



(University of Choice)

UNIVERSITY EXAMINATIONS
2018/2019 ACADEMIC YEAR
FIRST YEAR, SECOND TRIMESTER EXAMINATIONS
FOR THE DIPLOMA
OF
DIPLOMA OF MEDICAL BIOTECHNOLOGY/LABORATORY SCIENCES
COURSE CODE: BBD 121
COURSE TITLE: PHYSICS FOR BIOMEDICAL TECHNOLOGY
MAIN EXAMINATION

DATE: 20TH MAY 2019

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**).
ANSWER ALL QUESTIONS.

TIME: 2 HOURS

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 6 Printed Pages. Please Turn Over.

SECTION A

MULTIPLE CHOICE QUESTIONS (20 MARKS)

1. Which of the following types of radiation has the least penetrating ability?
 - (A) Gamma rays
 - (B) Alpha rays
 - (C) Beta rays
 - (D) X- rays
2. Which one of the following is a derived quantity?
 - (A) Velocity
 - (B) Mass
 - (C) Length
 - (D) Temperature
3. Choose the statement that best describes radioactive decay.
 - (A) Gamma decay results in transmutation
 - (B) Beta decay involves the emission of an electron
 - (C) Alpha decay does not change the parent nuclide
 - (D) Radioactive decay has no effect on the energy of a nuclide
4. Newton's first law of motion is also referred to as
 - (A) Inertia
 - (B) Friction
 - (C) Tension
 - (D) Toque
5. The binding energy of a nucleus
 - (A) Holds electrons in their position
 - (B) Is emitted during a radioactive decay
 - (C) Must be supplied to separate a nucleus into individual protons and neutrons
 - (D) Is lost when a nucleus is in an excited state
6. The temperature of an object is determined by
 - (A) Particles in matter
 - (B) Amount of heat
 - (C) Direction of heat transfer
 - (D) Volume of the object

7. Radioisotopes
- (A) Have the same mass numbers and proton numbers
 - (B) Have a stable nuclei
 - (C) Do not emit energy when they undergo radioactive decay
 - (D) Are naturally decaying atoms
8. Reactions that are caused by a collision between a nucleus and another particle are known as
- (A) Induced nuclear reactions
 - (B) Transmutations
 - (C) Spontaneous nuclear reactions
 - (D) Radioactive decay
9. The electromagnetic spectrum consists of six named regions. Which of the following is not part of the spectrum?
- (A) Sound waves
 - (B) Infrared
 - (C) Ultraviolet waves
 - (D) Microwaves
10. Which of the following statements best describes the critical angle?
- (A) It is more than 90°
 - (B) It is less than 90°
 - (C) It is an angle of incidence
 - (D) It is an angle of refraction
11. Which of the following statements best describes Kirchoff's law?
- (A) The current arriving at a junction is similar to the current leaving
 - (B) The force between two charged objects is directly proportional to the charge on each on them
 - (C) The force between charged objects varies inversely with the square distance between the two objects
 - (D) The magnitude of the induced emf around a loop is equal to the rate of change of the magnetic flux through the loop
12. The collision between a photon and an electron is responsible for
- (A) Photoelectric effect
 - (B) Compton Scattering
 - (C) X-ray Production

(D) Bremsstrahlung effect

13. The force that measures the pull on a given mass by gravity is known as

- (A) Gravity
- (B) Friction
- (C) Magnetism
- (D) Weight

14. Which of the following properties of matter will determine whether an object will sink or float?

- (A) Volume
- (B) Mass
- (C) Density
- (D) Weight

15. The law of conservation applies to all the following except

- (A) Energy
- (B) Momentum
- (C) Electric charge
- (D) Mass

16. Which of the following is an example of a semiconductor?

- (A) Boron
- (B) Arsenic
- (C) Silicon
- (D) Glass

17. The process of electrifying by friction is described as

- (A) Electrocution
- (B) Discharging
- (C) Earthing
- (D) Charging

18. Potential difference

- (A) Is the opposition to the passage of current
- (B) Is the amount of electrical energy transformed into other forms when unit charges pass from one point to the other.
- (C) Is defined according to the magnetic effect of current
- (D) Is the ability of an object to store charge

19. Which property of sound is applied in the ultrasound technology?

- (A) Reflection
- (B) Doppler effect
- (C) Refraction
- (D) Interference

20. The period of a wave describes

- (A) The number of vibrations per unit time
- (B) The distance from the midpoint to the crest/trough
- (C) The distance from the top of one crest to the top of the next one
- (D) Time taken for one complete vibration to occur.

SECTION B

SHORT ANSWER QUESTION (40 MARKS)

1. a) Give a brief description of the three types of radioactive decay. (6 marks)
b) Differentiate between nuclear fission and nuclear fusion. (4 marks)
2. a) State Kirchoff's first Law. (2 marks)
b) Briefly describe the components of a capacitor and mention different types of capacitors. (4 marks)
3. A current of 10A flowing through an electric heater for an hour converts 8.64 MJ of electrical energy into heat energy. Calculate:
(a) The total charge circulated through the heater. (3 marks)
(b) The potential difference across the heater. (2 marks)
4. Reflection of light occurs when light waves bounce off surfaces. Explain the phenomenon of total internal reflection and its application in medical imaging. (4 marks)
5. a) What is acceleration? (2 marks)
b) A net force of 16 N causes a mass to accelerate at a rate of 5m/s^2 . Determine the mass of the object. (3 marks)
6. a) What is the difference between work, energy and power? (3 marks)
b) State the law of conservation of energy. (2 marks)

7. A 500g physics book falls from a table and hits the ground at a speed of 12 m/s. How high is the table from the ground? (5 marks)

SECTION C

LONG ANSWER QUESTIONS (40 MARKS)

1. a) Define the specific heat capacity of an object. (2 marks)
- b) A hot water tank contains 160kg of cold water at 20°C. Calculate
- i) the quantity of heat required to raise the temperature of water to 60°C in Joules. (4 marks)
 - ii) the time this will take using a 5kW electric immersion heater. (4 marks)
- (shc of water = 4200J/kgK)
2. Describe the following properties of sound and elaborate on a few of their applications. Resonance, refraction, Doppler Effect, Interference. (15 marks)
3. Describe the photoelectric effect and Compton scattering with respect to the loss of electrons and protons. (15 marks)