BACHELOR OF SCIENCE (T.Y.B.Sc.) SIXTH SEMESTER

B.Sc. 4536 - PHYSICS PAPER-I
(Nuclear Physics, Nanotechnology and Biophysics)

P. Pages : 2 **GUG/W/18/1358**

Time : Three Hours * 1 0 7 1 * 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 $\alpha-$decay from radioactive substance. **6**

iii) Obtain an expression for Geiger-Nuttal 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**

$_7N^{14}(\alpha, P)_8O^{17}$ in MeV

Given: Mass of helium = 4.0026 amu
Mass of proton = 1.0078 amu
Mass of $_7N^{14}$ =14.0031amu
Mass of $_8O^{17}$ = 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**

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