

232/3

— **PHYSICS** —
(PRACTICAL)

Paper 3



Nov. 2019 – 2½ hours

Name Index Number

Candidate's Signature Date

Instructions to candidates

- Write your name and index number in the spaces provided above.
- Sign and write the date of examination in the spaces provided above.
- Answer **all** the questions in the spaces provided in the question paper.
- You are supposed to spend the first **15 minutes** of the 2½ hours allowed for this paper reading the whole paper carefully before commencing your work.
- Marks are given for a clear record of the observations actually made, their suitability, accuracy and the use made of them.
- Candidates are advised to record their observations as soon as they are made.
- Non-programmable** silent electronic calculators may be used.
- This paper consists of **10 printed pages**.
- Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.
- Candidates should answer the questions in English.

For Examiner's Use Only

Question 1	a	d	e(i)	e(ii)	f(i)	f(ii)
Maximum Score	2	8	4	3	1	2
Candidate's Score						

Total

Question 2	a	b	c	d	e	f	g
Maximum Score	1	1	7	4	3	3	1
Candidate's Score							

Total

Grand Total

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Turn over

Question 1

You are provided with the following:

- A stirrer
- A stand, a boss and a clamp
- A thermometer
- An ammeter
- A voltmeter
- A beaker
- A source of boiling water
- Two dry cells in a cell holder
- A switch
- Seven connecting wires
- A component labelled X

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Proceed as follows:

- (a) Set up the circuit as shown in figure 1.

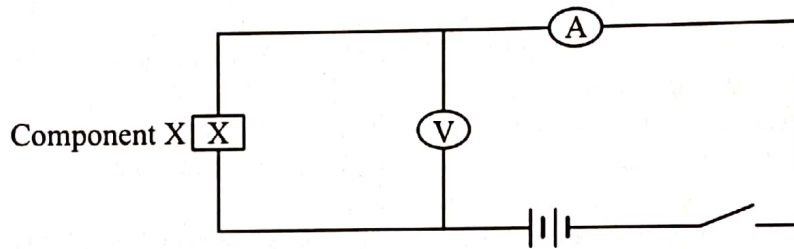


Figure 1

- (i) Close the switch, read and record the current I through component X and the potential difference V across it. (1 mark)

$I = \dots\dots\dots$

$V = \dots\dots\dots$

Open the switch.

- (ii) Determine the resistance R of component X given that: $R = \frac{V}{I}$ (1 mark)

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- (b) Pour hot water into the beaker and set up the apparatus as in **figure 2**, so that component X and the thermometer bulb are fully immersed.

