SCHOOL OF SCIENCES

UTTARAKHAND OPEN UNIVERSITY, HALDWANI (NAINITAL)

उत्तराखण्ड मुक्त विश्वविद्यालय, हल्द्वानी (नैनीताल)

M.Sc. Physics (MSCPHY13)

Second Year Assignment

Last Date of Submission: 15 May 2015

Course Title: Nuclear Physics and Analytical Techniques Course Code: PHY-551

Year : 2013-14 Maximum Marks :40

Section A

Section 'A' contains 08 short answer type questions of 5 marks each. Students are required to answer 4 questions only. Answers of short answer type questions should be in 250 words approximately.

1- Explain Fermi theory of β decay and selection rule for β decay.
2- 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, $m_p = 1.0007825u$, $m_n = 1.008665u$.
6- 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) $Be^{9}\ (p)\ Li^{6}$
7- Give the principle, theory and application of phase contrast microscopy.
8- Give the principle Mossbauer Effect. Explain the origin of magnetic hyperfine splitting of Mossbauer spectral line of Fe^{57}.

Section B

Section 'B' contain 04 long answers type question of 10 marks each and students are required to answers 02 questions only.

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.