Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2932959090

PHYSICS **0625/62**

Paper 6 Alternative to Practical **February/March 2020**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages. Blank pages are indicated.

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[Turn over

1 A student is determining the density of wood by two methods.

He is using the wooden rod shown in Fig. 1.1.

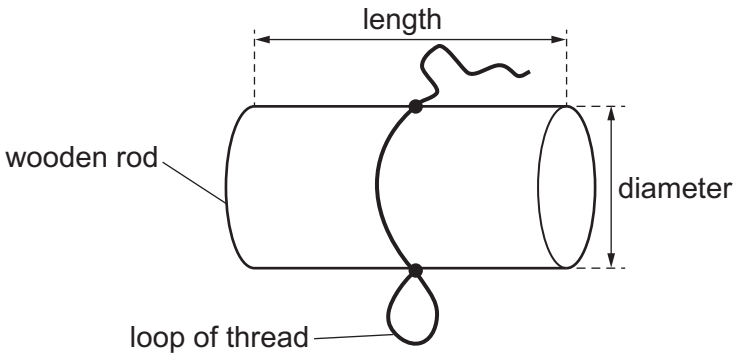


Fig. 1.1

Method 1

The dimensions of the wooden rod are shown full size in Fig. 1.2.

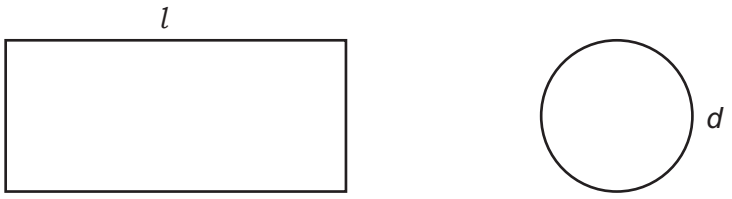


Fig. 1.2

(a) (i) Measure the length l and the diameter d of the wooden rod in Fig. 1.2.

l = ... cm

d = ... cm
[2]

(ii) Suggest an accurate method for measuring the diameter of the wooden rod in this experiment.
List any additional apparatus that might be required and briefly describe how you would determine the diameter.
You may draw a diagram if it helps to explain your answer.

.....

.....

..... [2]

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(b) The student uses a balance to measure the mass *m* of the wooden rod as shown in Fig. 1.3.

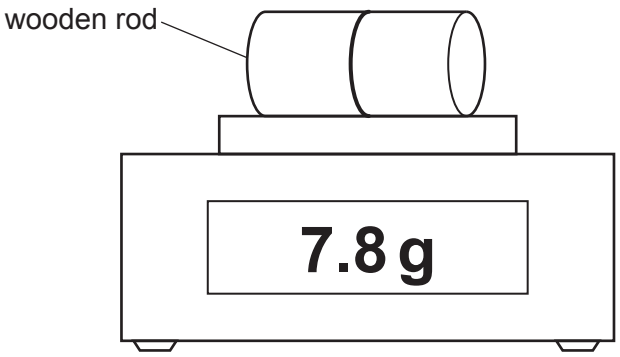


Fig. 1.3

Record the mass *m* of the rod.

m = ...g

Calculate a value ρ_1 for the density of the wooden rod. Use your values from **(a)(i)** and **(b)** and the equation $\rho_1 = \frac{4m}{\pi d^2 l}$. Include a suitable unit.

ρ_1 = ... [2]

Method 2

(c) The student pours water into a measuring cylinder as shown in Fig. 1.4.
He then floats the wooden rod in the water as shown in Fig. 1.5.

