

Paper Reference(s)     **1PH0 / 2H**

Pearson Edexcel Level 1/Level 2 GCSE (9–1)

**Physics**  
**Paper 2**  
**Higher Tier**

**Friday 14 June 2019 – Morning**

**Time: 1 hour 45 minutes plus your additional time allowance**

**INSTRUCTIONS TO CANDIDATES**  
**Write your centre number, candidate number, surname, other names and your signature in the boxes below. Check that you have the correct question paper.**

<b>Centre No.</b>					
<b>Candidate No.</b>					
<b>Surname</b>					
<b>Other names</b>					
<b>Signature</b>					
<b>Paper Reference</b>	1	P	H	0	/ 2 H

- Use **BLACK** ink or ball-point pen.
- Answer **ALL** questions.
- Answer the questions in the spaces provided – there may be more space than you need.
- Calculators may be used.
- Any diagrams may **NOT** be accurately drawn, unless otherwise indicated.
- You must show all your working out with your answer clearly identified at the end of your solution.

## **MATERIALS REQUIRED FOR EXAMINATION**

**Calculator, ruler**

## **ITEMS INCLUDED WITH QUESTION PAPERS**

**Equations Booklet**

## **INFORMATION FOR CANDIDATES**

- The total mark for this paper is 100.
- The marks for **EACH** question are shown in brackets – use this as a guide as to how much time to spend on each question.
- In questions marked with an **ASTERISK (\*)**, marks will be awarded for your ability to structure your answer logically showing how the points that you make are related or follow on from each other where appropriate.
- An Equations Booklet is provided.

**(Instructions continue on next page)**

**(Turn over)**

**ADVICE TO CANDIDATES**

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

**Answer ALL questions. Write your answers in the spaces provided.**

**Some questions must be answered with a cross in a box ☐. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☐.**

**(Questions begin on next page)**

1 (a) Figure 1 shows a paint sprayer.

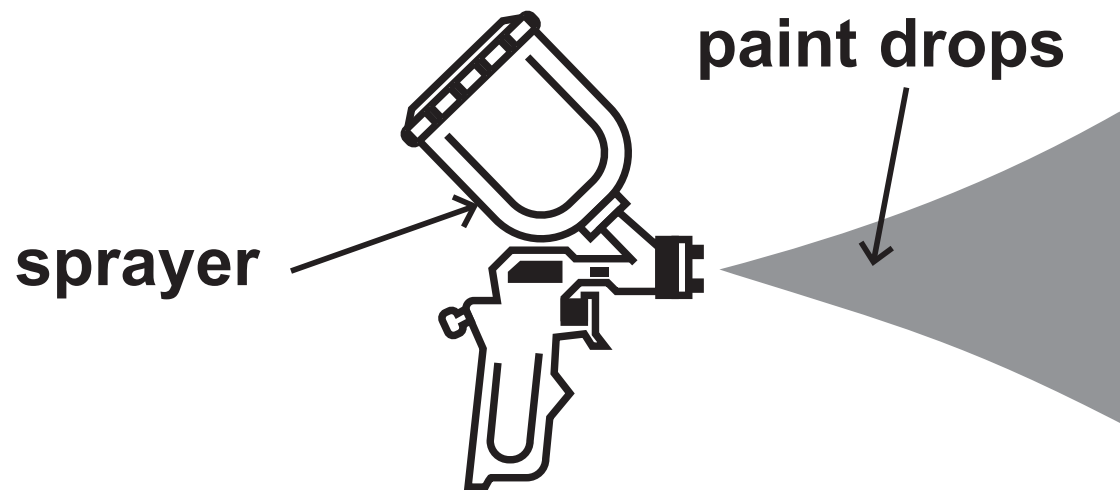


Figure 1

Some paint sprayers give the paint drops a positive charge as they leave the sprayer.

(i) The paint drops have a positive charge because the sprayer (1 mark)

- ☐ A removes electrons from the paint drops
- ☐ B adds electrons to the paint drops
- ☐ C removes protons from the paint drops
- ☐ D adds protons to the paint drops

(Question continues on next page)

(ii) Figure 2 shows the spray pattern from two different paint sprayers.



Figure 2

Sprayer X does not charge the paint drops.

Sprayer Y gives the paint drops a positive charge.

Explain how charging the paint drops changes the shape of the spray pattern. (2 marks)

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(Question continues on next page)

(Turn over)

**(iii) Sprayer Y is used in a factory to paint a metal object.**

**The object hangs by a metal wire that is connected to earth.**

**Explain why a metal wire is used to connect the object to earth. (2 marks)**

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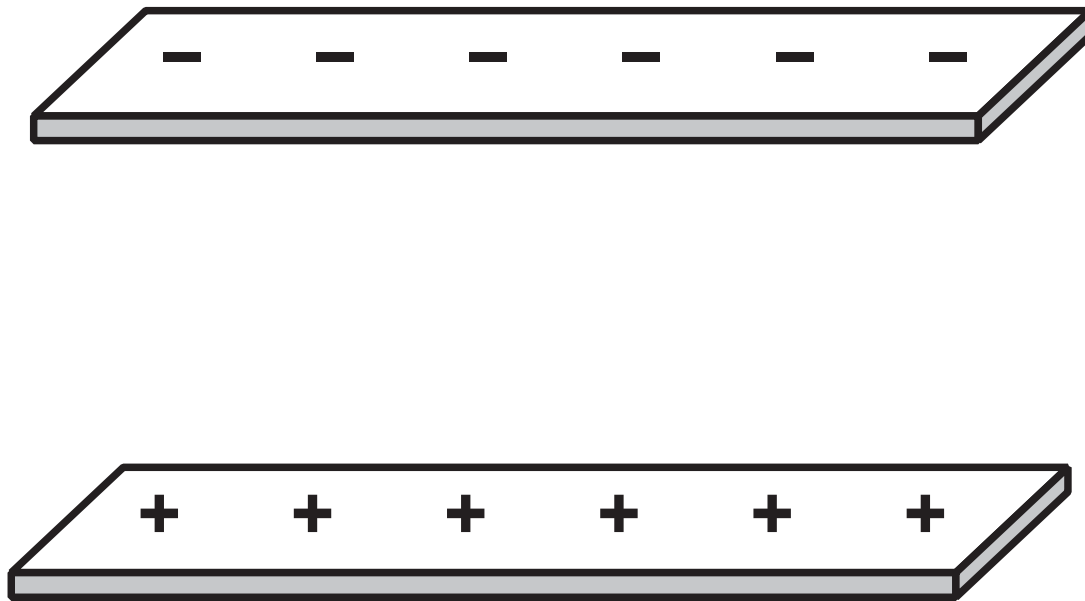
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**(Question continues on next page)**

(b) Figure 3 shows two charged metal plates.



