17P311 (Pages: 2) Name: ……..……………..

Reg. No…………………….

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018
(CUCSS-PG)
CC17P PHY3 C10 - NUCLEAR AND PARTICLE PHYSICS
(Physics)
(2017 Admission)

Time: 3 Hours   Maximum: 36 Weightage

PART A
Answer *all* questions. Each question carries 1 weightage.

1. What do you mean by Yukawa potential?
2. Explain the difference in netron scattering cross-sections from ortho and para hydrogen.
3. What are the similarities between nn and pp forces?
4. What do you mean by electric quadrupole moment?
5. Explain the difference between neutron scattering cross-sections of ortho and para hydrogen.
6. What is the difference between LS coupling and JJ coupling?
7. Write a note on collective model of the nucleus?
8. Write a short note on angular momentum selection rule in α decay.
9. What is Fermi-kurie plot?
10. What is the principle of proportional counter?
11. What are hyperons? Explain.
12. Explain CPT theorem.

(12 x 1=12 Weightage)

PART B
Answer any *two* questions. Each question carries 6 weightage.

13. Explain shell model of nucleus. Discuss how shell model together with spin orbit coupling explains the magic numbers and Explain how ground state spins can be accounted by the shell model.

14. What do you mean by γ decay of nucleus and write down the selection rules? Write the decay formula for multipole moments and explain different multipole radiations.

15. With neat diagram explain the basic processes in a scintillation detector and semiconductor detectors.

16. Illustrate by taking examples, the different Conservation laws followed by elementary particles.

PART C

Answer any *four* questions. Each question carries 3 weightage.

17. Calculate the mass of deuterium nucleus if the binding energy per nucleon is 1Mev. Estimate the energy released when two deuteron nuclei fuse together to form Helium nucleus, given that BE per nucleon of H^2 and He4 are 1.1 and 7 Mev respectively.

18. Find spin and parity of following nuclei. $_{17}Cl^{35}$, $_{10}Ne^{20}$, $_{13}Al^{27}$, $_{32}Ge^{73}$,

19. Write multipolarities of radiations emitted in the following transitions .

    a) $1^+ \rightarrow 0^+$ b) $2^+ \rightarrow 0^+$ c) $3^- \rightarrow 0^+$ d) $7^+ \rightarrow 1^-$

20. Discuss the following reactions using the conservation of isotopic spin

    1. $P + P \rightarrow P + P + \pi^0$

    2. $\pi^0 \rightarrow \gamma + \gamma$

    3. $\Lambda^o \rightarrow \pi^- + P^+$

21. Calculate the Q value of the reaction: $_1H^3 + {_1H^2} \rightarrow {_2H^4} + {_0n^1}$, masses are 3.01699824u, 2.01473614u, 4.00387274u and 1.00899324u respectively.

22. Which of the following reactions are allowed? Write the conservation laws followed and violated

    a) $p + p \rightarrow K^+ + \Sigma^+$

    b) $\pi^+ + n \rightarrow \Lambda^o + K+$

    c) $\Lambda^o \rightarrow p + K^-$

    d) $\pi^+ + n \rightarrow K^0 + K+$

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