

NAME: MARKING SCHEME INDEX NO:

SCHOOL: CANDIDATE SIGN:

DATE:

FORM 3

232/3

PHYSICS

(PRACTICAL)

PAPER 3



TIME: 2 HOURS

INSTRUCTIONS TO CANDIDATES

1. Answer all the questions in the spaces provided
2. Mathematical tables and electronic calculators may be used.
3. All workings MUST be clearly shown necessary.

For examiners use only

QUESTIONS	MAX.SCORE	CANDIDATE SCORE
1	20	
2	20	
Total score	40	

This paper consists of 6 printed pages.

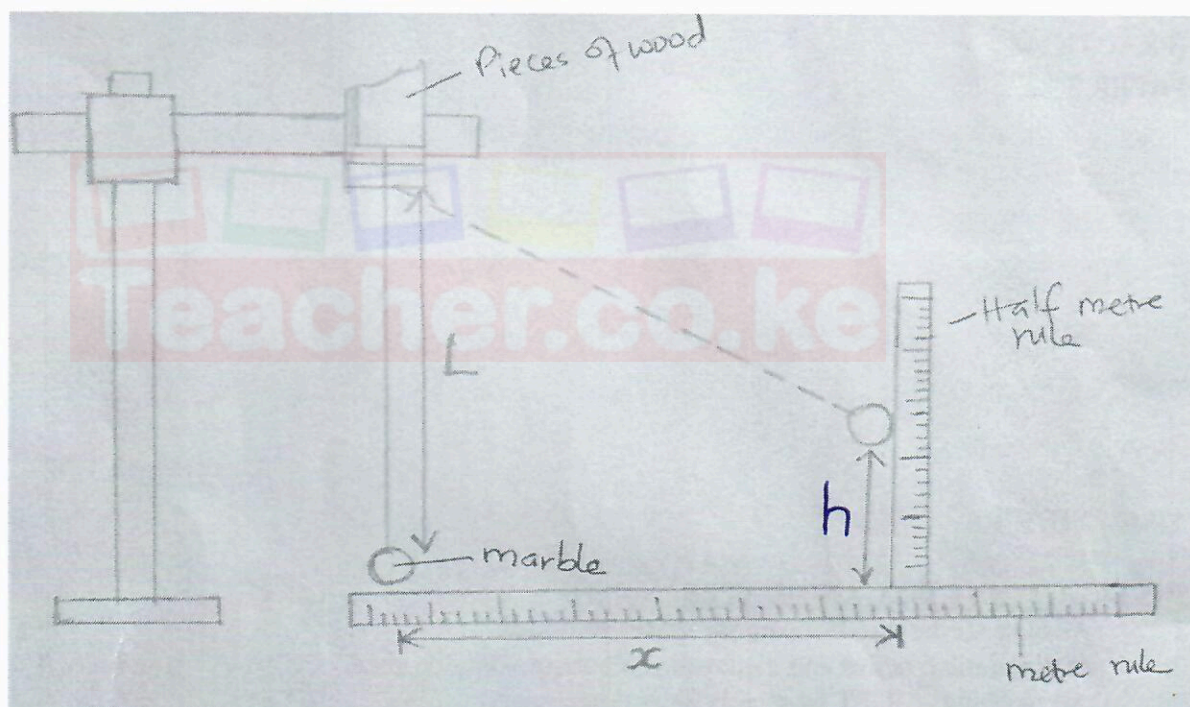
Candidates should check the question paper to

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1. You are provided with;
- (a) A Marble with a piece of the thread attached.
 - (b) Two wooden blocks.
 - (c) Clamp, stand + boss
 - (d) Metre rule.
 - (e) $\frac{1}{2}$ metre rule supported on a wooden block.
 - (f) 2 pieces of cello tape.
 - (g) Stop watch.

Procedure:

- (I) Fix the thread between the wooden blocks and fasten in the clamp. Adjust the thread so that the length, L , shown in the figure below is 50cm.
- (II) Fix the metre rule horizontally to the bench using the cello tape provided.



- (III) Adjust the clamp so that the marble is next to the end of the metre rule as shown above.
- (IV) Displace the marble by a horizontal distance $X20\text{cm}$ and measure the corresponding vertical displacement $h = 17.0\text{cm}$. (1mark)

QUESTION 2

PART A

You are provided with the following:-

- A 250ml glass beaker
- A Bunsen burner
- A Thermometer
- A Stop watch
- A Tripod stand and a Wire gauze
- A measuring cylinder 100ml
- Water

Set the apparatus as shown in figure 2 below.

