(6 pages) **Reg. No. :** .....

Code No. : 6388 **Sub. Code : HPHM 43**

M.Sc. (CBCS) DEGREE EXAMINATION,
APRIL 2016.

Fourth Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(For those who joined in July 2012 onwards)

Time : Three hours Maximum : 75 marks

PART A — (10 × 1 = 10 marks)

Answer ALL questions.

Choose the correct answer :

1. Which isobars decay into stable isobars by β emission

(a) $Z = Zo$ (b) $Z < Zo$

(c) $Z > Zo$ (d) $Z = 0$

2. Which model is the forerunner of the collective model of nuclear structure

(a) Fermi gas model

(b) Shell model

(c) Optical model

(d) Liquid drop model

3. Gamow explained α decay by means of

(a) Classical mechanics

(b) Statistical Mechanics

(c) Quantum Mechanics

(d) Fluid Mechanics

4. The selection rule of ΔI for triplet state is

(a) ±1 and +2 (b) +1,0,–1

(c) ±2, 0 (d) ±3, 0

5. The ground state of deuteron is

(a) ^1S state (b) ^2S state

(c) ^3S state (d) ^1P state

6. In n — p scattering, the measurement of σ_0 determines the magnitude of

(a) scattering angle

(b) scattering length

(c) total cross section

(d) phase shift

7. Which kind of nuclear reaction is this ${}_1H^2 + \gamma \rightarrow {}_1H^1 + {}_0n^1$

(a) elastic scattering

(b) disintegration

(c) photo disintegration

(d) radiative capture

8. In continuum theory when sharp resonances are no longer observable

(a) $\Gamma = D$ (b) $\Gamma > D$

(c) $\Gamma < D$ (d) $\Gamma >> D$

9. For nucleons the value of strangeness quantum number is

(a) $S = 0$ (b) $S = 1$

(c) $S = -1$ (d) $S = 3$

10. The mesons with zero baryon number must be formed from how many quarks?

(a) one quark and one anti quark

(b) two quarks and one anti quark

(c) three quarks and no anti quark

(d) one quark and two anti quarks

PART B — (5 × 5 = 25 marks)

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

Each answer should not exceed 250 words.

11. (a) Discuss about the evidence of magic number's.

Or

(b) Explain about spin orbit coupling.

12. (a) Explain neutrino hypothesis.

Or

(b) Discuss the classifications of nuclear isomerism.

13. (a) Discuss about non central Tensor forces.

Or

(b) Explain about spin dependence and charge independence of nuclear forces.

14. (a) Derive the critical size of a reactor and explain reactor buckling.

Or

(b) Explain fast neutron diffusion and arrive Fermi age equation.

15. (a) Write about the classifications of hadrons.

Or

(b) Briefly explain Quarks model.

PART C — (5 × 8 = 40 marks)

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

Each answer should not exceed 600 words.

16. (a) Derive the semi empirical mass formula and discuss the mass parabola for odd and even isobaric nuclei.

Or

(b) Explain the Bohr Wheeler theory of nuclear fission.

17. (a) Describe the Gamow's theory to explain the alpha decay.

Or

(b) Discuss in detail about the multipole radiation and explain selection rules and decay constants.

18. (a) Explain the magnetic moment and quadruple moment of Deuteron.

Or

(b) Explain the theory of partial wave analysis of n-p scattering and hence arrive the expression for phase shift δ_0.

19. (a) Derive Breit-Wigner dispersion formula for resonance scattering.

Or

(b) Describe about various types of power reactors and their salient features.

20. (a) Explain how the elementary particles obey conservation laws namely isospin, hyper charge and strangeness.

Or

(b) Explain elementary particle symmetry and arrive Gallman Okubo mass formula.

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