Reg. No. : ....

Name : ....

III Semester M.Sc. Degree (C.B.C.S.S. – O.B.E. – Regular) Examination, October 2024
(2023 Admission)
PHYSICS/PHYSICS WITH COMPUTATIONAL AND NANO SCIENCE SPECIALISATION
Open Elective Course
MSPHY03O01/MSPHN03O02 : Radiation Physics

Time : 3 Hours　　　　　　　　　　　　　　　　　　　　　　　　Max. Marks : 60

SECTION – A

Answer **any 5** questions, **each** carries **3** marks.　　　　　　　　　　**(5×3=15)**

1. Define exposure and absorbed dose. Define their units.

2. What is Relative Biological Effectiveness (RBE) ? What is the basis of RBE of a radiation ?

3. What is the fundamental mechanism of energy loss of charged particles in matter ?

4. Differentiate between a personal monitor and a survey meter.

5. What is effective dose ? How is it important in estimating the radiation hazard ?

6. What is coherent scattering ? How does it contribute to attenuation ?

SECTION – B

Answer **any 3** questions, **each** carries **6** marks.　　　　　　　　　　**(3×6=18)**

7. Assume that the average ionization energy of air is 100 eV. Calculate the strength of Cs-137 isotope, emitting 662 keV gamma rays, required to produce 1 Roentgen exposure. Assume the air is confined in a cubicle of $10\times10\times10$ cm³, kept at 10 cm away from the source.

P.T.O.

8. A 1332 keV gamma ray undergoes Compton scattering at 90 degree from a target foil. Calculate the energy of scattered electron and scattered gamma ray.

9. Calculate the voltage developed across the anode due to 1 MeV gamma ray in a proportional type detector. The gas multiplication factor is 10^4. The average ionization energy is 100 eV. The inter-electrode capacitance is 1 nF.

10. With the help of a neat diagram, discuss the functioning of a pocket dosimeter.

11. The strength of a Cs-137 source is 1Ci. Calculate the thickness of lead shielding required to bring down the count rate to 37000 at 1m. Attenuation coefficient of lead is 1.30 cm^{-1}. Cross sectional area of the detector is 3.1 cm^2.

SECTION – C

Answer **any 3** questions, **each** carries **9** marks. **(3×9=27)**

12. Discuss various quantities of measurement of radiations and their units. Analyze the role of each one in radiation hazards and safety.

13. Discuss the mechanism of energy loss by heavy charged particles. Explain the importance of specific energy loss, stopping power and range of the particle. How is the interaction mechanism different for neutrons ?

14. Discuss various interactions of electromagnetic radiations with matter. How is it affected by the energy of the incident radiation and charge and density of the medium ?

15. Give a detailed interaction of radiation in molecular level and cellular level. Identify various stochastic and deterministic effects induced and their thresholds.

16. Explain how radioactive sources are classified. What are the precautionary measures to be taken in handling artificial sources ? Why ?