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Western Provincial Department of Education

අධ්‍යයන පොදු සහතික පත්‍ර (උසස් පෙළ) විභාගය, 2026

General Certificate of Education (Adv. Level) Examination, 2026

Final term Test - Grade 13

භෞතික විද්‍යාව II Physics II	01 E II

පැය තුනයි
Three Hours

අමතර කියවීම් කාලය - මිනිත්තු 10 යි
Additional Reading Time - 10 minutes

Use additional reading time to go through the question paper, select the questions and decide on the questions that you give priority in answering.

Important :

- *This question paper consists of **16** pages.*
- *This question paper comprises of **two** parts, Part **A** and Part **B**. The time allotted for **both parts** is **three hours**.*
- *Use of calculators is **not** allowed.*

PART A – Structured Essay:
(Page 2 – 8)

*Answer **all** the questions on this paper itself. Write your answers in the space provided for each question. Note that the space provided is sufficient for your answers and that extensive answers are not expected.*

PART B - Essay
(page 9 – 17)

*This part contains **six** questions, of which, **four** are to be answered.*

- *At the end of the time allotted for this paper, tie the **two parts together** so that **Part A is on top** of **Part B** before handling them over to the supervisor.*
- *You are permitted to remove **only Part B** of the question paper from the Examination Hall.*

Index Number : .....

For Examiner's use Only		
For the second paper		
Part	Question Number	Marks awarded
A	1	
	2	
	3	
	4	
B	5	
	6	
	7	
	8	
	9(A)	
	9(B)	
	10(A)	
	10(B)	
Total	In numbers	
	In words	

Code Numbers

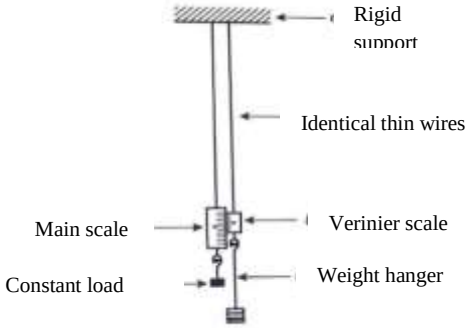
Marking Examiner 1	
Marking Examiner 2	
Marks Checked by	
Supervised by	

Part B – Structured Essay

*Answer **all four** questions on this paper itself.*

$g = 10\ N\ kg^{-1}$

1. A setup shown in the figure is arranged to determine the Young's modulus (Y) of steel in the form of a wire. The setup consists of two identical thin wires hung from the same rigid support, a main scale (M) calibrated in millimetres, alongside a vernier scale (V) attached to the other wire, and a set of 1/2 kg weights with a constant load.



(*a*) State the suitable measuring instruments used to measure the original length (*l*) and the diameter (d) of the wire correctly.

l ..... d - .....

(b) What procedure would you follow to eliminate random errors when taking readings for the diameter measurement?

.....

(c) If the mass of the suspended load is M, extension is e, initial length is *l*, and the diameter is d, derive an expression for Young's modulus (Y) using the given symbols.

.....

.....

(d) Rearrange the expression in (c) in a suitable form to plot a straight-line graph by taking mass (M) as the independent variable and extension (e) as the dependent variable.

.....

.....

(e) If the gradient obtained is m , how do you calculate the Young's modulus (Y) ?

.....

.....

(f) If the suspended mass is 3 kg, the diameter is 0.5 mm, and the gradient obtained from the graph is 0.5, calculate a value for Y. ($\pi = 3$)

.....

.....

(g) A student suggests that the accuracy of the experiment can be improved by using two wires. Do you agree with this ? Give reasons.

.....

.....

(h) State an error that can be minimized by taking two readings for the same weight while adding masses and removing masses.

.....

(i) Using the graph obtained in (d), Explain how to determine the elastic potential energy stored in the wire when a load is suspended.

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(ii) The following graph is provided to calculate the elastic potential energy stored per volume. From it, determine the elastic potential energy (E) stored per volume.

