15P306 (Pages: 2) Name……..

Reg. No……..

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOV. 2016

(CUCSS - PG)

(Physics)

CC15P PHY3 C10 - NUCLEAR AND PARTICLE PHYSICS

(2015 Admission)

Time : Three Hours Maximum : 36 Weightage

Section-A

(Answer ***all*** Questions. Each question carries weightage one)

1. Write down the semi empirical mass formula and explain each terms.
2. In what ways n-p scattering differ from p-p scattering?
3. Distinguish between singlet and triplet potentials.
4. What is internal conversion? Explain conversion coefficient.
5. Outline Gamow-Teller selection rules.
6. Briefly explain parity violation in beta decay.
7. Mention the evidences for the existence of magic numbers.
8. What are singlet and triplet potentials?
9. Explain the concept of effective cross section in nuclear reaction.
10. What are the basic characteristics of nuclear fusion?
11. Briefly explain quark flavours and colours.
12. State the law of conservation of baryon and lepton numbers.

(12×1=12 Weightage)

Section-B

(Answer *any* ***two*** questions Each question carries weightage 6)

13. Give the quantum theory of the ground state of deuteron using a square well potential. Explain the observed spin, Magnetic moment and quadrupole moment of deuteron.
14. Using Fermi's Theory of β- decay, explain allowed and forbidden β transitions.
15. Discuss the shell model of nucleus and predict the magic numbers. On this basis, what should be the spin and parity of the ground state of $_7N^{15}$.
16. Illustrate by taking examples, the different conservation laws followed by elementary particles.

(2×6=12 Weightage)

Section – C

(Answer *any **four*** Questions. Each Question carries weightage three)

17. Show that the deuteron cannot have an excited bound state.
18. Calculate the total cross section for n-p scattering at neutron energy 2Mev (lab). Given a_t=5.38F, a_s=-23.7F, r_{et}=1.70F and r_{es}=2.40F.
19. Determine the spin, parity, magnetic moment and quadruple moment of $_{83}Bi^{209}$
20. Energy released in the fission of U^{235} is 200MeV. What would be the quantity of U^{235} used per year in a 5MW reactor if the efficiency of conversion is 30%.
21. Calculate the Q value of the reaction: $_1H^3 + _1H^2 \longrightarrow {}_2H^4 + {}_0n^1$, masses are 3.01699824u, 2.01473614u, 4.00387274u and 1.00899324u respectively.
22. Explain why the following decay processes are not observed.
    a) $p+p \longrightarrow K^+ + \Sigma^+$
    b) $p+n \longrightarrow \Lambda^0 + \Sigma^+$
    c) $p+n \longrightarrow \Xi^- + K^+ + \Sigma^+$
    d) $\Xi^- \longrightarrow \Sigma^+ + \Lambda^0$

(4×3=12weightage)

****