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0972/05

For Examination from 2018

1 hour 15 minutes

Additional Materials: As listed in the Confidential instructions.

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

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.

This document consists of **9** printed pages and **1** blank page.

- 1 In this experiment, you will determine the mass of a load using a balancing method.

Carry out the following instructions referring to Fig. 1.1.

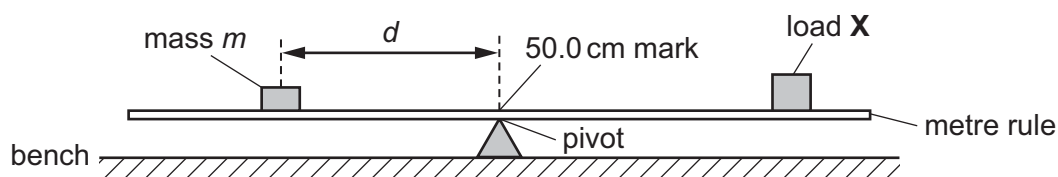


Fig. 1.1

The load **X** has been taped to the metre rule so that its centre is exactly over the 90.0 cm mark. **Do not move this load.**

- (a)
- Place a mass of 40 g on the rule and adjust its position so that the rule is as near as possible to being balanced with the 50.0 cm mark exactly over the pivot as shown in Fig. 1.1.
 - Record in Table 1.1 the distance d from the centre of the 40 g mass to the 50.0 cm mark on the rule.
 - Repeat the steps above using masses of 50 g, 60 g, 70 g and 80 g to obtain a total of five sets of readings. Record the readings in the table.
 - For each value of d calculate $\frac{1}{d}$ and enter the values in the table.

Table 1.1

m/g	d/cm	$\frac{1}{d}/\frac{1}{\text{cm}}$
40		
50		
60		
70		
80		

- (b) State how you overcame **one** difficulty you had in obtaining accurate results.

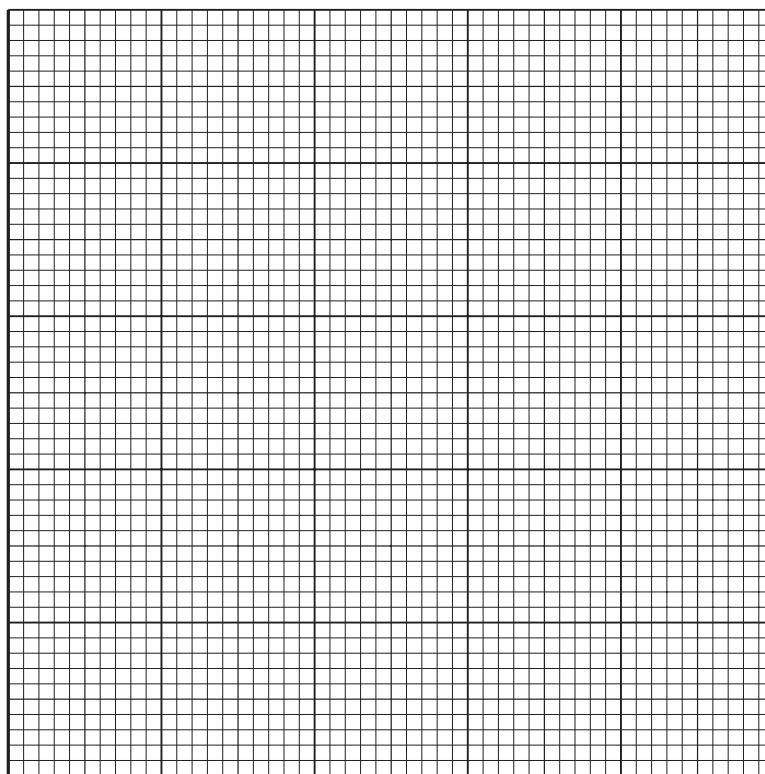
[3]

.....

.....

..... [2]

- (c) Plot a graph of m/g (y -axis) against $\frac{1}{d} / \frac{1}{\text{cm}}$ (x -axis).



[4]

- (d) Determine the gradient G of the graph. Show clearly on the graph how you obtained the necessary information.

$G = \dots\dots\dots$ [1]

- (e) Determine the mass μ , in grams, of the load **X**. Use the equation $\mu = \frac{G}{40.0}$.

$\mu = \dots\dots\dots \text{g}$ [1]

[Total: 11]

- 2 In this experiment, you will investigate the effect of a layer of cotton wool on the cooling of water in a test-tube.
- (a) Carry out the following instructions referring to Fig. 2.1. You are provided with a supply of hot water.

