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INTERNATIONAL GCSE PHYSICS

Paper 2

Thursday 6 June 2019 07:00 GMT Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the Physics Equations Sheet (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you worked out your answer.

Information

- The maximum mark for this paper is 90.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
TOTAL	

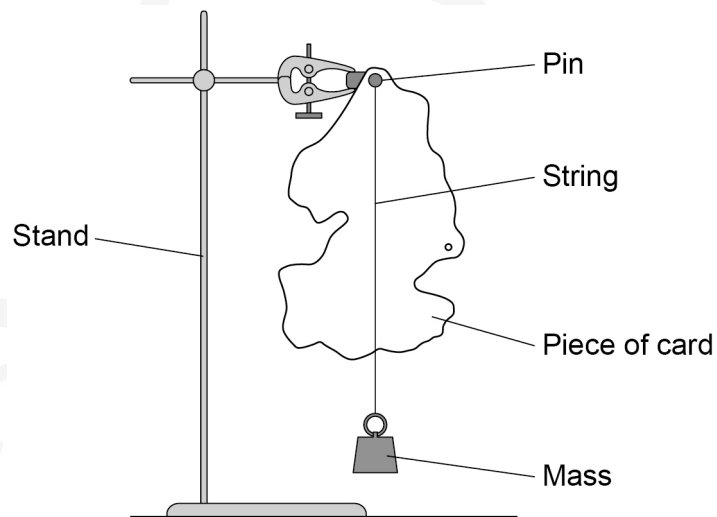
Answer **all** questions in the spaces provided.

0 1

A student wanted to find the centre of mass of a large, thin piece of card.

Figure 1 shows the apparatus the student used.

Figure 1



This is the method used:

- 1 Attach a mass to a piece of string.
- 2 Hang the piece of string from a pin that passes through the card.
- 3 Draw a line on the piece of card to mark the position of the string.

0 1 . 1

Which statement correctly describes the centre of mass of the piece of card?

Tick (✓) **one** box.

[1 mark]

The point at which all of the mass is located.

The point at which most of the mass is located.

The point at which the mass is a maximum value.

The point at which the mass may be thought to be concentrated.

0 1 . 2 Where is the centre of mass of the piece of card located?

Tick (✓) **one** box.

[1 mark]

Above the pin

At the position of the pin

Directly below the pin

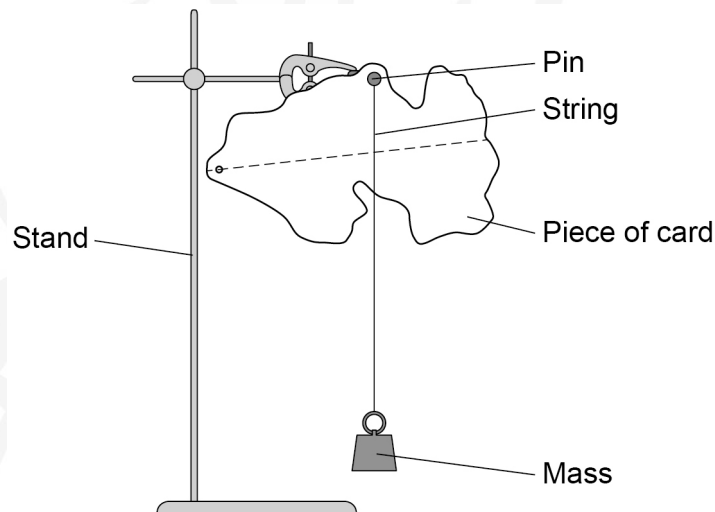
To the left of the pin

0 1 . 3 What is the name of the force that causes the string to hang vertically?

[1 mark]

0 1 . 4 Then the student hung the piece of card from a different point as shown in **Figure 2**.

Figure 2



The student marked the new position of the string.

How can the student use the two lines drawn on the card to find the centre of mass of the card?

[1 mark]

Question 1 continues on the next page

Turn over ►

0 1 . 5 Which of the following suggestions would improve the investigation?

Tick (✓) **one** box.

[1 mark]

Find the centre of mass of the same shape made from different materials.

Hang the card from another point and mark the position of the string again.

Repeat the experiment with a different card shape and compare the results.

Vary the mass attached and hang the card shape from the same point.

0 1 . 6 **Figure 3** shows a different piece of thin card.

Figure 3



Show how you can find the position of the centre of mass of this piece of card.

Draw your answer on **Figure 3**.

[1 mark]

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0 1 . 7 Figure 4 shows some stools in a school science laboratory.

Figure 4



Accidents can happen if a stool topples whilst a student is sat on the stool.