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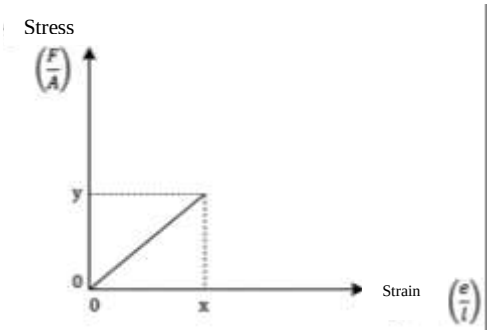
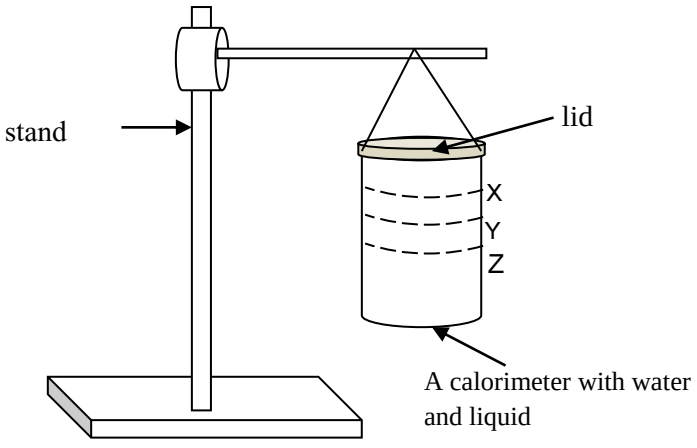
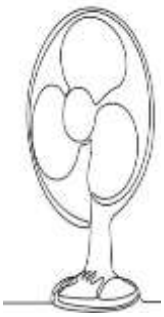


2. An experiment is planned in the school laboratory to determine the specific heat capacity of a liquid using the method of cooling. The experimental setup used for that is shown in the figure. It consists of a copper calorimeter with a lid, heated water or liquid, and a stand to hang the calorimeter setup. An experimental procedure similar to the standard method is performed by keeping the setup near an electric fan that provides air at a uniform speed throughout the experiment.



Electric fan



a) State the measuring instrument and the item, which are essential for the experiment but are not shown in the figure.

Measuring instrument - .....

item - .....

b) Give reasons for carrying out the following procedures during the experiment.

i) Using an electric fan that provides air at a uniform speed

.....

ii) Using a well-polished calorimeter

.....

iii) Performing the experiment with the calorimeter covered by a thermal insulating lid

.....

iv) The experiment is carried out by hanging the calorimeter using insulating threads

.....

c) At two different instances in this experiment, the same calorimeter is filled with equal volumes of the heated water and liquid, and temperatures are measured at equal time intervals.

i) It is important to use equal volumes of water and liquid in this experiment. What is the reason for that?

.....

.....

ii) To obtain more accurate results, up to which level among X, Y, and Z shown in the figure should the heated water or liquid be filled?

.....

iii) Give the reason for your answer in (ii).

.....

.....

d) What is the function performed using the item mentioned in part (a), and the experimental importance of carrying out that function.

Function.....

.....

Experimental importance - .....

.....

e) Write the relationship between the following quantities in a suitable form to calculate the specific heat capacity of the liquid using the specific heat capacity of water.

C_w = Specific heat capacity of water

C = Specific heat capacity of the calorimeter

m_1 = Mass of the empty calorimeter with stirrer

m_2 = Mass of the calorimeter with stirrer and water

m_3 = Mass of the calorimeter with stirrer and the liquid

t_w = The time taken to cool water within the range θ_1 to θ_2

t_l = The time taken to cool liquid within the range θ_1 to θ_2

.....