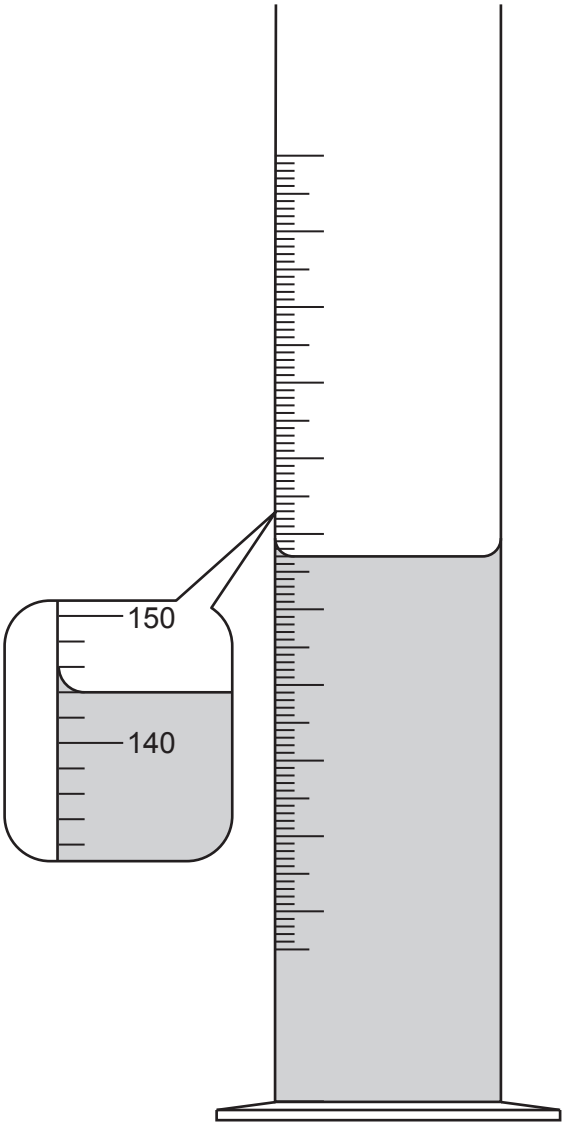


Fig. 1.4

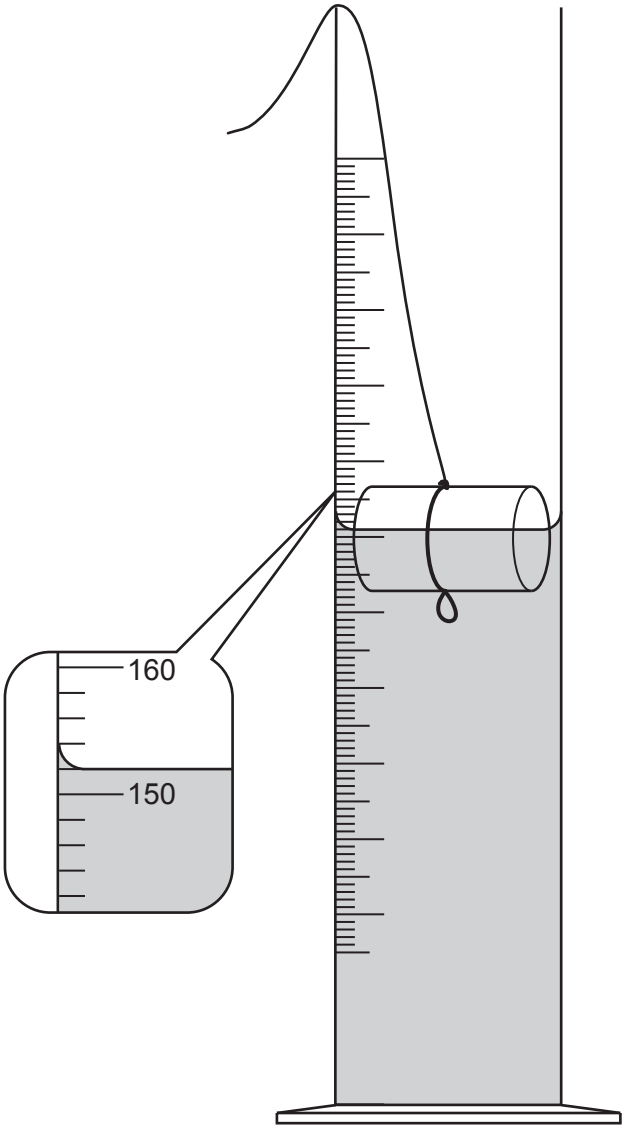


Fig. 1.5

Record the reading V_1 of the water level in the measuring cylinder as shown in Fig. 1.4.

V_1 = ...cm^3

Record the new reading V_2 of the water level in the measuring cylinder with the rod floating in the water as shown in Fig. 1.5.

V_2 = ...cm^3
[1]

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(d) The student removes the rod and lowers a piece of modelling clay into the water as shown in Fig. 1.6.
He then hooks the rod to the modelling clay and lowers them into the water as shown in Fig. 1.7.

