

121219509008

Code No. 17637 / CORE

FACULTY OF SCIENCE
M.Sc. IV-Semester Examination, July 2021

Sub: Physics
Paper – I : Nuclear Physics

Time: 2 Hours

Max.Marks:80

PART – A

Answer any five questions.

(5x7=35 Marks)

- 1 What are central and non-central forces? Explain them briefly.
- 2 What is magic number? Write its significance.
- 3 What is tunneling effect in the context of alpha decay?
- 4 What is internal conversion?
- 5 What is stopping power?
- 6 Explain the principle of ionization chamber.
- 7 What are nuclear reactions? Explain with figure.
- 8 List the basic forces of nature and discuss their characteristics features.

PART – B

Answer any three questions.

(3x15=45 Marks)

- 9 Discuss the theory of the ground state of deuteron as an admixture of S and D states.
- 10 Give an account of extreme single particle shell model and obtain single particle states in an infinite harmonic oscillator potential. Compare the predictions of this model with observed nuclear structure and properties.
- 11 On the basis of Fermi's theory, explain the essential features of an allowed beta transition and discuss the Fermi and Gamow-Teller selection rules.
- 12 Discuss the multipolarity of gamma radiation. Obtain the expression for transition probability and show their dependence on the mass number of the nucleus and the energy of the gamma ray.
- 13 Explain the various mechanisms through which the gamma rays interact with matter and discuss the factors that determine their relative contribution to the attenuation of gamma rays.
- 14 Compare and contrast gaseous and solid state detectors for nuclear radiations with regard to the principle of detection, efficiency and range of application.
- 15 State conservation laws relevant to elementary particles and show how the invariance property leads to conservation law?
- 16 Explain the terms Isotopic spin, strangeness and hypercharge with examples and illustrate the conservation principles involved.

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Sub: Physics / Applied Electronics
Paper – II : Spectroscopy

Time: 2 Hours

Max.Marks:80

PART – A

(5x7=35 Marks)

Answer any five questions.

- 1 What is Ritz combination principle?
- 2 Explain Lande interval rule.
- 3 Discuss the rotational spectra of rigid rotator.
- 4 Discuss the energy levels of a vibrating diatomic molecule as a harmonic oscillator.
- 5 Explain the Quantum theory of Raman effect.
- 6 What is mutual exclusion principle?
- 7 Explain the principle of NMR.
- 8 What are the applications of ESR?

PART – B

(3x15=45 Marks)

Answer any three questions.

- 9 What is isotope shift? Discuss hyperfine splitting of spectral lines in many electron atoms.
- 10 Obtain spectral terms for equivalent and non-equivalent electrons.
- 11 Obtain energy levels for a non-rigid diatomic molecule and discuss the effect of isotopic substitution on its rotational spectra.
- 12 What do you mean by anharmonic oscillator? Discuss vibrational-rotational spectra of anharmonic oscillator.
- 13 Explain classical theory of Raman effect and discuss vibrational Raman spectra of a diatomic molecule.
- 14 Explain the basic concept of IR spectroscopy. Describe principle and working of IR spectrophotometer.
- 15 Explain spin-lattice and spin-spin relaxation processes. Derive Bloch equations.
- 16 What is spin Hamiltonian? Discuss hyperfine structure of ESR spectrum of hydrogen atom.
