E2031
PHYSICS
2 hours 45 minutes

I

Candidate's Name:.....

Registration Number:.....

Serial Number:.....

Centre Name:.....

Centre Number:.....

NATIONAL EXAMINATIONS COUNCIL

Senior School Certificate Examination

2 hours 45 minutes

PHYSICS I
ALTERNATIVE TO PRACTICAL

Do **not** open this question booklet until you are told to do so. While waiting, read the following carefully:

Write your **Name, Registration Number, Serial Number, Centre Name** and **Centre Number** in the spaces provided at the top right-hand corner of this booklet.

Write your answer in blue or black ink inside this booklet.

Answer **two** questions only.

Each question carries **25** marks.

You are required to record your observations as soon as they are made. The observations, graphs and any other mathematical working and answers to questions must be written in the spaces and graph sheets provided. Scrap paper must **not** be used.

Use of mobile phone is not allowed.

Use of scientific calculator is allowed.

Fill in below the number of the questions answered in the order in which you have answered them.

FOR OFFICIAL USE ONLY.	
QUESTION NUMBER	MARK
1	
2	
3	
TOTAL	

PAPER I

Answer **two** questions only.

1a

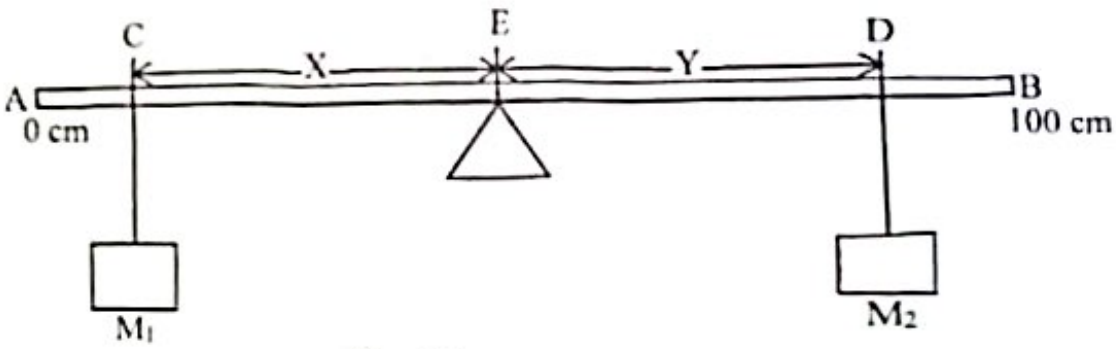


Fig. 1.1

A metre rule is adjusted on a knife edge until it balanced horizontally as shown in **Fig. 1.1**. The position of the knife edge E is read and recorded. Without changing position E on the metre rule, M_1 is hung at point C, 10 cm mark on the metre rule. Another mass M_2 = 100 g is then hung at the other side of the knife edge on the metre rule and its position D adjusted until the metre rule balances horizontally again. The position D is then read and recorded. The distances X and Y are then measured and recorded.

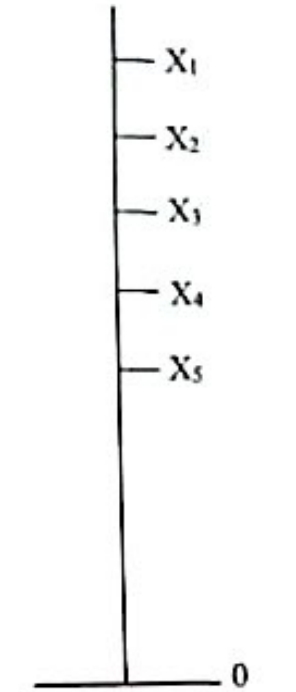
The procedure is repeated **four** more times by suspending M_1 at the 15, 20, 25 and 30 cm marks respectively.

Fig. 1.1(a) and **Fig. 1.1(b)** show the values of X_i and Y_i, where $i = 1, 2, 3, 4$ and 5.

(i) Read and record the **real** value of X_i.

