Specimen Paper

Centre Number						Candidate Number				
Surname										
Other Names										
Candidate Signature										

For Examiner's Use	
Examiner's Initials	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

AQA Level 1/2 Certificate in Science: Double Award
Specimen Paper

Double Award

Physics Paper 2H

For this paper you must have:
- a ruler
- a calculator
- the Physics Equations Sheet (enclosed).

Time allowed
- 60 minutes

Instructions
- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information
- The marks for questions are shown in brackets.
- The maximum mark for this paper is 60.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
  Question 4 should be answered in continuous prose.
  In this question you will be marked on your ability to:
  – use good English
  – organise information clearly
  – use specialist vocabulary where appropriate.

Advice
- In all calculations, show clearly how you work out your answer.

Answer **all** questions in the spaces provided.

1 (a) Describe how energy transfer takes place quickly by conduction in a metal.

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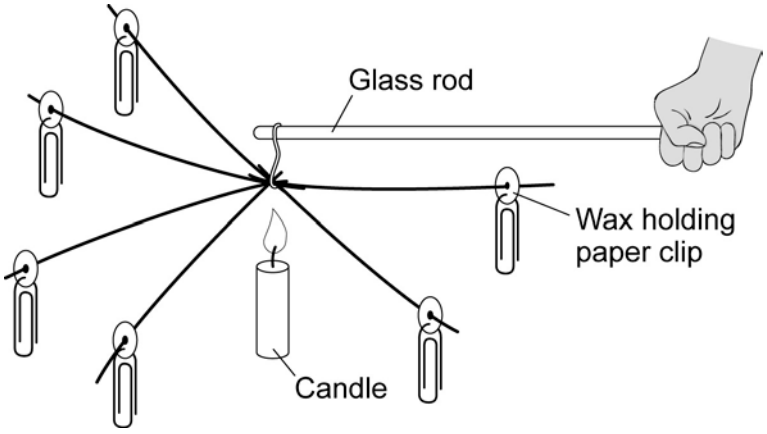
(3 marks)

1 (b) (i) A student knows that some metals are better thermal conductors than others.

She investigated wires made from several different metals.

The diagram shows the equipment the student used to test six of the wires.



She held the glass rod so that the junction where the six wires met was directly above the flame of the candle.

When the wax melted, the paperclip dropped down to the bench.

She measured the time taken for the wax holding the paperclip to melt.

The repeatability of the results of this investigation may be poor. Suggest why.

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(1 mark)

1 (b) (ii) The results of the investigation are shown below.

Metal	Time for wax to melt in seconds
aluminium	42
brass	94
copper	28
iron	106
lead	120
zinc	78

The metals from the table are made into 1 cm^3 blocks.

Which metal would produce a block with the lowest U-value?

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Give the reason for your answer.

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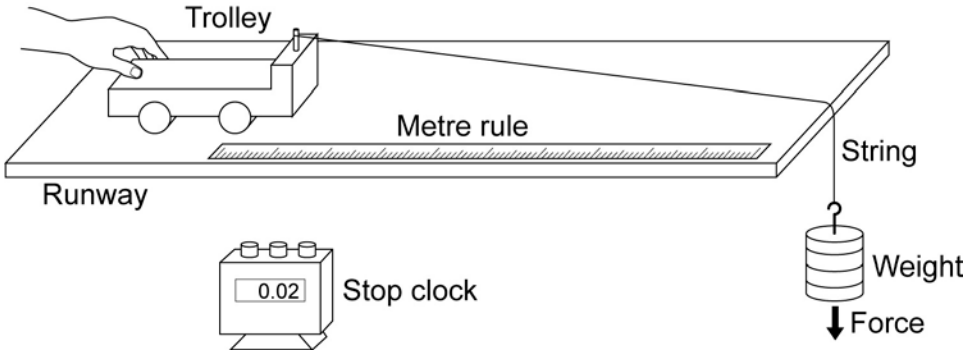
(2 marks)

6

Turn over for the next question

2 (a) Student **A**, investigated how the average speed of a trolley depends on the force applied to it.