Give **two** ways the stool could be designed to make it less likely to topple.

[2 marks]

1 _____

2 _____

0 1 . 8 One stool has a mass of 5.0 kg.

Calculate the weight of the stool.

gravitational field strength = 9.8 N/kg

Use the Physics Equations Sheet.

[2 marks]

Weight = _____ N

10

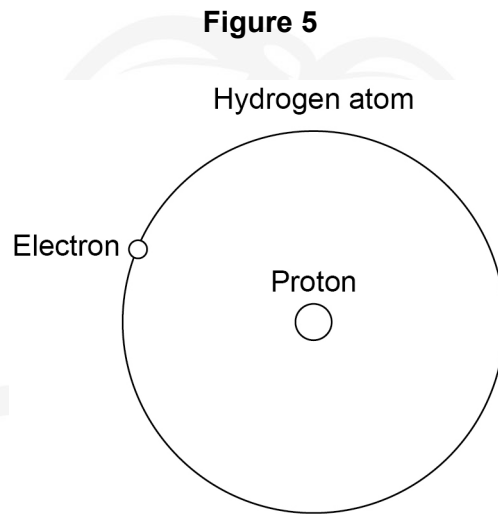
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0 2

There are more atoms of hydrogen in the human body than of any other element.

0 2 . 1

Figure 5 shows an atom of hydrogen.



Explain why an atom of hydrogen has no overall electric charge.

[2 marks]

0 2 . 2

Complete the sentence.

Choose the answer from the box.

[1 mark]

ions	isotopes	neutral	radioactive
------	----------	---------	-------------

Hydrogen atoms that lose an electron become _____.

0 2 . 3 Most atoms are made up of three different types of particles.

Complete **Table 1**.

[2 marks]

Table 1

Particle	Relative mass	Relative charge
proton		1
neutron	1	
electron	very small	

0 2 . 4 Most of the mass of a human body comes from two elements, carbon (C) and oxygen (O).

The elements are shown in **Figure 6**.

Figure 6



Describe the differences between the atoms of the two elements in **Figure 6**.

[4 marks]

0 3 Waves can be transverse or longitudinal.

0 3 . 1 What name is given to the distance from one peak on a transverse wave to the next peak?

Tick (✓) **one** box.

[1 mark]

Amplitude

Frequency

Period

Wavelength

0 3 . 2 What is the name given to the time taken for one complete oscillation of a wave?

Tick (✓) **one** box.

[1 mark]

Amplitude

Frequency

Period

Wavelength

0 3 . 3 Complete the following sentences about waves.

[2 marks]

Longitudinal waves have oscillations that are _____
to the direction of energy transfer.

Transverse waves have oscillations that are _____
to the direction of energy transfer.

Figure 7 shows a boy watching television. The television emits light waves and sound waves.

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Figure 7



0 3 . 4

The boy hears a sound wave emitted by the television. The sound wave has a frequency of 2500 Hz and a wavelength of 13.8 cm.

Calculate the speed of the sound wave through the air.

Use the Physics Equations Sheet.

[3 marks]

Speed of sound wave through the air = _____ m/s

Question 3 continues on the next page

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0 3 . 5 The light waves emitted by the television travel faster than the sound waves.

The boy does not notice that the light waves and the sound waves travel at different speeds.

Explain why.

[2 marks]

9



0 4

Pencils contain graphite.

When a length of graphite is used in an electric circuit, it behaves like a resistor and conducts electricity.

0 4 . 1

Complete the following sentence.

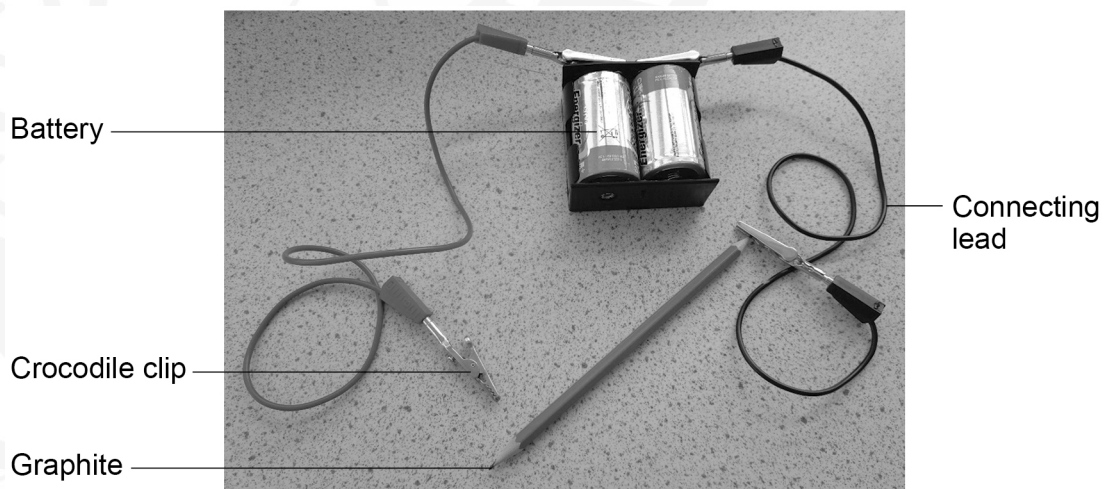
[1 mark]

