



**BEATTY SECONDARY SCHOOL
PRELIMINARY EXAMINATION 2026
SECONDARY FOUR EXPRESS / G3**

CANDIDATE
NAME

CLASS

REGISTER
NUMBER

PHYSICS

Paper 3

Practical Test

6091/03

12 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 name, class and register number on all the work you hand in.

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 or correction fluid.

Answer **all** questions.

All of your answers should be written in this Question Paper: scrap paper must **not** be used.

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.

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.

For Examiner's Use	
1	10
2	10
3	20
Total	40

Section A

- 1 *In this experiment, you will investigate how the volume of water affects the rate at which water in a beaker cools.*

You are provided with:

- a retort stand with boss and clamp,
- a thermometer,
- a 250 cm³ beaker,
- a thermal flask containing hot water,
- a stopwatch,
- a styrofoam cup,
- a piece of cloth.

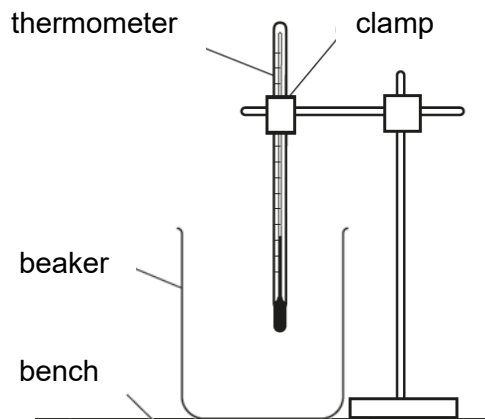


Fig. 1.1

- (a) Set up the apparatus as shown on Fig. 1.1. Clamp the thermometer such that it is near the bench top.

Take note that the thermometer should not be clamped too tightly to prevent breakage. The thermometer must remain in the clamp throughout the experiment.

- (b) Pour approximately 200 cm³ of hot water into the beaker and place the thermometer in the water.

When the temperature of the hot water stops increasing, this is the highest temperature T_H obtained by the hot water.

Record the highest temperature of the hot water, T_H , and start the stopwatch immediately.

$T_H = \dots\dots\dots$ [1]

- (c) Record the temperature T of the water every 30 s until $t = 180$ s in Table 1.1.

Include in the same table, the reading in (b) at $t = 0$ s.

After 180 s, carefully pour the hot water into the sink, using the cloth to hold the beaker.

Table 1.1

	beaker with 200 cm ³ of water	beaker with 100 cm ³ of water
t / s	T / °C	T / °C

[2]

- (d) Repeat (b) and (c) using 100 cm³ of hot water in the beaker. Record the temperature readings in Table 1.1.

[1]

- (e) By referring to your results, explain the effect of volume of water in the beaker on the rate of cooling of the water.

.....

.....

..... [2]

- (f) (i) Using your results for 100 cm³ of water, calculate the average rate of cooling r_1 for the first 90 s of the experiment using the formula,

$$r_1 = \frac{T_0 - T_{90}}{t}$$

where T_0 and T_{90} are the temperatures of water at 0 s and 90 s respectively, and $t = 90$ s.

Include the unit for the rate of cooling.

$r_1 =$ [1]

- (ii) Using your results for 100 cm³ of water,
calculate the average rate of cooling r_2 for the last 90 s of the experiment using
the formula,

$$r_2 = \frac{T_{90} - T_{180}}{t}$$

where T_{90} and T_{180} are the temperatures of water at 90 s and 180 s
respectively, and $t = 90$ s.

$r_2 = \dots\dots\dots$ [1]

- (g) A student suggests that the two different volumes of water should have the same
starting temperatures.

State whether your values for r_1 and r_2 support this suggestion. Justify your answer
with reference to your results in (f).

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

[Total: 10]

2 In this experiment you will investigate the oscillation of a wire triangle.

You are provided with

- a retort stand, clamp and boss
- one piece of wire
- a cork with a pin
- a stopwatch
- a half-metre rule
- one piece of blu-tack

- (a) Bend the wire to form the shape of a triangle, as shown on Fig. 2.1. Use a piece of blu-tack to ensure that the ends of the wire meet at one corner of the triangle. The bottom of the triangle should have a length L of 20.0 cm.

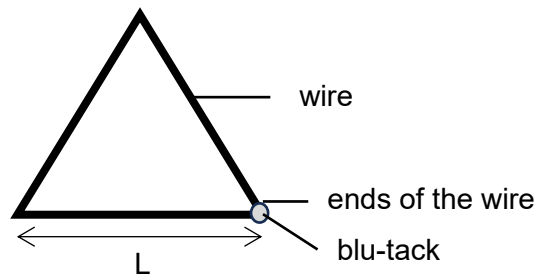


Fig. 2.1

- (i) Describe the steps taken to ensure a triangle with $L = 20.0$ cm is formed.

.....

 [1]

- (ii) Measure and record the length L .