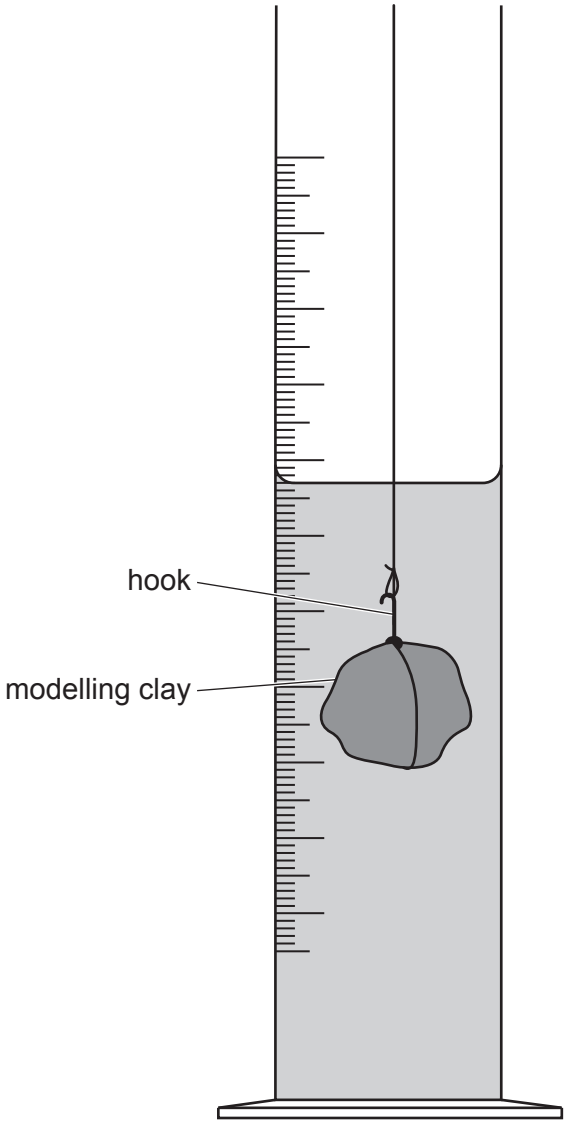


Fig. 1.6

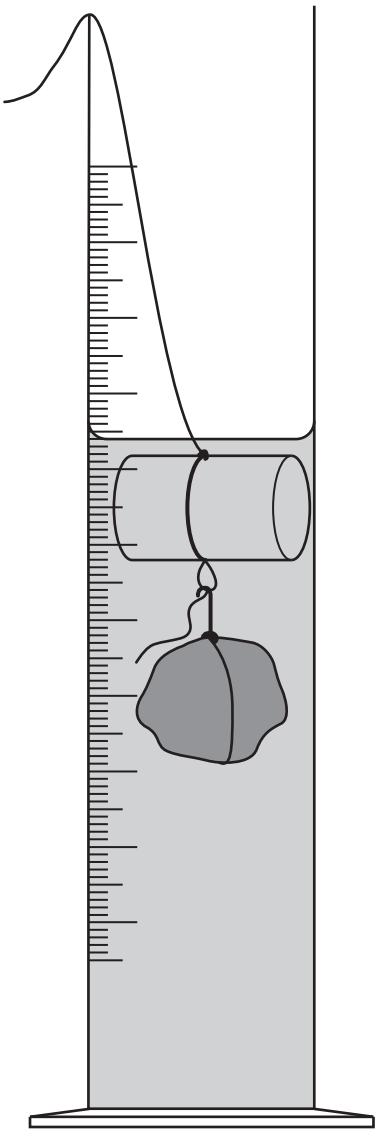


Fig. 1.7

He records the new reading V_3 of the water level in the measuring cylinder with the modelling clay.

He records the reading V_4 of the water level in the measuring cylinder with the modelling clay and rod.

V_3 = 164 cm^3

V_4 = 178 cm^3

Calculate another value ρ_2 for the density of the wooden rod. Use the values from **(c)** and **(d)** and the equation $\rho_2 = \dfrac{(V_2 - V_1)}{(V_4 - V_3)} \times k$ where $k = 1.0\,\text{g/cm}^3$.