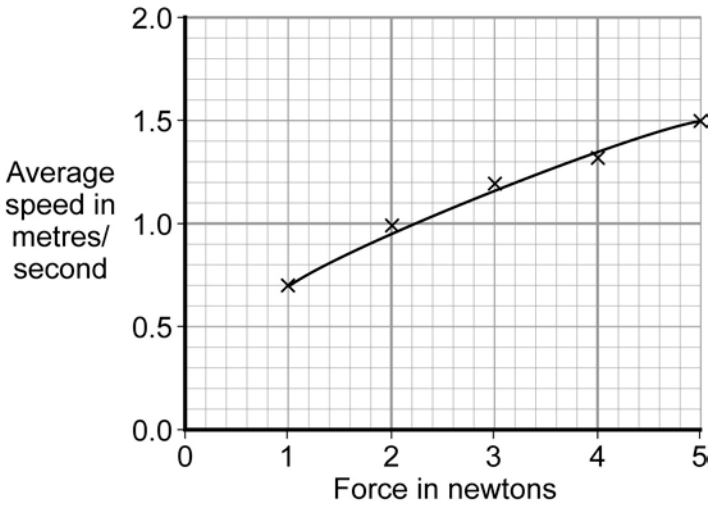
The diagram shows the trolley just before the student released it.



After releasing the trolley student **A**, measured the time it took for the trolley to travel 1 metre.

Student **A** repeated this with different weights tied to the string.

2 (a) (i) Student **A** calculated the average speed, for each weight used, and plotted the graph shown below.



Student **A** thought that the graph showed direct proportionality.
A second student, **B**, disagreed and said that the graph only showed a linear relationship.

State, with reason, whether you think the students are correct or incorrect.

Student **A** .....

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Student **B** .....

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(2 marks)

2 (a) (ii) Use the graph to identify the value of the force needed to obtain an average speed of 0.8 m/s.

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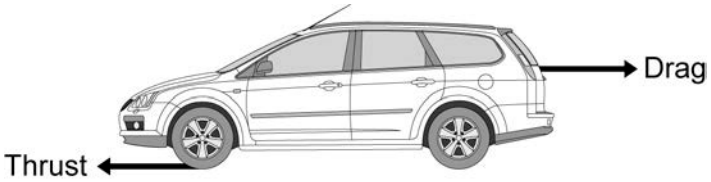
(1 mark)

Question 2 continues on the next page

2 (b) The diagram below shows the horizontal forces acting on a car as it moves along a straight road.

The resultant force on the car is zero.



2 (b) (i) What is meant by the term *resultant force*?

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(1 mark)

2 (b) (ii) Describe the movement of the car when the resultant force is zero.

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(1 mark)

2 (b) (iii) A resultant force of 3.6×10^3 N acting on the car and its driver, causes the car to accelerate at $3\,m/s^2$.

Calculate the total mass, in kilograms, of the car and the driver.

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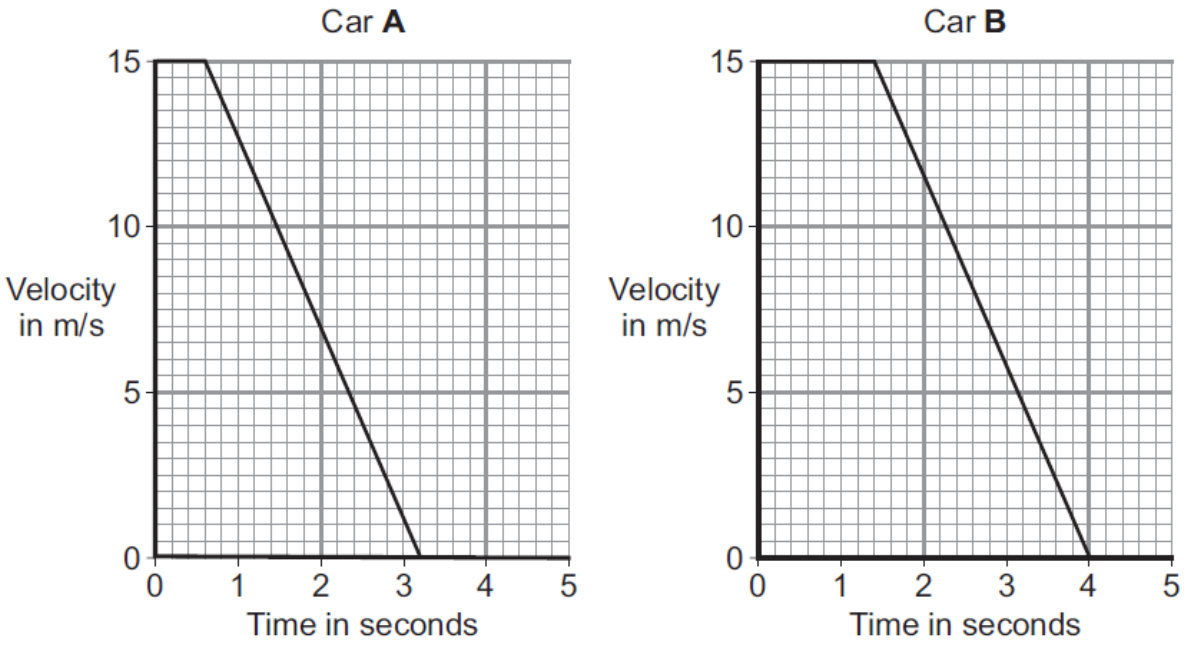
Mass = ... kg

