



**FUHUA SECONDARY SCHOOL**

Secondary Four Express

Preliminary Examination 2026

CANDIDATE  
NAME

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CENTRE  
NUMBER

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INDEX  
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## PHYSICS

**6091/03**

**Paper 3 Practical**

**04 August 2026**

**1 hour 50 minutes**

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

### READ THESE INSTRUCTIONS FIRST

Write your Centre number, index number and name on all the work you hand in.

Give details of the practical shift and laboratory where appropriate, in the boxes provided.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue, correction fluid or highlighters.

Answer **all** questions in the spaces provided on the Question Paper.

The use of an approved scientific calculator is expected, where appropriate.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

| Shift      |
|------------|
|            |
| Laboratory |
|            |

| For Examiner's Use |     |
|--------------------|-----|
| 1                  |     |
| 2                  |     |
| 3                  |     |
| Total              | /40 |

**Setter : Mr Raymond Loh**

**Vetter : Mr Nicholas Liu**

This question paper consists of **12** printed pages.

### Section A

1 In this experiment, you will measure the volume of a straw by two different methods.

You are provided with:

- a 30 cm ruler
- a 250 cm<sup>3</sup> beaker with a dropper
- a 50 cm<sup>3</sup> measuring cylinder
- a pair of scissors
- paper towels to wipe up any spillage
- two identical round straws
- two set squares.

#### (a) Method 1

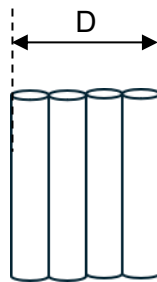
(i) Measure and record the length  $L$  of one of the straws.

$L = \dots\dots\dots$  [1]

(ii) Cut one of the straws into 4 pieces that are approximately equal in length.

Line up the pieces of straw as shown in Fig. 1.1.

Ensure the pieces of straw are touching.



**Fig. 1.1**

Length  $D$  is the width of the 4 pieces of straw placed side by side.

Measure and record length  $D$  for the four pieces of cut straw.

$D = \dots\dots\dots$  [1]

- (iii) Hence, determine the diameter  $d$  of **one** straw.

$d = \dots\dots\dots$  [1]

- (iv) Some items provided in the apparatus list can be used to ensure that your measurement of  $D$  is as accurate as possible.

Explain how you can use these items to obtain an accurate value of  $D$ .

You may draw a diagram to support your explanation.

.....  
 .....  
 .....  
 .....  
 ..... [1]

- (v) Volume  $V_1$  of the straw is given by the equation:

$$V_1 = \frac{3.14 d^2 L}{4}$$

Use your answers from **(a)(i)** and **(a)(iii)** to calculate  $V_1$ .

$V_1 = \dots\dots\dots$  [2]

**(b) Method 2**

Fill a 250 cm<sup>3</sup> beaker with tap water and use a dropper to draw up the water from the beaker.

Block one end of a straw with your finger, hold it vertically upright, and use the dropper to fill the straw completely with water.

Keep the straw upright throughout to prevent the water from escaping while filling.

Release your finger to transfer the water from the filled straw into a 50 cm<sup>3</sup> measuring cylinder.

Repeat this process 4 more times for a total of 5 transfers.

(i) Measure and record the volume of water  $V_T$  in the measuring cylinder.

$V_T = \dots\dots\dots$  [1]

(ii) Hence, calculate the volume of water  $V_2$  in one straw.

$V_2 = \dots\dots\dots$  [1]

(c) Suggest **two** reasons why  $V_1$  and  $V_2$  can possibly be different.

1 .....

.....

.....

2 .....

.....

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[2]

[Total: 10]

2 In this experiment, you will investigate a circuit containing a length of resistance wire.

You are provided with

- a power supply of two 1.5 dry cells connected in series
- an ammeter
- a voltmeter
- a switch
- an unknown resistor (labelled  $R$ )
- a length of resistance wire, mounted onto a metre rule
- 1 long connecting lead with a jockey (labelled  $J$ )
- 6 connecting leads with crocodile clips.

