

Sl. No. : 0021

MP-1.3

Total No. of Pages : 2

First Semester M.Sc. Degree Examination, July/August - 2019
(SLM Scheme)

PHYSICS (Course - III)
Atomic and Molecular Physics

Time : 3 Hours

Max. Marks : 80

Instruction : Answer all questions.

1. a) Obtain an expression for the energy of a rigid rotator model of a diatomic molecule and predict the pure rotational spectrum of the molecule. [10]
- b) Write a note on Born-Oppenheimer approximation. [5]

OR

2. a) Explain rotational structure of electronic transition along with energy level diagram. [10]
 - b) What do you mean by Franck-Condon principle? [5]
3. a) What is a chemical bond? Give a brief description of the formation of chemical bonds. [5]
 - b) Define unit cell. Write a note on different types of crystal systems with neat diagrams. [10]

OR

4. a) Discuss the formation and characteristic of orbitals formed by following types of hybridization; sp hybridization. sp^2 hybridization and sp^3 hybridization. [10]
 - b) Explain different types of covalent bonds. [5]
5. a) Obtain Einstein's A and B coefficients and discuss their significance. [10]
 - b) Write the properties and applications of Laser. [5]

OR

6. a) Explain the working of He-Ne laser and mention the applications. [10]
b) Explain the concept of excitation mechanism. [5]
7. a) Explain Raman scattering and Rayleigh scattering of light with a neat energy level diagram. [10]
b) Write a note on higher order non-linear effect. [5]

OR

8. a) What is mode locking of lasers? Discuss with examples. [10]
b) Explain holography using laser and write the industrial application of lasers. [5]

9. Answer **any four** of the following : [4 × 5 = 20]

- a) What are **P** and **R** branches in the vibration-rotation spectra?
b) Write a note on non-rigid rotator.
c) Write a note on bond length, its dependency and its variation.
d) Explain lattice energy. Mention some of its applications.
e) Write a note on spontaneous emission.
f) Write a note on population inversion.
g) Why Stokes lines are more intense than anti-Stokes lines?
h) Explain in detail the application of short pulse lasers.