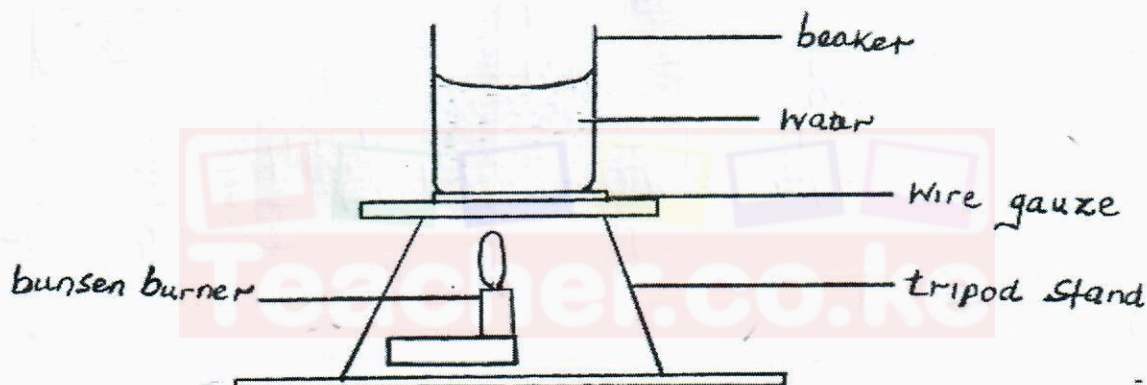


Fig. 2

- (a) Measure 100cm³ of water and pour it into the beaker. Take the initial temperature of the water.

$T_0 = \dots\dots\dots 17.0 \dots\dots\dots ^\circ\text{C}$ (1mk)

Now heat the water to a temperature of 80°C. switch off the gas tap and place a thermometer into the beaker and start the stop watch when the temperature is 65°C. Take the temperature $T^\circ\text{C}$ of water every two minutes. Record your results in the table below.

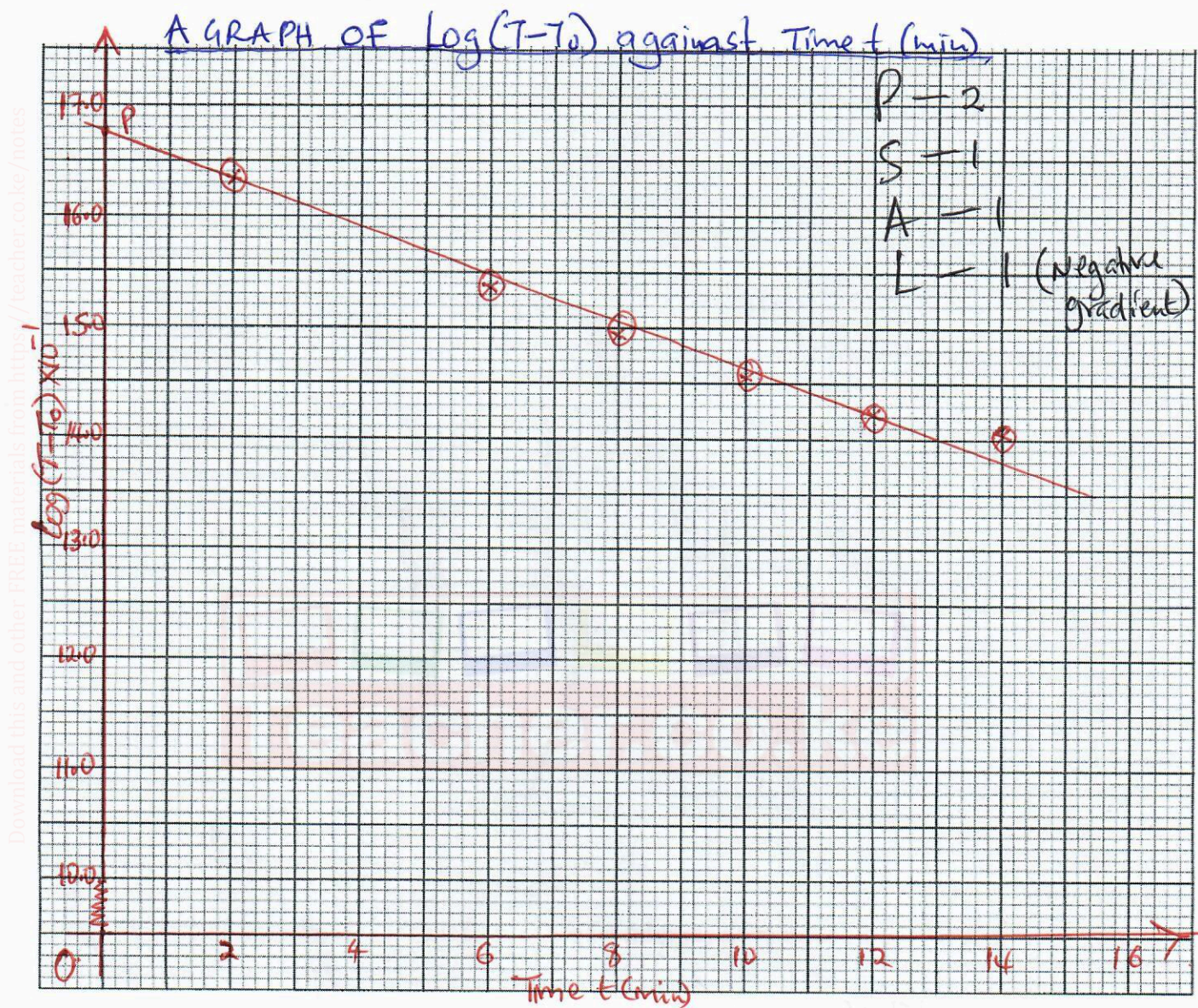
Time, t(min)	2	4	6	8	10	12	14
Temperature (T) $^\circ\text{C}$	60.0	50.5	51.5	48.0	45.5	43.5	42.5
(T - T_0)	43.0	33.5	34.5	31.0	28.5	26.5	25.5
Log (T - T_0)	1.633	1.525	1.537	1.491	1.454	1.423	1.406

