

Roll No. ....

**76615**

**M.Sc. Physics 3rd Semester (New)  
w.e.f. December, 2013  
Examination-December, 2015**

**ATOMIC AND MOLECULAR PHYSICS-I  
(Special Paper-II)**

**Paper : XIV(i)**

**Time : 3 hours**

**Max. Marks : 80**

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard will be entertained after the examination.

**Note :** Attempt five questions in all, selecting at least one from each unit. Question No. 1 is compulsory.

1. (a) Discuss Raman and Rayleigh scattering. 4
- (b) Why in Rotation Raman spectra of CO<sub>2</sub> every other line is missing? 4
- (c) Describe electronic states. 4
- (d) Differentiate X-ray and optical diffraction. 4

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(1)

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7. (a) Discuss the intensity alterations in Raman spectra using example of a molecule. 12

(b) Find the relative intensity of Stokes lines to anti Stokes lines in Raman spectrum of HCl. The fundamental frequency of HCl lies at  $2990 \text{ cm}^{-1}$ . 4

#### UNIT - IV

8. If X-rays are visible, how are they produced? On what factors the position of emission line depends? Discuss in detail. 16

9. Discuss the following:

(i) Difference between X-ray and optical spectra. 8

(ii) Continuous X-ray emission. 8

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#### UNIT - I

2. Discuss Quantum theory of Raman effect. 16

3. Discuss in detail the pure rotational Raman spectra, vibrational Raman spectra and vibrational rotational Raman spectra. 16

#### UNIT - II

4. Explain band head formation and intensities in electronic bands. 16

5. Describe the vibrational and rotational structure of electronic transitions. 16

#### UNIT - III

6. Write short notes on:  
(i) Raman effect in solid liquid and gases. 8  
(ii) Applications of Raman spectroscopy. 8

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