

Roll No.

78615

M. Sc. 4th Sem. Physics (New)

Examination – May, 2014

ATOMIC & MOLECULAR PHYSICS-II (NEW)

Paper : XVIII (Spl-II) Opt-(i)

Time : Three hours]

[Maximum Marks : 80

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

Note : Attempt *one* question from each Unit. Question No. 1 is *compulsory*.

1. (a) Why Mossbauer effect is not observed in gases and non-viscous liquid ? 4
- (b) How ESR and NMR are different ? 4
- (c) A He-Ne laser emits light-of wavelength 632.8 nm and as has power output of 4mW. How many photons are emitted per sec. ? 4
- (d) Discuss applications of Maser. 4

UNIT - I

2. Discuss the effect of spin-spin coupling on NMR resonance lines. Account for high resolution H^1 NMR spectra of ethyle alcohol. 16

3. (a) What is Mossbauer effect ? Discuss quadrupole splitting and magnetic hyperfine structure in Mossbauer spectra. 12

(b) In a given solution the signal of benzene is 483Hz higher in frequency than TMS. Calculate the chemical shift. Spectrometer is operating at 60 MHz. 4

UNIT - II

4. (a) What do you mean by ESR ? Explain. List the substances that can be investigated, obtain the resonance condition. 12

(b) Why water and alcohol are not suitable solvents for ESR studies. 4

5. Write short notes on :

(i) Fine structure in ESR

(ii) G factor

8 Each

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UNIT - III

6. Discuss four level laser in detail. Show why is it more efficient than four level laser. 16

7. (a) Discuss various resonators. Draw the stability diagram for a laser resonator and explain it. 12

(b) Calculate the relative rate of spontaneous and stimulated process in microwave region ($\nu = 10^{10}$ Hz) at 300 K. 4

UNIT - IV

8. Describe CO_2 laser with energy level diagram, its excitation mechanism, working and applications. 16

9. Write short notes on :

(i) Holography

(ii) Laser isotope separation.

8 Each

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