LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **PHYSICS**

FOURTH SEMESTER – **NOVEMBER 2016**

PH 4811/PH 4808 – NUCLEAR PHYSICS

Date: 10-11-2016   Dept. No.   Max. : 100 Marks
Time: 01:00-04:00

Answer ALL questions.   **(10 x 2 = 20 marks)**

1. Write a note on charge independence of nuclear forces.
2. What are mirror nuclei? Give two examples.
3. Give any two applications of the concept of magic numbers.
4. What is the reason for stability of $_2\text{He}^4$?
5. List any two kinds of nuclear reactions with an example each.
6. Mention the characteristic feature of the optical model.
7. Write a brief note on parity violation in β decay.
8. What are neutron stars?
9. What are leptons? Name any two leptons and their antiparticles.
10. How do you distinguish between a neutrino and anti-neutrino?

PART –B

Answer ANY FOUR questions.   **(4 x 7.5 = 30 marks)**

11. Discuss the different kinds of exchange forces.
12. Enlist the analogies drawn out between the nucleus and the liquid drop.
13. Derive the four factor formula for controlled chain reactions.
14. Give the Gamow Teller selection rules for beta decay.
15. Classify elementary particles with a neat sketch.
16. Derive Levy's formula for determination of atomic masses.

PART –C

Answer ANY FOUR questions.   **(4 x 12.5 =50 marks)**

17. Describe the electron scattering method for determination of nuclear size and outline its theoretical comparison.
18. Discuss the shell model and explain the significance of magic numbers.
19. Derive the Breit-Wigner single level formula for resonance scattering.
20. Discuss the Gamow's theory of alpha decay.
21. Elucidate the principle of CPT invariance in elementary particles.
22. Derive the semi-empirical mass formula of Weizacker and discuss it in detail.

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