LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FOURTH SEMESTER – **APRIL 2015**

PH 4811 / PH 4808 - NUCLEAR PHYSICS

Date : 17/04/2015 Dept. No. Max. : 100 Marks

Time : 09:00-12:00

PART – A

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

1. Name different forms of central and attractive two- nucleon potential.
2. Write a note on charge independence of nuclear forces.
3. What are magic numbers?
4. Find the binding energy (BE) and binding energy per nucleon (BE/A) of $_{26}Fe^{56}$ given m_n = 1.008665 amu; m_H = 1.007825 amu and m_{Fe} = 55.9349 amu.
5. What is the basic assumption of the continuum theory?
6. Distinguish between super-criticality and sub-criticality of fission reactors.
7. What are neutron stars?
8. Write down the Geiger Nuttal law and explain the various terms in it.
9. Illustrate Baryon number conservation through a nuclear reaction.
10. How do you distinguish between a neutrino and an anti-neutrino?

PART –B

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

11. Explain how the study of electric quadrupole moment of the nucleus gives information about the shape of the nucleus.
12. Obtain Levy's formula for determination of atomic masses.
13. Derive the four factor formula for controlled chain reactions.
14. Discuss Fermi and Gamow-Teller selection rules for various transitions in β decay.
15. Write a short note on classification of elementary particles.
16. Write a brief note on the various types of exchange forces.

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. Elucidate the basic aspects of a nuclear reactor.
20. Discuss in detail the Gamow's theory of alpha decay.
21. Elaborate on 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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