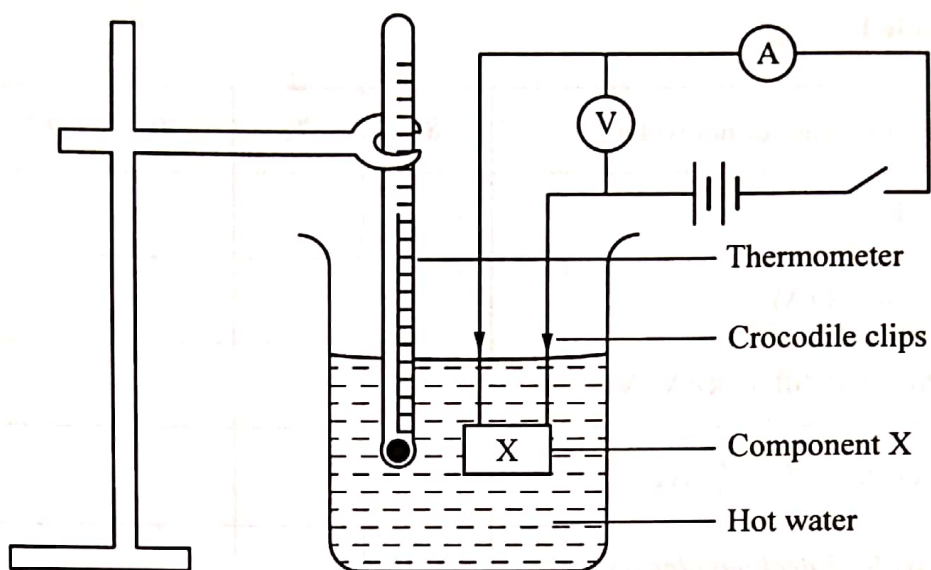


Figure 2

- (c) Stir the water from time to time, when the temperature falls to 80° , switch on the circuit, read and record the current I and the potential difference V in **table 1**. Then open the switch.



- (d) Repeat (c) as the temperature falls to the other values shown in **table 1**. Complete the table.

Table 1

(8 marks)

Temperature of hot water (°)	80	75	70	65	60	55
T (K)						
Current I (A)						
Potential difference V (V)						
Resistance $R = \frac{V}{I}$ (Ω)						
Log R (3 decimal places)						
Log T (3 decimal places)						

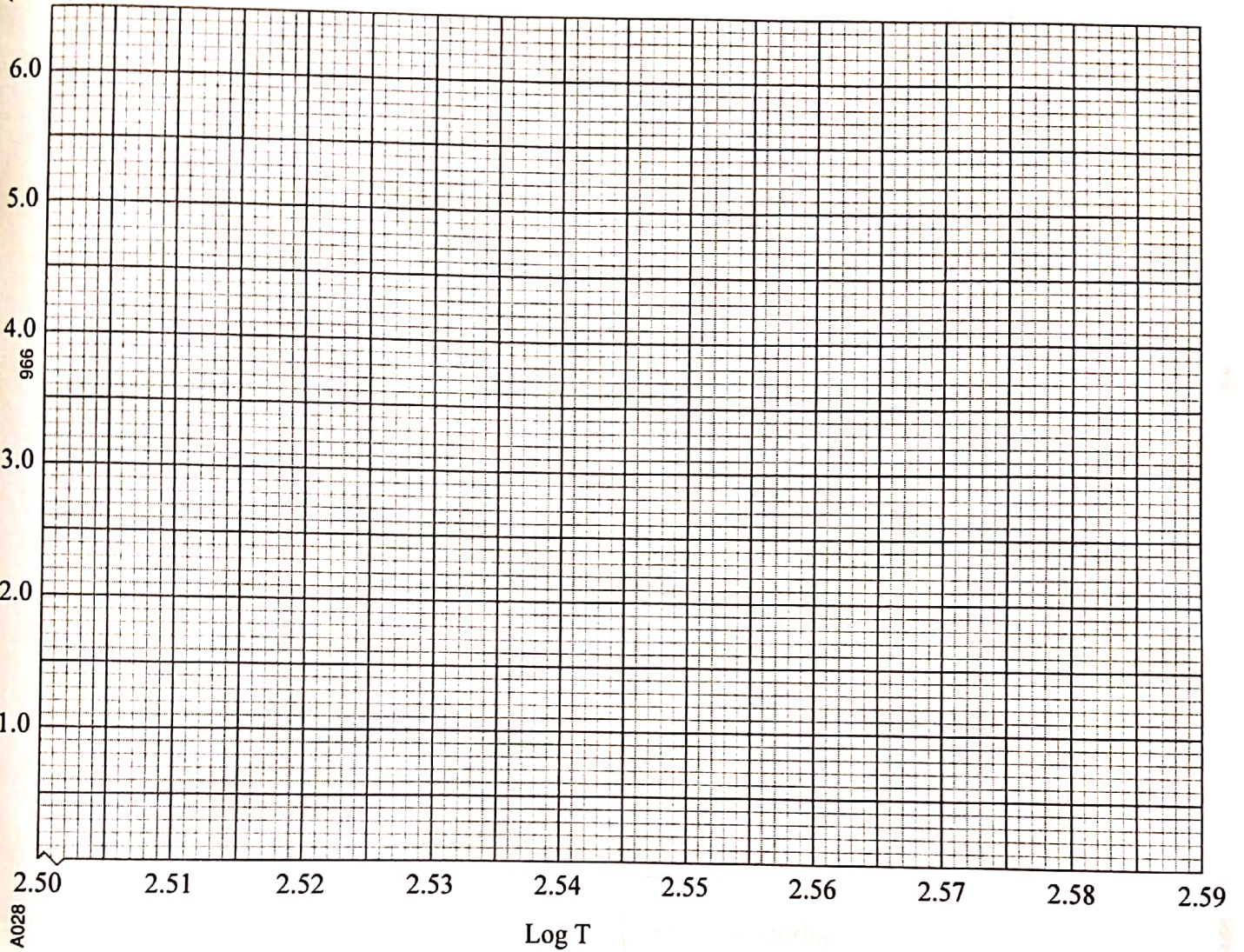
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(e) (i) On the axis provided, plot a graph of Log R against log T. (4 marks)