**Figure 3**

The top plate has a negative electric charge.

The bottom plate has a positive electric charge.

On Figure 3, draw the electric field lines between the two plates and show the direction of this electric field. (2 marks)

**(TOTAL FOR QUESTION 1 = 7 MARKS)**

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(Questions continue on next page)

(Turn over)



**2 (a) Which of these is the equation for work done?**  
**(1 mark)**

- ☐ **A**    **work done = force  $\div$  distance moved in direction of force**
- ☐ **B**    **work done = force  $\times$  distance moved in direction of force**
- ☐ **C**    **work done = force  $\div$  distance moved at right angles to direction of force**
- ☐ **D**    **work done = force  $\times$  distance moved at right angles to direction of force**

**(Question continues on next page)**

**(b) A ball has a mass of 0·046 kg.**

- (i) Calculate the change in gravitational potential energy when the ball is lifted through a vertical height of 2·05 m. (2 marks)**

**Use the equation**

$$\Delta\text{GPE} = m \times g \times \Delta h$$

**change in gravitational potential energy = \_\_\_\_\_ J**

**(Question continues on next page)**

**(ii) The ball is released.**

**Calculate the kinetic energy of the ball when the speed of the ball is 3.5 m/s. (3 marks)**

**kinetic energy of the ball = \_\_\_\_\_ J**

**(Question continues on next page)**

**(Turn over)**

(iii) The ball bounces several times.

Figure 4 shows how the height of the ball above the floor changes with time.

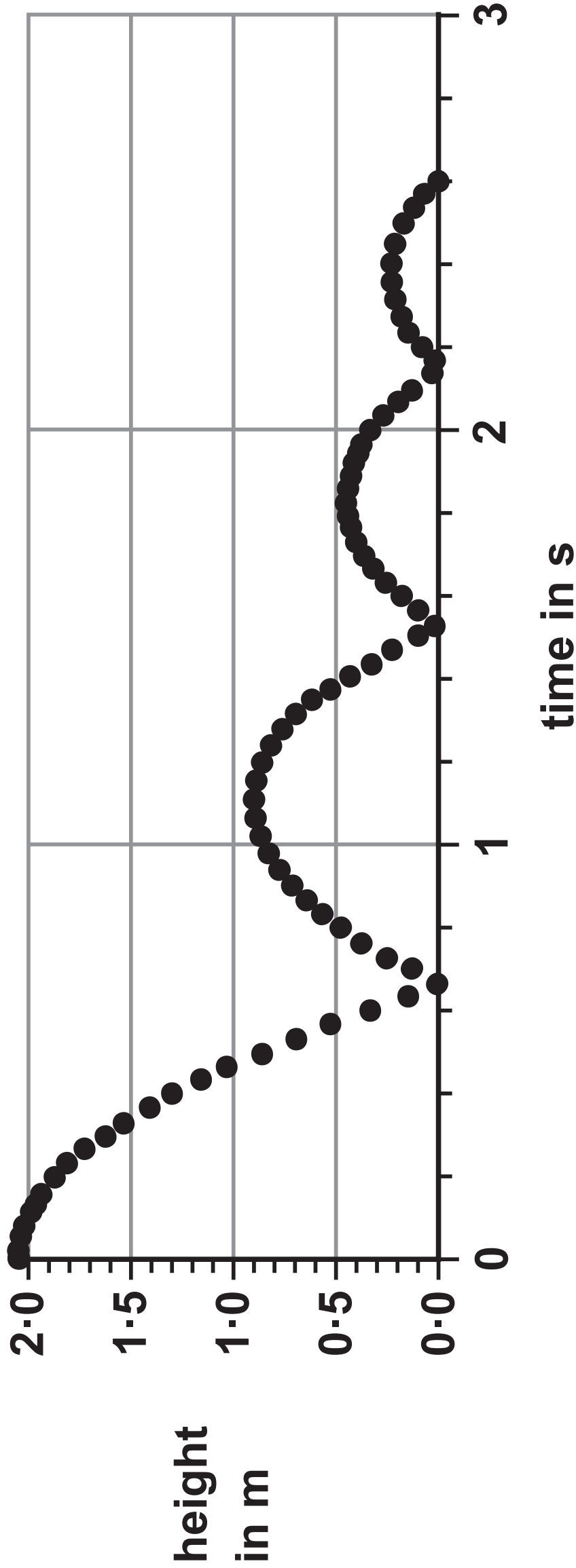


Figure 4

Use Figure 4 to estimate the maximum height that the ball reaches after the first bounce. (1 mark)

height after first bounce = \_\_\_\_\_ m

(Question continues on next page)

(Turn over)

**(iv) Explain why the ball does not bounce back to its starting height of 2.05 m. (2 marks)**

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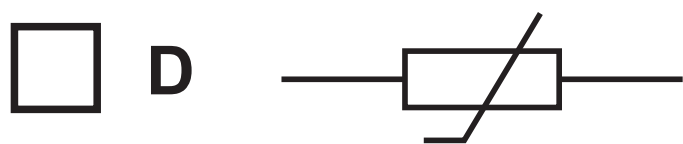
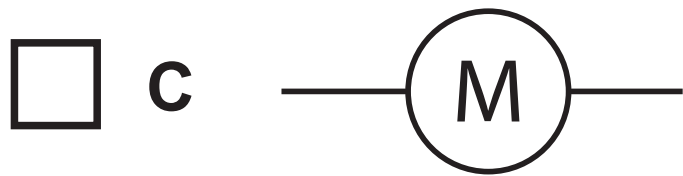
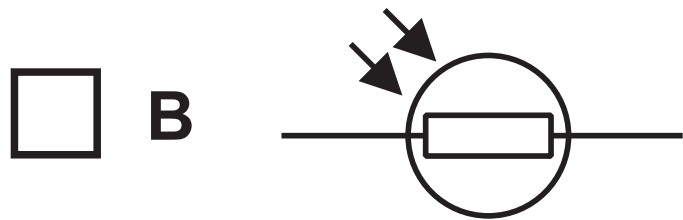
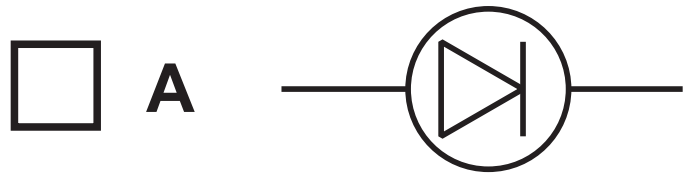
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**(TOTAL FOR QUESTION 2 = 9 MARKS)**

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**(Questions continue on next page)**

- 3 (a) Which of these symbols is used to represent a thermistor in an electrical circuit? (1 mark)



(Question continues on next page)

- (b) A student investigates how the current in a lamp changes with the potential difference across the lamp.