(2 marks)

2 (c) The graphs show how the velocities of two cars, **A** and **B**, change from the moment the car drivers see an obstacle blocking the road.



Compare and evaluate the information shown in the two graphs.

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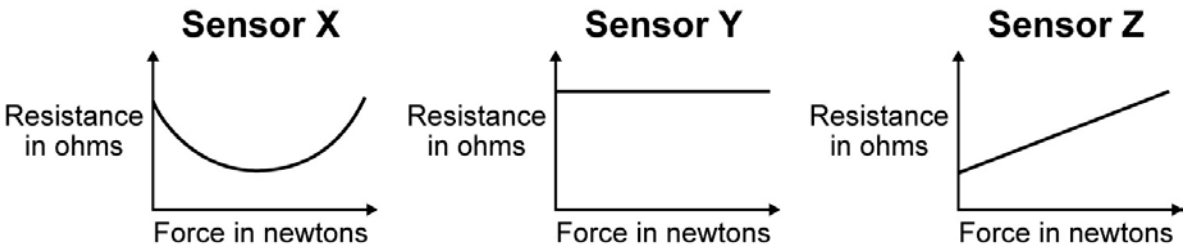
(6 marks)

Question 2 continues on the next page

2 (d) In a road accident test laboratory, scientists use sensors to measure the forces exerted during collisions.

The graphs show how the electrical resistance of 3 experimental types of sensor, **X**, **Y** and **Z**, change with the force applied to the sensor.



Which of the sensors, **X**, **Y** or **Z**, would be the best one to use as a force sensor?

Write your answer in the box. ☐

Give reasons for your answer.

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(3 marks)

16

Turn over for the next question

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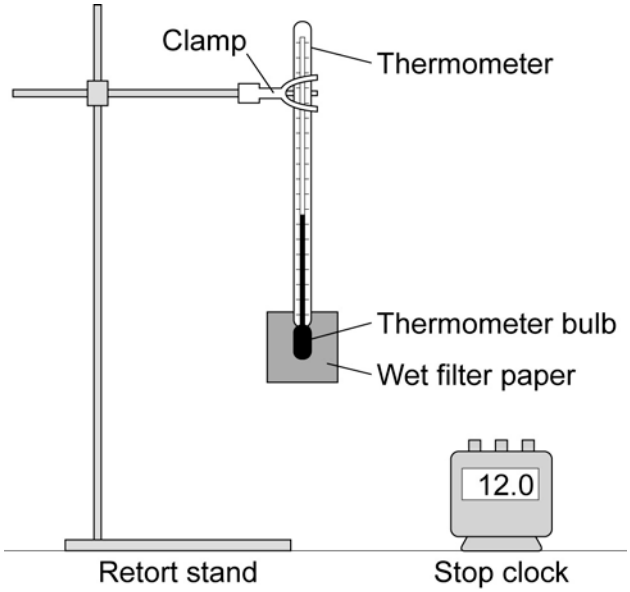
ANSWER IN THE SPACES PROVIDED