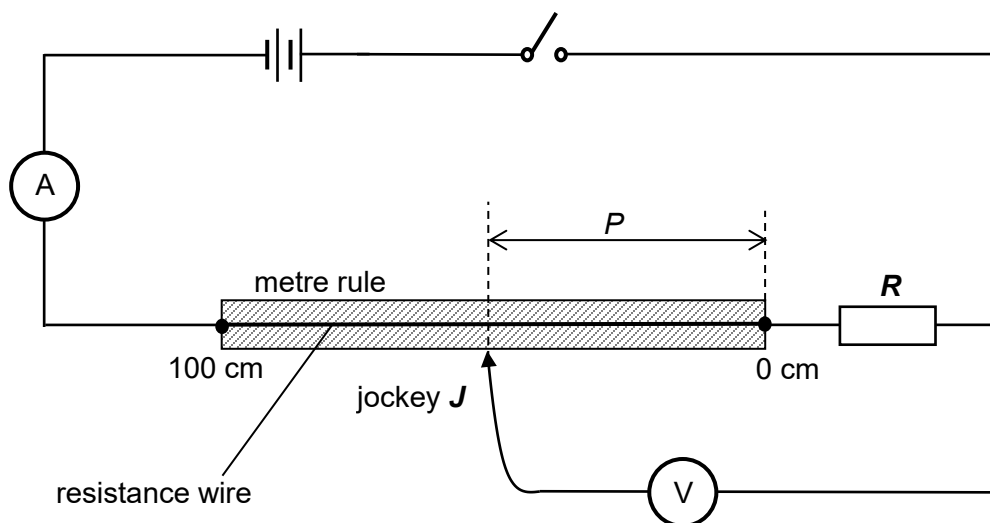


Fig. 2.1

(a) Assemble the apparatus as shown in Fig. 2.1.

(b) Close the switch.

Record the current  $I$  shown on the ammeter.

$I = \dots\dots\dots$  [1]

(c) The distance along the wire between jockey  $J$  and the end of the metre rule is  $P$ .

Place the jockey  $J$  on the resistance wire for the distance  $P = 40.0$  cm.

Record the potential difference,  $V$  shown on the voltmeter.

$V = \dots\dots\dots$  [1]

(d) Open the switch. Calculate

- (i) the total resistance  $X$ , which is the sum of the resistance of the wire segment of length  $P$  and the resistance of  $R$ , using the equation

$$X = \frac{V}{I}.$$

$X = \dots\dots\dots$  [1]

- (ii) the value of  $Y$ , using the equation

$$Y = \frac{X}{P}.$$

$Y = \dots\dots\dots$  [1]

(e) Plan

A student claims that the relationship between  $Y$  and  $P$  is

$$Y = a \left( \frac{1}{P} \right) + b$$

where  $a$  and  $b$  are constants.

Using the same apparatus as in Fig. 2.1, plan an experiment to investigate this relationship.

Your plan should include

- a control variable to be kept constant,
- a detailed description of how you would perform the experiment,
- a suitable table in which to display your measurements and calculated values (you do not need to enter any data into the table),
- a statement of the graph that you would plot to test the relationship,
- a sketch of the graph that you would obtain if the suggested relationship were correct,
- an explanation of how you would obtain the value of the constant  $b$  from your graph.

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## Section B

3 In this experiment, you will investigate the effect of buoyant force acting on an object.

You have been provided with

- a retort stand with boss and clamp
- a cork with pin
- a metre rule with a hole at the 50 cm mark and one loop of string
- a slotted mass hanger and slotted masses, with a total mass of 250 g
- a metal bob with a string tied to it
- a 100 cm<sup>3</sup> measuring cylinder
- a shared electronic balance.

(a) Measure and record:

(i) the mass  $M$  of the metal bob in grams,

$M = \dots\dots\dots$  [1]

(ii) the volume  $V$  of the metal bob in cm<sup>3</sup>.