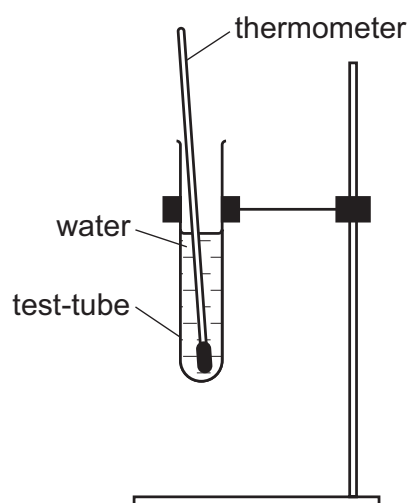


Fig. 2.1

- Pour hot water into the test-tube until it is about two thirds full of water. Place the thermometer in the water.
- When the thermometer reading stops rising, measure the temperature θ of the water in the test-tube and immediately start the stopclock. Record θ in Table 2.1 at time $t = 0$ s.
- Record in the table the temperature θ of the water every 30 s until you have a total of seven readings.
- Remove the thermometer and pour away the water from the test-tube. Wrap the cotton wool around the test-tube and secure it with the elastic bands. Repeat the steps above.
- Complete the time and temperature column headings in the table.

Table 2.1

$t /$	tube without cotton wool $\theta /$	tube with cotton wool $\theta /$
0		
30		
60		
90		
120		
150		
180		

[3]

- (b) Write a conclusion to this investigation, stating in which experiment the cooling was more rapid. Explain your answer by reference to your readings and any relevant science.

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.....

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.....

.....

..... [3]

- (c) Discuss the quality of your results, and suggest **two** improvements to the experiment which would allow a more certain conclusion to be drawn.

quality of results:

.....

improvements:

.....

.....

..... [3]

- (d) This experiment is being carried out by students in many different countries, using identical apparatus.

Suggest **two** differences in the conditions in the various laboratories that might lead to differences in their results.

1.

2.

[2]

[Total: 11]

- 3 In this experiment, you will investigate the effect of the length of resistance wire in a circuit on the potential difference across a lamp.

The circuit has been set up for you.

- (a) Fig. 3.1 shows the circuit without the voltmeter.

Draw on the circuit diagram the voltmeter as it is connected in the circuit. [2]

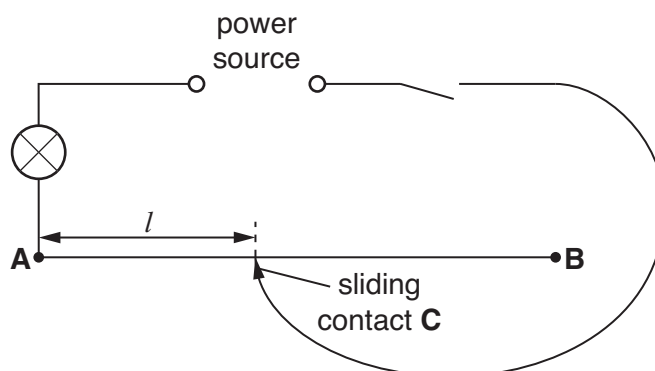


Fig. 3.1

- (b)
- Switch on and place the sliding contact **C** on the resistance wire at a distance $l = 0.150\text{ m}$ from end **A**. Record the value of l and the potential difference V across the lamp in Table 3.1. Switch off.
 - Repeat the instructions above using four different values of l to give a good range of data. Record all the values of l and V in Table 3.1.

Table 3.1

l/m	V/V

[4]

- (c) How does increasing length l affect the brightness of the lamp?

..... [1]

- (d) A student suggests that the potential difference V across the lamp is directly proportional to the length l of resistance wire in the circuit.

State whether you agree with this suggestion. Justify your answer by reference to your results.

statement

justification

.....

.....

[2]

- (e) Suggest a practical reason why, if you were to repeat this experiment, the repeat readings may be slightly different from those you recorded in Table 3.1.

.....

..... [1]

- (f) State one safety precaution that you would take when carrying out experiments like this with resistance wires.

..... [1]

[Total: 11]

- 4** A student's plastic bottle of water tips over in class.

Plan an experiment to investigate how the quantity of water in a plastic bottle affects its stability.

The plastic bottle holds up to 2000 cm^3 of water and has a height of 42 cm.

Write a plan for the experiment, including:

- the apparatus needed
- instructions for carrying out the experiment
- the values you will use for the quantity of water
- how you will make sure your results are as accurate as possible
- the graph you will plot from your results

A diagram is not required, but you may add to Fig. 4.1, or draw your own diagram, if it helps to explain your plan.

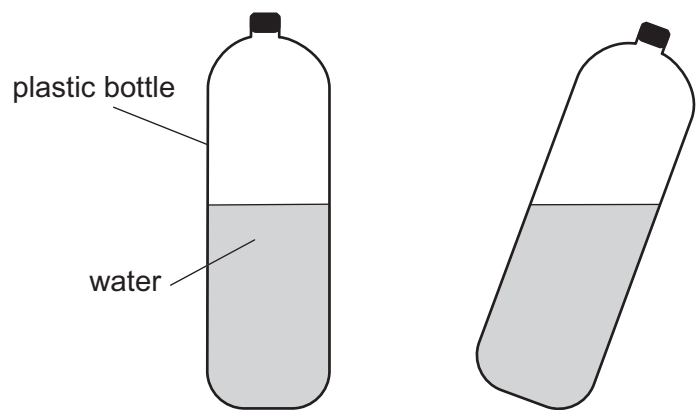


Fig. 4.1

This image shows a full page of white paper with horizontal dashed lines, typical of primary school writing paper. The lines are evenly spaced and run across the entire width of the page. There are no margins, text, or other markings present.

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