NAME.: _____ **EXAM NO.:** _____ **SHIFT.:** _____

KAMUZU BARRACKS COMMUNITY DAY SECONDARY SCHOOL

2023 MALAWI SCHOOL CERTIFICATE OF EDUCATION – FORM 3

PHYSICS

March, 2023

Subject Number: M164/I

Time Allowed: 2 hours

8:00 – 12:00 am

PAPER I

(100 marks)

Theory

Instructions

1. **This paper contains 11 printed pages. Please check.**

2. Write your **Candidate Name, Number** and **Shift** at the top of each page of the question paper.

3. This paper has **two** sections, **A** and **B**. In Section A there are four short answer questions while in Section B there are three essay questions.

4. Answer **all** the **eleven** questions in the spaces Provided.

5. Use of electronic calculators is allowed.

6. The maximum number of marks for each answer is indicated against each question.

7. In the table provided on this page, **tick** against the question number you have answered.

Question Number	Tick if answered	Do not write in these columns	
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
	Total		

Section A (70 marks)

Answer **all** question in this section.

1. a. **Figure 1** is a diagram of a measuring instrument with an error and has a scale ranging from **0kg** to **7kg**.

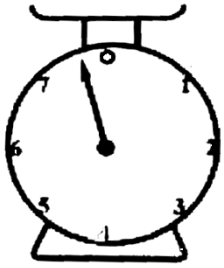

Figure 1

(i) Name the measuring instrument in **figure 1**.

_____

(1 mark)

(ii) Give the quantity that can be measured using the instrument in **figure 1**.

_____

(1 mark)

(iii) Identify the type of error demonstrated in **figure 1**.

_____

(1 mark)

(iv) Explain how the error in question **1a (iii)** could be minimized.

_____

_____

(2 marks)

b. Convert **2,500µm** to **m**.

(3 marks)

2. a. i. Define 'gas pressure'.

_____

_____

(1 mark)

ii. Give any **three** uses of gas pressure.

_____

_____

_____

(3 marks)

b. **Figure 2** is a diagram showing a balloon fitted to a bottle before heating.

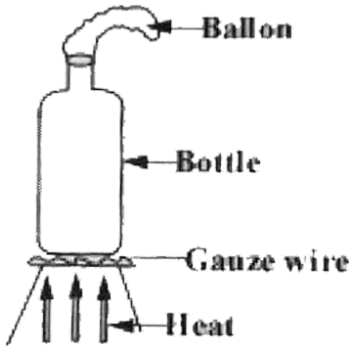

Figure 2

(i) What would happen to the volume of the balloon after heating?

_____

(1 mark)

(ii) Explain your answer in **2b (i)**.

_____

_____

_____

_____

_____

_____

_____

(5 marks)

3. a. Mention any **two** properties of a fluid that allow the Pascal's principle to hold.

_____

_____

(2 marks)

b. Explain why the walls of a dam are built thicker at the bottom.

_____

_____

_____

_____

(3 marks)

c. A beaker is filled with a certain liquid whose density is $1.5g/cm^3$ to a height of 11.5cm. Calculate the pressure exerted by the liquid at the bottom of the beaker in N/m^2. (Gravitational field strength = 9.8N/kg).

(4 marks)

4. a. Define 'thermometer'.

_____

_____

(1 mark)

b. Why do scientists prefer to use the Kelvin scale to the Degrees Celsius scale?

_____

_____

_____

(2 marks)

Continued/…

c. Convert 25 degrees celsius into kelvins

(3 marks)

d. The pressure in a constant volume gas thermometer is 755 mmHg at 0^{o}C of ice and 790 mmHg at 100^{o}C. Calculate the pressure at 28.6^{o}C.

(5 marks)

5. a. What is a 'manometer'?

_____

_____

(1 mark)

b. **Table 1** shows the results of an experiment that was carried out to demonstrate a certain gas law.

Pressure (Pa)	0.9	1.1	1.3	1.5
Temperature (^{o}C)	0	50	100	150

Table 1

(i) Plot a graph of pressure against temperature.

