



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – PHYSICS

SIXTH SEMESTER – NOVEMBER 2022

UPH 6502 – ATOMIC AND NUCLEAR PHYSICS

Date: 02-12-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART – A

Answer ALL questions

(10 x 2 = 20 Marks)

- 1 State Pauli's exclusion principle.
- 2 Calculate the limit of the Balmer series (Given $R = 1.097 \times 10^7 \text{ m}^{-1}$)
- 3 Write the differences between normal and anomalous Zeeman effect.
- 4 What is Larmor precession?
- 5 Draw the binding energy fraction versus mass number curve.
- 6 What are mirror nuclei? Give an example.
- 7 List out the classification of nuclear reactor.
- 8 What are the values of magnetic moment and the half life of a neutron?
- 9 Draw the quark structure of proton and neutron.
- 10 Mention any two differences between fermions and bosons.

PART – B

Answer any FOUR questions

(4 x 7.5 = 30 Marks)

- 11 Write a brief note on L-S coupling and j-j coupling.
- 12 Explain the Millikan's oil drop method to determine the charge of an electron.
- 13 With a neat diagram of the experimental set up, explain the normal Zeeman Effect.
- 14 Write a note on radioactive dating.
- 15 Draw a neat diagram of a nuclear reactor and explain its working.
- 16 Describe the conservation laws in elementary particle physics.

PART – C

Answer any FOUR questions

(4 x 12.5 = 50 Marks)

- 17 State the postulates of Bohr atom model. Derive the general expression for total energy and the radius of the hydrogen atom using the Bohr atom model.
- 18 Give the elementary theory of the origin of pure rotational spectrum of a rigid linear diatomic molecule.
 - a) Write a note on mass defect, binding energy and packing fraction. (7.5 marks)
 - b) Explain carbon-nitrogen cycle as a source of stellar energy. (5 marks)
- 19 Obtain an expression for the binding energy of a nucleus based on the semi-empirical mass formula.
- 20 Discuss in detail the classification of elementary particles.
 - a) What is Raman Effect? Write a note on characteristics of Raman spectrum. (8 marks)
 - b) Describe the quantum theory of Raman effect. (4.5 marks)
- 21
- 22

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