

PG (CBCS)
M.SC. Semester- IV Examination, 2026
PHYSICS
PAPER: PHS 404
(NUCLEAR PHYSICS – II)



Full Marks: 20

Time: 1 Hours

The figures in the right-hand margin indicate full marks.
Candidates are required to give their answers in their own words as far as practicable.

GROUP-A

Answer any **TWO** of the following questions: 2×2=4

1. Explain Stripping and Pick-up reaction with examples.
2. Explain the term “Islands of Isomerism”.
3. Explain exchange force and tensor force.
4. According to Shell model find the spin and parity of Sr_{38}^{89} nucleus.

GROUP-B

Answer any **TWO** of the following questions: 2×4=8

5. Explain “Nordheim’s rule” with an example.
6. How the magic numbers can be explained according to nuclear shell model?
7. Define threshold energy (E_{th}) for an endo-ergic reaction. Hence calculate the threshold energy for the $Li_3^7(p, n)Be_4^7$ reaction if the incident proton has an energy 4 Mev, Calculate the max. possible vel. of neutron. Given $Li_3^7=7.01824$, $Be_4^7=7.01916$, $n_0^1=1.00898$, $H_1^1=1.00759$.
8. Show that the mean logarithmic decrement in energy of neutron due to collision with nuclei in a medium is- $E = 1 + \frac{(A-1)^2}{2A} \log \frac{A-1}{A+1}$.

GROUP-C

Answer any **ONE** of the following questions: 1×8=8

9. Write down the properties of deuteron. Using square well potential and appropriate boundary conditions find the wave function of the bound state of deuteron. Represent it graphically. 2+4+2
10. What are the similarities between a liquid drop and an atomic nucleus? Why collective shell model was introduced? Find the total vibrational energy states of nucleus according to collective model. 2+2+4

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