



K17P 1351

Reg. No. :

Name :

**Third Semester M.Sc. Degree (Reg./Suppl./Imp.)
Examination, November 2017
(2014 Admn. Onwards)
PHYSICS**

PHY 3C12 : Nuclear and Particle Physics

Time : 3 Hours

Max. Marks : 60

SECTION – A

Answer **both** questions (either **a**) or **b**) :

1. a) What are the experimental evidences for the existence of nuclear shell structure and discuss the shell model of the nucleus ?

OR

- b) Derive an expression for the differential scattering cross section of electrons by a finite size nucleus.

2. a) Discuss in detail the Fermi theory of beta decay.

OR

- b) What are quarks ? Outline the basic properties of quarks and hence explain the quark model. (2×12=24)

SECTION – B

(1 mark for Part **a**), 3 marks for Part **b**) and 5 marks for Part **c**)). Answer **any four** :

3. a) What is meant by binding energy ?
b) Explain the characteristic features of nuclear forces.
c) A nucleus with $A = 235$ splits into two nuclei whose mass numbers are in the ratio 2 : 1. Find the radii of the new nuclei.
4. a) State the various types of fission process.
b) Discuss the carbon-nitrogen cycle.
c) Show that a nucleus will be stable against spontaneous fission if $\frac{Z^2}{A}$ is smaller than 50.

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5. a) What are the basic forces in nature ?
b) Discuss the important conservation laws obeyed in nuclear interactions.
c) Find the ground state spins and parities of the following nuclei :
- 1) ${}_{7}^{15}\text{N}$
 - 2) ${}_{14}^{29}\text{Si}$.
6. a) What is meant by parity ?
b) Is it a conserved quantity ? Explain.
c) Discuss the TGP theorem and its consequences.
7. a) What is meant by gamma decay ?
b) Describe the phenomena of internal conversion.
c) Discuss the detail the energetic of gamma decay.
8. a) What are gluons ?
b) Explain the conservation of isospin.
c) Outline the experimental evidence for quark model. (4×9=36)

SECTION-B