$V = \dots\dots\dots$  [1]

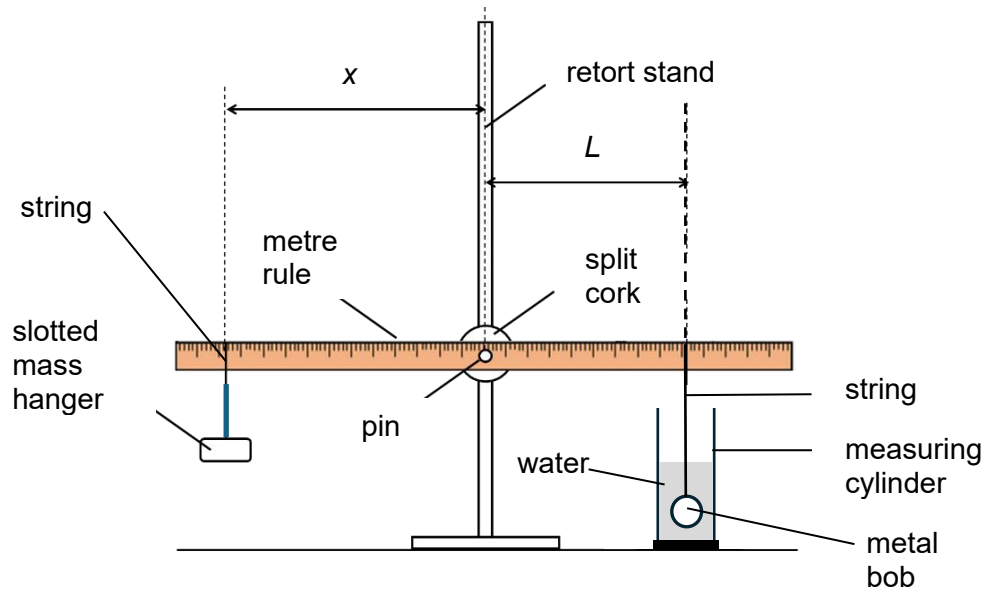
(b) Calculate the buoyancy force  $B$  acting on the metal bob by water, using the following equation.

$$B = \rho V g,$$

where  $\rho$  is the density of water 1.0 g / cm<sup>3</sup>,  
 $V$  is the volume of the metal bob in cm<sup>3</sup>,  
 $g$  is the gravitational strength 0.010 N / g.

$B = \dots\dots\dots$  [1]

(c) Set up the apparatus as shown in Fig. 3.1.



**Fig. 3.1**

Hang a slotted mass hanger, of  $m = 50$  g, on the left. Ensure that the metal bob remains fully immersed in the water and does not touch the sides or bottom of the measuring cylinder. Balance the metre rule by adjusting the length  $x$  and  $L$ .

(i) Measure and record the length  $x$  and  $L$ .

$x = \dots\dots\dots$

$L = \dots\dots\dots$  [1]

(ii) Calculate  $\frac{x}{L}$ .

$\frac{x}{L} = \dots\dots\dots$  [1]

- (d) Repeat steps (c)(i) and (c)(ii) with different values of  $m$ . Balance the metre rule by adjusting the position of the slotted masses with the mass hanger.