$\times 10^{-1}$ 16.33 15.25 15.37 14.91 14.55 14.23 (5mks) 14.07

1 d.p. 1/2 mk @
upto 12 min = 3mk
1 mk
1 mk

(b) Plot a graph of $\log(T - T_0)$ against Time (t).

(5mks)



(c) Find the value of P of $\log(T - T_0)$ when $t = 0$.

(1mk)

1.675 ✓ (Evidence from the extrapolated graph)

(d) Determine N, where N is the antilog of P.

(1mk)

$N = \text{Antilog } 1.675$ ✓
 $= 47.32^\circ$

(e) Calculate the temperature of the surrounding T_R using the expression $N = 65 - T_R$

$47.32^\circ - 65 = T_R$ ✓

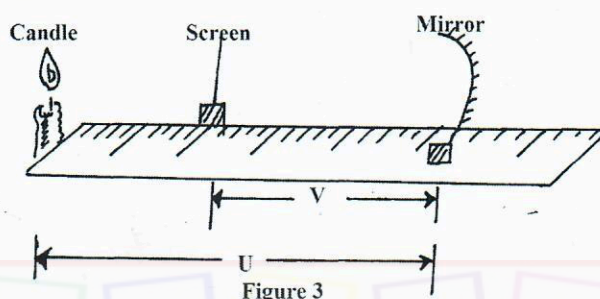
PART B

You are provided with the following:

- A concave mirror with holder
- A screen
- A meter rule
- A candle
- A match box (to be shared)

Proceed as follow:

(f) Set up the apparatus as in figure 3 below.



(g) Put the object at a distance $u = 30\text{cm}$ from the mirror. Adjust the position of the screen until a sharp image is formed on the screen. Record the distance V .

(h) Repeat procedure (b) above for the distance $u = 40\text{cm}$ and record the new distance V . complete the table 3 below. (2mks)

U(cm)	V(cm)	$M = \frac{V}{u}$	$(m+1)$
30	22.5 ✓ ^{1/2}	0.7500 ✓ ^{1/2}	1.7500 ✓ ^{1/2}
40	30.1 ✓ ^{1/2}	0.7525 ✓ ^{1/2}	1.7525 ✓ ^{1/2}

(i) Given $f = \frac{V}{(m+1)}$, calculate the values of f hence determine the average value f_{av} : (3mks)

