

26024145



26024145



Reg. No.....

Name.....

M.Sc. DEGREE (C.S.S.) EXAMINATION, MAY 2026

Fourth Semester

Faculty of Science

Branch II—Physics (A) Pure Physics

PH4C12—NUCLEAR AND PARTICLE PHYSICS

(2016 - 2018 Admissions—Mercy Chance)

Time : Three Hours

Maximum Weight : 30

Part A

*Answer any **six** questions.*

Each question carries a weight of 1.

1. Define nuclear radius and give its empirical formula.
2. What are the characteristics of nuclear forces ?
3. Define nuclear binding energy.
4. What is compound nucleus reaction and direct reaction ?
5. What is beta decay ?
6. What are heavy ion reactions ?
7. Define electric quadrupole moment. What does it indicate ?
8. What are the characteristics of fission ?
9. Differentiate between hadrons and leptons.
10. State the Gell-Mann—Nishijima formula.

(6 × 1 = 6)

Part B

*Answer any **four** questions.*

Each question carries a weight of 2.

11. Calculate binding energy per nucleon for ^{238}U and comment on nuclear stability.
12. Write short notes on nuclide abundance.

Turn over





26024145

13. Write a short note on the comparative half-life and forbidden beta decays.
14. A reactor is developing energy of the rate of 32×10^6 watt. How many atoms of ^{235}U undergo fission per second. Assume that average energy released per fission is 200 MeV.
15. Write a short note on Grand unified theories.
16. What are valence nucleons ? Explain their role in nuclear structure.

(4 × 2 = 8)

Part C

Answer all questions.

Each question carries weight of 4.

17. (a) Explain nuclear angular momentum and parity in detail.

Or

- (b) Describe the exchange force model of nuclear force.

18. (a) What is neutrino hypothesis ? Give a detailed account of the Fermi's theory of beta decay.

Or

- (b) Discuss the Coulomb scattering with theory. Give an account on scattering and reaction cross sections.

19. (a) Discuss the liquid drop model and explain its successes and limitations.

Or

- (b) Explain nuclear fusion and discuss the characteristics of fusion reactions.

20. (a) Describe the quark model of hadrons including the properties of quarks.

Or

- (b) Explain the various conservation laws in particle physics.

(4 × 4 = 16)

