15432

M. Sc. EXAMINATION

(For Batch 2021 & Onwards)

(Fourth Semester)

PHYSICS

MSc/Phy/4/CC16(A)

Radiation Physics

Time : Three Hours   *Maximum Marks : 70*

Note : Attempt *Five* questions in all. Q. No. **1** (Section A) is compulsory. Attempt *four* more questions, selecting *one* question from each Section B, C, D, E.

Section A

1. Attempt the following :   5×2= 10

    (a) Differentiate between thermal and fast neutrons.

(b) What is meant by the radiation dose and mention its units ?

(c) How gamma camera can be used in medical diagnosis and treatment ?

(d) Explain steps to be taken for radiation protection.

(e) Discuss the biological effects of ionizing radiation on humans.

Section B

2. (a) Explain the principle and working of boron detector for slow neutrons. 5

(b) Explain the different types of neutron interactions with matter. 5

(c) Discuss the various types of neutron sources. 5

3. (a) Explain the origin of energy spectra and discuss, how can it be used to analyse different types of radiations. 7

(b) Discuss the phenomenon of Compton scattering and write its advantages. 8

Section C

4. (a) Discuss the basis of classification of nuclear radiation detectors with examples. 5

(b) Explain the various multiplicative regions of gas filled detectors by showing the variation of pulse size with applied voltage. 5

(c) Describe the working principle of semiconductor detectors and mention one advantage of these over gas detectors. 5

5. (a) Describe various sources of radiation exposure and discuss the importance of radiation monitoring for occupational and environmental safety. 10

(b) Discuss the phenomenon of pulse formation in GM Counter. 5

Section D

6. (a) What is nuclear spectrometric data ? Explain, how is it used to study the effects of radiations on the environment and human health. 5

(b) Define the concept of spin and parity for nuclear states. How these can be measured using magnetic dipole moments, electric quadrupole moments and reaction cross-sections ? 10

7. (a) What is the g-factor ? Explain its significance in understanding magnetic properties of particles. 5

(b) Discuss the safety limits for radiation exposure for occupational workers and the general public. Why are different limits being set for these groups ? 5

(c) Define the Internal Conversion Coefficient (ICC). How is it calculated and what is its role in nuclear spectroscopy ? 5

Section E

8. (a) What is Positron Emission Tomography ? Explain its principle, working and applications to diagnose the human body. 10

(b) Explain the principle of ion beam therapy in cancer treatment and discuss its advantages over conventional radiation therapies. 5

9. (a) Explain the principles of diagnostic and therapeutic nuclear medicines. How do these differ in their applications ? 5

(b) Describe the underlying principles and working of MRI and explain, how is it used in diagnosing conditions in different body organs. 10

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