

[4]

SECTION 'C'

4 × 10 = 40

Long Answer questions (Word limit 400-450 words.)

Q. 1. Discuss the effective range theory in $n - p$ scattering.

OR

Describe the Iso-spin formalism and charge symmetry.

Q. 2. Discuss the Fermi theory of $\beta - decay$.

OR

Describe the allowed and forbidden transition in nuclear reaction.

Q. 3. Describe the Bohr-wheeler theory of Fission reaction.

OR

Show that only even angular momentum I states are allowed for $K=0$.

Q. 4. Derive the Breit-Wigner formula for resonance cross section.

OR

Write down the classification of elementary particles. Discuss the four fundamental interaction to study the elementary particles.

[1]

ROLL NO.....

PHY. 403/21

IV SEMESTER EXAMINATION, 2021

M.Sc. (PHYSICS)

PAPER-III

NUCLEAR AND PARTICLE PHYSICS

TIME: 3 HOURS

MAX.- 80

MIN.- 16

Note: The question paper consists of three sections A, B & C. All questions are compulsory.

Section A- Attempt all MCQ questions

Section B- Attempt one question from each unit.

Section C- Attempt one question from each unit.

SECTION 'A'

2 × 8 = 16

Multiple Choice Questions

1. Yukawa's theory suggest that nuclear force arises through exchange of -
 - (a) Electron
 - (b) Proton's
 - (c) Neutrons
 - (d) Mesons
2. Which is true?
 - (a) Nuclear force is dependent on charge
 - (b) Nuclear force is weaker than the electromagnetic force
 - (c) Nuclear force is independent of charge
 - (d) Nuclear force is weaker than the gravitational force

[2]

3. The existence of the neutrino was postulated in order to explain-
- (a) α – decay (b) β – decay
(c) γ – emission (d) Fission
4. β – ray spectra is -
- (a) Discrete (b) Continuous
(c) Both (d) None of the above
5. Nuclear fission can be successfully explained by using -
- (a) Shell model (b) Optical Model
(c) Collective model (d) Liquid drop model
6. How many electrons are present in the M-shell of the atom of an element with atomic number 24?
- (a) 5 (b) 6 (c) 12 (d) 13
7. Which is BOSON?
- (a) Electron (b) Positron
(c) Photon (d) Muon
8. Neutrino is-
- (a) Chargeless and has no spin
(b) Chargeless and has spin
(c) Charged like electrons and spin
(d) Uncharged, but has mass nearly that of protons

[3]

4 × 6 = 24

SECTION 'B'

Short Answer Type Questions

- Q.1.** Explain the significance of the scattering length.

OR

Describe the theory of Yukawa interaction.

- Q.2.** Explain Nuclear isomerism.

OR

Explain parity violation in β – decay.

- Q.3.** Give experimental evidence of nuclear magic numbers.

OR

Write the main assumption of liquid drop model of the nucleus.
Justify the name liquid drop model.

- Q.4.** Describe the quark theory in brief.

OR

Obtain an expression for reaction cross section.