of the most stable isobar of a given 'A' and use it to find the most stable isobar of A = 25. **8**

5. (a) Plot the energy spectrum of electron emerging out during the beta decay. Discuss the puzzling aspects regarding conservation principles of energy, linear and angular momentum in context of beta decay. **7**

(b) Derive a formula for calculating binding energy per nucleon using liquid drop model. **8**

Unit III

6. (a) What is stopping power ? Discuss the Bethe-Bloch formula. **5**

(b) Discuss the general behaviour of gas filled counter and then specifically discuss the principle, construction, working, merits and limitations of G.M. counter. **10**

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D512

Dual Degree B.Sc. (Hons.) Physics-M. Sc. Physics EXAMINATION, May 2019

(Fourth Semester)

(Main Only)

DPH204

FUNDAMENTALS OF NUCLEAR AND PARTICLE PHYSICS

Time : 3 *Hours*] [*Maximum Marks :* 75

Before answering the question-paper candidates should ensure that they have been supplied to correct and complete question-paper. No complaint, in this regard, will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting at least *one* question from each Unit. Q. No. **1** is compulsory. All questions carry equal marks.

Compulsory Question

1. (a) In order to study the nuclear size, shape and density distribution one way employ electron, proton and neutron as probes, what are the criteria in selecting the probe ? **2**

(b) The nuclide ^{7}Be is unstable and decay into ^{7}Li by electron capture. Why does it not decay by positron emission ? **4**

(c) Is it possible to occur pair production in empty space ? If no than explain with reasons. **3**

(d) The free end of a anode in Geiger Muller counter is covered by a glass bead why it so. Give reason. **4**

(e) The free neutron is not stable while proton is which factor is responsible for preventing the stability of a free proton comment on it. Write the channel for decay of a neutron. **2**

Unit I

2. (a) Draw the sketch of nuclear binding energy with mass number and extract useful conclusion from it. **7**

(b) Discuss the electron scattering experiment used to measure nuclear size. **8**

3. (a) Write the suitable expression to represent the charge and matter distribution in a nucleus. Explain the terms appeared in the expression. **7**

(b) Deduce the expression for electric quadrupole moments of a nucleus. Give its physical signicance. **8**

Unit II

4. (a) Explain the various decay mechanism with suitable example and also write the required conservation principle. **7**

(b) As you know that isobars are the nuclides with the same mass number say 'A'. Now derive a formula for the atomic number

7. (a) Write different nuclear reactions. Also discuss the conservation laws essentially fulfilled during these reactions. **5**

(b) How the gas filled detectors works ? Discuss the working and construction of proportional counter. **10**

Unit IV

8. (a) Explain the various fundamental interactions between elementary particles also give their relative strength and their respective role in the existing universe. **7**

(b) Discuss different quantum numbers for elementary particle which needs to be conserved during the reactions involving these particles. **8**

9. (a) Explain the Quark model of proton, neutron and their antiparticles also write their quark content, spin, charge, baryon and strangeness number. **7**

(b) On which parameters the elementary particles are being classified. Give the classification scheme on the basis of spin of the particles. **8**