



EXAMINATION NO.: \_\_\_\_\_  
**THE MALAWI NATIONAL EXAMINATIONS BOARD**

2024 MALAWI SCHOOL CERTIFICATE OF EDUCATION EXAMINATION

# PHYSICS

Subject Number: M164/I

Monday, 15 July

Time Allowed: 2 hours  
8:00 – 10:00 am

## PAPER I

(100 marks)

### Instructions

1. This paper contains 12 printed pages. Please check.
2. Write your **Examination Number** at the top of each page of this question paper.
3. This paper contains **two** sections: A and B. In **Section A** there are ten short answer questions while in **Section B** there are **three** restricted essay questions.
4. Use of scientific calculators is allowed.
5. The maximum number of marks for each answer is indicated against each question.
6. In the table provided on this page, tick against the number of the question you have answered.
7. Hand in your paper to the invigilator when time is called to stop writing.

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
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10			
11			
12			
13			



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Turn over



## Section A (70 marks)

Answer all the ten questions in this section in the spaces provided.

1. a. Give any two sources of zero errors.

\_\_\_\_\_  
\_\_\_\_\_  
(2 marks)

- b. State any two methods of communicating results from an experiment.

\_\_\_\_\_  
\_\_\_\_\_  
(2 marks)

- c. Figure 1 shows a graph of frequency against length of pendulum.

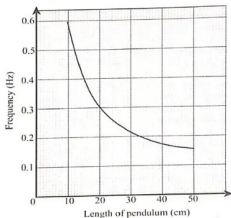


Figure 1

- (i) State the relationship between frequency and length of pendulum.

\_\_\_\_\_  
(1 mark)

- (ii) Find the frequency when the length of the pendulum was 25 cm.

\_\_\_\_\_  
(1 mark)

Continued/...

2. a. Define the term 'absolute zero temperature'.

(1 mark)

- b. Calculate the pressure exerted when hydrogen gas of volume  $8 \text{ cm}^3$  exerts a pressure of 6 atm at  $27^\circ\text{C}$  given that its volume is doubled and heated to  $127^\circ\text{C}$ .

(5 marks)

- c. Give the **three** factors that affect liquid pressure.

(3 marks)

3. a. **Figure 2** shows diagrams X, Y and Z illustrating the arrangement of particles in three states of matter.



X



Y



Z

**Figure 2**

- (i) Identify the state of matter which has the highest density.

(1 mark)

- (ii) Give a reason for the answer in a (i).

(1 mark)

- b. Why are gaps left between panels when constructing a brick fence?

(1 mark)



Continued/...

4. a. Explain the energy-work theorem.

(2 marks)

- b. Figure 3 is a graph showing behaviour of water as the temperature changes from  $0^{\circ}\text{C}$  to  $10^{\circ}\text{C}$ .

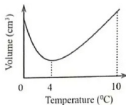


Figure 3

- (i) Name the behaviour of water shown in the graph.

(1 mark)

- (ii) Give any two problems caused by this behaviour of water.

(2 marks)

- c. Why is it that an object falling in a vacuum does not reach its terminal speed?

(3 marks)

Continued/...



5. a. Mention any **two** factors that affect the terminal velocity of an object falling into a fluid.

(2 marks)

- b. Calculate the force required to stretch a spring through a distance of 0.25 m if it has a constant of 200 N/m.

(3 marks)

- c. **Figure 4** shows a block being pulled by a force  $F$  on a smooth horizontal surface.

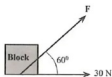


Figure 4

- (i) Calculate the force  $F$ .

(3 marks)

- (ii) Explain how force  $F$  could be affected if the surface used was rough.

(2 marks)



Continued/...

6. a. State any **two** applications of Hooke's law.

\_\_\_\_\_  
\_\_\_\_\_  
(2 marks)

- b. **Table 1** shows readings obtained by a student in an experiment on Hooke's law.

**Table 1**

Load (N)	Length of spring (cm)
0	17
90	27
X	24

- (i) Identify the actual length of the spring.

\_\_\_\_\_  
(1 mark)

- (ii) Calculate the value of X.

(3 marks)

- c. What is the difference between natural frequency and forced vibration?

\_\_\_\_\_  
\_\_\_\_\_  
(1 mark)



Continued/...

7. a. Define centripetal force.

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(1 mark)

- b. Calculate the centripetal force acting on a 2 kg ball which is moving at a uniform speed of 10 m/s in a circular path of radius 0.8 m.

(3 marks)

- c. How does potential difference differ from electromotive force?

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(1 mark)

8. a. Explain why there is poor electrical conductivity in insulators according to the Band theory.

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(2 marks)

- b. How does the AND logic gate operate in a circuit?

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(2 marks)

- c. How does change in temperature affect the speed of sound in air?

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(3 marks)

Continued/...



9. a. Table 2 shows power rating of different appliances.

Table 2

Appliance	Power rating
Television	210 W
Immersion heater	3 KW
Air conditioner	600 W

- (i) Which appliance consumes most power?

(1 mark)

- (ii) Explain the answer in a (i).

(2 marks)

- (iii) Calculate the amount of energy consumed by the air conditioner after switching it on for 5.5 hours.

(3 marks)

- b. State any two electrical safety measures.

(2 marks)



Continued/...



10. a. Give any **two** uses of ultrasonic sound waves.

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(2 marks)

- b. Calculate the frequency of a sound wave travelling at 375 m/s if it has a wave length of 2.5 m.

(3 marks)

- c. State any **two** properties of electromagnetic waves.

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(2 marks)



Continued/...

## Section B (30 marks)

Answer all the **three** questions in this section in an essay form in the spaces provided.

11. a. With the aid of well labelled diagrams, explain the difference in the spreading of waves passing through a narrow gap and a wide gap.

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(6 marks)

- b. Explain how Newton's first law of motion is applied when a car seat belt is in use.

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(4 marks)



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12. a. Explain in terms of the kinetic theory why an inflated balloon bursts when heated.

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(5 marks)

- b. Describe how a Geiger- Muller tube works during the detection of radiations.

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(5 marks)

Continued/...

