

- (b) What is meant by radioactive disintegration? Derive an expression for the rate of disintegration of a radioactive material. (2.5+5)
6. (a) What is nuclear pollution? Write about the causes of radioactive pollution. (3+4.5)
- (b) Elaborate the different methods of nuclear waste management. (7.5)
7. (a) What do you mean by the term "radiometric dating method"? Explain in brief. (4)
- (b) Write a brief note on the medical applications of radiotracers. (4)
- (c) What is the full form of PET? Why is it done? Explain in brief. (2+5)
8. (a) What is ionizing radiation, and how does it differ from non-ionizing radiation? (3)
- (b) Is it possible to carry out nuclear fusion in the laboratory? Explain. (3)
- (c) Explain α , β and γ radioactive decays with reactions. (3+3+3)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3025

I

Unique Paper Code : 2174001010

Name of the Paper : GE-Radiochemistry in Energy, Medicine and Environment

Name of the Course : B.Sc. (H)/B.Sc. Prog.

Semester : I/III/V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Answer six questions in all.
3. Each question carries 15 marks.

1. (a) What are radiopharmaceuticals? Differentiate between diagnostic and therapeutic radio pharmaceuticals with appropriate examples of each along with their applications another words.

- (b) How can we contain and limit the impact of a nuclear accident to a specific area?
- (c) Explain the key concept of elementary particles, along with examples. Also, describe the number of steps involved and the number of α and β particles emitted in the spontaneous decay of ${}_{92}\text{U}^{238}$ to ${}_{82}\text{Pb}^{208}$ (6+5+4)
2. (a) Discuss the role of radioisotopes in studying photosynthesis.
- (b) Explain the difference between acute and chronic radiation exposure, and give examples of each.
- (c) What are exoergic and endoergic reactions? (4+6+5)
3. (a) Describe the different types of radionuclides present in our environment, providing suitable examples to support your answer. (5)
- (b) Write the functions of the following components of a nuclear reactor and include a labeled diagram of a nuclear reactor. (2×5)
- Control rods
 - Coolant

- Moderator
 - Fissile materials
 - Containment
4. (a) The C^{14} to C^{12} ratio in a certain piece of wood is 13% that of atmosphere. Calculate the age of wood, given that half life of $\text{C}^{14} = 5580$ years. (5)
- (b) What are nuclear reactions? How do they differ from chemical reactions? (2.5+2.5)
- (c) Calculate the energy released (Q) from the fusion of ${}_{3}\text{Li}^6$ and ${}_1\text{D}^2$ by the reaction (5)
- $${}_1\text{D}^2 + {}_3\text{Li}^6 \rightarrow {}_2\text{He}^4 + {}_2\text{He}^4 + Q$$
- where, isotopic masses are, ${}_1\text{D}^2 = 2.01474$ amu, ${}_3\text{Li}^6 = 6.01702$ amu and, ${}_2\text{He}^4 = 4.00387$ amu.
5. (a) Explain the following terms: (2.5×3)
- Mean tissue or organ dose (D_T)
 - Equivalent dose (H_T)
 - Cosmogenic radionuclides