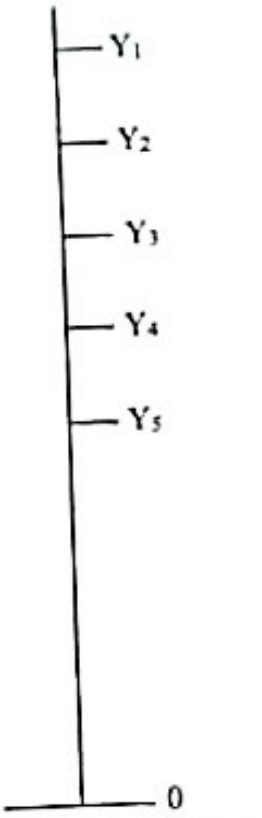
(ii) Read and record the **real** value of Y_i.

(iii) Evaluate $T = M_2Y$ in each case.



1 cm represents 5 cm

Fig. 1.1(a)



1 cm represents 5 cm

Fig. 1.1(b)

(iv) Tabulate your readings in the space provided below:

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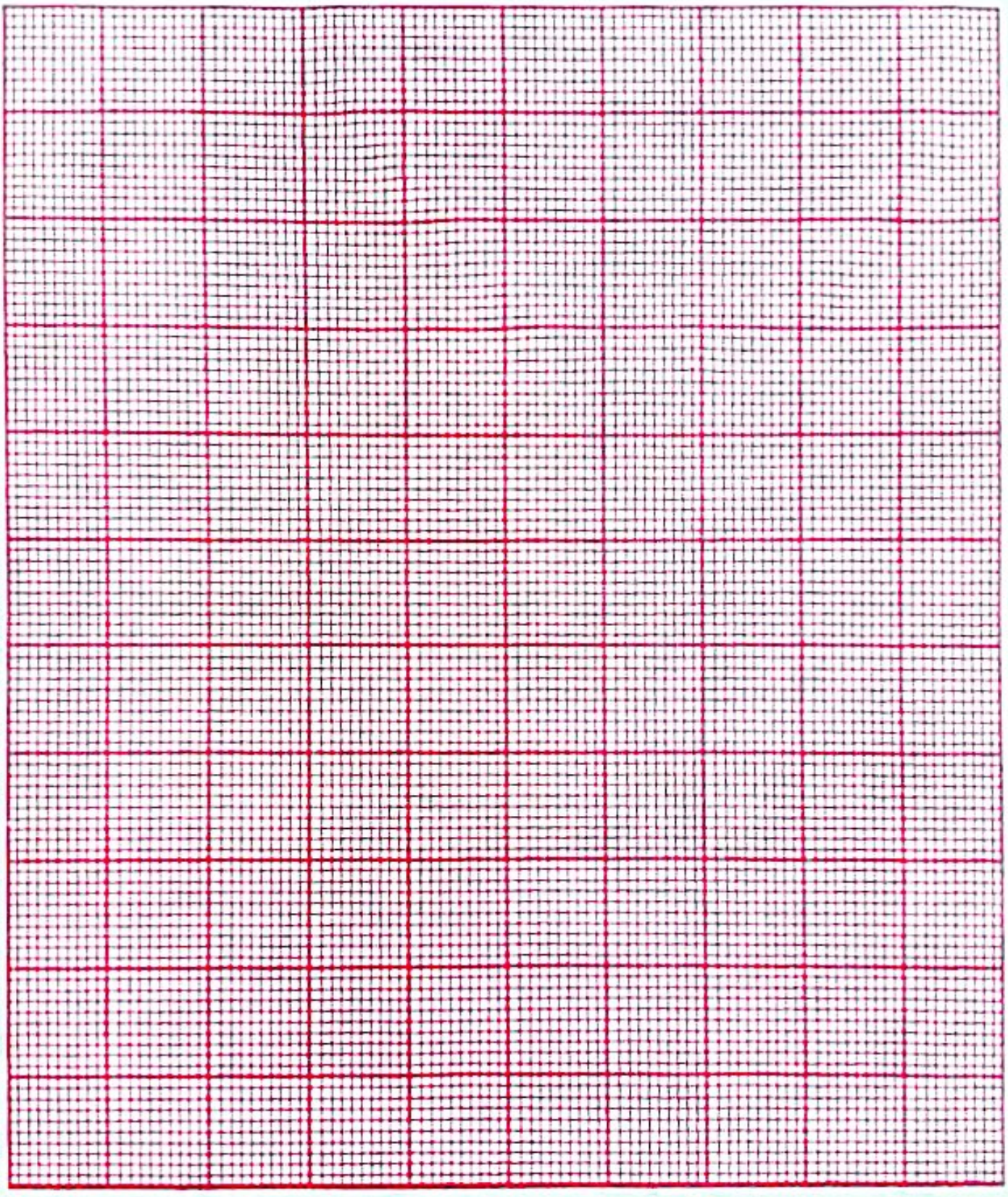
(v) Plot a graph of T on the vertical axis and X on the horizontal axis, starting both axes from the origin (0,0).