The student uses the results to calculate the resistance of the lamp.

The results are shown in the table in Figure 5.

potential difference in V	current in A	resistance in $\Omega$
1.0	0.09	11
2.0	0.14	14
3.0	0.18	17
4.0	0.22	18
5.0	0.26	
6.0	0.30	20

Figure 5

(Question continues on next page)

- (i) One value of resistance is missing from the table in Figure 5.

Calculate the value of resistance that is missing from the table. (3 marks)

missing resistance = \_\_\_\_\_  $\Omega$

(Question continues on next page)

(Turn over)



**(ii) The student writes this conclusion:**

**‘The resistance of the lamp is directly proportional to the potential difference.’**

**Comment on the student’s conclusion.**

**Use information from Figure 5 in your answer.  
(3 marks)**

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**(Question continues on next page)**

**(Turn over)**

- (iii) The student used a power supply that had fixed output voltage settings.  
Each of these outputs was a whole number of volts.

Describe how the student could add a component to the circuit that would provide a continuously variable voltage across the lamp.  
(2 marks)

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**(TOTAL FOR QUESTION 3 = 9 MARKS)**

**(Questions continue on next page)**

**(Turn over)**

- 4 (a) Figure 6 shows four forces, P, Q, R and S, acting on a rod.

The rod can rotate around an axle.

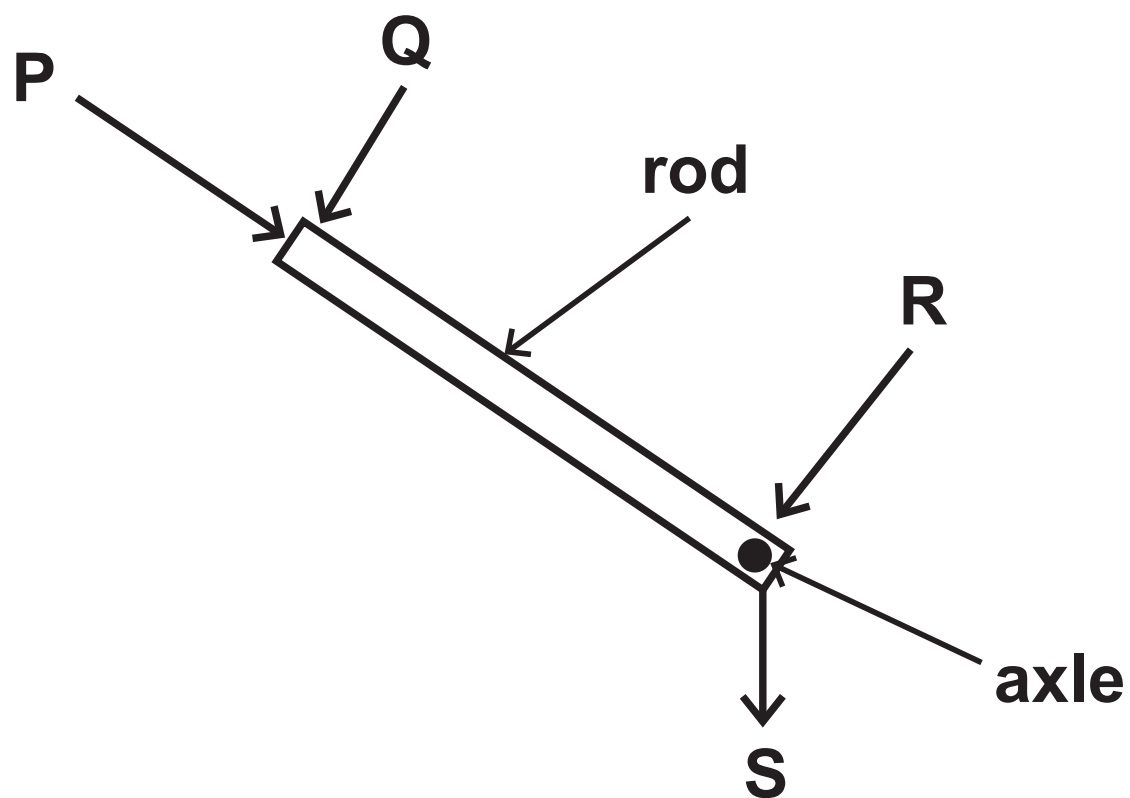


Figure 6

Which force will make the rod rotate about the axle? (1 mark)

☐ A P

☐ B Q

☐ C R

☐ D S

(Question continues on next page)

(Turn over)

(b) Figure 7 shows a person trying to lift a large rock using a metal bar.