ρ_2 = ... [2]

(e)

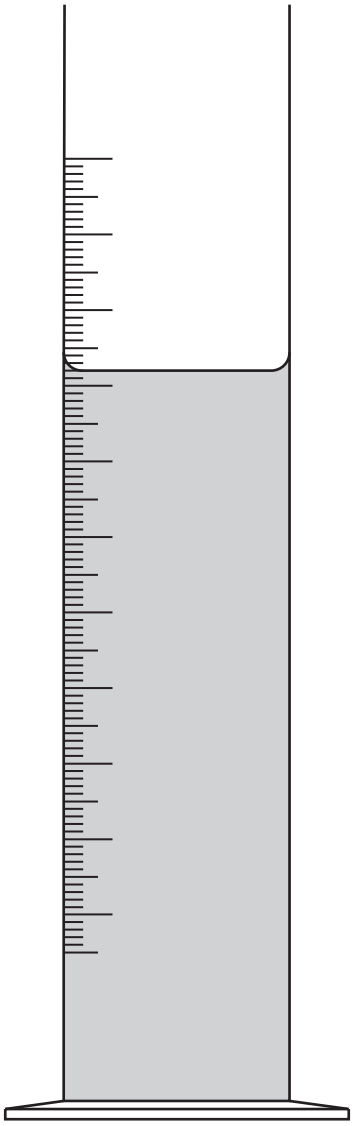


Fig. 1.8

On Fig. 1.8, **draw** an arrow showing the correct line of sight for reading the volume of water in the measuring cylinder. [1]

(f) Suggest a possible source of inaccuracy in **Method 2**, even if it was carried out carefully.

.....

..... [1]

[Total: 11]

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2 Students are investigating the cooling of hot water in a beaker.

They are using the apparatus shown in Fig. 2.1.

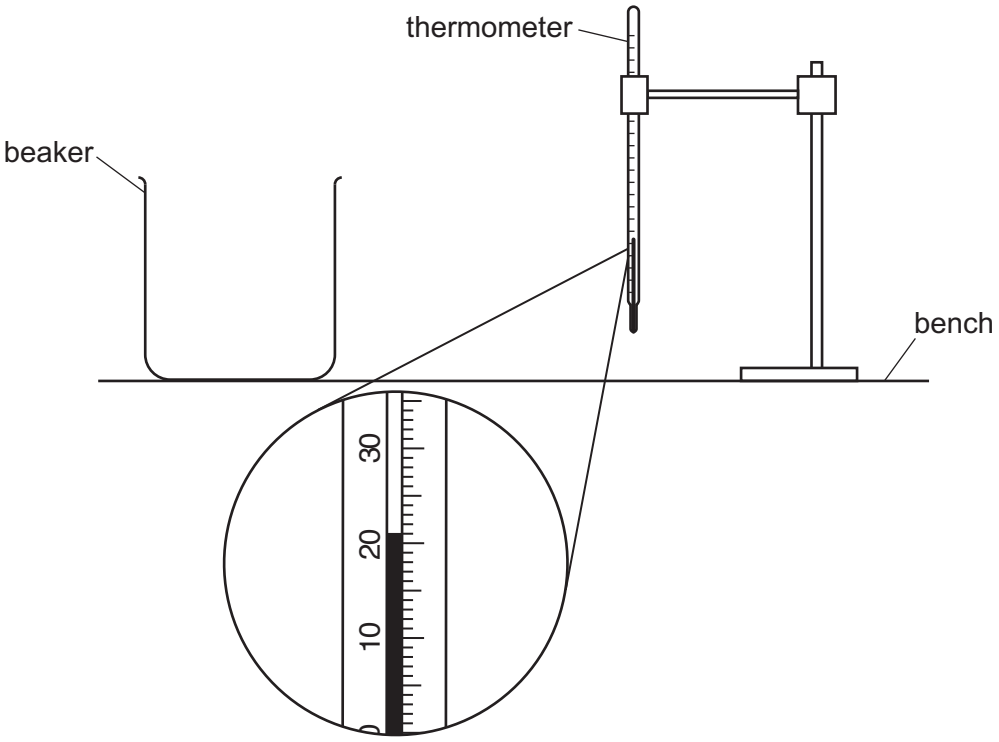


Fig. 2.1

(a) Record room temperature θ_R shown on the thermometer in Fig. 2.1.

