



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – PHYSICS

FOURTH SEMESTER – APRIL 2014

PH 4808 - NUCLEAR PHYSICS

Date : 02/04/2014
Time : 01:00-04:00

Dept. No.

Max. : 100 Marks

PART A

Answer **ALL** the questions

(10 × 2 = 20)

1. ${}^2\text{He}^4$ nucleus has no magnetic moment. Why?
2. Give examples for mirror nuclei?
3. What is the similarity between (nn) and (pp) forces?
4. What is a compound nucleus? Give an example.
5. How are fast neutrons produced?
6. Prove that nuclear magnetic dipole moment $\mu_N = \mu_r e \hbar / 2m_n$.
7. What are moderators? Give an example?
8. Why parity is not conserved in β decay?
9. Write the shell configuration and predict the spin and parity of ${}_{13}\text{Al}^{27}$ nuclei on the basis of single particle shell model?
10. Give the decay modes of pions?

PART – B

Answer any **FOUR** questions

(4 × 7.5 = 30)

11. Give a brief account on the meson theory of nuclear forces.
12. What are the assumptions of the liquid drop model? Explain the phenomenon of nuclear fission using the liquid drop model.
13. Explain Gamow's theory of alpha decay. Derive Geiger -Nuttal law.
14. Explain the compound nucleus theory of nuclear reaction.
15. Write a short note on Nuclear reactors?

PART – C

Answer any **FOUR** questions

(4 × 12.5 = 50)

16. Briefly explain Neutron-proton scattering at low energies and find expression for scattering cross section and scattering length of nucleus.
17. Give a detailed account on nuclear shell model. Also discuss its merits and demerits.
18. Derive is Breit-wigner dispersion formula for resonance and cross section.
19. Explain Fermi theory of β decay and energy spectrum.
20. Write a short note on CPT theorem with examples.