3 The diagram shows the apparatus used by a student to investigate the cooling effect produced by evaporation.



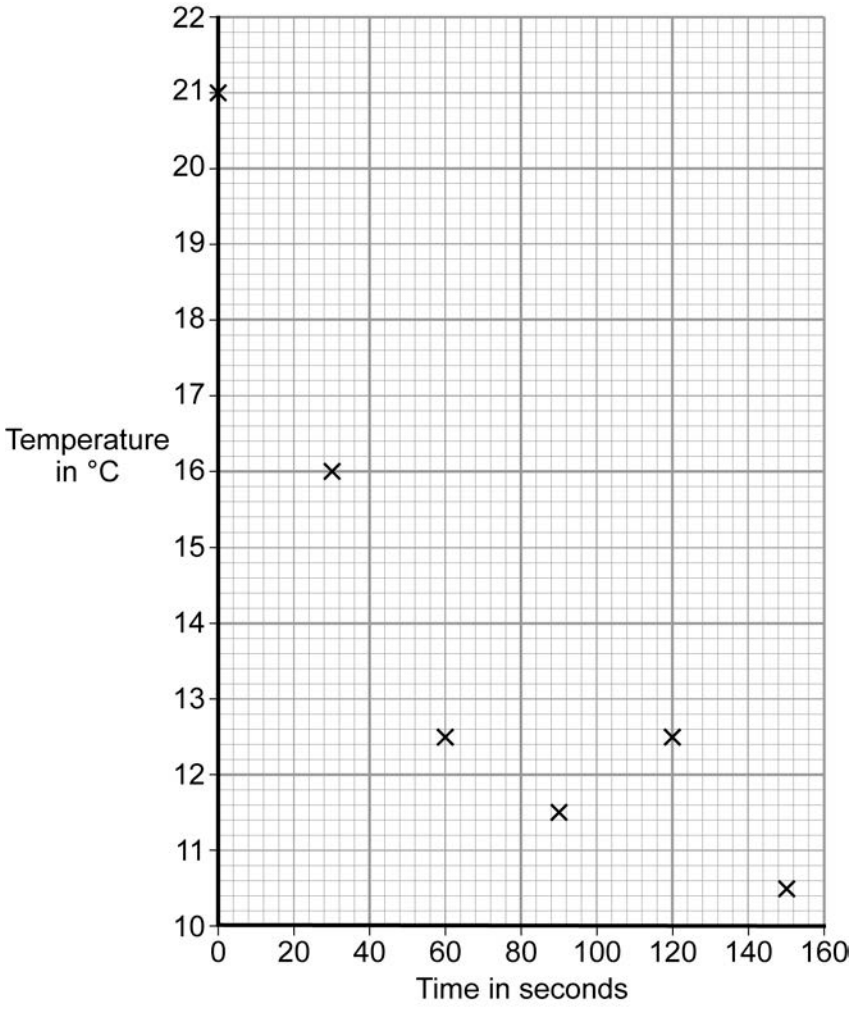
After wetting the paper with water, the student took a temperature reading every 30 seconds.

The student's results are given in the table.

Time in seconds	0	30	60	90	120	150
Temperature in °C	21.0	16.0	12.5	11.5	12.5	10.5

3 (a) (i) The graph shows the student's results.

Draw a line of best fit on the graph.



(1 mark)

3 (a) (ii) One of the student's results is anomalous.

Draw a ring around the anomalous data point on the graph, and suggest **one** reason why the anomalous result may have occurred.

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(2 marks)

Question 3 continues on the next page

3 (a) (iii) What should the student have done to improve the validity of the data?

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(2 marks)

3 (a) (iv) Explain the advantage in this investigation of using a temperature sensor and data logger rather than a thermometer and stop clock.