Graphite conducts electricity because it contains free _____ .

A student investigated how the current in the graphite varies with the potential difference across it.

Figure 8 shows some of the apparatus used.

Figure 8



0 4 . 2

The student connected the pencil to a battery using crocodile clips and connecting leads.

List **three** other pieces of apparatus that the student should use that are not shown in **Figure 8**.

[2 marks]

- 1 _____
- 2 _____
- 3 _____

Question 4 continues on the next page

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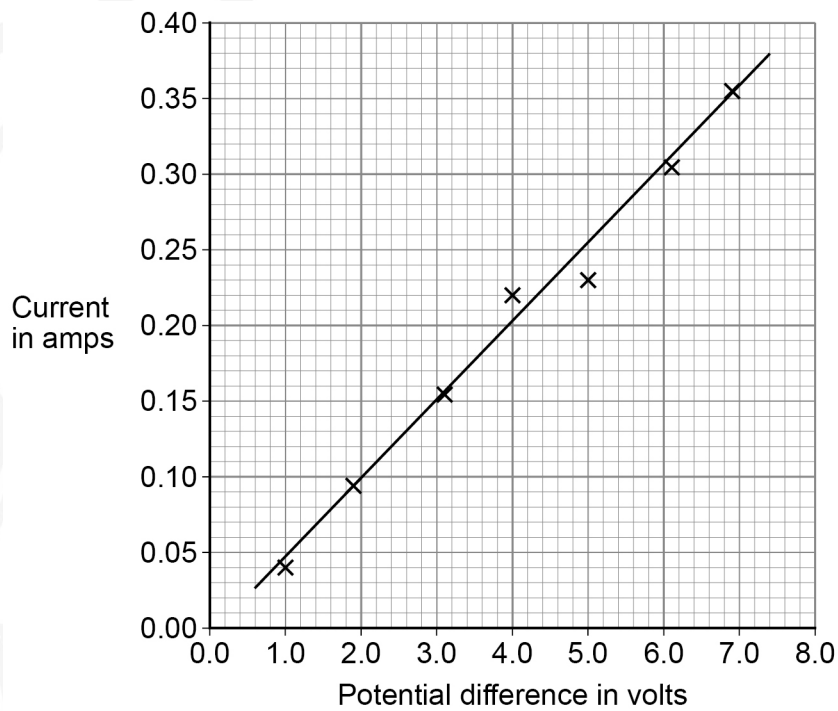
0 4 . 3 The student disconnected the battery between readings.

Explain why this improves the investigation.

[2 marks]

Figure 9 shows the results.

Figure 9



0 4 . 4 Give a conclusion that can be made from the graph in **Figure 9**.

Justify your answer.

[2 marks]

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0 4 . 5 Experimental data can contain random errors and systematic errors.

Explain how the data in **Figure 9** shows evidence of random errors and systematic errors.

[4 marks]

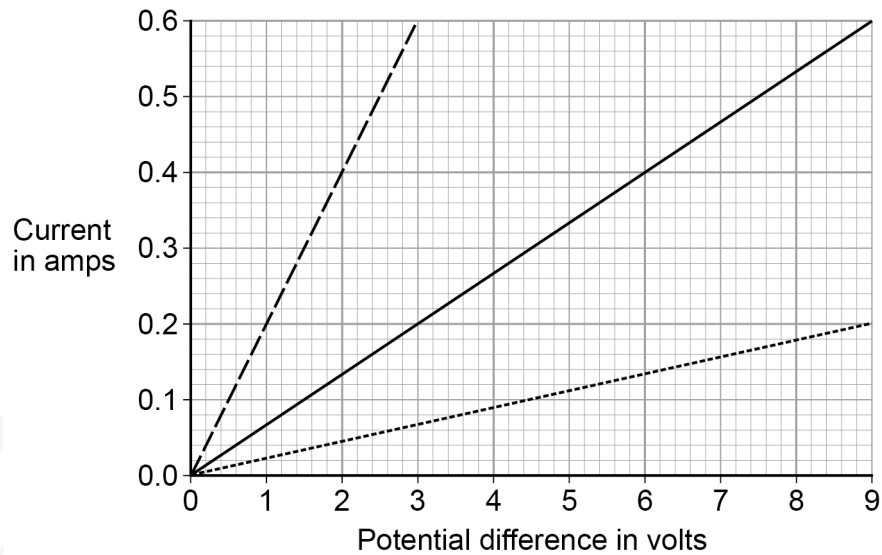
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The student did a similar investigation using different pencils that contained different lengths of graphite. The lengths of graphite all had the same diameter.

