DESHA EXAMINATION BOARD

2024 MSCE MOCK EXAMINATION

PHYSICS

Friday, 22nd March 2024 **Subject Number: M164/I**

Time allowed: 2 hours
08:00 – 10:00 am

PAPER I

(100 marks)

Theory

Instructions

1. **This paper contains 15 printed pages. Please check.**
2. Firstly, write your **Full Name** in the spaces provided at the top of every page of the question paper.
3. This paper has **two** sections, **A** and **B**. in section **A** there are **11** short answer questions while in Section **B** there are **three** essay questions.
4. Answer **all** the **thirteen** questions in the spaces provided.
5. Use of electronic calculators is allowed
6. In the table provided on this page, **tick** against the number of the question you have answered.
7. Hand in your completed question paper when time is called to stop writing.

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12 & 13			
14 &15			

SECTION A - (70 marks)

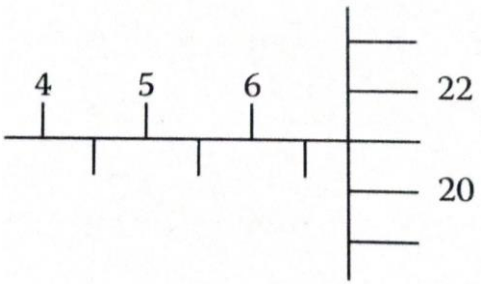
Answer all questions in this section in the spaces provided.

1. a. Explain how parallax errors can be minimized

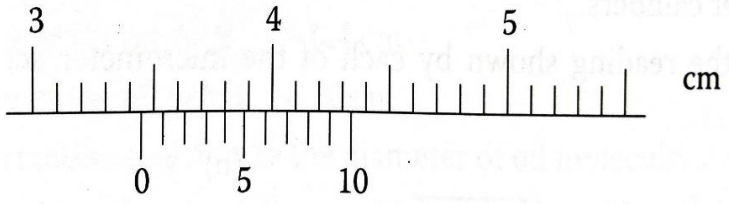
_____

_____ **(1 mark)**

b. Figure 1 below shows a micrometer screw gauge and a vernier caliper. Give the values shown by the two instrument scales.



(a)



(b)

Micrometer screw-gauge reading (a):

(2 marks)

Vernier caliper reading (b):

(2 marks)

2. a. Explain how the density of water changes as temperature increases from $0^{\circ}C$ to $4^{\circ}C$.

_____

_____

_____

_____

_____

_____ **(2 marks)**

b. Briefly describe how fish survive in frozen waters

_____

_____

_____

_____

_____

_____ **(3 marks)**

c. Describe how two stuck tumblers can be separated using principles of thermal expansion and contraction.

_____

_____

_____

_____

_____ **(2 marks)**

3. a. Differentiate between **distance** and **displacement**.

_____

_____

_____

_____ **(2 marks)**

b. A truck delivering supplies to a construction site is late with delivery. The truck covered the first 10,000 metres of the trip in 600 seconds. How much time does the truck have to cover the remaining 4000 metres so that its average velocity is 20 metres per second.

(4 marks)

c. A body is thrown vertically upwards with initial velocity of 20m/s. Given that the gravitational acceleration (g) = 10m/2s. Workout the maximum height (H) reached by the body above the starting point.

(4 marks)

4. a. Differentiate between *Ohmic conductors* and *non-ohmic conductors*

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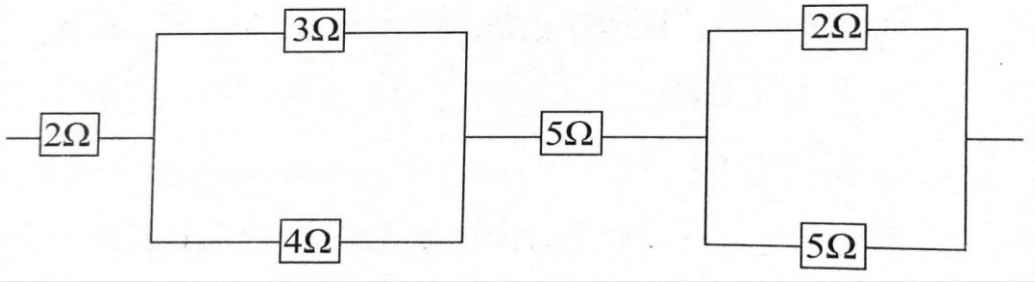
_____

_____

_____ **(2 marks)**

b. Figure 2 below is a circuit diagram.



i. Calculate the equivalent resistance in the circuit.

