

SINGAPORE SPORTS SCHOOL PRELIMINARY EXAMINATIONS SECONDARY 4 EXPRESS

CANDIDATE
NAME

CLASS

4B

Physics

6091/03

Paper 3 Practical Test

21 Aug 2026

Candidates answer on the Question Paper.

1 hour 50 minutes

Reminder on Academic Honesty

All student-athletes are expected to complete this assessment independently.

Do not share, discuss, or seek information about this assessment with others who have yet to complete it. Any student-athlete who gives, receives, or attempts to obtain unfair assistance will be considered to have breached academic integrity and will face disciplinary action.

As a school, we uphold the value of **Integrity**. Every student-athlete is expected to demonstrate honesty, fairness, and responsibility in all assessments.

READ THESE INSTRUCTIONS FIRST

Write in dark blue or black pen.

You may use a soft pencil for any diagrams, graphs, tables or rough working.

Answer **all** questions.

All of your answers should be written in this Question Paper.

Graph paper is provided in this Question Paper. Additional sheets of graph paper should be used only if it is necessary to do so.

You will be allowed to work with the apparatus for a maximum of 55 minutes for each section. You are expected to record all your observations as soon as they are made. An account of the method of carrying out the experiments is **not** required.

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

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

This document consists of **12** printed pages.

For Examiner's Use	
Section A	
Q1	10
Q2	10
Section B	
Q3	20
Total	40

Section A

1 *In this experiment, you will investigate the effect of stirring water in a beaker.*

You have been provided with:

- an empty 250 cm³ beaker with a mark at the 200 cm³ level
- a beaker containing water
- a stirrer
- a stop-watch
- a ruler
- a measuring cylinder.

(a) Pour water into the 250 cm³ beaker up to the 200 cm³ mark.
Hold the beaker on the bench.
Stir the water so that the water rotates quickly.
Remove the stirrer.

(i) Observe the shape of the surface of the rotating water through the side of the beaker.

Draw a diagram of your observation.

Label on your diagram:

- the initial level of the water in the beaker
- the maximum height h of the rotating water surface above this mark
- the maximum depth d of the rotating water surface below this mark.

[2]

(ii) Determine a value for $\frac{d}{h}$. Record all your measurements.

$$\frac{d}{h} = \dots\dots\dots [2]$$

(iii) Describe **one** source of error in your measurements of h and d .

.....

 [1]

- (b) (i)** Stir the water again so that the water rotates quickly. Remove the stirrer.

Determine the average time t_1 for the water to return to its initial level after you remove the stirrer.

$t_1 =$ [2]

- (ii)** Pour 50 cm³ of water from the 250 cm³ beaker into the measuring cylinder.

Repeat **(b)(i)** and record t_2 .

$t_2 =$ [1]

- (iii)** Describe **one** source of error in determining t_2 .

.....
 [1]

- (c)** Describe **one** improvement that could be made to this experiment.

.....
 [1]

[Total: 10]

2 *In this experiment, you will investigate the motion of a mass on a piece of wire.*

You have been provided with:

- a piece of wire
- two crocodile clips
- a rule
- a stop-watch
- a boss and a stand.

(a) Place one end of the piece of wire in the jaws of one of the crocodile clips.

Attach the crocodile clip to the boss and attach the boss to the stand, as shown in Fig. 2.1.

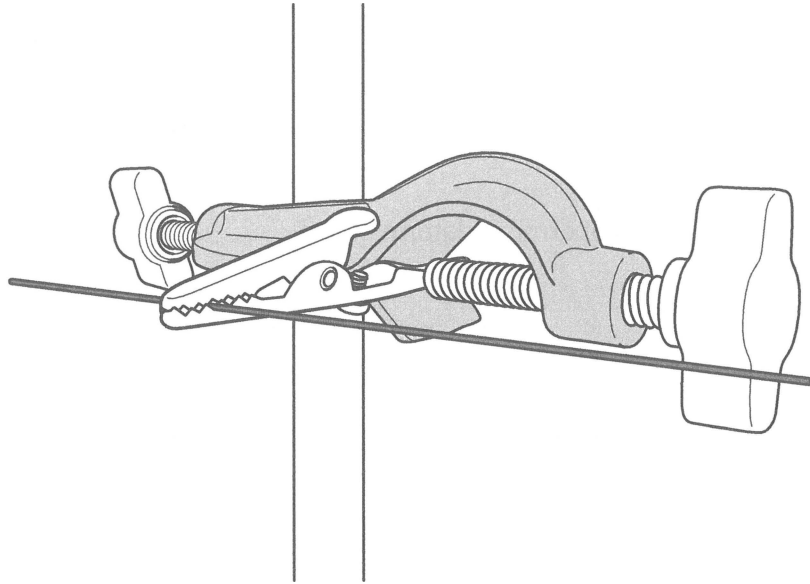


Fig. 2.1

Adjust the boss until the height h of the free end of the wire is approximately 30 cm above the bench, as shown in Fig. 2.2.

