

BACHELOR OF SCIENCE (T.Y.B.Sc.) SIXTH SEMESTER
B.Sc. 4536 - PHYSICS PAPER-I
(Nuclear Physics, Nanotechnology and Biophysics)

P. Pages : 2

Time : Three Hours



GUG/W/18/1358

Max. Marks : 50

- Notes : 1. All questions are compulsory.
2. Draw neat labelled diagram wherever necessary.

1. Either:

- a) i) Describe the principle, construction and working of Geiger-Mueller counter. 5
ii) What is dead time and recovery time? Explain the necessity of recovery time. 3
iii) What do you mean by quenching of a G.M. Counter? 2

OR

- b) i) What is tunneling effect? 2
ii) Give an account of Gamow's theory of α – decay from radioactive substance. 6
iii) Obtain an expression for Geiger-Nuttall law from Gamow's theory. 2

2. Either:

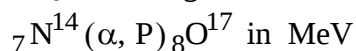
- a) i) State difference between Nanomaterials and bulk materials. 3
ii) State different method of synthesis of Nano materials. Explain any one in detail. 4
iii) What are the advantages and disadvantages of SEM? 3

OR

- b) i) What are the applications of Nano technology in medical science? 3
ii) How Biophysics explain compound action potential of human body? 3
iii) Explain the working principle of electro cardiogram (ECG) for heart. 4

3. Either:

- a) Obtain Q-value of given nuclear reaction and identify its types. 2½



Given: Mass of helium = 4.0026 amu

Mass of proton = 1.0078 amu

Mass of ${}_7\text{N}^{14}$ = 14.0031 amu

Mass of ${}_8\text{O}^{17}$ = 16.9991 amu

- b) What is range of α – particle ? Explain how it can be determined? 2½
- c) Explain Transmission Electron Microscope with ray diagram. 2½
- d) What do you understand by Nano sensing? 2½

OR

- e) Explain interaction of charged particle with matter. Also, discuss interaction of neutron with charge particle. 2½
- f) What is chain reaction? What are the condition for self sustained chain reactions? 2½
- g) State the advantages and disadvantages of TEM. 2½
- h) Discuss the various application of Nano-technology in electronics industries. 2½

4. Either:

- a) What are the exothermic and endothermic Nuclear reactions? Give suitable example of each one. 2½
- b) What is nuclear fusion? Explain its working mechanism. 2½
- c) Explain how one Nano meter is a magical point on the dimensional scale. 2½
- d) What is Bio Physics? Discuss its objectives. State the names of different branches of biophysics. 2½

OR

- e) Explain the term packing fraction. Draw a curve for variation of packing fraction with mass number and explain it. 2½
- f) What are magic numbers of nuclei? How does the shell model explain the existence of magic numbers 2, 8, 20 and 28 only? 2½
- g) Explain the phenomenon of formation of quantum dots. 2½
- h) Explain in detail about Nano magnetics. 2½

5. Attempt **any ten** of the followings.

- a) State the principle of proportional counter. 1
- b) Draw the graph of binding energy per nucleon with mass number. 1
- c) What are different types of scintillators used to study scintillation counter. 1
- d) State the properties of Nuclear Force. 1
- e) What is potential barrier? 1
- f) Classify Elementary Particles in different groups. 1
- g) Explain diagrammatically how the reduction of dimensions 3D, 2D, 1D. and 0D materials take place? 1
- h) What are the sources of Nano Cluster? 1
- i) Write the principle of Wet Chemical Synthesis method. 1
- j) Who is the father of Nanotechnology? 1
- k) What are the major waves on a single ECG Pattern. 1
- l) What are the applications of Bio Physics? 1