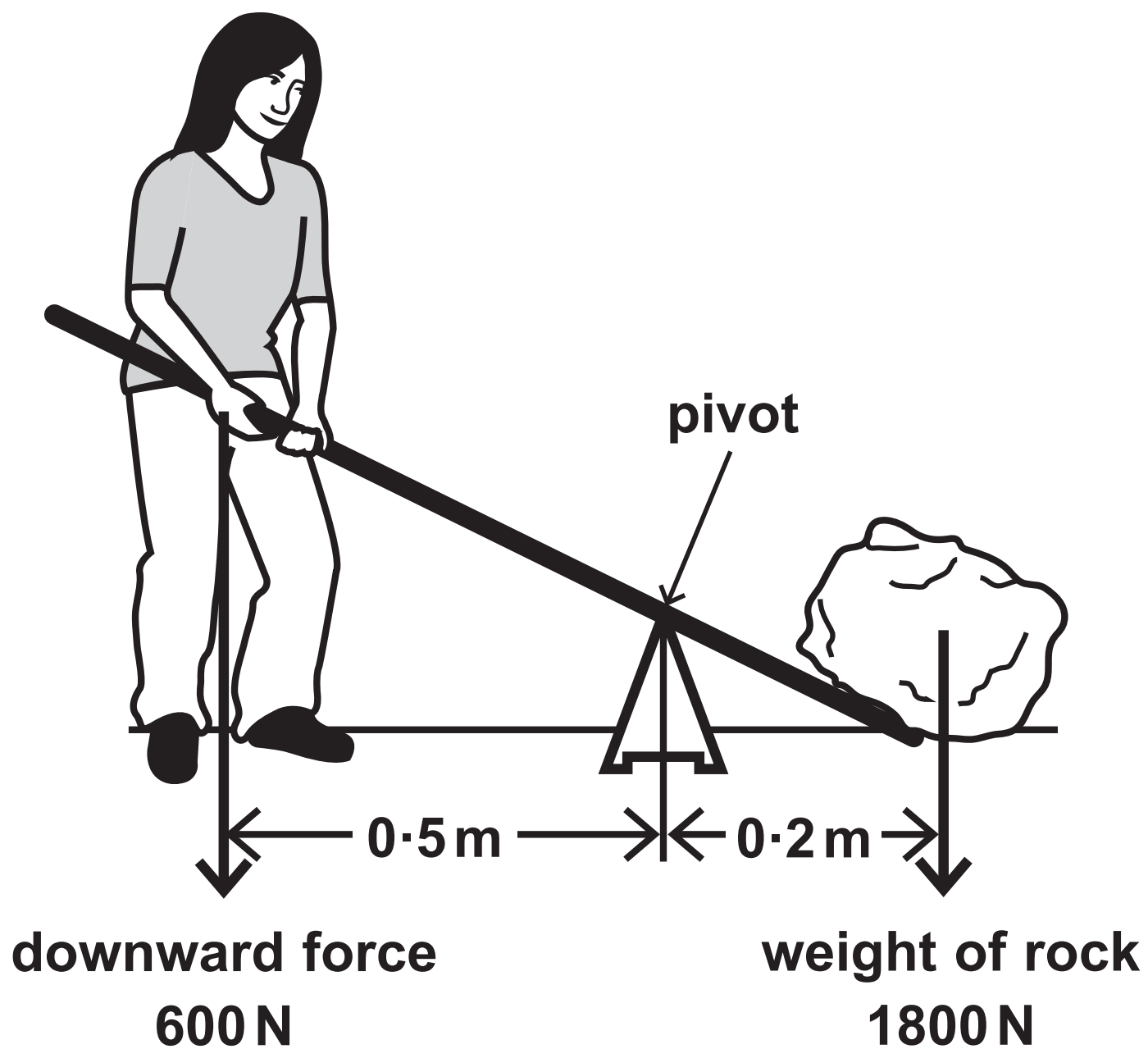


Figure 7

The rock weighs 1800 N.

The person can only produce a downwards force of 600 N.

The person cannot lift the rock.

(Question continues on next page)

(Turn over)

- (i) Explain, using calculations, why the person cannot lift the rock. (3 marks)

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(Turn over)

- (ii) Explain ONE change to the arrangement that will make it possible for this person to lift the rock. (2 marks)

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(Question continues on next page)

(c) Figure 8 shows a bicycle.

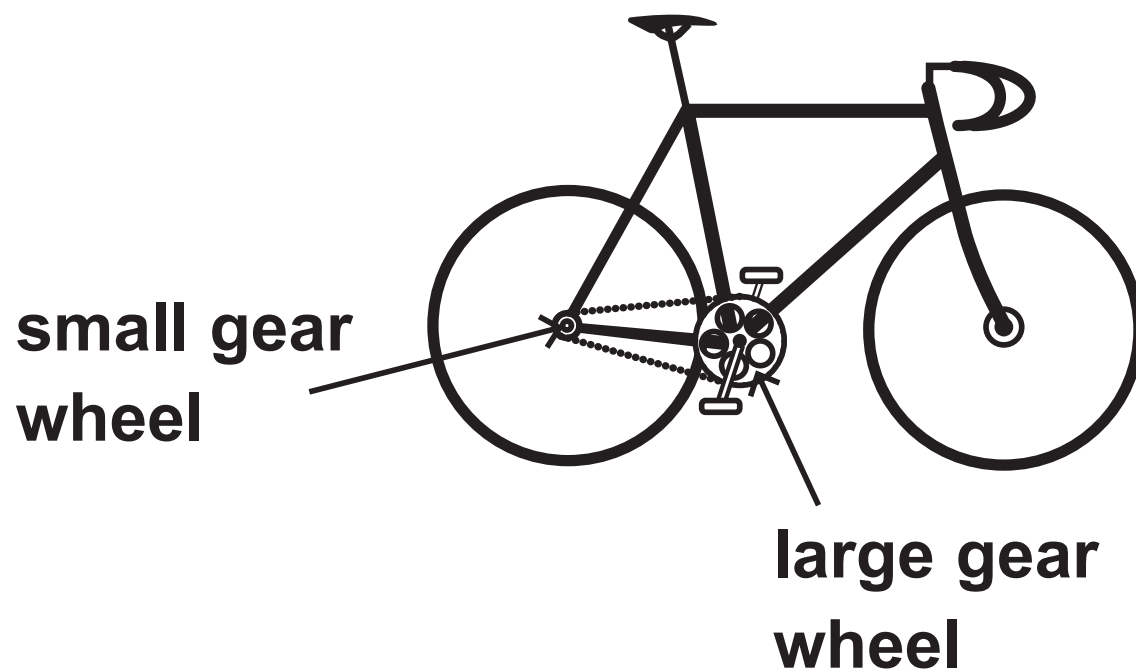


Figure 8

- (i) The rider uses the pedals to make the large gear wheel turn.

The large gear wheel moves the chain.  
The chain turns the small gear wheel.

The large gear wheel has 48 teeth.

The small gear wheel has 12 teeth.

The large gear wheel turns 2 times each second.

(Question continues on next page)

(Turn over)

**Calculate the number of times that the small gear wheel turns each second. (2 marks)**

\_\_\_\_\_ turns each second

**(Question continues on next page)**



- (ii) Oil is applied to the wheel of a bicycle at the point shown in Figure 9.

