



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

MAIN EXAMINATION

UNIVERSITY MAIN EXAMINATIONS

2019/2020 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER

COURSE CODE BML 124

COURSE TITLE PHYSICS FOR BIOMEDICAL LABORATORY SCIENCES

DATE: 9TH DECEMBER 2020

TIME: 2.00 - 4.00PM

INSTRUCTIONS TO CANDIDATES

Attempt question **ONE (1)** and **ANY THREE (3)** other questions
Read additional instructions under various sections

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 5 Printed Pages. Please Turn Over.

QUESTION ONE (20 MARKS)

- 1) 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

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

- 3) 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) Inertia (B) Inertia (C) Enertia (D)Enertia

- 4) Identify an odd one out description of inelastic collision among the following statement.
 - (A) The momentum is conserved while Kinetic Energy is not conserved
 - (B) The total mass is the sum of the masses of the individual bodies.
 - (C) The momentum is not conserved while the kinetic energy is conserved.
 - (D) The bodies end up moving with a common velocity.

- 5) If 0.6 C charge passes through a wire in 12 s, then current flowing through wire is
 - A) 70 mA
 - B) 60 mA
 - C) 50 Ma
 - D) 25 mA

- 6) The number of electrons which can be accommodated in an orbital is
 - (A) One
 - (B) Two
 - (C) Three
 - (D) Four

- 7) Formula written as $V=(Q/t)$ is of
 - A) Acceleration
 - B) Work done
 - C) Power
 - D)Velocity

- 8) EMF is an abbreviation of
 - A) Electromotive force
 - B) Electrical motive force
 - C) Electronic motive force
 - D) Both a and b

- 9) SI unit of conductivity of material is
 - A) Ω m
 - B) Ω
 - C) $\Omega^{-1}\text{m}$
 - D) $\Omega^{-1}\text{m}^{-1}$

- 10) The number of electrons which can be accommodated in an orbital is
 - (A) One
 - (B) Two
 - (C) Three
 - (D) Four

- 11) Ohmic devices are devices that consequently
 - A) Obey Ohm's law

- B) Doesn't obey Ohm's law
 C) Violate Ohm's law
 D) Satisfy Ohm's law
- 12). What is the value of capacitance of a capacitor which has a voltage of 4V and has 16C of charge?
 A) 2F
 B) 4F
 C) 6F
 D) 8F
- 13) "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
- 14) Bar of iron $2\text{ cm} \times 2\text{ cm}$ having area 4 cm^2 and resistivity of $11 \times 10^{-8}\Omega$ meter will have resistance of
 A) $2.1 \times 10^{-4}\Omega$
 B) $3.1 \times 10^{-4}\Omega$
 C) $4.1 \times 10^{-4}\Omega$
 D) $1.1 \times 10^{-4}\Omega$
- 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) Normal human body's temperature is
 A) 30°C
 B) 37°C
 C) 42°C
 D) 32°C
- 18) 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
- 19) The electrons would go to lower energy levels first and then to higher energy levels according to which of the following
 (A) Aufbau principle
 (B) Pauli's exclusion principle
 (C) Hund's rule of maximum multiplicity
 (D) Heisenberg's uncertainty principle
- 20) The following are factors that affect pressure in liquid, which one is not.
 (A) Density of the liquid.
 (B) Gravitational force acting on the liquid.
 (C) Volume of the liquid.
 (D) Column height of the liquid.

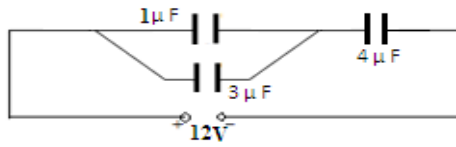
QUESTION TWO (40 MARKS)

- a) State and explain the factors that affect the magnitude of induced EMF in a transformer. (5 Marks)

b) State three laws of thermodynamics.

(3 Marks)

c) In the circuit below $C_1 = 4\mu\text{F}$, $C_2 = 3\mu\text{F}$ and $C_3 = 1\mu\text{F}$. Given that 12v, calculate:



i) The combined capacitance (3mks)

ii) The total charge (2mks)

d) Find the energy of x-rays whose wavelength is 2.0×10^{-10} m in a vacuum ($c=3.0 \times 10^8 \text{m/s}$ $h=6.63 \times 10^{-34} \text{Js}$)
(3 Marks)

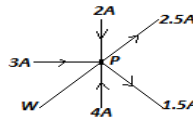
e) State three applications of heating effect of an electric current .

(3 Marks)

f) State the following laws as applied in physics (3mks)

- a) Fleming's right hand grip rule
- b) Newton's first law of motion
- c) Basic law of electrostatics

c) 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)



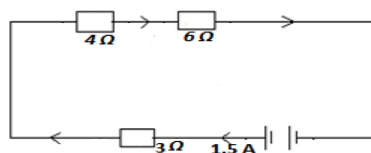
d) By the help of a diagram explain the following :

i) The magnetic domains theory (3mks)

ii) State three factor that affect resistance (3mks)

iii) State three properties of waves (3mks)

I) The figure below shows 3 resistors in series connected to power source. A current of 1.5A flow through the circuit.



Calculate:

- a) The total resistance (3mks)
- b) The voltage across the source (3mks)

QUESTION THREE (40 MARKS)

1) Here is a diagram of the electromagnetic spectrum:

Radio waves	P	Infrared	Visible	Ultra violet	Q	Gamma rays
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- a) What are the missing parts of the electromagnetic spectrum labeled P and Q? (2 marks)
- b) Give the order of arrangement of the radiation according to the increasing wavelength (2 mark)
- c) Explain the hazards of the following electromagnetic waves and outline how the effects are minimized (6Mks)
 - i) X-rays
 - ii) Infrared
 - iii) Microwaves
- d) Give two use for infrared and radio waves (4 mark)
- e) Name two detectors of visible light and gamma radiation. (4 marks)
- f) A student designed a transformer to supply a current of 30A at a potential difference of 80V to a motor from an a.c. mains supply of 240V. If the efficiency of the transformer is 80%, calculate:
 - i) The power supplied to the transformer. (6 Marks)
 - ii) The current in the primary coil. (4 Marks)
- g) The minimum frequency of light that will cause photoelectric emission from potassium surface is 5.37×10^{14} Hz. When the surface is irradiated using a certain source photoelectrons are emitted with a speed of $7.9 \times 10^5 \text{ms}^{-1}$ calculate
 - (a) Work function of potassium. (3mks)
 - (b) Maximum K.E of the photoelectrons.(3nks)
 - (c) The frequency of the source of irradiation(4mks)
- h) Define the following physical quantities (2marks)
 - i) pressure
 - ii) Electric current