θ_R = ... [1]

(b) A volume of 150 cm^3 of hot water is poured into the beaker and the initial temperature θ is recorded in Table 2.1.
The temperature of the water is recorded every 30 s. The values are shown in Table 2.1.

(i) Complete the headings in Table 2.1. [1]

Table 2.1

t/	θ/
0	95.0
30	89.0
60	83.5
90	79.0
120	75.0
150	71.5
180	68.5
210	66.0
240	64.0
270	62.5

(ii) Describe **one** precaution that you would take to ensure that the temperature readings in the experiment are as accurate as possible.

.....

..... [1]

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(c) (i) Calculate the average cooling rate x_1 during the first 90 s of the experiment. Use the readings from Table 2.1 and the equation

$$x_1 = \frac{\theta_0 - \theta_{90}}{T}$$

where T = 90 s and θ_0 and θ_{90} are the temperatures at t = 0 and t = 90 s.
Include the unit for the cooling rate.

x_1 = ... [1]

(ii) Calculate the average cooling rate x_2 during the middle 90 s of the experiment. Use the readings from Table 2.1 and the equation

$$x_2 = \frac{\theta_{90} - \theta_{180}}{T}$$

where T = 90 s and θ_{90} and θ_{180} are the temperatures at t = 90 s and t = 180 s.

x_2 = ... [1]

(iii) Calculate the average cooling rate x_3 during the last 90 s of the experiment. Use the readings from Table 2.1 and the equation

$$x_3 = \frac{\theta_{180} - \theta_{270}}{T}$$

where T = 90 s and θ_{180} and θ_{270} are the temperatures at t = 180 s and t = 270 s.

x_3 = ... [1]

(d) (i) The temperature of the water falls as time passes. Use the results from **(c)** to describe the pattern of the rate of cooling of the water during the experiment.
Justify your answer by reference to the results.

.....

.....

.....

..... [1]

(ii) Give an estimate of the probable final temperature θ_F of the water if left to cool for many hours.

θ_F = ... [1]

(e) (i) A student in another school carries out a similar experiment.
She starts with the hot water at a lower initial temperature.
Suggest how her cooling rates are likely to compare with those calculated in **(c)**.
Use the results to explain your answer.

suggestion .....

.....

explanation .....

.....

.....
[2]

(ii) State **one** variable, other than the initial temperature, which the student should control.

.....

..... [1]

[Total: 11]

3 A student is investigating a power supply.
She is using the circuit shown in Fig. 3.1.

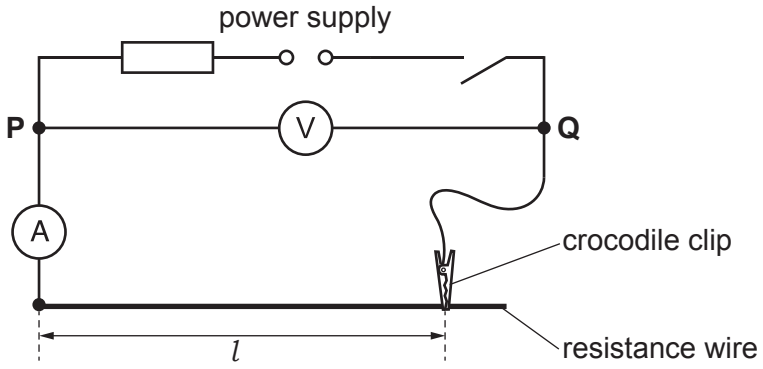


Fig. 3.1

(a) The student connects the crocodile clip to a length l = 100.0 cm of the resistance wire and measures the potential difference V_0 across terminals **P** and **Q** and the current I_0 in the circuit.