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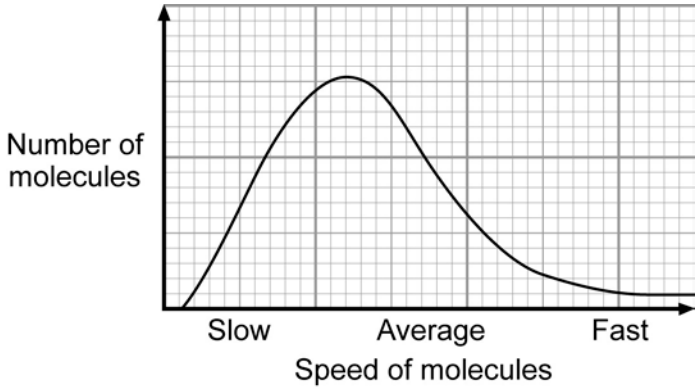
(2 marks)

3 (b) The graph shows that the molecules in a liquid do not all have the same speed.



Use the information in the graph to explain why a liquid cools down when it evaporates.

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(5 marks)

Question 3 continues on the next page

3 (c) Evaporation helps to regulate body temperature. The evaporation of sweat from the body transfers energy, producing a cooling effect.

State and explain the effect of an increase in humidity on the cooling effect produced by the evaporation of sweat.

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(2 marks)

14

Turn over for the next question

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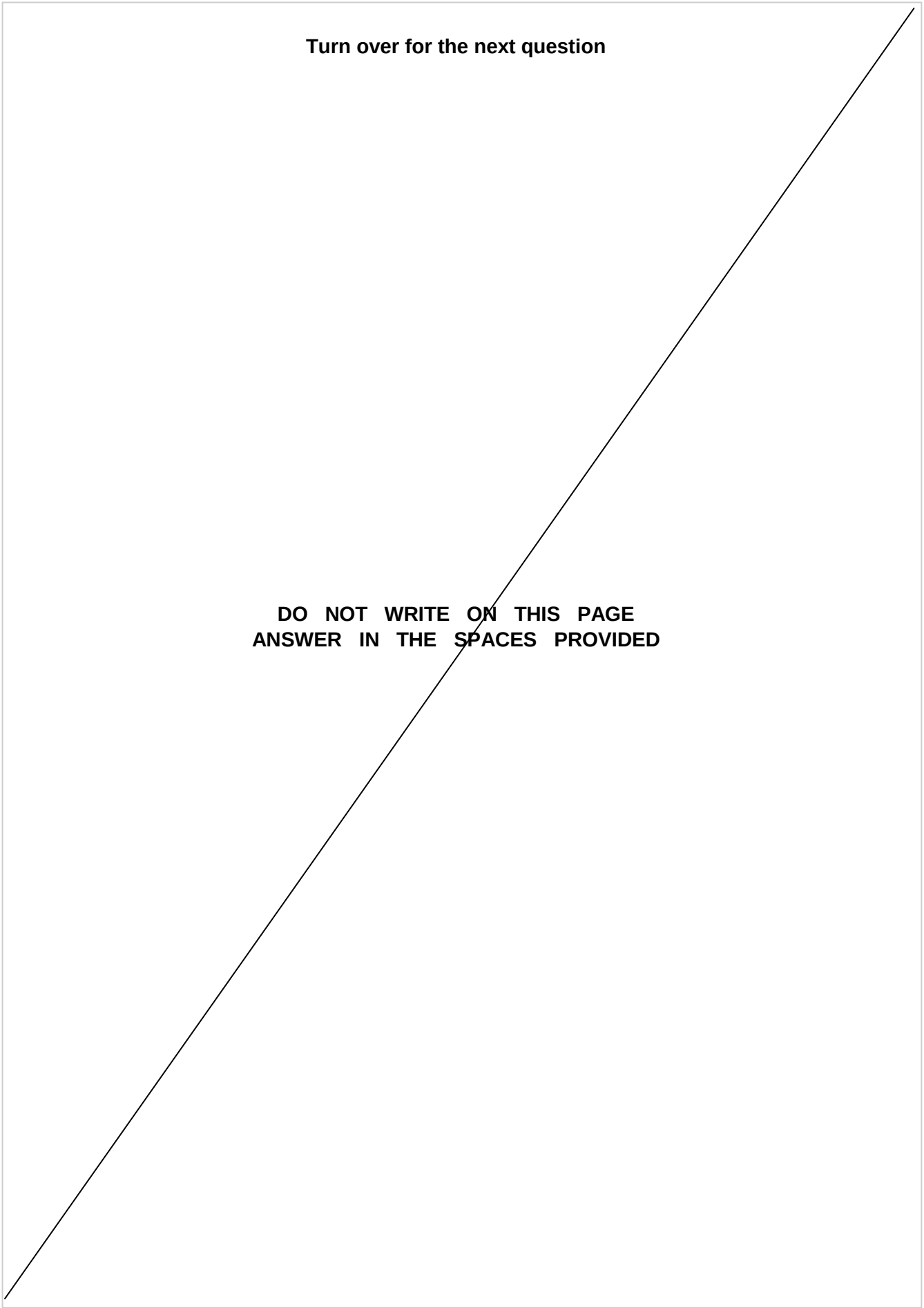
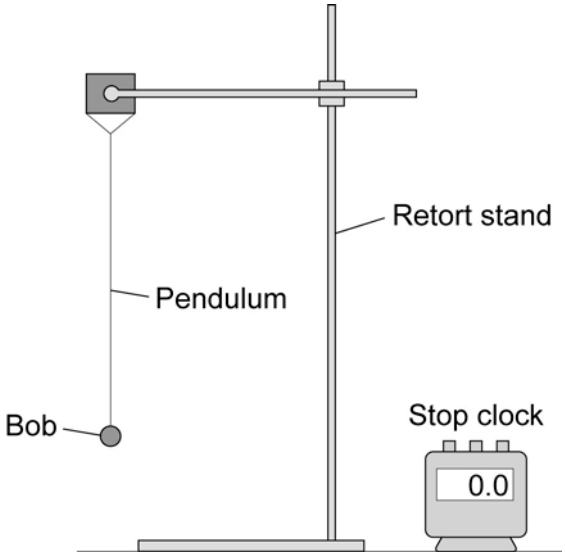