$L =$ [1]

- (iii) Position the pin in the cork and clamp the cork.
Hang the triangle-shaped wire from the pin as shown on Fig. 2.2.

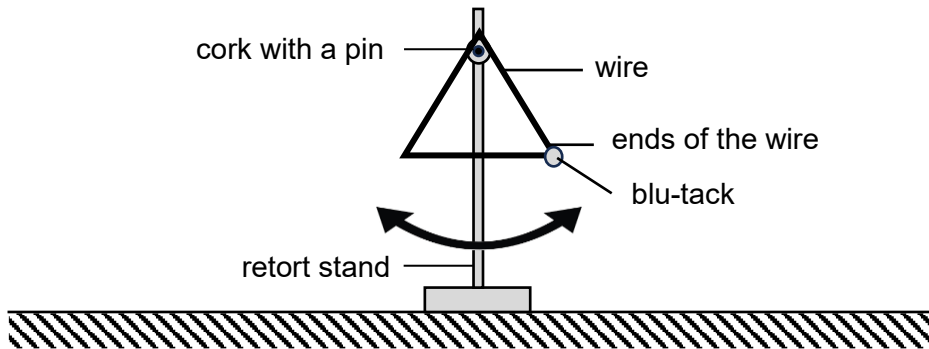


Fig. 2.2

- (iv) Gently displace the triangle-shaped wire and release it so that it oscillates sideways as shown on Fig. 2.2.
- (v) Determine an accurate value for the period T of the oscillations.

$$T = \dots\dots\dots [1]$$

- (vi) Calculate T^2 .

$$T^2 = \dots\dots\dots [1]$$

- (b) A student claims that T^2 is *directly proportional to* L .

Using the same apparatus as in Fig. 2.2, plan an experiment to find out if the student is right.

Your plan should include

- the quantities that you should keep constant,
- a detailed description of how you will perform the experiment,
- a suitable table, with column headings, 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 is correct.

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.....

.....

[6]

[Total: 10]

Section B

3 In this experiment you will investigate the resistance of a salt solution.

You are provided with:

- a power supply (three dry cells)
- a retort stand with two sets of bosses and clamps
- a beaker with two wooden rods wrapped in wire
- a voltmeter (0 – 6.00 V)
- an ammeter (0 – 1.00 A)
- a switch
- connecting leads
- a 100 cm³ measuring cylinder
- seven canisters of salt Q of 1.0 g each
- a bottle of deionised water
- a stopwatch
- a spatula.

- (a) Set up the apparatus as shown in Fig. 3.1. Fill the beaker with 400 cm³ of deionised water.

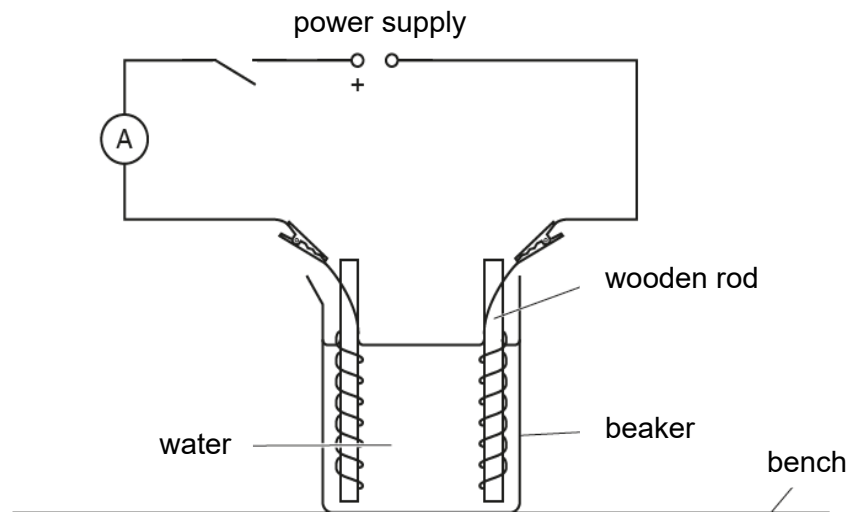


Fig. 3.1

- (i) Connect the voltmeter across the terminals of the power supply.

Record the voltage reading V on the voltmeter.

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

- (ii) Describe how exactly 400 cm³ of deionised water is added into the beaker.

.....

.....

..... [1]

- (b) Add the contents of one canister of salt Q into the beaker of deionised water. Stir gently to ensure all the salt is dissolved.

- (i) Each canister contains 1.0 g of salt Q.

Calculate the concentration of salt Q, C , in the beaker of deionised water.

$$C = \dots\dots\dots [1]$$

- (ii) Close the switch.

Record the current reading I on the ammeter.

Open the switch immediately.

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

- (iii) The resistance R of the solution is given by the equation:

$$R = \frac{V}{I}$$

Calculate R .

$$R = \dots\dots\dots [1]$$

- (iv) Suggest why the switch must be opened immediately after the current reading has been taken in (b)(ii).