Figure 10 shows the results.

Figure 10



0 4 . 6

Calculate the resistance of the longest piece of graphite in Figure 10.

Use the Physics Equations Sheet.

Give the unit.

[5 marks]

Resistance = _____

Unit = _____

16

0 5

Figure 11 shows a microwave oven. The microwave oven is connected to the mains supply.

Figure 11

**0 5 . 1**

The mains supply is alternating current.

What is meant by alternating current?

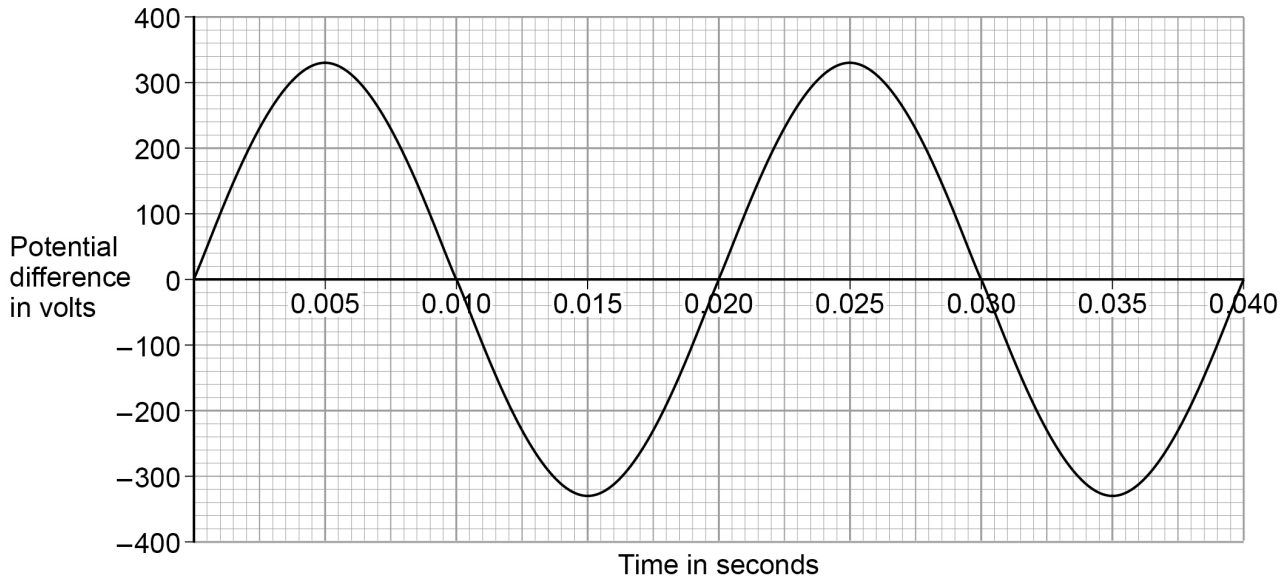
[1 mark]

Question 5 continues on the next page

Turn over ►

Figure 12 shows how the potential difference of the mains supply varies with time.

Figure 12



0 5 . 2 Determine the peak potential difference of the mains supply.

[1 mark]

Peak potential difference = _____ V

0 5 . 3 Determine the frequency of the mains supply.

Show your working.

[2 marks]

Frequency = _____ Hz

0 5 . 4 Figure 13 shows some information from the back of the microwave oven.

Figure 13

Input = 1200–1400 W

Output = 750–875 W

The efficiency of the microwave oven is constant.

Calculate the efficiency of the microwave oven.

Use the Physics Equations Sheet.

[2 marks]

Efficiency = _____

0 5 . 5 The microwave oven has a metal casing.

Explain why it is important that the microwave oven is earthed.

[2 marks]

Question 5 continues on the next page

Turn over ►

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0 5 . 6

Fuses and circuit breakers are safety features used in electrical systems.

Compare the use of circuit breakers and fuses in electrical systems.