Question .....
Write on both sides of the paper



(vi) Determine the slope S of the graph.

SLOPE

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(vii) State **two** precautions you would take if you were to perform this experiment in the laboratory.

PRECAUTIONS

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(21 marks)

b(i) State **two** conditions that must be satisfied, if a body is to be kept in equilibrium by the action of parallel forces.

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(2 marks)

(ii) A uniform rod 2.0 m long and weighing 3 N is supported horizontally on two supports A and B placed 0.1 m from its ends. What is the reaction at A when a mass of 60 g is suspended 1.1 m from A.

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(2 marks)

2a

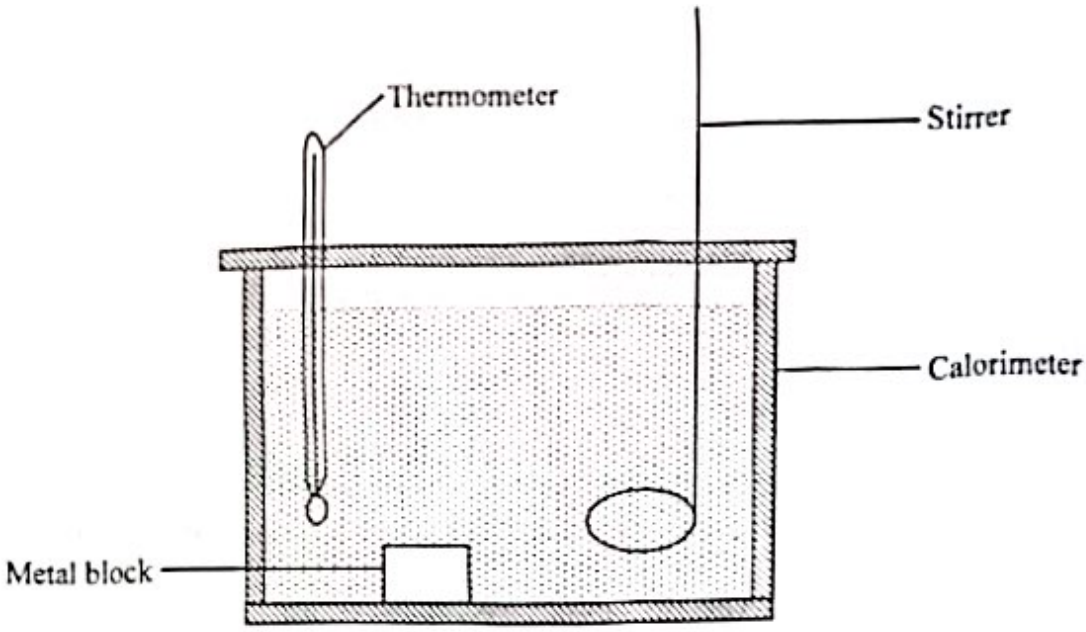

Fig. 1.2

A metal block at 100°C is transferred into a well lagged copper calorimeter containing water of mass m = 50 g at temperature t_o as shown in **Fig. 1.2**. The water is gently stirred and the final temperature t of the water is read from the thermometer and recorded. The calorimeter is then emptied.

The procedure is repeated for **four** values of m at temperature t_o each time. In each case, the final temperature t is read and recorded.

Fig. 1.2(a) and **Fig. 1.2(b)** show the mass of water m_i and temperatures t_o and t_i of the water, where $i = 1, 2, 3, 4$ and 5.

(i) Read and record the value of m_i.

(ii) Read and record the **real** value of t_o.

(iii) Read and record the **real** value of t_i.

(iv) Evaluate $\theta = t_i - t_o$.

(v) Evaluate $T = 100 - t_i$.

(vi) Evaluate $Z = \frac{T}{\theta}$.

