

18. (a) Using liquid drop model discuss the theory of nuclear fission and obtain the limit of nuclear stability.

Or

- (b) How does shell model explain
- (i) angular momenta and parities of nuclear ground states.
 - (ii) magnetic momenta and
 - (iii) quadrupole moments of nuclei.
19. (a) Give a detailed account of the meson-theory of nuclear forces.

Or

- (b) Setup and solve schrodinger equation for the deuteron in S-state assuming a square well potential and show that no excited state is possible for deuteron.
20. (a) How are elementary particles classified? State and explain the law of conservation of parity, Baryon number and lepton number.

Or

- (b) Discuss in detail the SU(3) symmetry and also construct the Baryon Octet.

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M.Sc.(CBCS) DEGREE EXAMINATION,
NOVEMBER 2012.

Third Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(For those who joined in July 2008 and afterwards)

Time : Three hours

Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

1. Give four properties of β -rays.
2. What is meant by nuclear isomerism?
3. What do you mean by level width?
4. Write Briet-Winger dispersion formula.
5. Distinguish between stretch and Jack knife cases of nuclear states.
6. Give any two evidences for existence of magic numbers.

7. What do you mean by scattering?
8. What is the difference between n-p and p-p scattering?
9. What are hadrons?
10. What is the importance difference between Bosons and Fermions?

PART B — ($5 \times 5 = 25$ marks)

Answer ALL questions, choosing either (a) or (b).

11. (a) Obtain an expression for disintegration energy.

Or

- (b) Write a note on parity violation.

12. (a) Explain Knockout reaction with schematic diagram.

Or

- (b) Explain what is meant by stripping process.

13. (a) Explain any five evidences that lead to shell model.

Or

- (b) Explain the salient features of the shell model.

14. (a) Give a brief description of exchange forces. Explain their significance for nuclear structure.

Or

- (b) Starting from wave function of deuteron, obtain an expression for root mean square radius.

15. (a) State and explain CPT theorem.

Or

- (b) Explain in detail the different types of particle interactions among elementary particles.

PART C — ($5 \times 8 = 40$ marks)

Answer ALL questions, choosing either (a) or (b).

16. (a) Explain Gamow's theory of α -decay. How is Geiger-Nuttall law obtained from it?

Or

- (b) Give the Fermi theory of β -decay. Explain the transitions in β -emission with selection rules.

17. (a) What is meant by nuclear resonance? Derive Breit-Wigner formula for nuclear reactions.

Or

- (b) Give the theory of Stripping reactions with particular reference to Semi classical description and wave mechanical description.