S-1129

Total Pages : 3 Roll No. .....

PHY-551

Nuclear Physics and Analytical Techniques

M.Sc. Physics (MSCPHY)

2nd Year Examination, 2022 (Dec.)

Time : 2 Hours] **Max. Marks : 70**

Note : This paper is of Seventy (70) marks divided into two (02) Sections A and B. Attempt the questions contained in these sections according to the detailed instructions given therein.

SECTION–A
(Long Answer Type Questions)

Note : Section 'A' contains Five (05) long answer type questions of Nineteen (19) marks each. Learners are required to answer any Two (02) questions only.

(2×19=38)

1. Discuss the Gamow theory of α decay and how it explain the main features of α particle emission process. Write the limitations of the theory.

2. Explain the basic properties of neutrons. How these neutrons can be classified as slow, fast and intermediate neutrons. Derive four factor formula and also discuss its importance.

3. Explain the term nuclear cross section. Derive an expression for the number of particles emerging out of a slab of finite thickness.

4. Describe the shell model in detail with the experimental evidences and predictions related with the theory. Explain the basic difference between the liquid drop model and shell model of the nucleus?

5. Derive an expression for the semi-empirical formula by Weizsacker. Also show that the binding energy per nucleon is the sum of volume, surface, coulomb and asymmetry energies.

SECTION–B

(Short Answer Type Questions)

Note : Section 'B' contains Eight (08) short answer type questions of Eight (08) marks each. Learners are required to answer any Four (04) questions only. (4×8=32)

1. Write a note on the energies and selection rules for alpha particle emission.

2. State and explain the selection rules of beta emission.

3. Explain the term multipolarity in gamma transition.

4. Explain the terms isospin and strangeness. Why they are important in the classification of the elementary particles?

5. Calculate the average binding energy per nucleon for $^{64}_{28}Ni$ having mass 63.9280 *u*. (Given that m_p = 1.007825 *u* and = 1.0086665 *u*).

6. Discuss Yukawa's meson exchange theory of the nuclear force.

7. Discuss the compound nucleus theory of nuclear reactions.

8. What do you mean by a neutron? How do you classify neutrons as fast and slow neutrons based on their energy range?