.....

 [1]

- (v) State **one** precaution that must be taken when taking a reading on the ammeter.

.....

 [1]

- (c) By adding increasing number of canisters of salt Q to the beaker, repeat steps (b)(i) to (b)(iii) for additional values of R .

Assume that voltage V across the terminals of the power supply recorded in (a) remains unchanged throughout the experiment.

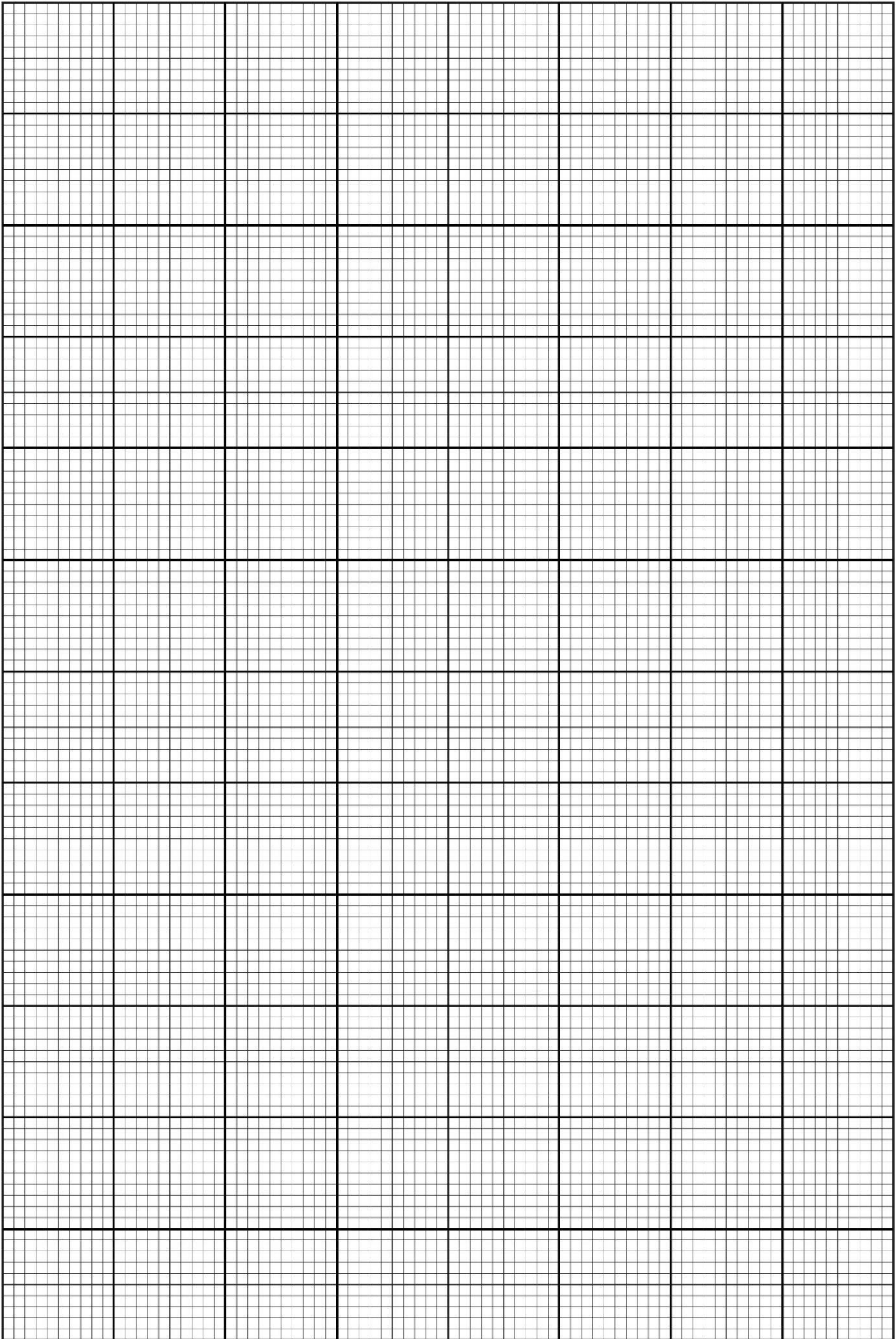
Record your values of C , I and R in a table. Include your results from (b) in the table.

[4]

- (d) On the grid provided, plot a graph of R against C .

Draw the curved line of best fit.

[4]



- (e) (i) Draw a tangent to the curve at $C = 0.010 \text{ g/cm}^3$.

Determine the gradient G of this tangent.

$G = \dots\dots\dots$ [2]

- (ii) Explain why the gradient G decreases with C .

.....

 [1]

- (f) Identify **one** significant source of error in the experiment and suggest **one** improvement to obtain a more accurate value of R .

source of error

 improvement

 [2]

[Total: 20]