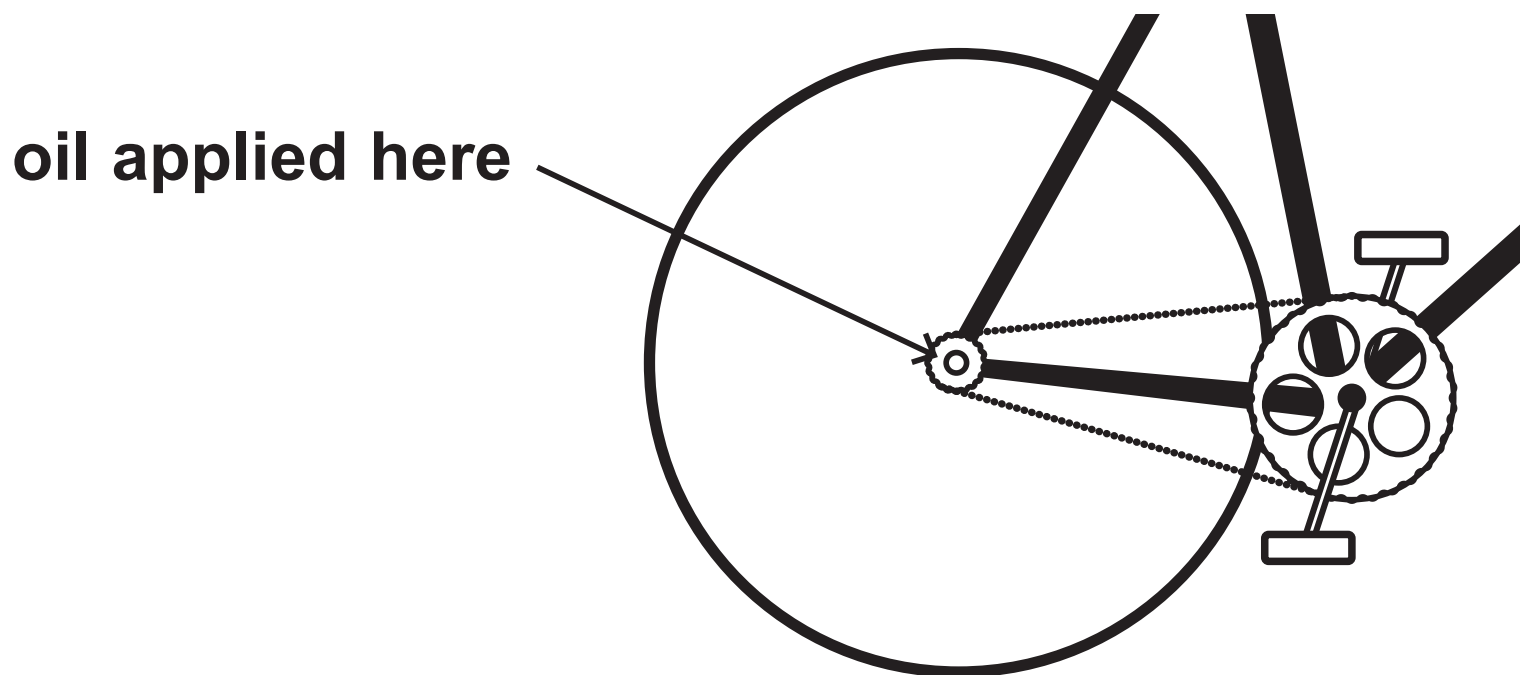


Figure 9

Explain how the oil improves the efficiency of the bicycle. (3 marks)

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(Continue your answer on next page)

(Turn over)

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**(TOTAL FOR QUESTION 4 = 11 MARKS)**

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**(Questions continue on next page)**

- 5 (a) A student uses a plotting compass to investigate the magnetic field around a wire.

Figure 10 shows the wire going straight through a card.