Log R
($\times 10^4$)



(ii) Determine the slope S of the graph. (3 marks)

.....
.....
.....



(f) Given that R and T are related by the equation $\text{Log } R = \text{Log } K + n \text{Log } T$, determine the value of;

(i) n (1 mark)

.....
.....
.....

(ii) K (2 marks)

.....
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Question 2

You are provided with the following:

- A metre rule
- A stand, boss and clamp
- A piece of string
- A 20 g mass
- A 50 g mass
- A measuring cylinder containing water
- A concave mirror
- A screen
- A candle
- Pieces of sewing threads
- A mirror holder (Lens holder)

Proceed as follows:

PART A

- (a) Using a string, suspend the metre rule on the stand so that it balances horizontally at its center of gravity. Record the centimetre mark at which the metre rule balances.

Centimetre mark = cm (1 mark)

- (b) With the metre rule balanced at its centre of gravity, suspend a 20 g mass at a distance of 30 cm from the centre of gravity. Suspend the 50 g mass on the other side of the centre of gravity and adjust its position until the rule is balanced. See figure 3.

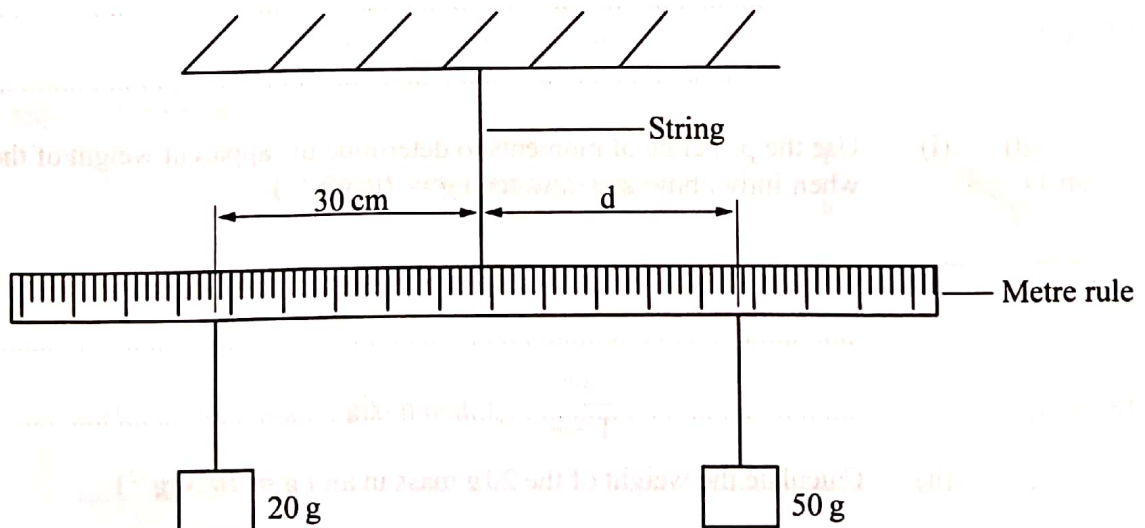


Figure 3

Record the distance d of the 50 g mass from the centre of gravity.