4 The diagram shows a pendulum and a stop clock.

A student carried out an investigation to find out how the time for one swing of the pendulum depends on the length of the pendulum.



The student's data is recorded in the table.

Experiment	Mass of bob in grams	Length of pendulum in metres	Time for 10 swings in seconds	Time for 1 swing in seconds
A	15.2	0.20	9.2	0.92
B	15.2	0.40	12.8	1.28
C	15.2	0.60	15.0	1.50
D	15.2	0.80	18.0	1.80
E	15.2	1.00	20.0	2.00

In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

Describe how the student would use the apparatus in the diagram to obtain the data shown in the table.

You should include:

- the measurements the student would make
- a risk assessment.

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(6 marks)

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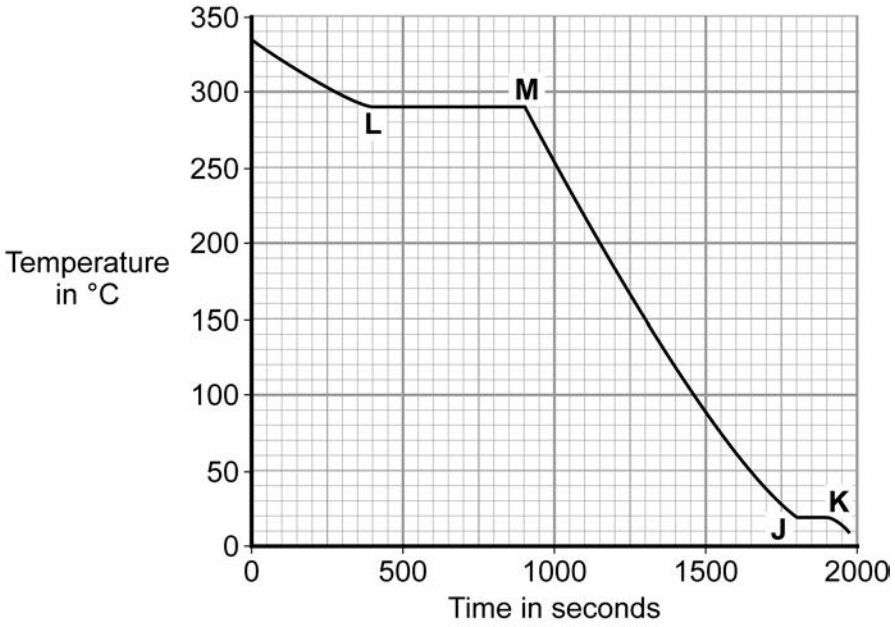
Turn over for the next question

5 (a) The graph shows how the temperature of a pure substance changes as it cools from 330 °C.



