



**UNIVERSITY OF RUHUNA – FACULTY OF ALLIED HEALTH SCIENCES**

**DEPARTMENT OF PHARMACY**

**FOURTH BPHARM PART II EXAMINATION - SEPTEMBER 2023**

**PH 4241 RADIOPHARMACY – SEQ PAPER**

**TIME: TWO HOURS**

**INSTRUCTIONS**

- There are **four** questions in this SEQ paper.
- Answer all questions.
- No paper should be removed from the examination hall.
- Do not use any correction fluid.
- Use illustrations where necessary.

**1.**

- 1.1. Define one Becquerel (1Bq) radioactivity. **(10 marks)**
- 1.2. State the relationship between the units Ci and Bq. **(10 marks)**
- 1.3. Explain the term “ionizing radiation.” **(15 marks)**
- 1.4. Give two examples each for below radiation types. **(10 marks)**
  - 1.4.1. directly ionizing radiation
  - 1.4.2. indirectly ionizing radiation
- 1.5. Briefly describe the role of a radiopharmacist (nuclear pharmacist) in a nuclear medicine department. **(15 marks)**
- 1.6. “High quality radiopharmaceutical preparation is a main importance in nuclear medicine”. Explain this statement. **(20 marks)**
- 1.7. Gamma irradiation is an attractive method for sterilizing medical devices. List three advantages and one disadvantage of Gamma irradiation compared to heat steam sterilization. **(20 marks)**

**2.**

- 2.1.
  - 2.1.1. Define the radiation intensity of a gamma source. **(15 marks)**
  - 2.1.2. State the SI units of intensity. **(05 marks)**
- 2.2. Briefly explain the inverse square law for electromagnetic radiation. **(15 marks)**
- 2.3. What is the half value layer? **(15 marks)**



2.4. The exposure rate from a gamma source at 1 m distance is 40 mR/min. How many half-value layers are required to reduce the exposure rate to 1.25 mR/min at 2 m distance.

(20 marks)

2.5. 100 mCi activity, sodium iodide (I-131) capsules were ordered by a hospital with a reference date and time set for each capsule on 06<sup>th</sup> September 2023, at 8.00 am. Physical half-life of sodium iodide (<sup>131</sup>I) is 8 days. Calculate the activity of a capsule:

2.5.1. At the time of manufacture, if 4 days are needed for transportation from the company to the relevant hospital

(15 marks)

2.5.2. At 10.00 am on 07<sup>th</sup> September 2023, if they are used for patients on this day

(15 marks)

3.

3.1. Write down the decay process of <sup>99</sup>Mo radionuclide. (15 marks)

3.2. What is the most commonly used radionuclide in nuclear imaging? Explain why.

(15 marks)

3.3. Briefly discuss the transient equilibrium of radionuclide. (20 marks)

3.4. Draw a graph illustrating the variation in daughter product activity and parent activity over time when eluted daily from the technetium generator. (15 marks)

3.5. What is meant by low level radioactive waste? (15 marks)

3.6. List four examples each of solid and liquid waste generated in a nuclear medicine department. (20 marks)

4.

4.1. Briefly discuss the following terms in relation to ionizing radiation.

4.1.1. Stochastic effect (10 marks)

4.1.2. Deterministic effect (10 marks)

4.1.3. Somatic effect (10 marks)

4.1.4. Hereditary effect (10 marks)

4.2. Briefly explain three basic principles of radiation protection. (30 marks)

4.3. List the recommended annual whole body dose limits for occupational workers and the general public. (10 marks)

4.4. Briefly explain the uses of following radiation detectors in a nuclear medicine department.

4.4.1. Geiger-Muller counter (10 marks)

4.4.2. Thermo Luminescent Dosimeter (TLD) (10 marks)

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