[4 marks]

12



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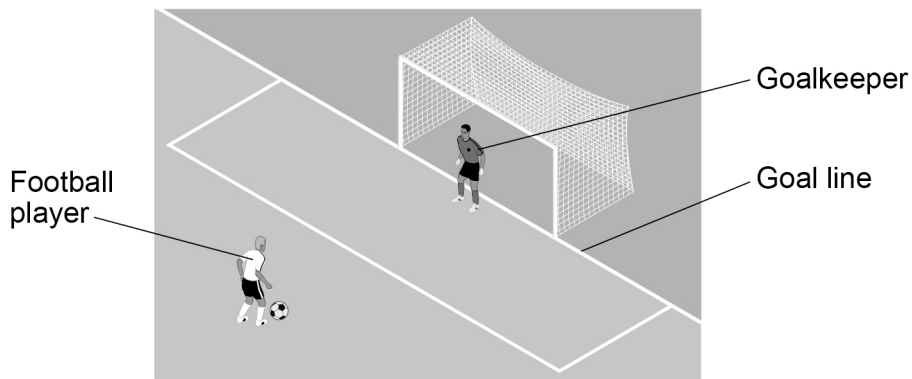
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0 6

Figure 14 shows a football player kicking a ball towards the goal. The goalkeeper is trying to stop the ball crossing the goal line.

Figure 14



After being kicked the ball has a speed of 20 m/s.

0 6 . 1

The mass of the ball is 450 g.

Calculate the kinetic energy of the ball.

Use the Physics Equations Sheet.

[3 marks]

Kinetic energy = _____ J

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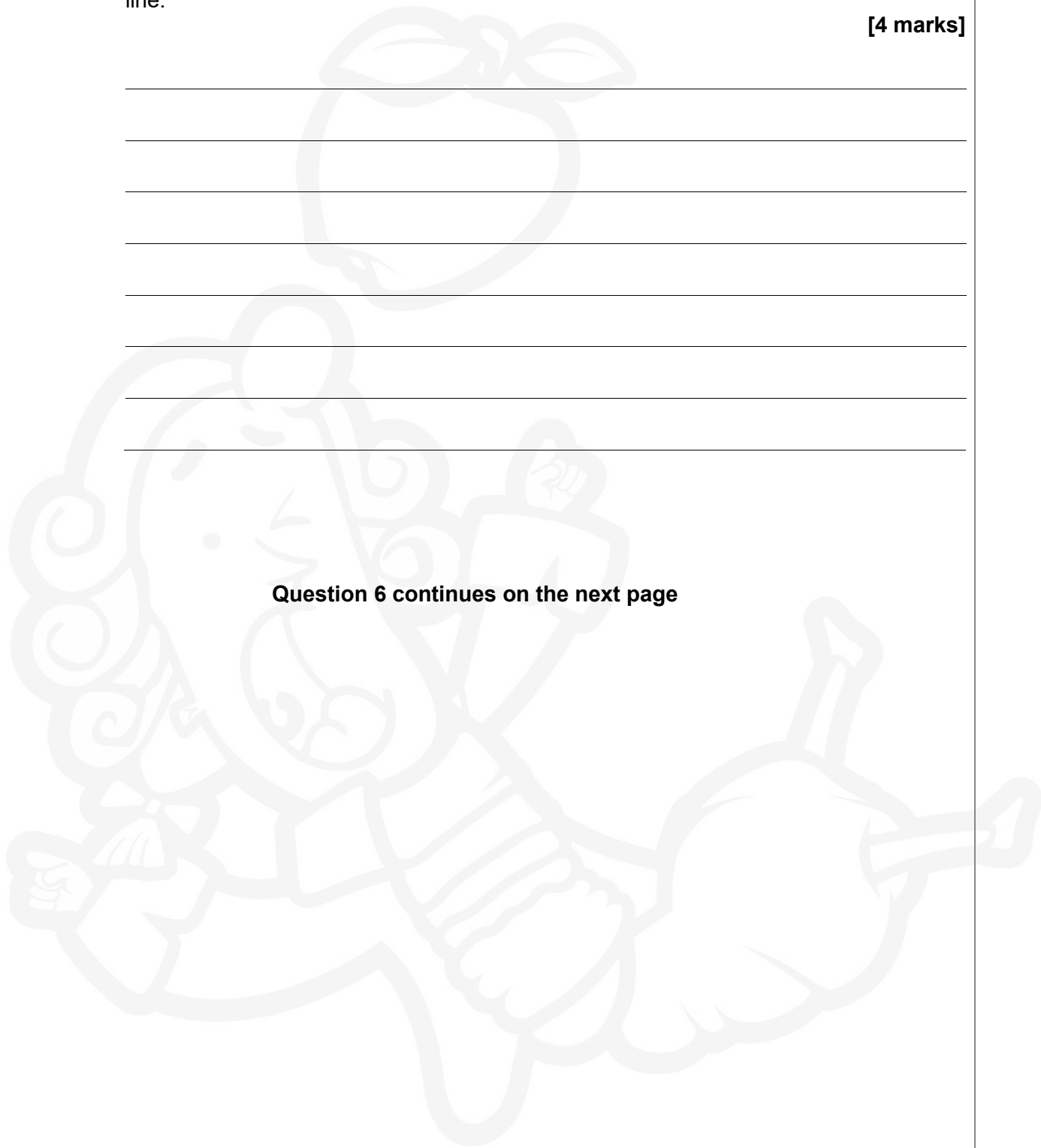
0 6 . 2

