



Reg. No. :

Name :



K19P 1121

III Semester M.Sc. Degree (CBSS-Reg./Sup./Imp.)

Examination, October - 2019

(2014 Admission Onwards)

PHYSICS

PHY 3C 12 - NUCLEAR & PARTICLE PHYSICS

Time : 3 Hours

Max. Marks : 60

SECTION-A

Answer both questions (either a or b) (2x12=24)

1. a) Explain the partial wave analysis of low energy n-p scattering and obtain the scattering cross section.

(OR)

- b) Discuss the collective model of nucleus.

2. a) Find the energy released during beta decay and also explain the Fermi theory of beta decay.

(OR)

- b) Describe the quark model of particle physics and explain the quark model of Baryons.

SECTION B

(Answer any Four) (1mark for part (a), 3 marks for part (b), 5 marks for part (c)) (4x9=36)

3. a) Give the reasons for the existence of shell model.
b) Obtain the expression for spin orbit doublet separation.
c) Explain magnetic dipole moment on the basis of shell model.

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4. a) Define the internal conversion Phenomenon.
b) Explain the significance of internal conversion coefficient.
c) Deduce the expression for internal conversion coefficient using point nucleus model.
5. a) Discuss the important properties of a deuteron.
b) Explain the characteristics of nuclear force.
c) The first excited state of W^{182} is 2^+ and is 0.1MeV above the ground state. Estimate the energies of the lowest lying 4^+ and 6^+ states of W^{182} .
6. a) Explain the fission cross section.
b) Obtain the expression for the critical energy for fission.
c) Show that the nucleus would be stable against spontaneous fission if $\frac{Z^2}{A}$ is smaller than 50.
7. a) Explain the origin of stellar energy
b) Discuss Carbon - Nitrogen cycle. Give its importance.
c) A helium nucleus is formed by the fusion of four hydrogen nuclei, Calculate the energy released by 1Kg of hydrogen. Given the masses of ${}_1H^1$ and ${}_2He^4$ atoms are 1.00813 and 4.00386 amu respectively.
8. a) Write the four basic forces
b) What are the important conservation laws obeyed in particle interactions?
c) Predict the missing particle for the following reaction
 $\pi^+ + \text{---} \rightarrow \Lambda^0 + K^+$
Find i) Charge
ii) Baryon number
iii) Strangeness
iv) I_3 for this particle.
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