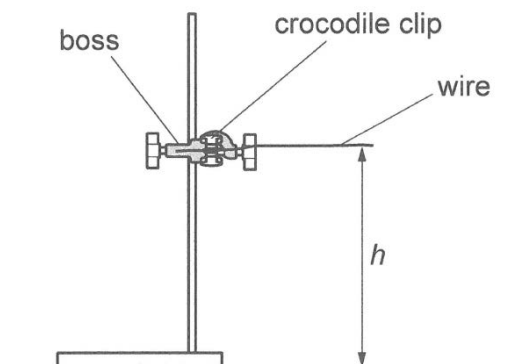


Fig. 2.2

- (i) Measure and record h .

$h = \dots\dots\dots$ [1]

- (ii) Attach the second crocodile clip to the free end of the wire, as shown in Fig. 2.3.

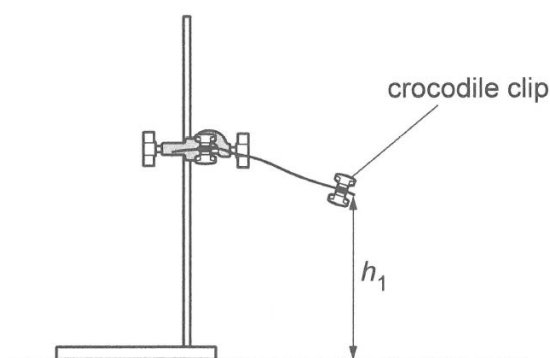


Fig. 2.3

Measure and record h_1 .

$h_1 = \dots\dots\dots$

Calculate the deflection y of the wire, where $y = h - h_1$.

$y = \dots\dots\dots$ [1]

- (b) Push the free end of the wire down a small distance and then release it. The wire oscillates.

Determine the period T of oscillation of the wire.

$T = \dots\dots\dots$ [2]

- (c)** A student claims that $T = a\sqrt{y} + b$, where a and b are constants and y is the deflection of the wire.

Plan an experiment to investigate the student's claim.

In your plan, you should:

- explain briefly how to do the experiment
- draw a table, with column headings, to show how to display the range of readings
- explain how to determine a and b if the student's claim is correct.

This image shows a blank sheet of white paper with horizontal dashed lines. The lines are evenly spaced and run across the width of the page, providing a guide for handwriting practice. There are no margins, text, or other markings on the paper.

Section B

3 *In this experiment, you will investigate combinations of resistors in an electrical circuit.*

You have been provided with:

- a battery
- a resistor X
- an ammeter
- a voltmeter
- a switch
- connecting leads
- two 3.3Ω resistors
- two 10Ω resistors.

Assemble the apparatus as shown in Fig. 3.1.

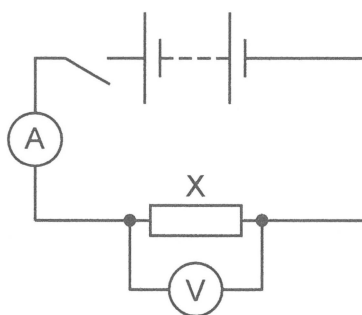


Fig. 3.1

(a) (i) Record:

- the voltmeter reading V

$V = \dots\dots\dots$

- the ammeter reading I .

$I = \dots\dots\dots$

Open the switch immediately after taking the readings.

[2]

(ii) Calculate the resistance R_X of resistor X using the equation $R_X = \frac{V}{I}$.

$R_X = \dots\dots\dots$ [1]

(b) The resistors can be connected:

- in parallel, as shown in Fig. 3.2
- in series, as shown in Fig. 3.3.

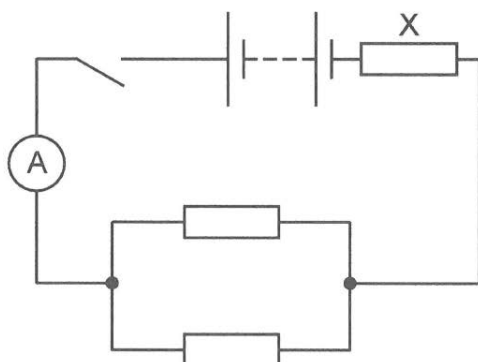


Fig. 3.2

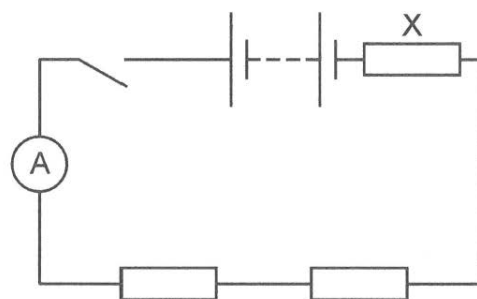


Fig. 3.3

For a **parallel** combination of resistors of resistance R_1 and R_2 , the combined resistance is

$$\frac{R_1 \times R_2}{R_1 + R_2}.$$

For a **series** combination of resistors of resistance R_1 and R_2 , the combined resistance is

$$R_1 + R_2.$$

Make **six** circuits with different combined resistances, each using two of the four resistors in different combinations.