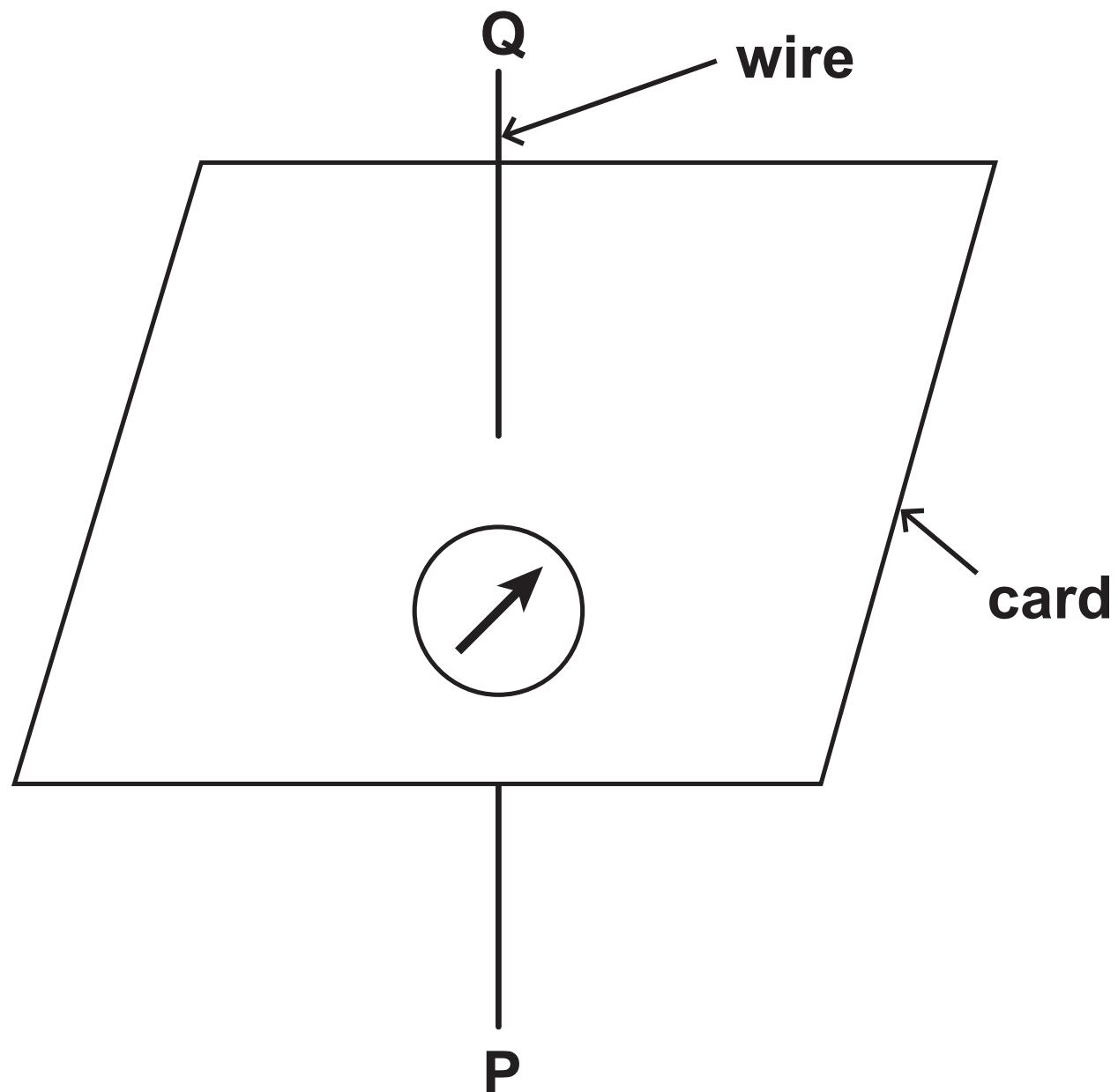


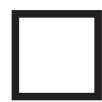
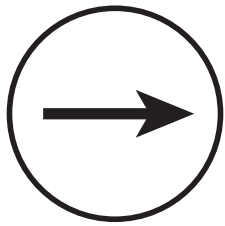
Figure 10

Figure 10 shows the compass needle when there is no current in the wire.

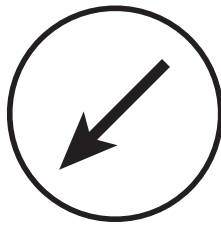
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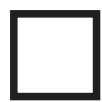
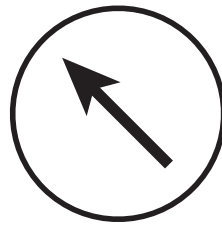
- (i) Which of these shows a possible direction of the compass needle when there is a current in the wire going from P to Q? (1 mark)



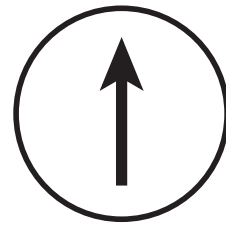
A



B



C



D

(Question continues on next page)

- (ii) Describe how the student could develop the investigation to find the shape of the magnetic field produced by the current. (3 marks)

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(b) Figure 11 shows a copper wire between two magnetic poles.

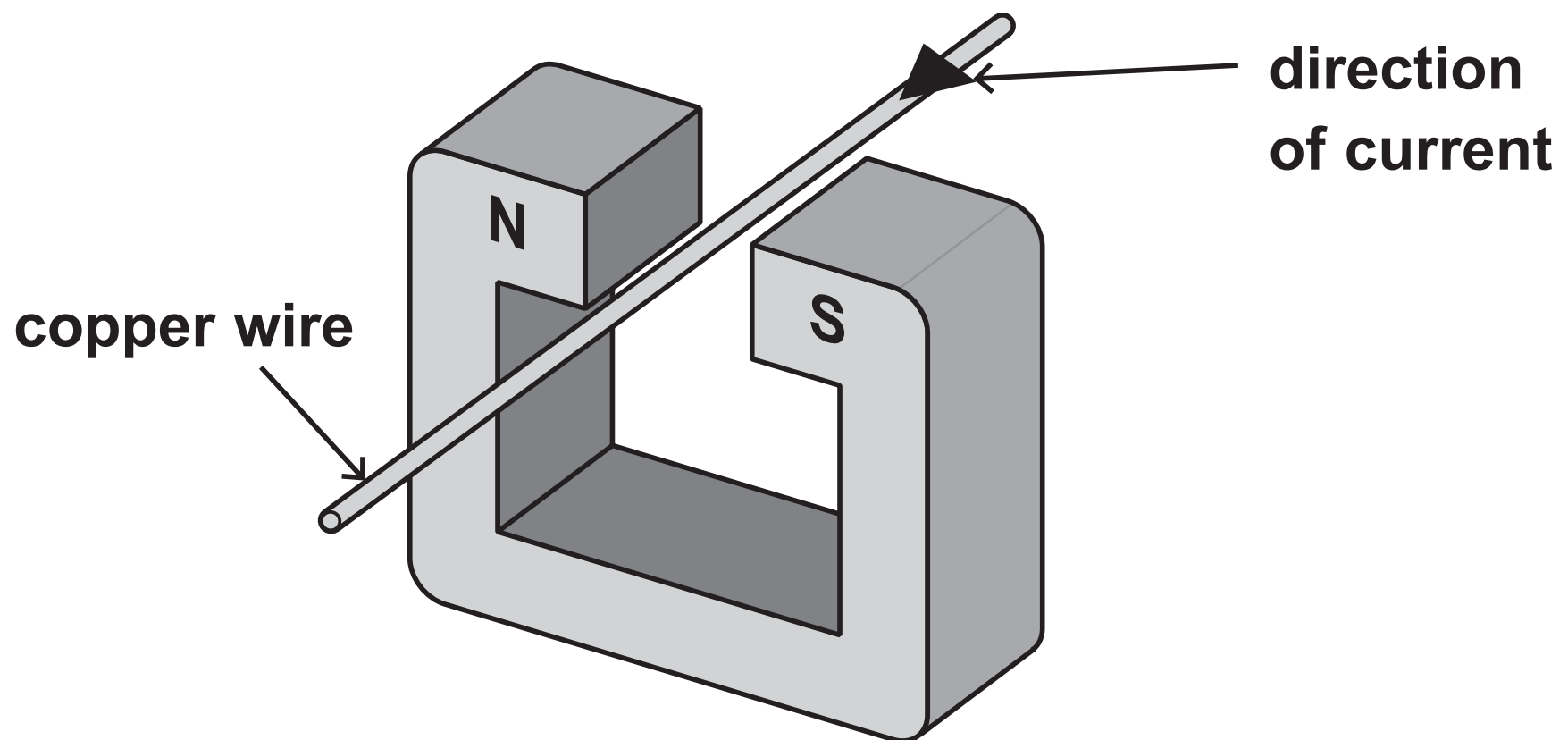


Figure 11

The current in the wire is in the direction shown by the arrow.

The wire experiences a force due to the magnetic field.

(i) The direction of the force due to the magnetic field is (1 mark)

- ☐ A down
- ☐ B up
- ☐ C towards the north pole of the magnet
- ☐ D towards the south pole of the magnet

(Question continues on next page)

(Turn over)

- (ii) The interaction between the magnetic fields produced by the magnet and the current in the wire produces forces on the magnet and the wire.