The distance from where the ball was kicked to the goal line is 11.4 m. It takes the goalkeeper 0.65 seconds to react and move his hand to the point where the ball will cross the line.

Determine if the goalkeeper can stop the ball with his hand before the ball crosses the line.

[4 marks]

Question 6 continues on the next page



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0 6 . 3 Figure 15 shows two boys playing football.

Figure 15



One of the boys heads the ball. In some countries heading the ball is banned in matches for young players.

Suggest why players may be injured when heading the ball.
Use ideas about momentum in your answer.

[3 marks]

10

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0 7

A student investigated how the force needed to break a wire varies with the diameter of the wire.

0 7 . 1

Table 2 shows the results of the investigation.

Table 2

Diameter of wire in mm	Force needed to break the wire in newtons
0.14	3.7
0.16	5.0
0.18	6.3
0.20	7.9
0.22	9.8
0.24	11.9
0.26	14.5

Plan an investigation that would safely produce the results in **Table 2**.

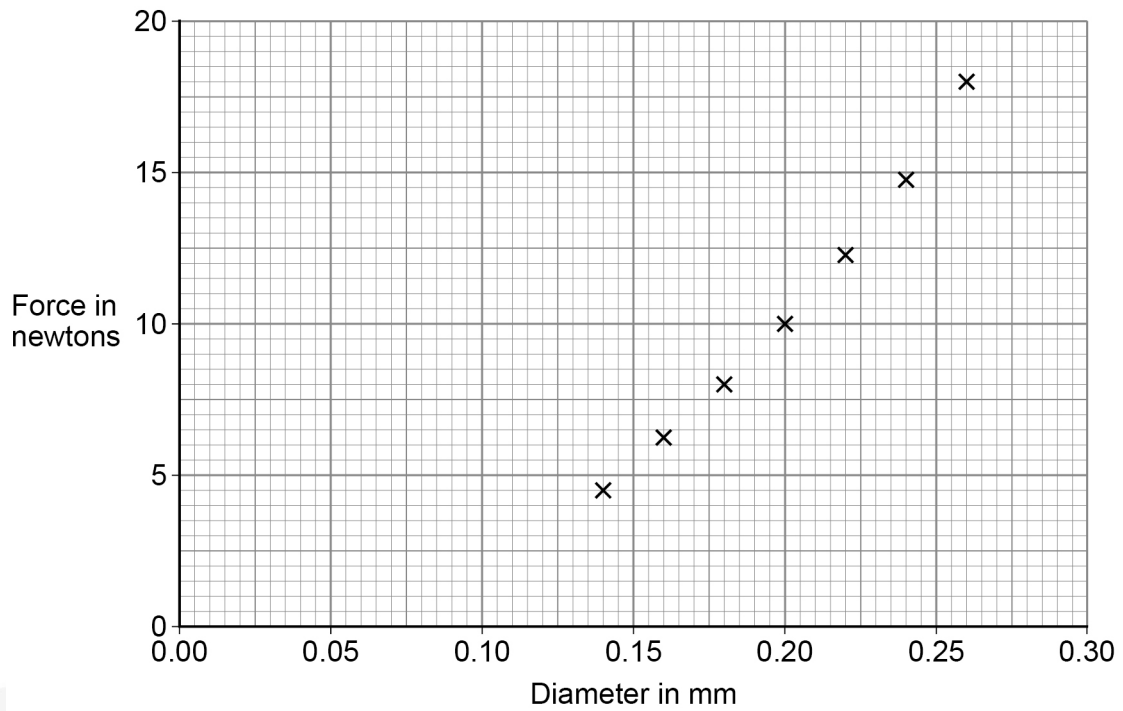
You may include a diagram in your answer.

[4 marks]

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Figure 16 is a graph of the results.

Figure 16



0 7 . 2 Determine the force required to break a wire with a diameter of 0.10 mm.

