This question paper contains **3** printed pages]

Roll No. | | | | | | | | | | |

S. No. of Question Paper : **5696**

Unique Paper Code : **2173012010**

Name of the Paper : **DSE : NUCLEAR AND ENVIRONMENTAL CHEMISTRY**

Name of the Course : **B.Sc. (Hons.) Chemistry**

Semester : **IV**

Duration : **3 Hours** Maximum Marks : **90**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *six* questions in all.

All questions carry equal marks.

1. (*a*) In what way is the mode of decay of a particular nucleus related to the ratio of neutrons to protons ? Explain on the basis of Stability Curve.

(*b*) Calculate the energy released per fusion in MeV per fusion $^{2}D_{1} + {}^{1}H_{1} \longrightarrow {}^{3}H_{1}$. Given the atomic masses are $^{2}D = 2.01410$ amu, $^{1}H = 1.007825$ amu, $^{3}H = 3.01603$ amu.

(*c*) The half-life period of ^{32}P is 8 days. What percentage of the original radioactive material will be present after 40 days ? 5,5,5

P.T.O.

2. Explain the following :

(*a*) Disposal of nuclear waste and its management

(*b*) Different theories on the stability of nucleus.

(*c*) Nuclear fission and fusion reactions. 5,5,5

3. (*a*) Explain the construction and working principle of Geiger Muller Counter.

(*b*) What are fast breeder reactors ? How are they different from conventional thermal reactors ? Describe the main components of a fast breeder reactor.

(*c*) How are isotopes separated for use in nuclear reactors ? Explain using at least *three* different methods. 5,5,5

4. (*a*) What are air pollutants and how are they classified ? Elaborate on the major sources contributing to air pollution.

(*b*) Discuss the major regions of Earth's atmosphere. Describe the characteristics of each region.

(*c*) Explain different air pollution control methods. 5,5,5

5. (*a*) Discuss the chemistry and environmental consequences of photochemical smog. How is it formed and what are its main components ?

(*b*) What is ozone depletion ? Explain the mechanisms involved, highlighting the role of chlorofluorocarbons (CFCs) and other ozone-depleting substances.

(*c*) Describe the greenhouse effect and the role of greenhouse gases in global warming. Explain the chemical nature and environmental impact of major greenhouse gases. 5,5,5

6. (*a*) What is water pollution ? What are its impacts on the hydrological ecosystem ?

(*b*) What are the key physicochemical parameters used to assess water quality ? Explain the significance of each parameter.

(*c*) Explain the working principles and applications of *two* different water purification methods. 5,5,5

7. (*a*) Explain the sources and causes of water pollution.

(*b*) Describe the various stages of the hydrological cycle and explain how each stage contributes to the continuous movement and transformation of water within the Earth's system.

(*c*) Explain the effluent treatment process. How is the effluent from different industries treated ? 5,5,5

8. Write short notes on any *three* of the following : 5,5,5

(*a*) α, β and γ

(*b*) Chernobyl disaster

(*c*) Nuclear reactors in India

(*d*) Radioactive Series.