



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

(MAIN CAMPUS)

**UNIVERSITY EXAMINATIONS (MAIN EXAM)
2022/2023 ACADEMIC YEAR**

THIRD YEAR SECOND SEMESTER MAIN EXAMINATIONS

**FOR THE DIPLOMA
OF
MEDICAL BIOTECHNOLOGY**

COURSE CODE: BBD 325

COURSE TITLE: RADIONUCLIDE TECHNOLOGY

DATE: 17TH APRIL 2023

TIME: 8.00 – 10.00AM

INSTRUCTIONS TO CANDIDATES

This paper is divided into three sections, **A B** and **C**, carrying respectively: Multiple Choice Questions (**MCQs**), Short Answer Questions (**SAQs**) and Long Answer Questions (**LAQs**). **Answer all questions. DO NOT WRITE ON THE QUESTION PAPER.**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over

SECTION A: Multiple Choice Questions (20 Marks)

1. The neutral atoms of all isotopes of the same element contain the same number of _
 - a. Neutrons only.
 - b. Electrons
 - c. Mass numbers
 - d. Masses
2. The atomic number is not changed by which type of radioactive decay?
 - a. Beta
 - b. Gamma
 - c. Alpha
 - d. The atomic number is affected by all forms of radioactive decay
3. : Isotopes of an element have a different number of
 - a. Proton
 - b. Neutron
 - c. Electron
 - d. atom
4. Three types of radioactive elements are emitted when unstable nuclei undergo radioactive decay. Which of the following is not one of them
 - a. Beta
 - b. Gamma
 - c. Alpha
 - d. delta
5. : A nuclear fission reaction becoming self-sustaining depends on
 - a. electrons
 - b. Neutrons
 - c. Energy
 - d. Protons
6. : Helium nuclei particles are called
 - a. Gamma particles
 - b. Beta particles
 - c. Alpha particles
 - d. No particles that are helium nuclei
7. : When two atomic nuclei combine it is called as
 - a. Chain reaction
 - b. Nuclear fusion
 - c. Nuclear decay
 - d. Nuclear fission
8. : The number of protons or atomic number is reduced to 2 by which form of radioactive decay?
 - a. Beta-decay
 - b. Gamma decay
 - c. Alpha decay
 - d. None of the above

9. Which statement is true for all three types of radioactive emission?
- They are deflected by electric fields
 - They ionise gases
 - They are completely absorbed by a thin aluminium sheet
 - They emit light
10. : A nuclide of the element plutonium ${}_{94}\text{Pu}^{242}$. What is the number of neutrons in its nucleus?
- 242
 - 336
 - 148
 - 94
11. Spontaneous nuclear transmission:
- Occurs as a result an external force
 - Occurs due to being bombarded by another particle
 - Occurs naturally
 - All of the above
12. . Which one of the following is a property of gamma rays?
- They cannot penetrate the skin
 - They are more penetrative than X-rays
 - They are less penetrative than X-rays
 - They cannot penetrate wood and paper
13. Radioactivity is also referred to all of the following except:
- Radioactive decay
 - Nuclear decay
 - Radioactive disintegration
 - Radioisotope
14. Radionuclides attempt to reach through all of the following mechanisms except
- Ejecting neutrons and protons
 - Converting one radionuclide to another with ejection of a beta particle or positron
 - Gaining neutrons and protons
 - Release of additional energy by a photon
15. SPECT stands for
- Single photon emission computed tomography
 - Spaced photon computed tomography
 - Singular photon computed tomography
 - Single photon computerised topography
16. One sievert is 1,000 millisieverts (mSv) and one millisievert is _____ microsieverts
- 100
 - 1000
 - 1010
 - 10000
17. With reference to radioactive materials. D value refers to:
- The quantity of radioactive material which is considered a dangerous source
 - The quantity of radioactive material considered safe
 - The quantity of radioactive material considered inactive
 - The quantity of radioactive material remaining

8. All the following are expressed in are expressed in sieverts (Sv) except:
- Equivalent dose
 - Effective dose,
 - Committed equivalent dose
 - Radioactive decay
18. Which one of the following is an advantage of the Geiger Muller counter?
- Energies can be measured by it as it has differentiating abilities.
 - It can detect uncharged particles like Neutrons.
 - It has high sensitivity
 - It is more efficient due to the large paralysis time limits and large dead time.
19. All the following refer to the thermoluminescent dosimeter except:
- It is annealed at a high temperature after the TLD reader reads the emitted light
 - It is not applicable to situations where real-time information is not needed
 - It measures exposure to radiation
 - It applicable to situations where real-time information is not needed
20. . Beta counters:
- Have the sample dissolved (or uniformly distributed) in a liquid scintillant
 - Measure gamma radiations
 - Are divided into two categories
 - None of the above

SECTION B: Short Answer Questions (40 Marks)

- State any three biological effects of ionizing radiations [6 Marks]
- Show the difference between the following terms: Radiation, ionising radiation, radionuclide and radioactivity [4 marks]
- State the exponential decay law [2 marks]
- State any three medical uses of radioisotopes [3 marks]
- By stating the type of radioisotopes used, describe the principle of operation of MRI [6 Marks]
- Distinguish between autoradiography and an autoradiograph [4 marks]
- Beta decay occurs in two ways, state and explain the two ways [4 marks]
- Differentiate between scintillation and liquid scintillation counting[4 marks]
- Outline the disadvantages of the Geiger Muller counters [4 marks]
- Give any 3 radionuclides and their medical applications [3 Marks]

SECTION C: Long Answer Questions (60 Marks)

- Describe:
 - Radioimmunoassay [2 marks]
 - The principle of action of RIA [18 marks]
- Radioactive materials are used in a myriad of places. Explain how the personnel who work in those places can be protected from the radiations emitted from the materials [20 marks]
- Describe and outline the principle of action of the following radiation detectors and recorders
 - Geiger Muller counters [10 marks]
 - Thermoluminescent dosimeter [10 marks]