[2 marks]

Breaking force = _____ N

Question 7 continues on the next page

Turn over ►

0 7 . 3

When a force is first applied to a piece of wire, the wire behaves like a spring and stores 2.25×10^{-3} J of elastic potential energy.

Calculate the extension of the wire.

Give your answer in mm.

spring constant = 2000 N/m

Use the Physics Equations Sheet.

[4 marks]

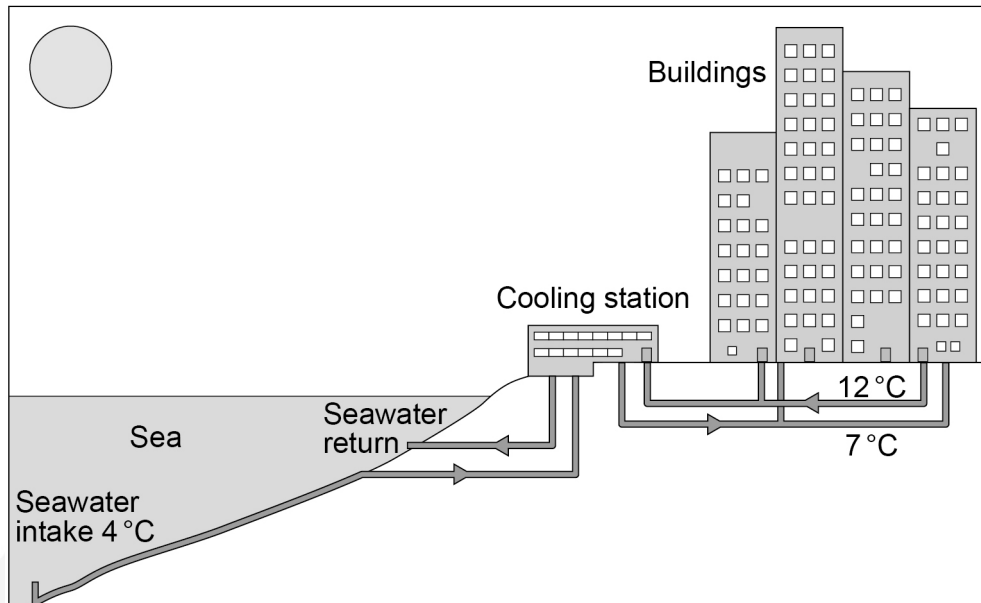
Extension = _____ mm

10

0 8

Figure 17 shows a system that uses cold sea water to cool buildings.

Figure 17



0 8 . 1

Some of the energy from the Sun is absorbed by the surface of the sea.

Explain why heating the water at the surface increases the rate of evaporation from the sea.

[3 marks]

Question 8 continues on the next page

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0 8 . 2

Energy from the Sun that is absorbed by the sea does not heat up the water deep below the surface.

Explain why.

[4 marks]

0 8 . 3

The cooling station shown in **Figure 17** has a power of 315 MW. It cools water from 12 °C to 7 °C.

Calculate the mass of water that the cooling station can cool each second.

specific heat capacity of water = 4200 J/kg °C

Use the Physics Equations Sheet.

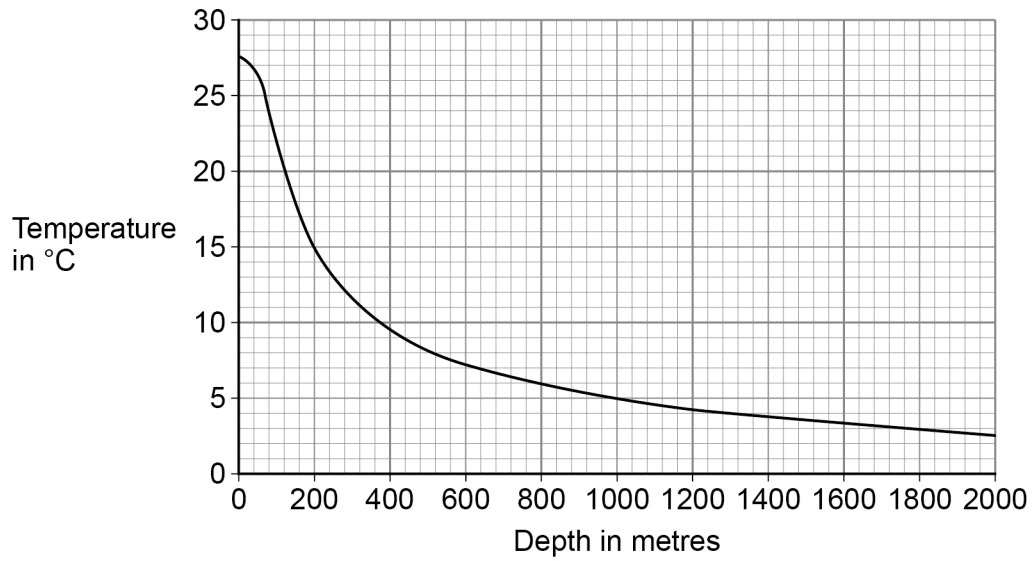
[4 marks]

Mass of water each second = _____ kg

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0 8 . 4 Figure 18 shows the temperature of the sea at different depths.