(3 marks)

ii. List **two** factors affecting the efficiency of a transformer

_____

_____

_____ **(2 marks)**

5. a. State the <u>two</u> assumptions made in the kinetic theory of gases.

_____

_____

_____

_____

_____ **(2 marks)**

b. Explain the importance of each of the following features in a liquid in glass thermometer.

i. **Constriction**

_____

_____ **(1 mark)**

ii. **The thin capillary tube with uniform cross-section**

_____

_____ **(1 mark)**

c. A gas occupies a volume of $2m^3$ when its pressure is 1140 mmHg and its temperature is 27˚C. What volume would it occupy at standard temperature and pressure (0˚C and 760 mmHg)?

(3 marks)

6. a. State the law of conservation of linear momentum

_____

_____ **(1 mark)**

b. Explain the difference between **elastic** and **inelastic** collision.

_____

_____

_____

_____ **(2 marks)**

c. What is the use of a crumple zone of a car in times of a collision?

_____

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_____

_____ **(2 marks)**

7. a. Why is an object moving at uniform speed in a circular path of constant radius is said to be accelerating?

_____

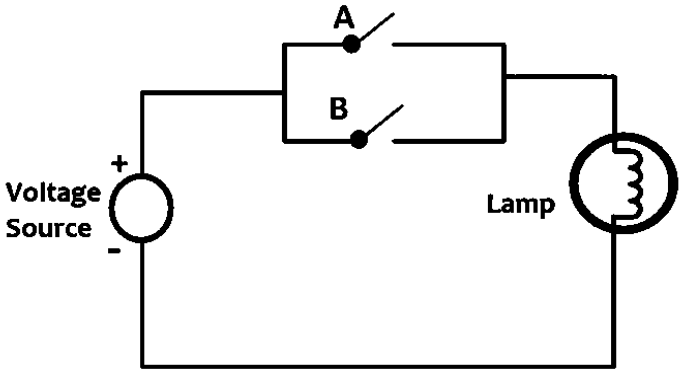
_____ **(1 mark)**

b. A giant wheel of radius 40m is rotating about the axis at a frequency of 5Hz. Calculate:

i. Angular velocity in radians/second

(3 marks)

8. a. Figure 3 below is a diagram of a type of logic gate.



i. Identify the type of logic gate

_____ **(1 mark)**

ii. Draw the truth table of the logic gate.

(3 marks)

9. a. State any **two** similarities between a camera and a human eye.

_____

_____

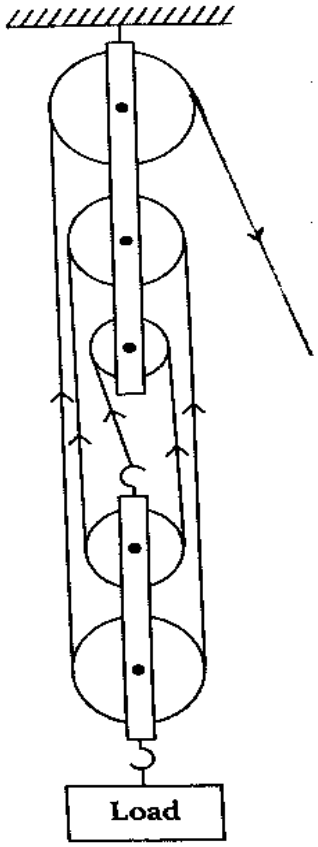
_____

_____ **(2 marks)**

b. An object 2cm high is placed 8cm away from the converging lens of focal length 2cm. Using the lens formula, calculate (i) the image distance **(v)** and (ii) magnification of the image formed.

(4 marks)

10. **Figure 4 below** is a diagram of a pulley system being used to lift a 20kg mass through a vertical height of 2m when an effort of 50N is applied.



Find:

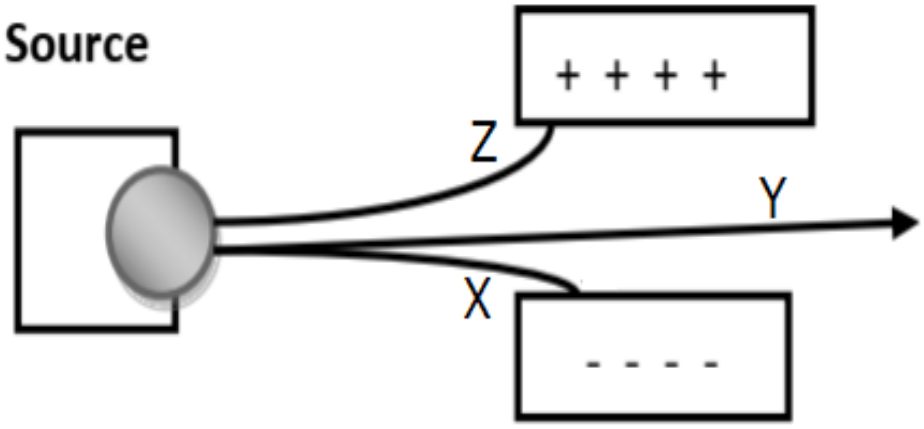
i. The Efficiency of the machine.