.....

f) $m_1 = 280\ g$, $m_2 = 480\ g$, $m_3 = 452\ g$, $C_w = 4 \times 10^3\ J\ kg^{-1}K^{-1}$ and $C = 4 \times 10^2\ J\ kg^{-1}K^{-1}$. At a certain temperature difference, the average rate of heat loss of the calorimeter with water was found to be $38\ J\ s^{-1}$. It is found that the average rate of temperature drop of the calorimeter with liquid in the same temperature difference was $5\ ℃\ min^{-1}$. Calculate the specific heat capacity of the liquid.

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g) Sketch the graphs showing the variation of temperature (θ) with time (t) expected for both the liquid and water.

3. The following items are provided to a student to design an experiment in the school laboratory to determine the frequency of a tuning fork using a sonometer.

A set of 500 g weights, the sonometer, a tuning fork of unknown frequency, a rubber pad

a) A diagram of the sonometer used in the experiment is shown in Figure 1.

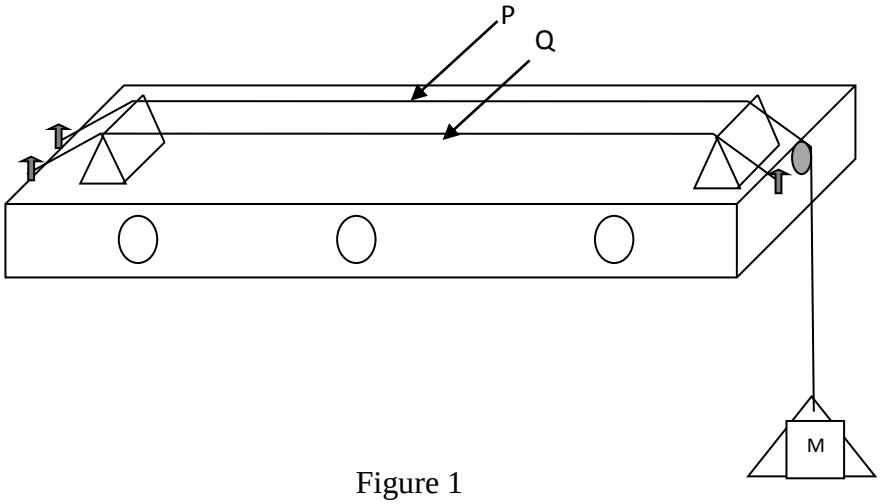

Figure 1

i) Which of the two strings, P or Q, should the student use to carry out the experiment?

……

……

ii) This experiment uses the fundamental mode of resonance. What is the reason for that ?

……

……

……

iii) What type of wave is produced in the string at resonance? Underline the correct answer.

a. Transverse / Longitudinal
b. Progressive / Stationary

iv) How is the selected type of wave produced?

……

……

…..……

v) What is the essential item that the student needs in order to identify the resonance condition accurately?

……

..

vi) Mark the most appropriate position to place that item as ***X*** on the diagram below. What is the reason that the student choose that position?

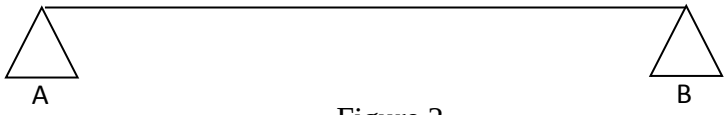

Figure 2

……

……

……

b) When the suspended mass is M and the string resonates in the fundamental mode , the distance between bridges A and B is *l*.

i) Draw the wave pattern formed between bridges A and B in Figure 2.

ii) If the mass per unit length of the string is m, obtain an expression for the frequency (f) of the tuning fork.

……

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……

……

iii) How to obtain the resonance length *l* by experimentally.

……
……
……
……

c) i) To determine the frequency of the tuning fork using a graphical method, which quantity should the student choose as the independent variable?

……

ii) Rearrange the expression obtained in (b)(ii) into a suitable form for plotting a graph.

……
……

4. A student plans to carry out an experiment in the school laboratory to determine the e.m.f. (E) and internal resistance (r) of a given cell using a graphical method. The following items are provided for that.

