110

(University of Choice)

MASINDEMULIROUNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN EXAMINATION

UNIVERSITY MAIN EXAMINATIONS

2021/2022 ACADEMIC YEAR

FIRST YEARSECOND **SEMESTER**

COURSE CODE: BML 124

COURSE TITLE: PHYSICS FOR BIOMEDICAL LABORATORY SCIENCES

DATE: 21/04/2022 **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**. **DO NOT WRITE ON THE QUESTION PAPER.**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 5 Printed Pages. Please Turn Over

SECTION A: MULTIPLE CHOICE QUESTIONS

1) Which of the following is not a basic physical quantity?
   A) Mass (M)
   B) Temperature (θ)
   C) Time (T)
   D) None of the above

2) Device that is used to store charge, is named as
A) Capacitor
   B) Resistor
C) Transistor
   D) Diode

3 Heat is measured in
   A) Joules
   B) Calories
   C) Both a and b
   D)Juole/second

4) Which physical quantity is described by the expression **Q/t.**
   (A) Current (B) pressure (C) mass (D) Density.

5) In the Fleming's right-hand rule the fingers always point the direction what?
   (A) Magnetic field (B) current. (C) Thumb. (D) Third Finger.

6) A potential difference across a lump is 12 volts. How many joules of electrical energy are changed to heat when a charge of 5 coulombs passes through it?
   (A) 60J (B) 06J (C) 0.6J (D) 6.6J

7) The circuit in which current has a complete path to flow is called _____ circuit.
   A) short
   B) open
   C) closed
   D) open loop

8) When do we say that a magnetic material is in a saturated state of magnetism.
   (A) When all the dipoles are aligned toward one direction
   (B) When all the domains are aligned toward one direction.
   (C) When all the dypoles are aligned toward one direction.
   (D) When the domeins are aligned toward one direction.

9) Electromagnetic waves are classified by range of frequencies and wave length. Which wave is not among the last four in terms of wavelengths?
   (A) Ultraviolet Light (B) X-Rays (C) Microwaves (D) Infrared Light.

10) In photoelectric effect, electrons should be removed from the
   A) Inner shells
   B) Surface
   C) From core
   D) The nucleus

11) Which of the following term define by the statement "a natural tendency of an object to maintain a state of rest or maintain a uniform motion in straight line".
   A)Inartia (B) Inertia (C) Enartia (D)Enertia

12) Pauli's exclusion principle states that
(A) Nucleus of an atom contains no negative charge
(B) Electrons move in circular orbits around the nucleus
(C) Electrons occupy orbitals of lowest energy
(D) All the four quantum numbers of two electrons in an atom cannot be equal

13) What is the S.I unit for force
A) Newton
B) Kilograms
C) Electronic motive force
D) Both a and b

14) Bar of iron 2 cm × 2 cm having area 4 cm^2 and resistivity of 11 × $10^{-8}\Omega$ meter will have resistance of
A) 2.1 × 10^{-4} Ω
B) 3.1 × 10^{-4} Ω
C) 4.1 × 10^{-4} Ω
D) 1.1 × 10^{-4} Ω

15) Product of voltage and current is known as
A) Work done
B) Power
C) Velocity
D) Acceleration

16) Every action has an equal and opposite reaction" is Newton's
A) First law
B) Second law
C) Third law
D) Fourth law

17) Ability of capacitor to store charge depends upon
A) Area of plates
B) Distance between plates
C) Type of dielectric used
D) All of above

18) According to the first law of thermodynamics, if work is done in a system then;
(A) The internal energy of the system must change.
(B) Heat must be transferred from the system.
(C) Both of the above.
(D) Heat is transferred to the system

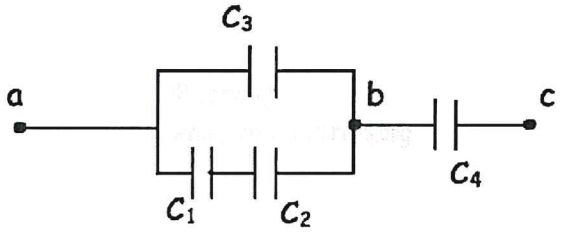
19) "Sum of all currents meeting at a point is zero", stated law is
A) Kirchhoff's first rule
B) Kirchhoff's third rule
C) Kirchhoff's fourth rule
D) Kirchhoff's second rule

20) Normal human body's temperature is
A) 30 °C
B) 37 °C
C) 42 °C
D) 32 °C

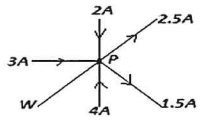
SECTION B (40 MARKS)

1. State three factors affecting resistance of resistors. (3 Marks)

2. A 1 kg ball moving at 12 m/s collides head on with 2 kg ball moving with 24 m/s in opposite direction. What is the velocity after collision if the two balls got stuck together? (5 Marks)
3. State three laws of thermodynamics. (3 Marks)
4. In the circuit given below, C1=40μF, C2=30 μF, C3=12 μF and C4=16 μF. If the potential difference between points a and b Vab= 120V find the effective capacitance of capacitors. (5 Marks)



5. State and explain the factors that affect the magnitude of induced EMF in a transformer. (5 Marks)
6. What is the equivalent resistance of three resistors (1.0Ω, 2.0Ω and 3.0Ω) when they are connected in series. (3 Marks)
7. State three laws of thermodynamics. (3 Marks)
8. Find the energy of x-rays whose wavelength is 2.0×10^{-10} m in a vacuum ($c=3.0\times10^{8}$m/s $h=6.63\times10^{-34}$Js) (3 Marks)
9. State the following laws as applied in physics (3mks)
   a) Ohms law
   b) Kirchhoff's laws of current
   c) Basic law of magnetism
10. State three factors affecting heating effect of an electric current. (3 Marks)
11. The circuit in the figure below shows the current at junction P. Find the amount and direction of the current that passes through the wire W.(3mks)



12. By the help of a diagram explain the following :

i) The magnetic domains theory (2mks)

ii)Flemings right hand grip rule (2mks)

SECTION C(40marks)

1. Explain the following categories of instruments as used in measurements
i) Analogue and digital instruments (2mks)
ii) Electrical and electronic instruments (2MKS)
iii) Absolute and secondary instruments (2mks)
2. State any four factors that affect selection of the instruments used in measurements (4mks)
3. By giving examples explain the following types of errors made in measurements

i) Systematic errors (4mks)
ii) Random errors (2mks)

4) a) State any four forces that apply in the preparation of specimens for laboratory investigations (4mks)

b) Explain how each of the forces in part (a) apply (4mks)

5)a) i) State four characteristics of waves (4mks)
ii) Briefly explain any three properties of waves (6mks)
iii) Distinguish between mechanical and electromagnetic waves (2mks)
iv) a) Arrange theelectromangnetic waves spectrum according to increasing frequency (2mks)

b) Outline the application of the following electromagnetic waves (4mks)
i) Radio waves
ii) X- rays
iii) Ultra-violet
iv) Visible spectrum