Compare these two forces. (1 mark)

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(Question continues on next page)

(iii) Figure 12 shows a different wire inside a uniform magnetic field.

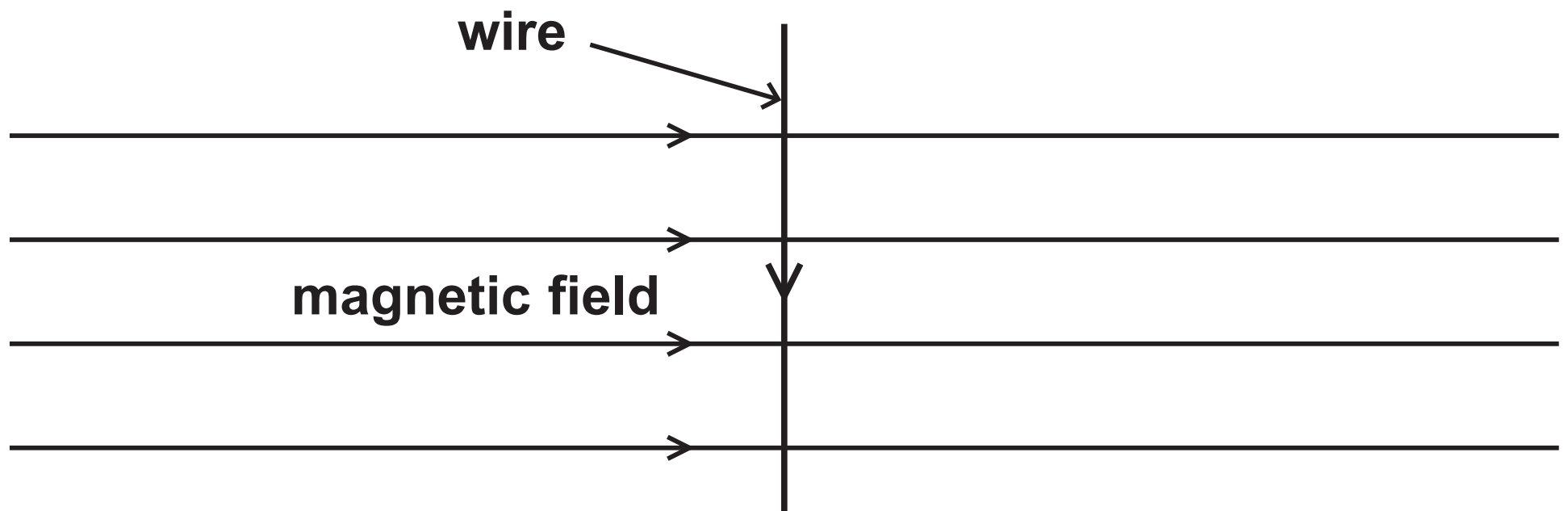


Figure 12

The magnetic flux density of the magnetic field is  $0.72 \text{ N/Am}$ .

The length of the wire inside the field is  $30 \text{ mm}$ .

The size of the force due to the magnetic field on the wire is  $0.045 \text{ N}$ .

Calculate the size of the current in the wire.

(Question continues on next page)



**Use an equation selected from the Equations Booklet supplied with this paper. (3 marks)**

**current in the wire = \_\_\_\_\_ A**

**(TOTAL FOR QUESTION 5 = 9 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 6 (a) A teacher is demonstrating electromagnetic induction.**

**The teacher has a bar magnet, a coil of wire and a sensitive voltmeter.**

- (i) Draw a diagram to show how the teacher should arrange the apparatus. (1 mark)**

**(Question continues on next page)**

- (ii) Explain how the teacher could use this apparatus to demonstrate the factors affecting the size and direction of the induced potential difference. (4 marks)

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(Turn over)

**(b) There is a changing magnetic field in the core of a transformer.**

**(i) Describe the cause of the changing magnetic field in the core of the transformer. (2 marks)**

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**(Question continues on next page)**

- (ii) A potential difference of 230 V is applied across the primary coil of a transformer.

There is a potential difference of 15 V across the secondary coil.

The primary coil has 2000 turns.

Calculate the number of turns in the secondary coil.

Use an equation selected from the Equations Booklet supplied with this paper. (3 marks)

\_\_\_\_\_ turns

(TOTAL FOR QUESTION 6 = 10 MARKS)

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(Questions continue on next page)

(Turn over)

**7 (a) A student measures the density of glass.**

**The student has**

- a bag of marbles, all made from the same type of glass**
- a weighing balance**
- a plastic measuring cylinder containing water**

**Describe how the student could find, as accurately as possible, the density of the glass used for the marbles. (4 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

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**(Question continues on next page)**

- (b) A beaker contains 0.25 kg of water at room temperature.**

**The beaker of water is heated until the water reaches boiling point ( $100^{\circ}\text{C}$ ).**

**The specific heat capacity of water is  $4200 \text{ J/kg}^{\circ}\text{C}$ .  
The total amount of thermal energy supplied to the water is 84 000 J.**

- (i) Calculate the temperature of the water before it was heated.**

**Use an equation selected from the Equations Booklet supplied with this paper. (3 marks)**

**temperature before heating = \_\_\_\_\_  $^{\circ}\text{C}$**

**(Question continues on next page)**

**(Turn over)**



- (ii) The heating continues until 0.15 kg of the water has turned into steam.  
The thermal energy needed to turn the boiling water into steam is 0.34 MJ.

Calculate the specific latent heat of vapourisation of water.

Use an equation selected from the Equations Booklet supplied with this paper. (2 marks)

specific latent heat = \_\_\_\_\_ MJ/kg

- (iii) On page 42 the graph in Figure 13 shows how the VOLUME of 1 kg of water changes with temperature.

