explain the significance of lande's g-factor.

<div align="center">Or</div>

   (c) Explain Linear and Quadratic Stark effect.

   (d) What is meant by natural line width of spectral line? How does the natural line width arise?

11. (a) Distinguish between Linear Symmetrical top, Spherical top and Asymetric top molecules.

   (b) Write a note on applications of rotational spectroscopy.

<div align="center">Or</div>

   (c) Obtain an expression for the rotational energy levels of a diatomic molecule, taking it as a rigid rotator.

   (d) Write a note on intensity of rotational lines of electronic spectra.

12. (a) State and explain the Frank- Condon principle.

   (b) Discuss how the study of vibrational spectrum of diatomic molecules enables us to determine the anharmonicity constant.

<div align="center">Or</div>

   (c) Discuss the use of Deslander's table in carrying out vibrational analysis of an electronic band system.

   (d) Write a brief note on PQR branches in vibrational rotational spectrum.

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