Explain why the temperature of the substance is constant between the points marked **J** and **K**.

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(2 marks)

5 (b) A book of scientific data contains the statement:

'The specific latent heat of fusion of pure ice is 3.3×10^5 J/kg'.

What does this statement mean?

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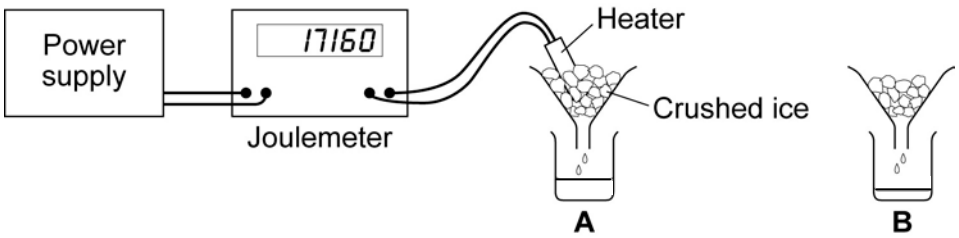
(1 mark)

5 (c) The diagram shows one method of measuring the specific latent heat of fusion of ice in a laboratory where the temperature is 20°C. Two funnels, **A** and **B**, contain equal amounts of crushed ice at 0 °C.

The mass of melted ice from each funnel is measured after 12 minutes.

The joulemeter measures the energy supplied to the heater.



5 (c) (i) Why is it necessary to set up funnel **B** to obtain an accurate result?

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(2 marks)

Question 5 continues on the next page

Turn over ▶

5 (c) (ii) The measurements taken are given in the table.

Mass of melted ice collected from funnel **A**	63 g
Mass of melted ice collected from funnel **B**	24 g
Joulemeter reading	17160 J

Use the data in the table to calculate the specific latent heat of fusion of ice.

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Specific latent heat of fusion of ice = ... J/kg

(2 marks)

5 (c) (iii) Suggest **two** reasons why the value obtained by this method and the value given in the data book are not the same.

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(2 marks)