Figure 18



Explain why sea water is not pumped up to the cooling station from depths greater than 1700 m.

[3 marks]

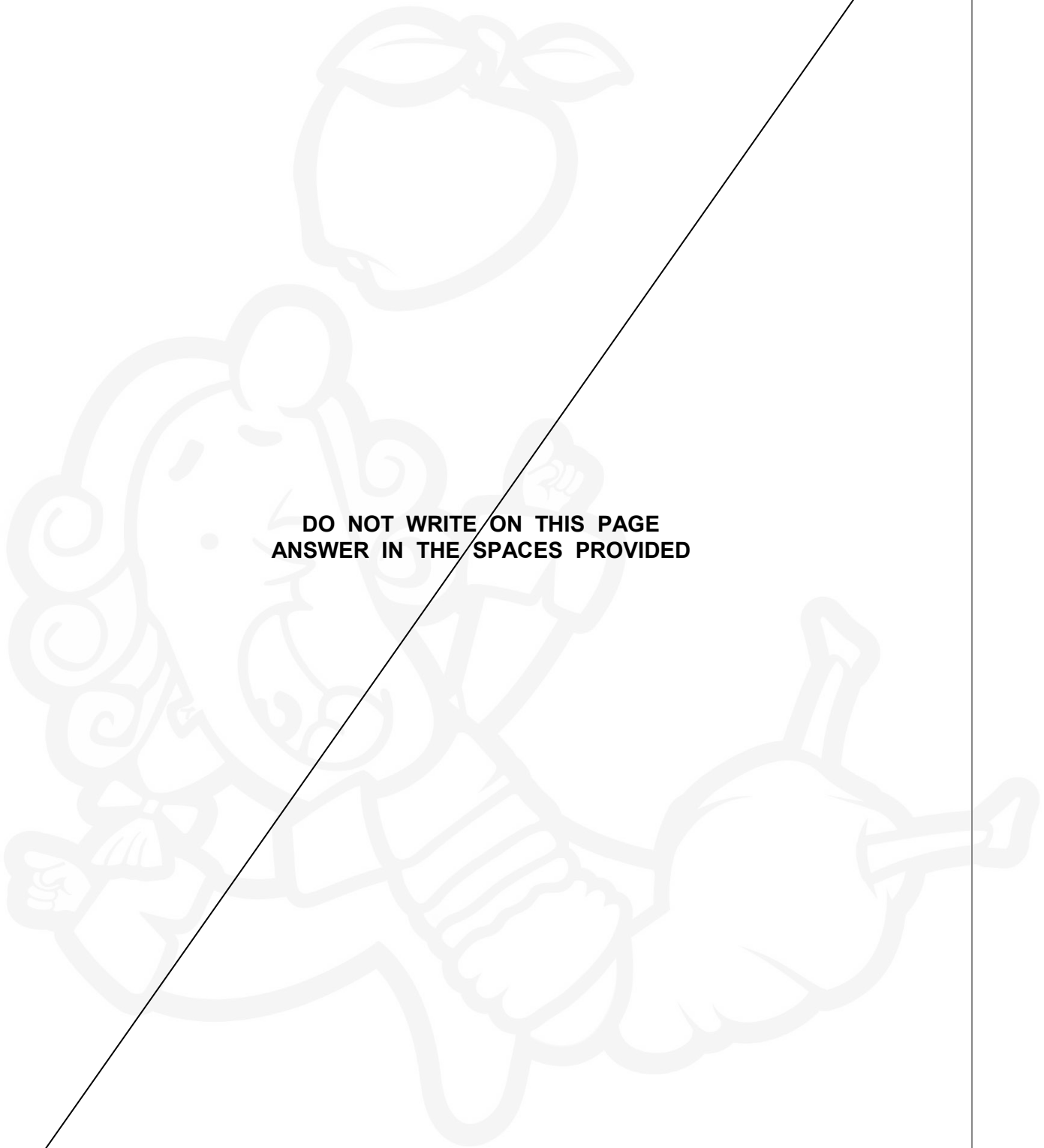
14

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