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Reg. No. :

Code No. : 8117

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M.Sc. (CBCS) DEGREE EXAMINATION,
NOVEMBER 2011.

Third Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(For those who joined in July 2008 and afterwards)

Time : Three hours

Maximum : 75 marks

PART A — ($10 \times 1 = 10$ marks)

Answer ALL the questions.

1. What do you mean by β - decay?
2. Give four properties of β - rays?
3. What do you infer from stripping reaction? Give an example.
4. How is Q value of a reaction determined?

5. What do you mean by barrier penetration?
6. Define Magnetic moment, Mention its significance.
7. Why the Deuteron cannot exist in an excited state?
8. What do you mean by scattering length?
9. Name the fundamental interactions.
10. Give the significance of Isospin.

PART B — ($5 \times 5 = 25$ marks)

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

11. (a) Discuss the method for the detection of Neutrino.

Or

- (b) Obtain an expression for disintegration energy.

12. (a) Compute the Q value for the β^+ decay
 ${}^{16}_6C \rightarrow {}^{10}_6B$

Or

- (b) State and explain reciprocity theorem.
13. (a) Explain in detail the spin orbit coupling.

Or

- (b) Explain the salient features of the shell model.
14. (a) Discuss the nature of nuclear forces.

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 the meaning of the term elementary particles. Give a brief account of the discovery of the electron.

PART C — (5 × 8 = 40 marks)

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

16. (a) α - particles emitted from Polonium ${}^{210}Po$ have Kinetic energy 5.3 Mev. If they are subjected to a magnetic field of 1 Tesla, what is the radius of curvature of their track?

Or

- (b) What do you mean by nuclear isomers? Give examples with nuclear energy diagram.

17. (a) Give an outline of the statistical theory of nuclear reactions and hence calculate the cross section of a specific reaction.

Or

- (b) Describe the method of partial wave analysis for finding nuclear reaction cross section.

18. (a) On the basis of liquid drop model give a simple derivation of Weizaker semi - empirical mass formula.

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) Discuss neutron - proton scattering below 10 Mev.

Or

- (b) Setup and solve Schrödinger equation for the deuteron in S - state assuming a square well potential and show that no excited state is possible for Deuteron.

20. (a) Classify the different types of interactions known in nature and bring out clearly the role of their characteristic coupling constants and life time.

Or

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