(3 marks)

ii. Work input

(3 marks)

11.a. Figure 4 is a diagram showing radiation passing through an electric field.



i. Name the particles taking paths X, Y and Z within an electric field.

X: _____ **(1 mark)**

Z: _____ **(1 mark)**

ii. Explain why particle Z will deflect towards the positive plate of the electric field

_____

_____

_____ **(1 mark)**

b. When Thorium -230 nucleus decays it emits radiation and changes into Radium -226.

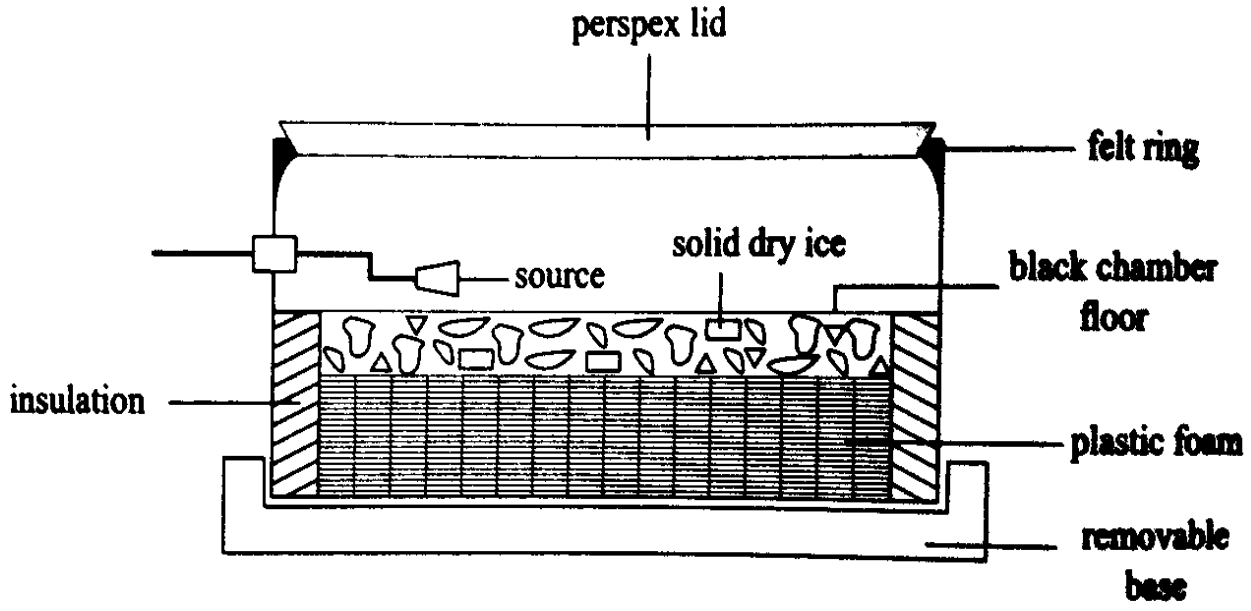
$$^{230}_{90}Th \rightarrow ^{226}_{88}Ra + \square$$

i. Complete the equation by filling the box **(1 mark)**

ii. What type of radiation particle is emitted by Thorium -230 in the reaction above?

_____ **(1 mark)**

c. Figure 5 below shows a detector of radiation.



i. Identify the instrument

_____ **(1 mark)**

ii. How does the instrument work to measure presence of radiation?

_____

_____

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_____ **(3 marks)**

SECTION B (30 marks)

12. Describe an experiment that could be done in order to calibrate a spring balance

(10 marks)

13. Describe an experiment that could be conducted to determine acceleration due to gravity of an area.

(10 marks)

14. With the aid of a labelled diagram, describe an experiment that could be conducted in order to verify the principle of moments of more than two forces in levers.

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_____ **(10 marks)**

END OF QUESTION PAPER

This paper contains 15 printed pages.