Continued/…

(6 marks)

(ii) Use the graph to find pressure of gas when temperature was at 120^{o}C

_____

(1 mark)

(iii) State and describe the gas law being demonstrated in the graph.

_____

_____

_____

(2 marks)

Continued/…

6. a. Name a thermometer that is used to measure very high temperatures.

_____

(1 mark)

b. State any **three** uses of expansion of solids in everyday life.

_____
_____
_____

(3 marks)

c. In terms of the kinetic theory of matter, explain what will happen when a solid is exposed to very high temperatures.

_____
_____
_____
_____
_____

(5 marks)

7. a. Give any **three** methods of presenting the findings of a scientific investigation.

_____
_____
_____

(3 marks)

b. Differentiate between a dependent and an independent variable.

_____
_____
_____

(2 marks)

c. A student measured the length of her book as 24.6 cm. Calculate the relative error in the measurement if the actual length of the book is 24.3 cm.

(3 marks)

Continued/…

8. a. Mention **two** factors to consider when selecting the appropriate instrument for measuring the volume of a given body.

_____

_____

(2 marks)

b. **Figure 3** is a hydraulic system used at Kamuzu Barracks garage to lift vehicles under repair.

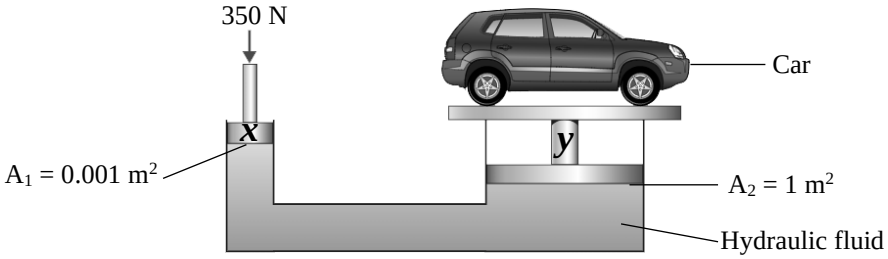

Figure 3

(i) Why is air **not** used as a hydraulic fluid.

_____

(1 mark)

(ii) Determine the pressure exerted by piston ***x*** on the fluid.

(2 marks)

Section B (30 marks)

9. a. With the aid of a diagram, describe how a clinical thermometer works.

_____
_____
_____
_____
_____
_____
_____

(6 marks)

b. Describe any **two** applications of pressure in fluids.

i_____
_____
_____
_____

ii_____
_____
_____
_____

(4 marks)

10. a. With the aid of a labelled diagram, derive the formula for calculating the pressure exerted by a liquid at the bottom of a container.

_____
_____
_____
_____
_____
_____

(6 marks)

Continued/…

b. **Figure 4** is a diagram of a solid building block resting on a bench.

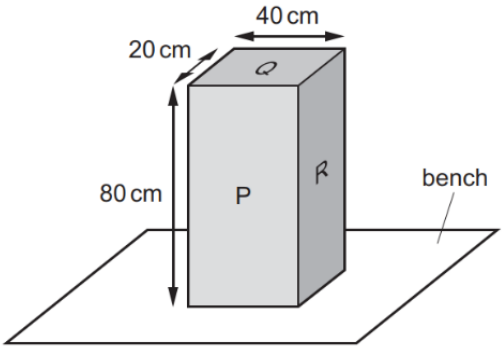

Figure 4

Calculate the maximum pressure that can be exerted by the block on the bench given that the density of the block is 3.5g/cm^3 and pull of gravity being 9.8N/kg

(4 marks)

11. a. Explain in terms of the kinetic theory of matter, why clothes dry faster on a sunny day than on a cloudy day.

_____
_____
_____
_____
_____
_____
_____
_____

(5 marks)

Continued/…

b. Explain how the decrease in temperature affects the molecular motion.

_____
_____
_____
_____
_____
_____
_____
_____

(5 marks)

END OF QUESTION PAPER

This paper contains 11 printed pages.