G-3/385/22

Roll No. .....

III Semester Examination, January, 2022

M.Sc.

PHYSICS

Paper I

(Nuclear and Particle Physics)

Time : 3 Hours] [Max. Marks : 80

Note : *All questions are compulsory. Question Paper comprises of 3 Sections. Section A is objective type/multiple choice questions with no internal choice. Section B is short answer type with internal choice. Section C is long answer type with internal choice.*

SECTION A **1×8=8**

(Objective Type/Multiple Choice Questions)

Choose the correct answer :

1. For nuclear force which of the following statement is not true ?

(a) Spin dependent (b) Charge dependent

(c) Short range (d) Velocity dependent

2. The gas used in GM counter is ?

(a) Oxygen (b) Helium

(c) Neon (d) CO_2

P.T.O.

3. Binding energy per nucleon is max for :

(a) He^4 (b) Ca^{40}

(c) Fe^{56} (d) Pb^{206}

4. 1 barn is unit of area having the magnitude of :

(a) 10^{25} cm^2 (b) 10^{-24} cm^2

(c) 10^{-28} m^2 (d) None of these

5. The order of magnitude of the binding energy per nuclear is :

(a) 10^{-3} MeV (b) 10 MeV

(c) 10^{-3} MeV (d) 0.1 MeV

6. The querk structure of Δ^{++} is :

(a) *uuu* (b) *udu*

(c) *sss* (d) *ddd*

7. The mass of β-particle is equal to the mass :

(a) Proton (b) Neutron

(c) Electron (d) Photon

8. The α-particle does not travel for enough in air :

(a) Due to its high charge

(b) Due to its large mass

(c) Due to intense ionisation

(d) Due to its penetration

SECTION B **6×4=24**

(Short Answer Type Questions)

Note : *Answer the following questions in* ***250*** *words.*

Unit-I

1. Explain neutrino hypothesis and its indirect method.

Or

Explain parity violation of decay.

Unit-II

2. Explain nuclear cross-section.

Or

Explain four factor formula.

Unit-III

3. Explain difference between gas filled counter and solid counter.

Or

Explain difference between linear accelerator and betatron.

Unit-IV

4. Explain exact conservation law.

Or

Discuss about meson and hypermeson with its decay modes and reactions.

SECTION C **12×4=48**

(Long Answer Type Questions)

Note : *Answer the following questions in* ***500*** *words.*

Unit-I

1. Explain Gammow theory of particle and its advantageous in the theory of alpha decay.

Or

What are allowed and forbidden β-transition ? Discuss fermi and Gammow-Teller selection rules in the context of Fermi theory of β-disintegration.

Unit-II

2. Discuss about compound nucleus and nucleus cross-section with Breit-Wigner dispersion formula.

Or

Explain about nuclear fusion and fission reaction. What is prospect of controlled fusion energy ?

Unit-III

3. Explain neutron detection, its principle and experimental detail with application.

Or

Explain proton synchrotron with principle working method and application.

Unit-IV

4. Explain SU(2) & SU(3), model with its properties.

Or

Write down classification of elementary particles with quark numbers.

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