

(iii) Effective equivalent dose (HE) (10,5)

6. (a) Explain the elements of a nuclear reactor followed by its working with an illustration.

(b) Explain the application of radioisotopes as tracers for studying chemical reactions involved in Friedel-Crafts reaction and photosynthesis. (10,5)

7. (a) What do you mean by "nuclear waste"? Classify and explain different types of nuclear waste disposal facilities.

(b) Explain the following nuclear accidents in detail :

(i) Windscale

(ii) Harrisburg (10,5)

8. (a) Explain Hershey and Chase Experiment. Explain the role of radioactive isotope in proving that DNA is a genetic material. Support your answer with a suitable diagram.

(b) Write short notes on :

(i) Nucleus composition

(ii) Elementary particles (10,5)

(2000)

Your Roll No.....

Sr. No. of Question Paper : 1240

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Unique Paper Code : 2174001010

Name of the Paper : GE-19, Radiochemistry in Energy, Medicine

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

Semester : I

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 questions carries 15 marks.

1. (a) What do you mean by radioisotopes and radiotracers? Write any three characteristics and three applications of radiotracers in environmental studies.

(b) Describe various types of radionuclides found in our environment. Support your answer with the help of suitable examples. (10,5)

P.T.O.

2. (a) (i) How can we localize and restrict the damage caused by a nuclear accident in a particular area? Explain.
- (ii) What are radiation monitoring devices? Explain your answer by providing suitable examples.
- (b) Explain the key term elementary particles along with some examples. Write the number of steps involved and number of beta particles emitted in the spontaneous decay of  ${}_{92}\text{U}^{238} \rightarrow {}_{82}\text{Pb}^{208}$  respectively. (10,5)
3. (a) (i) What is radio carbon dating? The remnants of an ancient fire in a cave showed carbon-14 decay rate of 3.1 counts per minute per gram of carbon. Assuming that the decay rate of carbon-14 in freshly cut wood is 13.6 counts per minute per gram of carbon, calculate the age of remnants. The half-life of carbon is 5715 years.
- (ii) What is Radiiodine therapy and how is it used? Explain in brief.
- (b) Write a short note on enriched Uranium. (10,5)

4. (a) (i) Differentiate between natural and artificial radioactivity and name any atom having both the mentioned isotopes?
- (ii) Differentiate between nuclear fission and fusion and write suitable reactions to support your answer.
- (b) What is the full form of PET? Why is it done? Explain in brief. (10,5)
5. (a) (i) Write a short note on nuclear stability and briefly mention factors responsible for the stability of a nucleus.
- (ii) Calculate the energy released (Q) from the fusion of  ${}_3\text{Li}^6$  and  ${}_1\text{D}^2$  by the reaction
- $${}_1\text{D}^2 + {}_3\text{Li}^6 \rightarrow {}_2\text{He}^4 + {}_2\text{He}^4 + Q$$
- 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.
- (b) Explain the following terms :
- (i) Mean tissue or organ dose (DT)
- (ii) Equivalent dose ( $H_T$ )