Fig. 1.2(a)

Fig. 1.2(b)

(vii) Tabulate your readings in the space provided below:

READINGS

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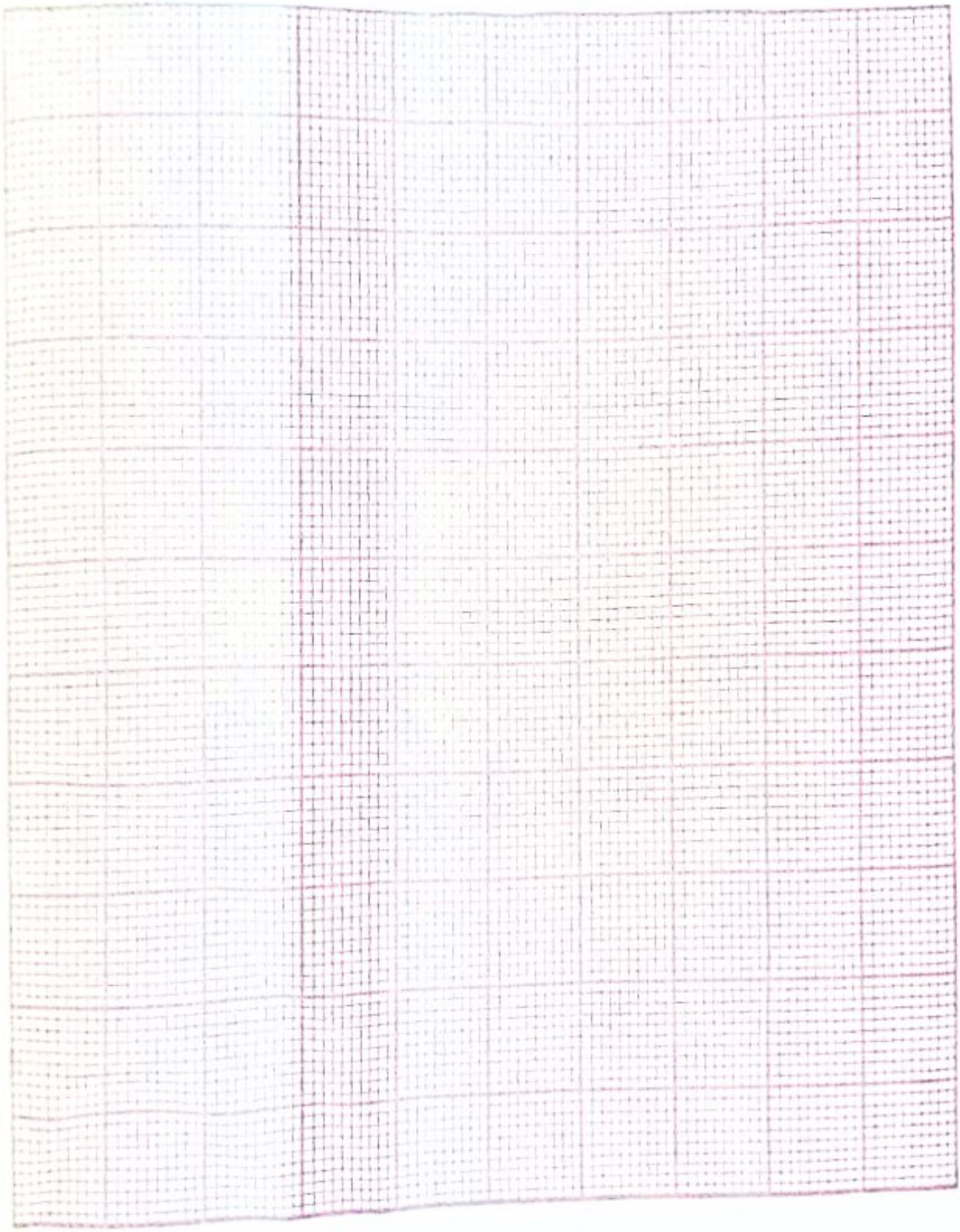
(viii) Plot a graph of Z on the vertical axis and m on the horizontal axis, starting both axes from the origin (0,0).

Question.....
Write on both sides of the paper



(ix) Determine the slope S of the graph.

SLOPE

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(x) Evaluate $K = \frac{11}{S}$.

EVALUATION

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(xi) State two precautions you would take if you were to perform this experiment in the laboratory.

PRECAUTIONS

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(21 marks)

b(i) Define latent heat.