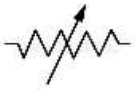
Mili ammeter 

Digital voltmeter 

A standard cell (10Ω) 

The cell whose EMF is to be measured 

a tap key 

a variable resis 

(*a*) Draw the correct circuit diagram for the experiment using the appropriate circuit symbols given above.

(b) Give the reason why the given tap key has been selected for this experiment.

.....

.....

(c) If the milliammeter reading is I, the e.m.f. is E, and the internal resistance is r, write an expression for the voltmeter reading V.

.....

.....

(d) Write the procedure that the student should follow to obtain the voltmeter reading V.

.....

(e) Choose suitable independent and dependent variables for plotting a straight-line graph, and rearrange the expression obtained in part (c) accordingly.

.....

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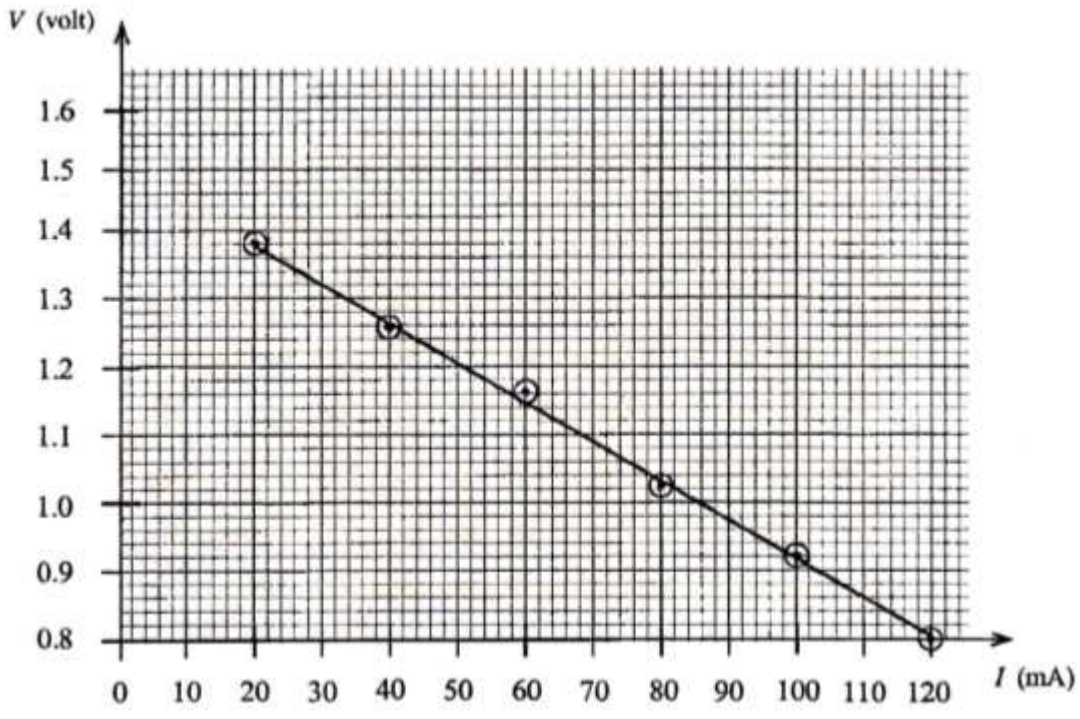
(f) The graph obtained by the student is shown below.



(i) Calculate the gradient of the given graph.

.....

.....

(ii) Hence find the internal resistance of the cell.

.....

.....

(iii) What is the construction should the student carry out on the above graph to determine the e.m.f. (E) of the cell?

.....

.....

(iv) Using the part (iii), write down the value of the e.m.f. (E).

.....

(g) What is the reason for using a digital voltmeter to measure the potential difference in this experiment?

.....

(h) The student considers the voltmeter mentioned in part (g) to be an ideal voltmeter. Is this statement true or false?

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**