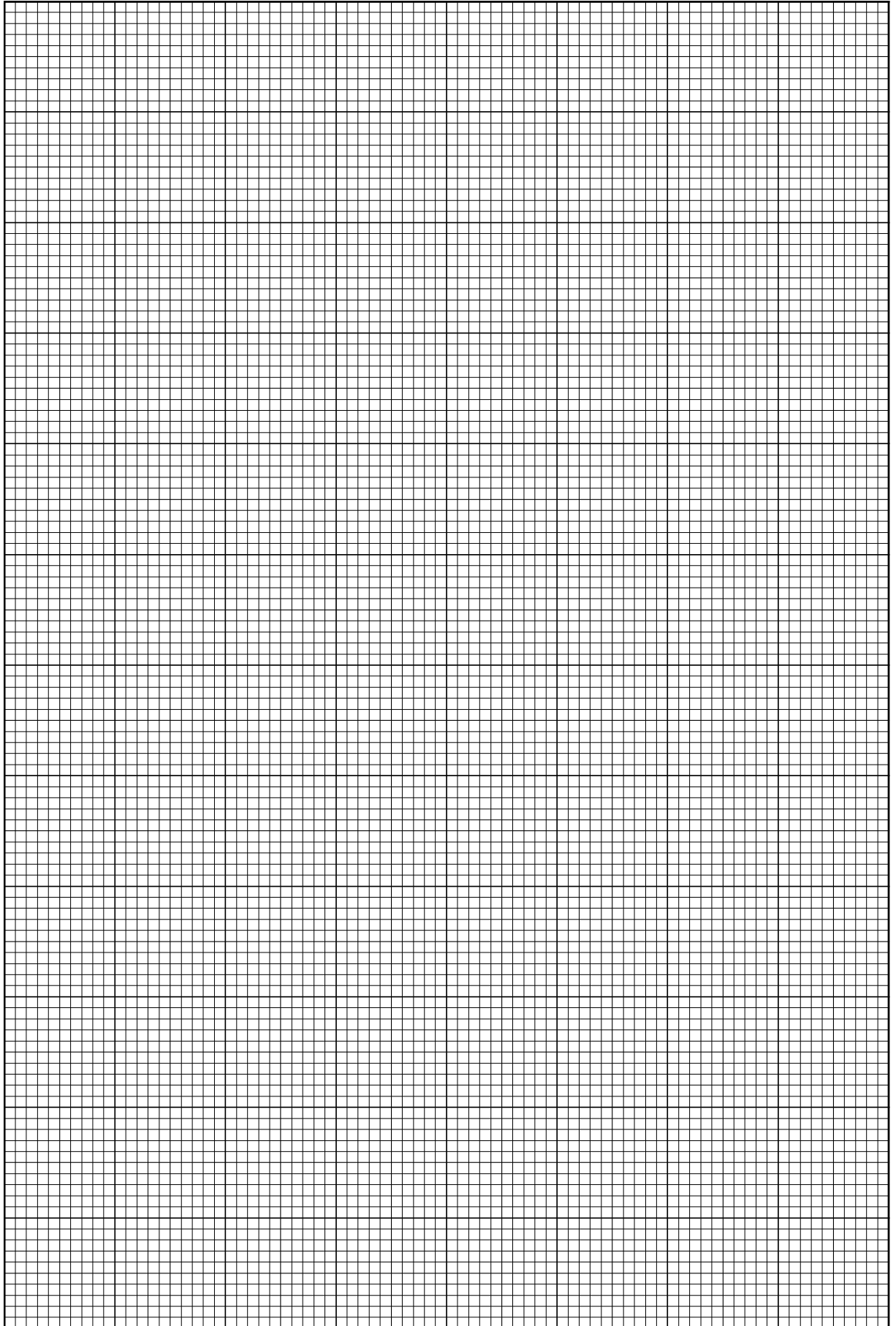
For each combination of resistors, measure I and calculate $\frac{1}{I}$.

Record all of your measurements and calculations in a suitable table.

[7]

(c) (i) On the grid provided, plot a graph of $\frac{1}{I}$ against R . Start the x-axis at $R = 0$.

[4]



- (ii) Determine the gradient G of the line of best fit.

$G =$ [2]

- (iii) Determine the y -intercept Y of the line of best fit.

$Y =$ [1]

- (d) (i) A student suggests that $R_X = \frac{Y}{G}$.

Use your values of G and Y to calculate another value for the resistance R_X of resistor X using this equation.

$R_X =$ [1]

- (ii) Describe **one** source of error that results in different values of R_X in (a)(ii) and (d)(i).

Suggest **one** improvement to reduce this error.

source of error

.....

improvement

.....

[2]

[Total: 20]