Total No. of Printed Pages : 4

Roll No.....

PHY-551 NUCLEAR PHYSICS AND ANALYTICAL TECHNIQUES

M.Sc. PHYSICS (MSCPHY-12/13/16/17)

2nd Year, Examination-2020

Time Allowed : 2 Hours Maximum Marks : 80

Note: This paper is of Eighty (80) marks divided into Two (02) sections A and B. Attempt the question 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 twenty (20) marks each. Learners are required to answer any two (02) questions only. (2×20=40)

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P. T. O.

- 1. Describe the construction and working of scintillation and solid state detectors with diagram.
- 2. Explain different properties of nucleus in detail. Define terms Bohr magneton and magnetic dipole moment.
- 3. Describe the theory of shell model and give the difference between liquid drop model and shell model.
- 4. What is Q equation? Find out the solution of Q equation. Calculate the Q value of reaction ${}^{14}_{7} N(\alpha, p) {}^{17}_{8} O$ which occurred in Rutherford's α range in nitrogen experiment.
- 5. Give the principle and application of ESR and NMR.

Section-B

(Short answer type questions)

Note: Section-B Contains Eight (08) short answer type questions of Ten (10) marks each. Learners are required to Answer any four (04) questions only. (4×10=40)

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- 1. Explain Fermi theory of β decay and selection rule for β decay.
- Define gamma emission and selection rule for gamma decay.
- 3. Give the classification of fundamental interactions and elementary particle.
- 4. What are the different mechanics by which gamma ray interacts with matter? Explain the Dirac's theory of pair production.
- 5. Calculate the average binding energy per nucleon for ${}^{64}_{28}Ni$ having 63.9280u. Given that Z=28, A=64, m_p=1.0007825u, m_n=1.008665u.
- Calculate the Q value of the following reactions.
 Which are endothermic and which are exothermic.
 - (i) C^{12} (d, n) N^{12}
 - (ii) $O^{16}(d, n) F^{17}$
 - (iii) $Be^{9}(p) Li^{6}$

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P. T. O.

- Give the principle, theory and application of phase contrast microscopy.
- Give the principle Mossbauer Effect. Explain the origin of magnetic hyperfine splitting of Mossbauer spectral line of Fe⁵⁷.

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