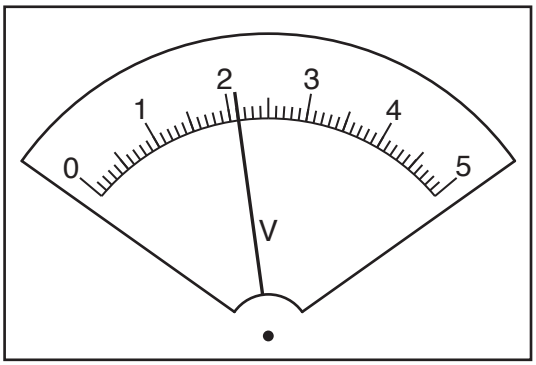


Fig. 3.2

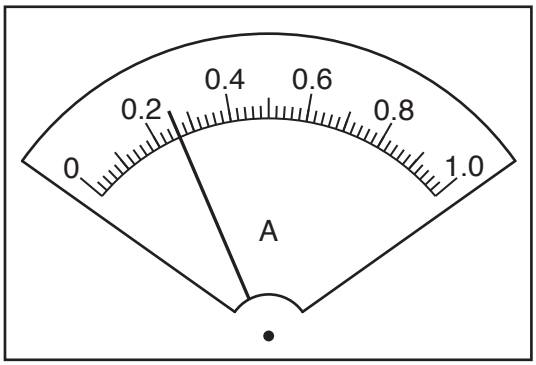


Fig. 3.3

(i) Record the values of V_0 and I_0 shown on the meters in Fig. 3.2 and Fig. 3.3.

V_0 = ... V

I_0 = ... A
[1]

(ii) Calculate the resistance R_0 of 100.0 cm of the wire. Use your values of V_0 and I_0 and the equation $R_0 = \frac{V_0}{I_0}$.

R_0 = ... Ω
[1]

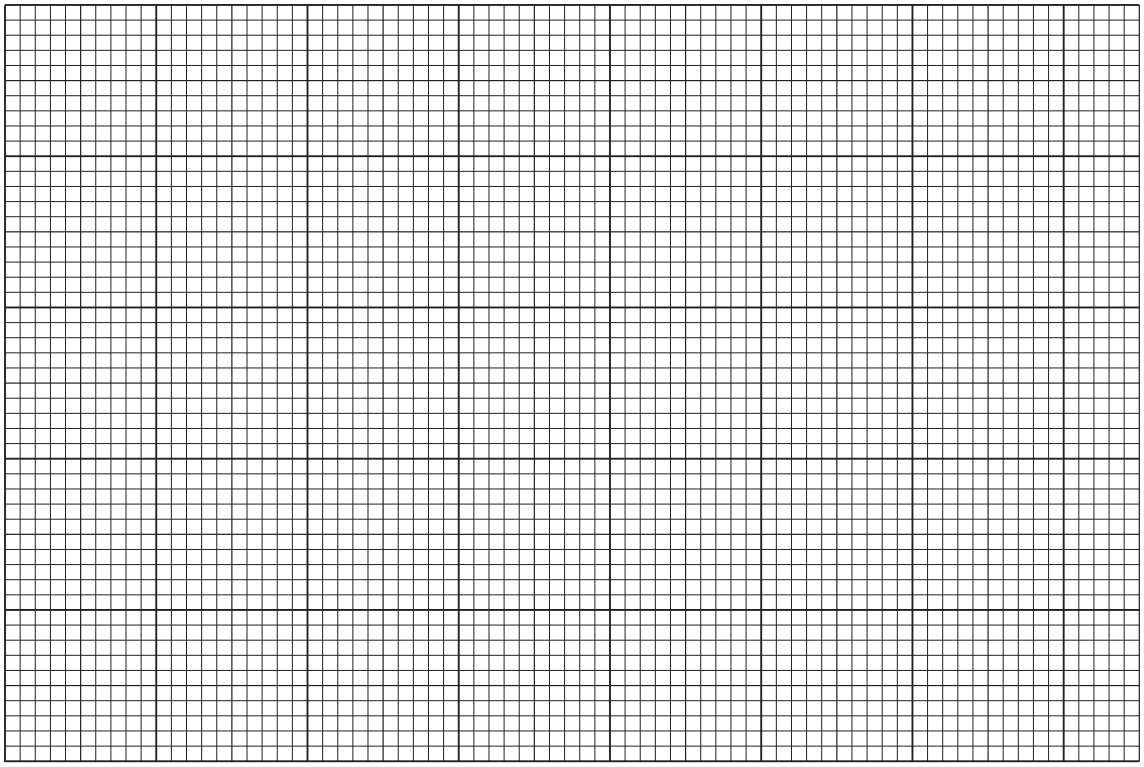
(b) The student then connects the crocodile clip to lengths l = 70.0 cm, 60.0 cm, 50.0 cm, 40.0 cm and 30.0 cm of the resistance wire. She measures the current I in the circuit for each length. Her readings are shown in Table 3.1.