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(2 marks)

(ii) Calculate the quantity of heat required to raise the temperature of 300 g of water by 50°C.
[Specific heat capacity of water = 4.2 $Jg^{-1}K^{-1}$]

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(2 marks)

3a

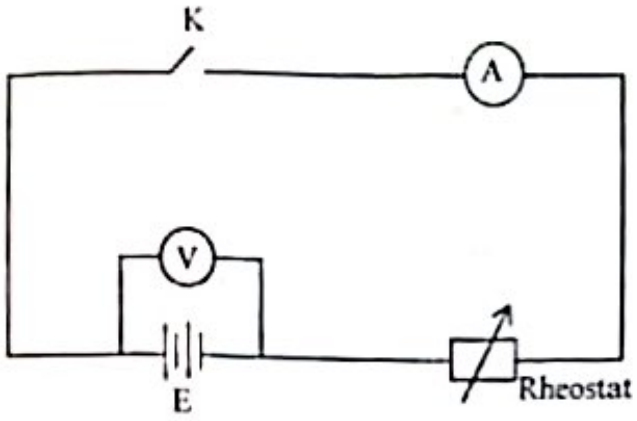

Fig. 1.3

An electric circuit is connected as shown in **Fig. 1.3.** With the key opened, the voltmeter reading E is read and recorded. The key is then closed and the rheostat is adjusted until a small current flows in the circuit. The current I and the potential difference V are measured from the ammeter and voltmeter respectively.

The procedure is repeated **four** more times by adjusting the rheostat each time and obtaining values of I and V.

Fig. 1.3(a) and **Fig. 1.3(b)** show the values of I_i and the corresponding V_i respectively, where $i = 1, 2, 3, 4,$ and 5.

(i) Read and record the value of E.

(ii) Read and record the value of I_i.

(iii) Read and record the value of V_i.

(iv) Evaluate P = E – V in each case.

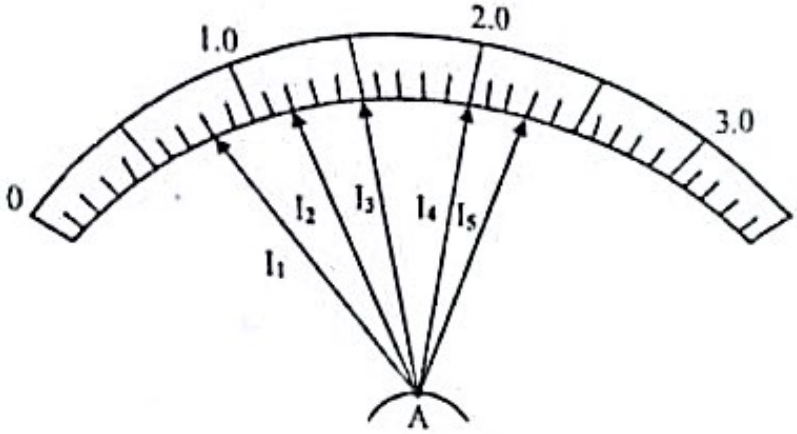

Fig. 1.3(a)

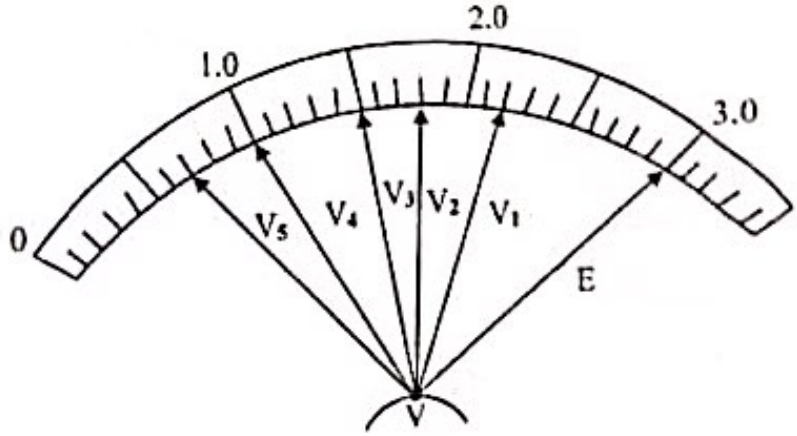

Fig. 1.3(b)

(v) Tabulate your readings in the space provided below:

READINGS

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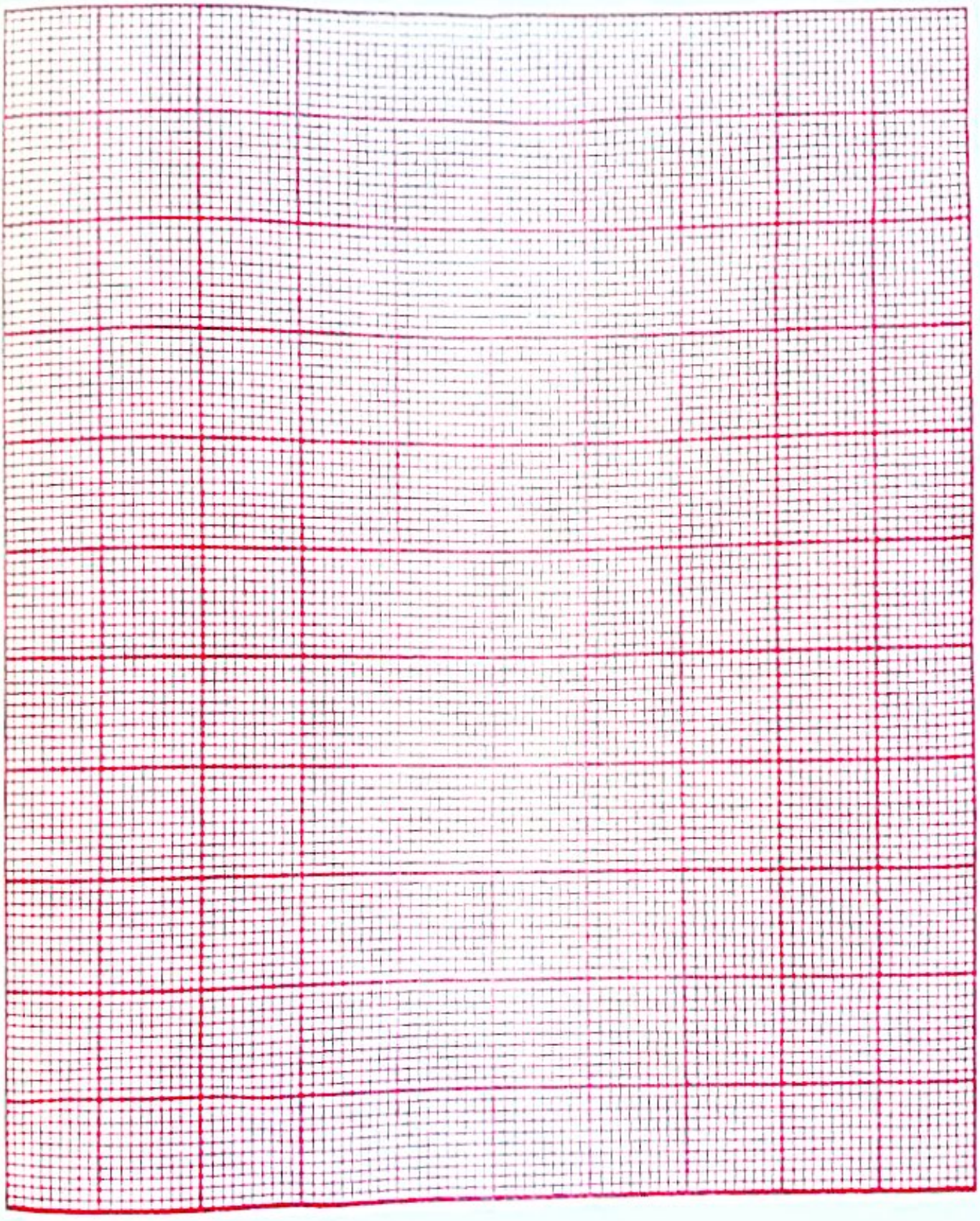
(vi) Plot a graph of I on the vertical axis and P on the horizontal axis.

Question.....
Write on both sides of the paper



(vii) Determine the slope S of the graph.

SLOPE

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(viii) State **two** precautions you would take if you were to perform this experiment in the laboratory.

PRECAUTIONS

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(21 marks)

b(i) Explain what is meant by *lost volt*.

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(2 marks)

(ii) Two cells each of e.m.f 2.0 V and internal resistance 0.5 Ω are connected in series to an external resistor of 3 Ω. Calculate the current passing through the circuit.

(2 marks)