9

Turn over for the next question

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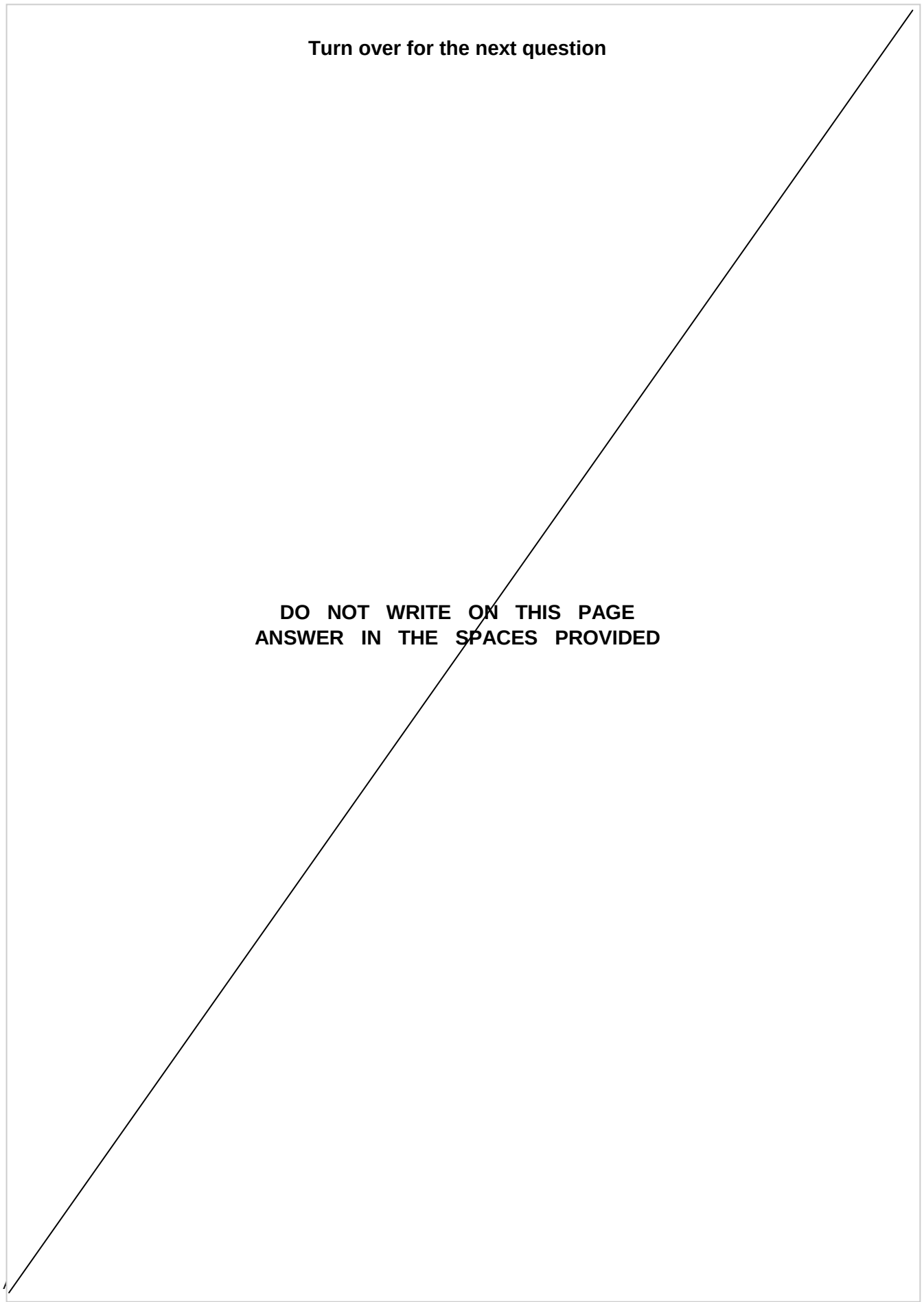

6 (a) A small electric kettle is rated at 230 V, 500 W.

6 (a) (i) Calculate the current rating, in amps, of the kettle.

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Current rating = ...amps

(2 marks)

6 (a) (ii) The fuse in the kettle has to be replaced.

Why should a 13 A fuse **not** be fitted inside the plug of the kettle?

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(2 marks)

6 (b) The student reads the following in a science magazine.

Some 1A fuses can take 10A for 0.1s to allow for a large current when a circuit is first switched on.

He decides to investigate this statement by allowing different currents above 1A to flow through a 1A fuse. For each different current he measured the time taken for the fuse to act and break the circuit.

6 (b) (i) The student wants to set up a circuit that will allow him to change and measure the current through a fuse.

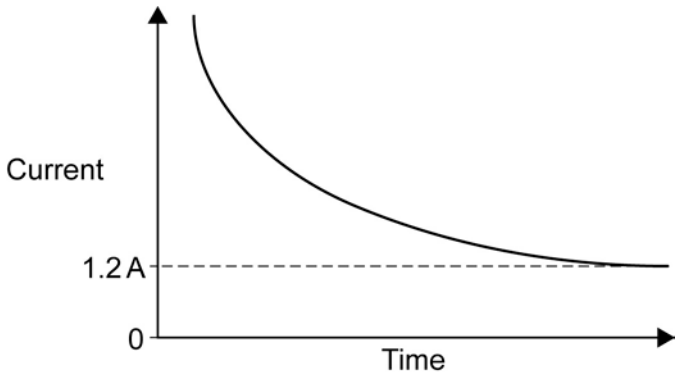
Complete the circuit diagram below to show the circuit the student should use.

You should include:

- a fuse
- an ammeter
- a variable resistor.

(2 marks)

6 (b) (ii) The student's results are shown in the graph.



The student concludes that the graph shows that the current is inversely proportional to the time taken for the fuse to act.
Explain whether you agree with this conclusion.

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(2 marks)

6 (b) (iii) The student used an electronic timer for his investigation. The timer started at the instant he closed the switch in his circuit.

Why would a stopwatch **not** be suitable for this investigation?

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(1 mark)

9

END OF QUESTIONS

There are no questions printed on this page

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