Table 3.1

l/cm	I/A	$\frac{1}{I}\Big/\frac{1}{\text{A}}$
70.0	0.35	
60.0	0.40	2.50
50.0	0.44	2.27
40.0	0.53	1.89
30.0	0.65	1.54

Calculate, and record in Table 3.1, the value of $\frac{1}{I}$ for length l = 70.0 cm of the wire. [1]

(c) Plot a graph of l/cm (y-axis) against $\frac{1}{I}\Big/\frac{1}{\text{A}}$ (x-axis). You do **not** need to start your axes at the origin (0,0).



[4]

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

G = ... [1]

(ii) Calculate the electromotive force (e.m.f.) E of the power supply. Use your value of R_0 from **(a)(ii)** and the equation $E = \frac{G \times R_0}{k}$, where k = 100 cm.

E = ...V [1]

(e) The ammeter in this circuit has a small resistance which affects the current. The effect of this resistance on the measured current I will be different for each measured length l of the resistance wire.
State and explain which length l will be most affected by the resistance of the ammeter.

statement .....

explanation .....

.....
[2]

[Total: 11]

4 A student investigates a wind turbine, which is an electrical generator driven by a propeller blade.

Plan an experiment which will enable him to investigate how the current in a resistor connected across the terminals of the turbine varies with the speed of the air flow through the turbine.

The apparatus available includes:

a model wind turbine as shown in Fig. 4.1
an electric fan to provide the moving air to turn the turbine
a device for measuring air speed.

In your plan, you should:

- list any additional apparatus needed
- complete the wind turbine circuit diagram on Fig. 4.1
- state the key variables to be kept constant
- explain briefly how to carry out the experiment, including how the speed of the air flow is to be changed
- explain how to use the readings to reach a conclusion.

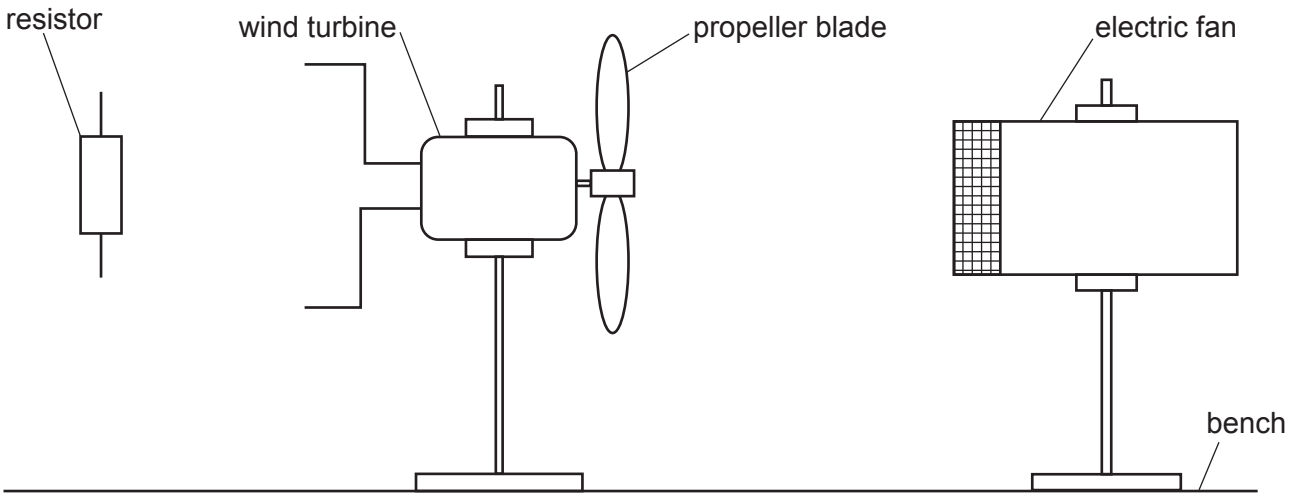


Fig. 4.1

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..... [7]

[Total: 7]

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