

[This question paper contains 4 printed pages]

Your Roll No. : .....

Sl. No. of Q. Paper : 2401 IC

Unique Paper Code : 32423907

Name of the Course : B.Sc. (Hons.) Physics /  
B.Sc. (Prog.) : SEC

Name of the Paper : Radiation Safety

Semester : IV

Time : 3 Hours Maximum Marks : 50

**Instructions for Candidates :**

- Write your Roll No. on the top immediately on receipt of this question paper.
- Attempt **five** questions in **all**.
- Question **NO.1** is compulsory.
- Use of non-programmable scientific calculator is allowed.

1. Attempt any **five** of the following questions :

5×2=10

- Define *ionizing radiation*.
- What is nuclear waste and disposal management system ?

P.T.O.

- (iii) Differentiate between effective dose and equivalent dose.
- (iv) Discuss the properties of alpha, beta and gamma radiation.
- (v) How is the nuclear techniques used in crime detection? Explain briefly.
- (vi) What are the uses of radiation therapy?
- (vii) What do you mean by Derived Air Concentration (DAC)?
- (viii) Explain the principle and working of MRI.
2. (i) What do you understand by Photoelectric effect? Explain it. 4
- (ii) What is the law of radioactive decay? Derive an expression for half-life of a radioactive isotope. 6
3. (i) Discuss the construction and working of Proportional Counter. 5
- (ii) Explain the kinematics of nuclear reactions. 5

4. (i) Discuss the Accelerator Driven Sub-critical system (ADS) for waste management. 4
- (ii) Explain the term :
- (a) ionization potential,
  - (b) range
  - (c) stopping power with reference to ionizing radiation. 2,2,2
5. (i) How nuclear techniques are useful in the field of medical science ? 5
- (ii) Describe Beth-Bloch Formula. Explain, using stopping power expressions and cross sections, why the energy loss due to ionization drops off so sharply with increasing energy, while radiation loss increases linearly. 5
6. (i) Calculate the binding energy, and the binding energy per nucleon, for a nucleus of the  $^{238}\text{U}$  isotope (238.0508u), mass of proton = 1.00728u, mass of neutron = 1.00867u. 5
- (ii) What are the various models used to study the types of nuclear reaction ? 5

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7. (i) Discuss the Inorganic and Organic Scintillators. 5
- (ii) Describe the interaction of heavy charged particles. 5
8. Write short notes on any two of the following : 5,5
- (a) Auger electron
  - (b) Nuclear spin
  - (c) Cherenkov radiation
  - (d) Annual Limit of Intake (ALI)