$$f_1 = \frac{22.5}{1.75} = 12.857$$

$$f_2 = \frac{30.1}{1.7525} = 17.175$$

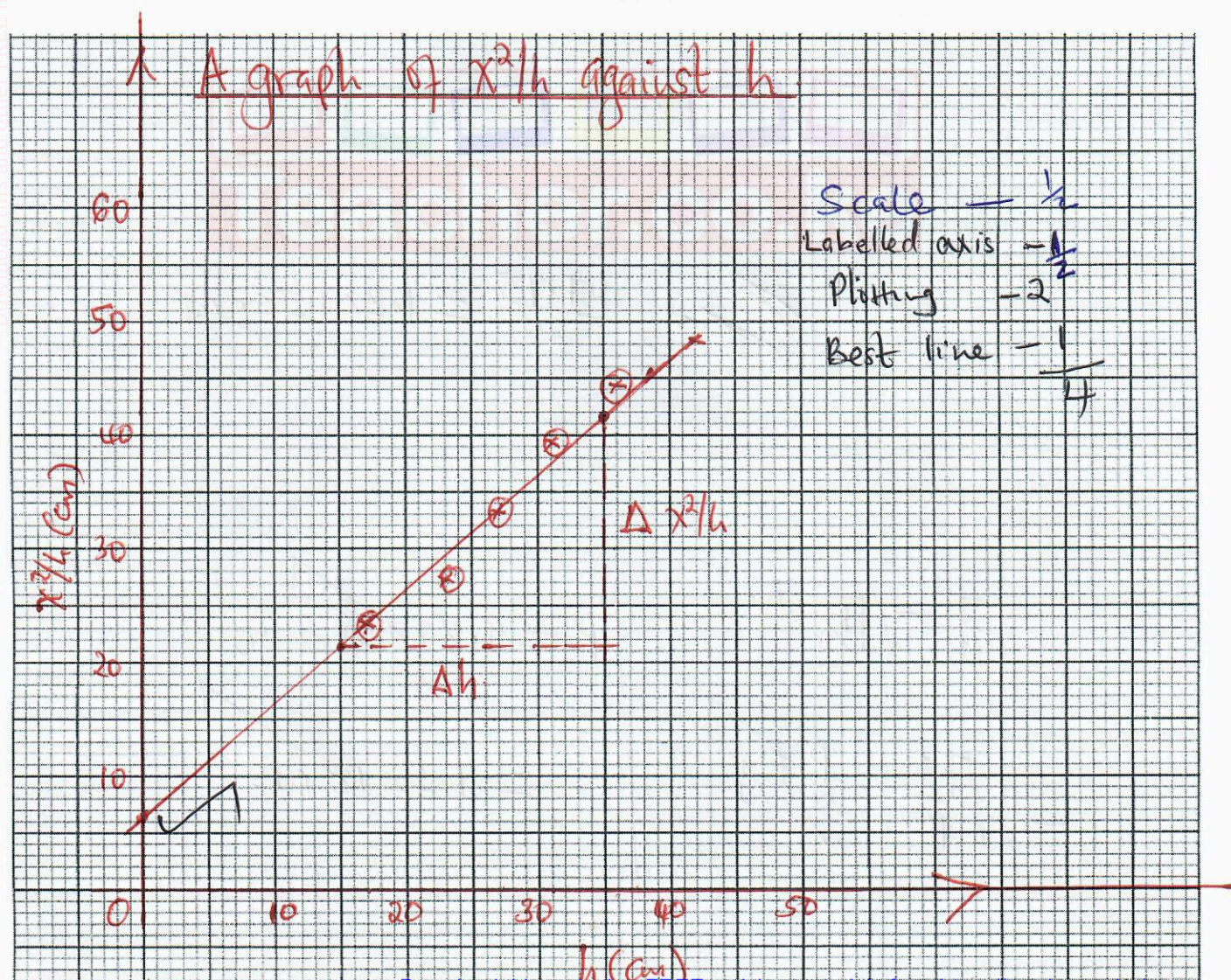
$$f_{av} = \frac{12.857 + 17.175}{2} = 15.016 \text{ cm}$$

(V) Repeat the experiment to find h for each of the following values of X and complete the table. (6 marks)

X cm	h (cm)	X^2 cm ²	X^2/h cm
20	17.0 ✓ $\frac{1}{2}$	400	23.53
25	23.0 ✓ $\frac{1}{2}$	625	27.17
30	27.0 ✓ $\frac{1}{2}$	900	33.33
35	31.0 ✓ $\frac{1}{2}$	1225	39.52
40	36.0 ✓ $\frac{1}{2}$	1600	44.44
45	42.0 ✓ $\frac{1}{2}$	2025	48.21

$\frac{1}{2}$ - for X^2 column
(All values correct)
1 mark for more than half values correct.
 $\frac{1}{2}$ marks - X^2/h column.
(All values correct)
1 mark for more than half values correct.
(4 marks)

(VI) plot a graph X^2/h against h .



(VII) Determine the slope of the graph.

(2mks)

$$\text{slope} = \frac{\Delta x^2/h}{\Delta h} = \frac{41.5 - 21.5}{35 - 15} = \frac{20}{20} = 1.00$$

(VIII) From the graph find the value of X^2/h when $h=0$

(2mks)

6.5 cm (Evidence on the ^{extrapolated} graph)

(IX) With the metre rule and half-metre ^{rule} removed — Displace the marble through a horizontal distance of about 10cm and let it to swing freely, Time 20 oscillations.

Time for 20 oscillations

27.75s

(1mk)

(X) Determine periodic time, T

Periodic time, T =

(1 mk)

$$\frac{27.75}{20} = 1.3875 \text{ sec}$$

(XI) Calculate the value of P from the following equations.

(3mks)

$$T = 2\pi \sqrt{p/g}$$

$$g = 10 \text{ m/s}^2$$

$$\left(\frac{T}{2\pi}\right)^2 = \left(\sqrt{\frac{p}{g}}\right)^2$$

$$g \times \frac{T^2}{4\pi^2} = \frac{p}{g} \times g$$

$$p = \frac{(1.3875)^2 \times 10}{4 \times 3.142}$$

$$= 1.5318 \text{ ms}$$