

PE – 489
(524) M.Sc.PHYSICS (Fourth Semester)
Examination June 2022 Compulsory/Optiona
Group - Paper -II
NUCLEAR PHYSICS

Time : Three Hours]

[Maximum Marks : 80
[Minimum Pass Marks : 29

नोट : दोनों खण्डों से निर्देशानुसार उत्तर दीजिए। प्रश्नों के अंक उनके दाहिनी ओर अंकित हैं।

Note : Answer from both the Sections as directed. The figures in the right-hand margin indicate marks.

Section-A

Q 1. Answer the following very short type question :-

1x10=10

- (a) The antrineutrino is an elementary subatomic Particle with infinitesimal mass and no electric charge (True or False)
- (b) Alpha decay occurs when a nucleus is unstable because it has too many(fill in the blank)
- (c) The time required for a quantity to reduce to half of its initial value is called.....
- (d) What is Q in a reaction?
- (e) What is meant by conservation law?
- (f) What is Solid state counter?
- (g) What does a Geiger counter measure?
- (h) What is Proton-synchrotron used for?
- (i) Mesons are Particles found in.....
- (j) Is there an antiproton?

Q 2. Answer the following short type question:-

2x5 =10

- (a) How can neutrino be detected?
- (b) How is thermonuclear energy produced?
- (c) Does fusion require high temperature.
- (d) What happens to neutrons during beta decay?
- (e) What happens When a Proton meets an antiproton?

Section - B

Answer the following long answer type questions :-

15x4 = 60

Q 3. Discuss the Geiger-Nuttall law and explain how successful it was in estimating the half-life of α -emitters?

Or

- (a) What are the selection rules for allowed and forbidden transitions in β -Process?
- (b) Why it is necessary to bring in the concept of neutrino in β -decay?

Q 4. Describe the partial wave analysis for nuclear reaction cross-section and obtain the relations for elastic, inelastic and total reaction cross-sections.

Or

- (a) What is fusion and why is it so difficult to achieve?
- (b) What are the main challenges in building a fusion reactor?

Q 5. Describe in brief the principle, construction and working of scintillation counter.

Or

Explain the Principle of acceleration of electrons in betatron and find the energy gained by electrons in betatron.

Q 6. What are the conservation laws and invariance principles used in elementary particles?

Or

Discuss the elementary particle symmetries. explain SU(2) and SU (3) symmetries.