

TDC Odd Semester Exam., 2020
held in July, 2021

PHYSICS
(Honours)

(5th Semester)

Course No. : PSHH-501

(Atomic and Molecular Physics)

Full Marks : 35
Pass Marks : 12

Time : 2 hours

*The figures in the margin indicate full marks
for the questions*

Answer **five** questions, selecting **one** from each Unit

UNIT—I

1. (a) What is Rutherford's atom model?
Discuss its limitations. 2+2=4
- (b) Discuss briefly Rutherford's experiment
on scattering of α -particles by gold foil. 3

2. (a) What are excitation and ionization
potentials? 3
- (b) Explain how the ionization potential can
be determined by Frank and Hertz
experiment. 4

UNIT—II

3. (a) State and explain Moseley's law.
Discuss the importance of Moseley's
observations of X-ray spectra of
different elements. 2+3=5
- (b) What is doublet fine structure of
X-rays? Give one example. 2
4. (a) Distinguish between continuous and
characteristic X-ray spectra. 3
- (b) How is the production of characteristic
X-ray spectra accounted for? 2
- (c) What is Bohr's correspondence
principle? 2

UNIT—III

5. Discuss vector atom model. What are
different quantum numbers associated with
different quantizations in this model? 4+3=7

(3)

6. (a) Discuss any *one* of the following : 4
(i) Stern-Gerlach experiment
(ii) *L-S* and *j-j* couplings
- (b) Explain Pauli's exclusion principle. 3

UNIT—IV

7. What is Zeeman effect? Distinguish between normal and anomalous Zeeman effects. Discuss the experimental arrangement for observing normal Zeeman effect. 2+2+3=7
8. (a) What is Compton scattering? Find the expression of Compton shift. 1+4=5
- (b) What is Paschen-Back effect? 2

UNIT—V

9. What are different types of motion possible in a diatomic molecule? Deduce the expression of energy levels in a diatomic molecule considering both rotation and vibration of the molecule. 1+6=7

(4)

10. (a) What are continuous and diffuse molecular spectra? Explain the Born-Oppenheimer approximation. 2+3=5
- (b) What are the rotational and vibrational energy levels of a molecule? 2