$d = \dots\dots\dots$ cm

$d = \dots\dots\dots$ m (1 mark)

(c) (i) Record the volume of the water in the measuring cylinder provided.

$V = \dots\dots\dots$ (1 mark)

(ii) Immerse the 20 g mass fully into the water and adjust the position of the 50 g mass so that the rule balances horizontally. Record the volume V_1 of the water plus 20 g mass and the distance d_1 of the 50 g mass from the centre of gravity.

$V_1 = \dots\dots\dots$ (1 mark)

$d_1 = \dots\dots\dots$ (1 mark)

(iii) (I) Determine the volume of the water displaced (1 mark)

.....

(II) Determine the weight of the water displaced. (density of water = 1 gcm^{-3}) (3 marks)

.....

.....

.....

(d) (i) Use the principle of moments to determine the apparent weight of the 20 g mass when fully immersed in water. ($g = 10 \text{ Nkg}^{-1}$) (2 marks)

.....

.....

.....

(ii) Calculate the weight of the 20 g mass in air ($g = 10 \text{ Nkg}^{-1}$) (1 mark)

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- (iii) Determine the apparent loss in weight of the 20 g mass. (1 mark)

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PART B

- (e) Light the candle and place it at distance $u = 20\text{ cm}$ in front of the concave mirror. Adjust the position of the screen until a sharp image of the candle flame is obtained. See figure 4.

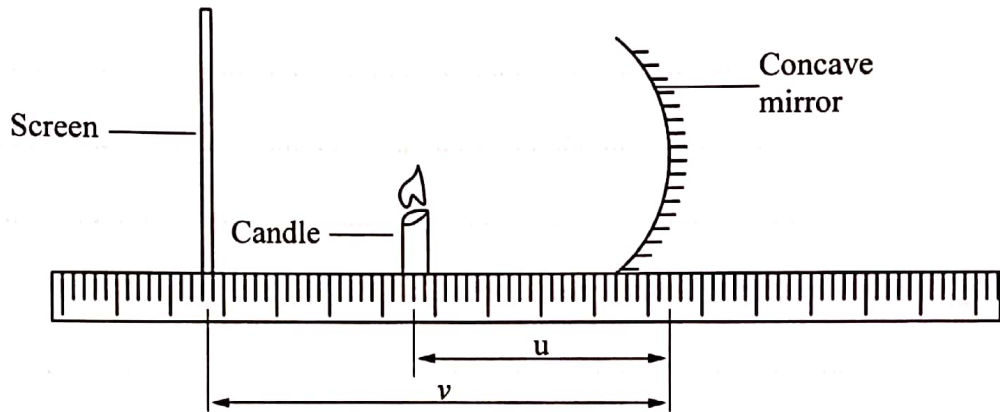


Figure 4

- (i) Read and record the distance v between the screen and the mirror.

$v =$ (1 mark)

- (ii) Determine:

I. the magnification m of the mirror given that: $m = \frac{v}{u}$, (1 mark)

.....

II. the value f_1 given that: $f_1 = \frac{mu}{m+1}$ (1 mark)

.....

(f) Repeat part (e) for distance $u_1 = 18\text{ cm}$

(i) Read and record the distance v_1 between the screen and the mirror.

$v_1 = \dots\dots\dots$ (1 mark)

(ii) Determine the magnification m_1 of the mirror. (1 mark)

$\dots\dots\dots$
 $\dots\dots\dots$

(iii) Hence determine f_2 . (1 mark)

$\dots\dots\dots$
 $\dots\dots\dots$
 $\dots\dots\dots$

(g) Determine the average value of f . (1 mark)

$\dots\dots\dots$
 $\dots\dots\dots$

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