



K15P 0092

Reg. No. :

Name :

**Third Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.)
Examination, November 2015
PHYSICS
(2014 Admn.)
PHY 3C 12 : Nuclear and Particle Physics**

Time : 3 Hours

Max. Marks : 60

SECTION – A

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

1. a) Discuss the shell model of nucleus.

OR

b) What is meant by β -decay ? Describe the Fermi theory of β -decay.

2. a) i) Obtain semiempirical mass formula.

ii) Discuss nuclear electromagnetic moments.

OR

b) Discuss the conservation laws in particle physics.

(2×12=24)

SECTION – B

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

3. a) What is meant by skin thickness parameter of a nucleus ?

b) With the help of a schematic diagram briefly explain the working of a mass spectrograph.

c) Calculate the binding energies of the ${}^{64}_{28}\text{Ni} = 63.927958 \text{ u}$ and

${}^{64}_{29}\text{Cu} = 63.929759 \text{ u}$. ($M_n = 1.008665 \text{ u}$, $M_H = 1.007825 \text{ u}$)

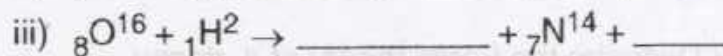
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4. a) What are the basic similarities between a liquid drop and an atomic nucleus ?
 b) What are the main nuclear properties on which the idea of shell model rests ?
 c) The meson theory of nuclear forces assumes the virtual exchange of pions. If a nucleon emits a virtual pion of rest mass $270 m_e$, calculate the range of the nuclear force.

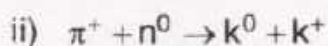
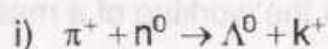
5. a) Write a short note on deuteron.
 b) Explain the exchange characteristics of nuclear forces.
 c) Explain the classification of Beta transitions.

6. a) Write a short note on quarks.
 b) Describe the phenomenon of internal conversion.
 c) Complete the following nuclear reactions



7. a) What is nuclear photoeffect ?
 b) What are the various conservation laws to be valid in ordinary nuclear reactions ?
 c) Calculate the fission rate for ${}^{235}\text{U}$ required to produce 2 watt and the amount of energy that is released in the complete fissioning of 0.5 kg of ${}^{235}\text{U}$. (Assume that the average energy released per fission is 200 MeV).

8. a) What is the difference between a neutrino and an antineutrino ?
 b) Give an account classification of elementary particles.
 c) Say which of the following reactions are possible.



(4×9=36)