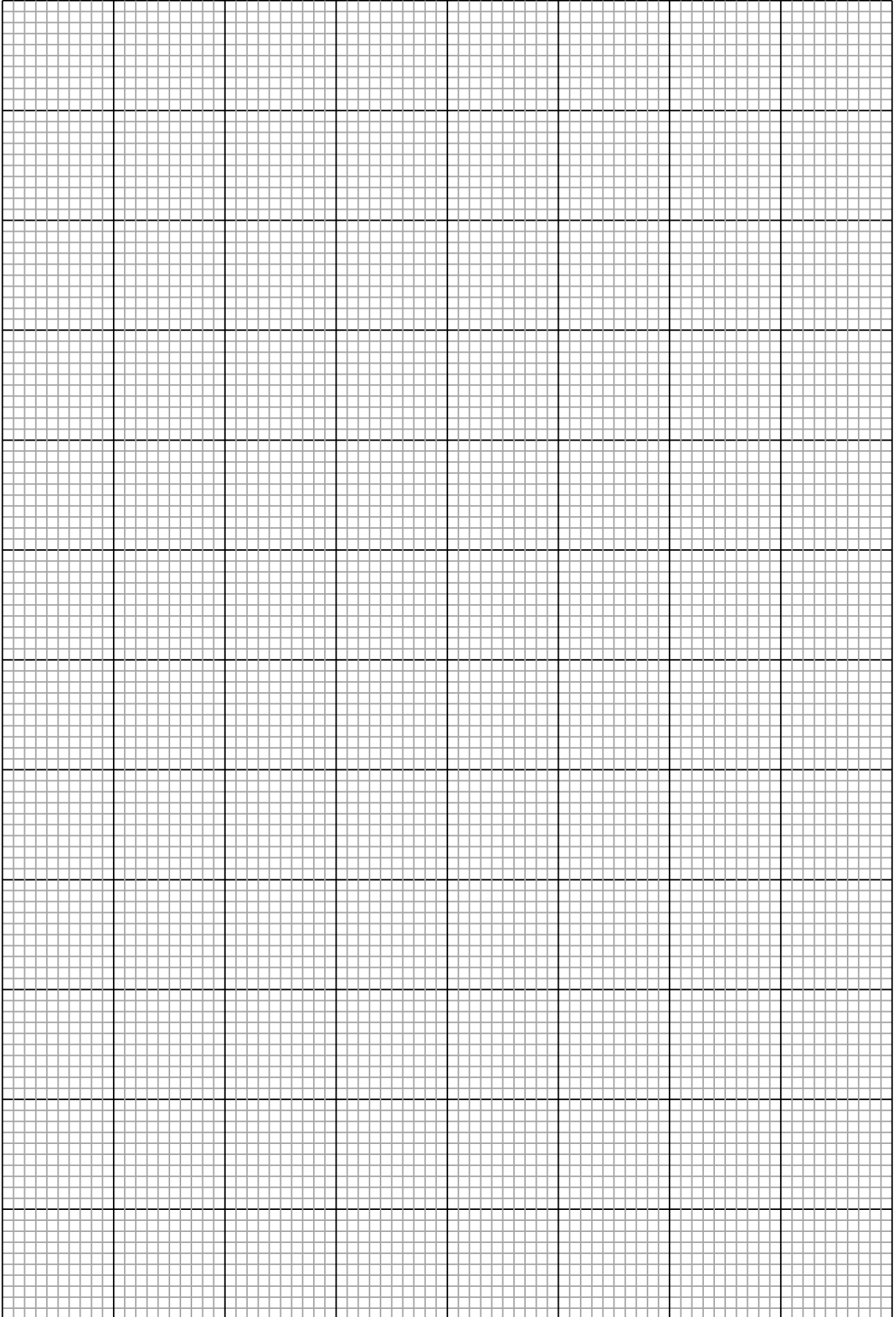
Tabulate and measure  $m$ ,  $x$  and  $L$ . Include columns to show the values of  $\frac{1}{m}$  and  $\frac{x}{L}$ . Include your readings from (c)(i) and (c)(ii).

[5]

- (e) Plot a graph of  $\frac{x}{L}$  against  $\frac{1}{m}$  on the grid on page 11.

Draw the line of best fit.

[4]



- (f) Calculate the gradient.

gradient = ..... [3]

- (g) It is suggested that  $\frac{1}{m}$  and  $\frac{x}{L}$  are related by the expression,

$$\frac{x}{L} = \left( M - \frac{B}{g} \right) \frac{1}{m},$$

where  $g = 0.010 \text{ N / g}$

Using your experimental results, state whether the suggested relationship is supported. Give evidence for your answer.

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 .....  
 ..... [2]

- (h) Other than taking repeated readings and calculating the average, suggest one precaution to improve the accuracy of the measured values of  $L$  and  $x$  throughout the experiment.

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 .....  
 ..... [1]

[Total: 20]