(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS
2019/2020 ACADEMIC YEAR

THIRD YEAR SECOND TRIMESTER EXAMINATIONS

FOR DIPLOMA IN
MEDICAL BIOTECHNOLOGY
MAIN EXAM

COURSE CODE: BBD 325

COURSE TITLE: RADIONUCLIDE Technology

DATE: 11ᵀᴴ DECEMEBR 2020   **TIME**: 8.00 -10.00 AM

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**). Attempt all the questions
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. Spontaneous nuclear transmission:
A. Occurs as a result an external force
B. Occurs due to being bombarded by another particle
C. Occurs naturally
D. All of the above

2. Which one of the following is a property of gamma rays?
A. They cannot penetrate the skin
B. They are more penetrative than X-rays
C. They are less penetrative than X-rays
D. They cannot penetrate wood and paper

3. Radioactivity is also referred to all of the following except:
A. Radioactive decay
B. Nuclear decay
C. Radioactive disintegration
D. Radioisotope

4. Radionuclides attempt to reach through all of the following mechanisms except
A. Ejecting neutrons and protons
B. Converting one radionuclide to another with ejection of a beta particle or positron
C. Gaining neutrons and protons
D. Release of additional energy by a photon

5. SPECT stands for
A. Single photon emission computed tomography
B. Spaced photon computed tomography
C. Singular photon computed tomography
D. Single photon computerised topography

6. One sievert is 1,000 millisieverts (mSv) and one millisievert is_____microsieverts
A. 100
B. 1000
C. 1010
D. 10000

7. With reference to radioactive materials. D value refers to:
A. The quantity of radioactive material which is considered a dangerous source
B. The quantity of radioactive material considered safe
C. The quantity of radioactive material considered inactive
D. The quantity of radioactive material remaining

8. All the following are expressed in are expressed in sieverts (Sv) except:
A. Equivalent dose
B. Effective dose,
C. Committed equivalent dose
D. Radioactive decay

9. Which one of the following is an advantage of the Geiger Muller counter?
A. Energies can be measured by it as it has differentiating abilities.
B. It can detect uncharged particles like Neutrons.
C. It has high sensitivity

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D. It is more efficient due to the large paralysis time limits and large dead time.

10. All the following refer to the thermoluminescent dosimeter except:
A. It is annealed at a high temperature after the TLD reader reads the emitted light
B. It is not applicable to situations where real-time information is not needed
C. It measures exposure to radiation
D. It applicable to situations where real-time information is not needed

11. Beta counters:
A. Have the sample dissolved (or uniformly distributed) in a liquid scintillant
B. Measure gamma radiations
C. Are divided into two categories
D. None of the above

12. About radioactive material waste management,
A. They should be disposed together with other materials
B. They should be disposed of by authorised personel
C. They can be disposed of by anyone
D. All of the above

13. An alpha-particle consists of:
A. one proton and two neutrons
B. two protons and one neutron
C. two protons and two neutrons
D. one proton and one neutron

14. What is detected during positron emission tomography (PET)?
A. Positrons
B. Electrons
C. Neutrons
D. Photons

15. The half-life period of a radioactive substance is best determined by counting the number of alpha particles emitted per second in a Geiger Muller counter from its known quantity. If the half-life period of a radioactive substance is one month, then
A. It will completely disintegrate in two months
B. 1/8th of it will remain intact at the end of four months
C. 3/4th of it will disintegrate in two months
D. It will completely disintegrate in four months

16. A radioactive isotope undergoes decay with respect to time following _____ law
A. logarithmic
B. exponential
C. inverse square
D. linear

17. What activities are not allowed in the Nuclear Medicine Lab where radioactive materials are used or stored?
A. Eating and Drinking
B. Applying lipstick or makeup
C. Storage of personal effects
D. All of the above

18. Particles that are helium nuclei are called:
A. alpha particles

B. beta particles
C. gamma particles
D. There are no particles that are helium nuclei.

19. Radioactive particles give off
A. waves
B. rays
C. energy
D. light

20. Electron Emission involves the ejection of:
A. a beta-minus particle
B. an alpha-particle
C. a beta-plus particle
D. a proton and two neutrons

SECTION B: SHORT ANSWER QUESTIONS (40 MARKS)

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

SECTION C: LONG ANSWER QUESTIONS (60 MARKS)

1. Describe:
   a. Radioimmunoassay   [2 marks]
   b. The principle of action of RIA   [18 marks]
2. 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]
3. Describe and outline the principle of action of the following radiation detectors and recorders
   a. Geiger Muller counters   [10 marks]
   b. Thermoluminescent dosimeter   [10 marks]

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