(Question continues on next page)

(Turn over)

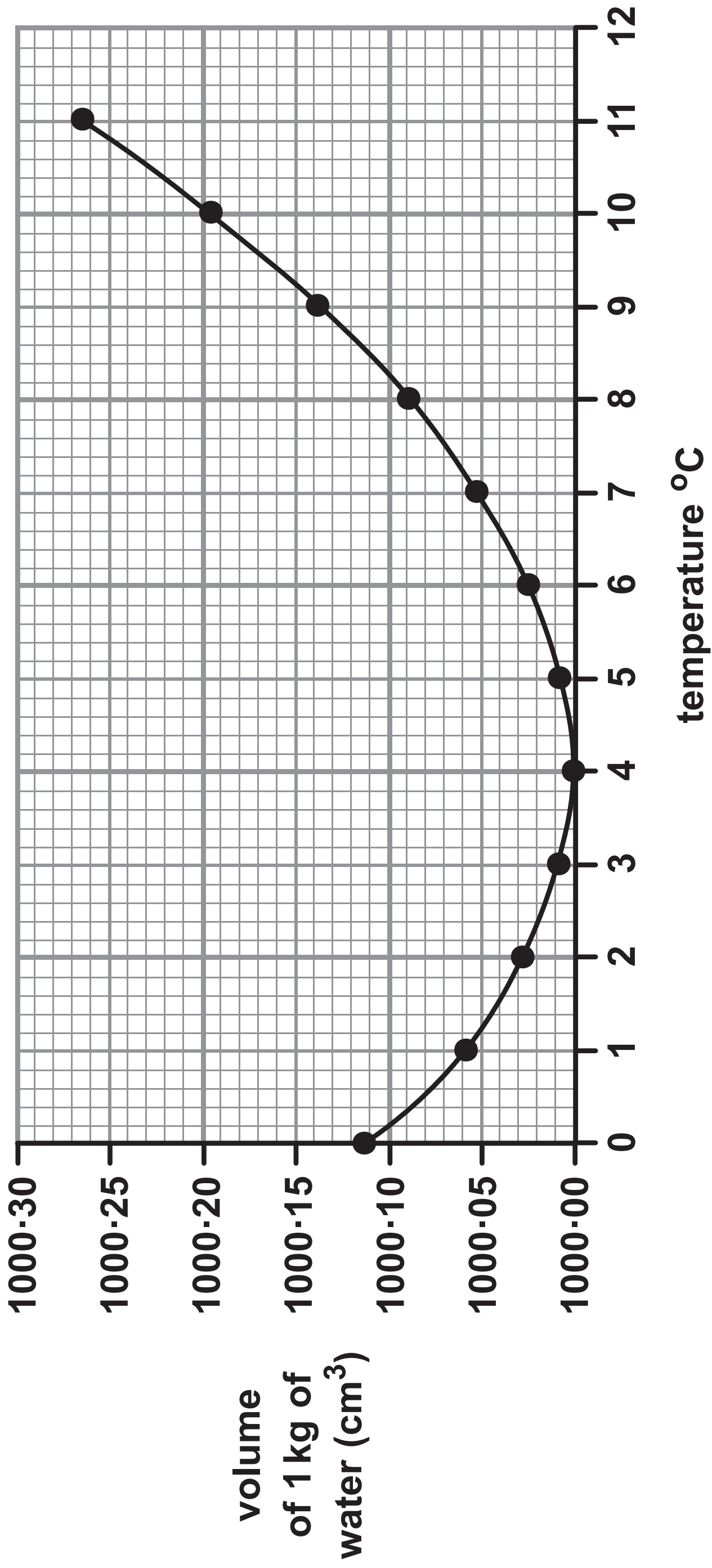


Figure 13

(Question continues on next page)

(Turn over)

**Describe how the DENSITY of water changes with temperature over the range of temperature shown in Figure 13.**

**Calculations are not required. (2 marks)**

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**(TOTAL FOR QUESTION 7 = 11 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 8 (a) Figure 14 shows an athlete using a fitness device.

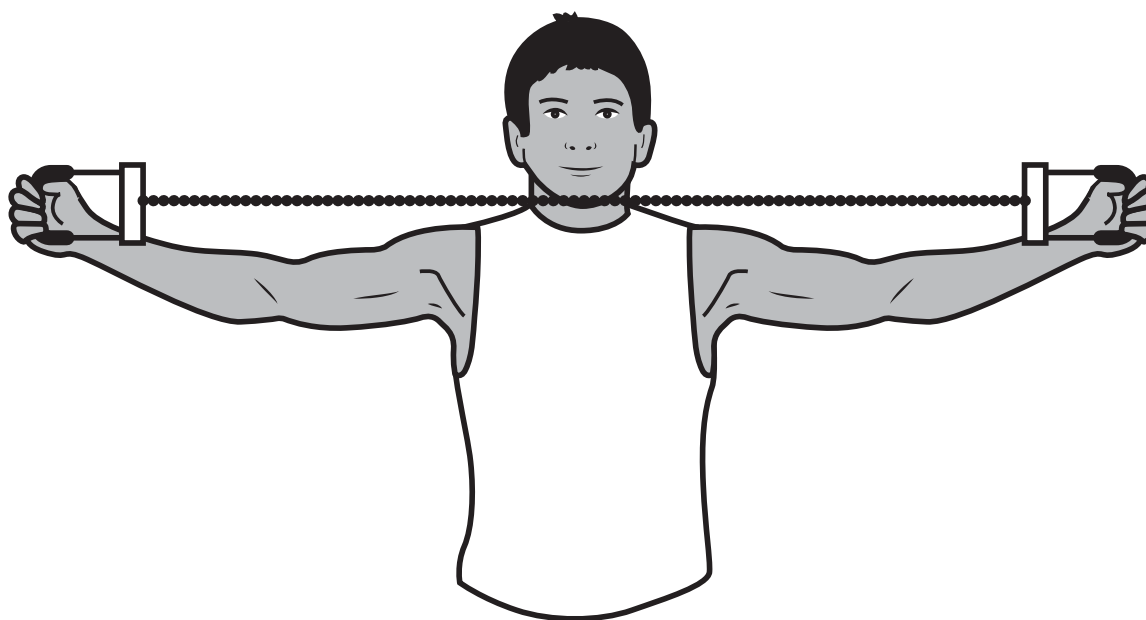


Figure 14

The athlete stretches the spring in the device by pulling the handles apart.

The spring constant of the spring is  $140 \text{ N/m}$ .

The athlete does  $45 \text{ J}$  of work to extend the spring.

The athlete takes  $0.6 \text{ s}$  to expand the spring.

- (i) Calculate the useful power output of the athlete when stretching the spring. (2 marks)

useful power output of the athlete = \_\_\_\_\_ W

(Question continues on next page)

(Turn over)

**(ii) Calculate the extension of the spring.**

**Use an equation selected from the Equations Booklet supplied with this paper. (3 marks)**

**extension of the spring = \_\_\_\_\_ m**

**(Question continues on next page)**

**(Turn over)**

- (b) A student investigates the stretching of a long piece of rubber.

Figure 15 shows the apparatus to be used.

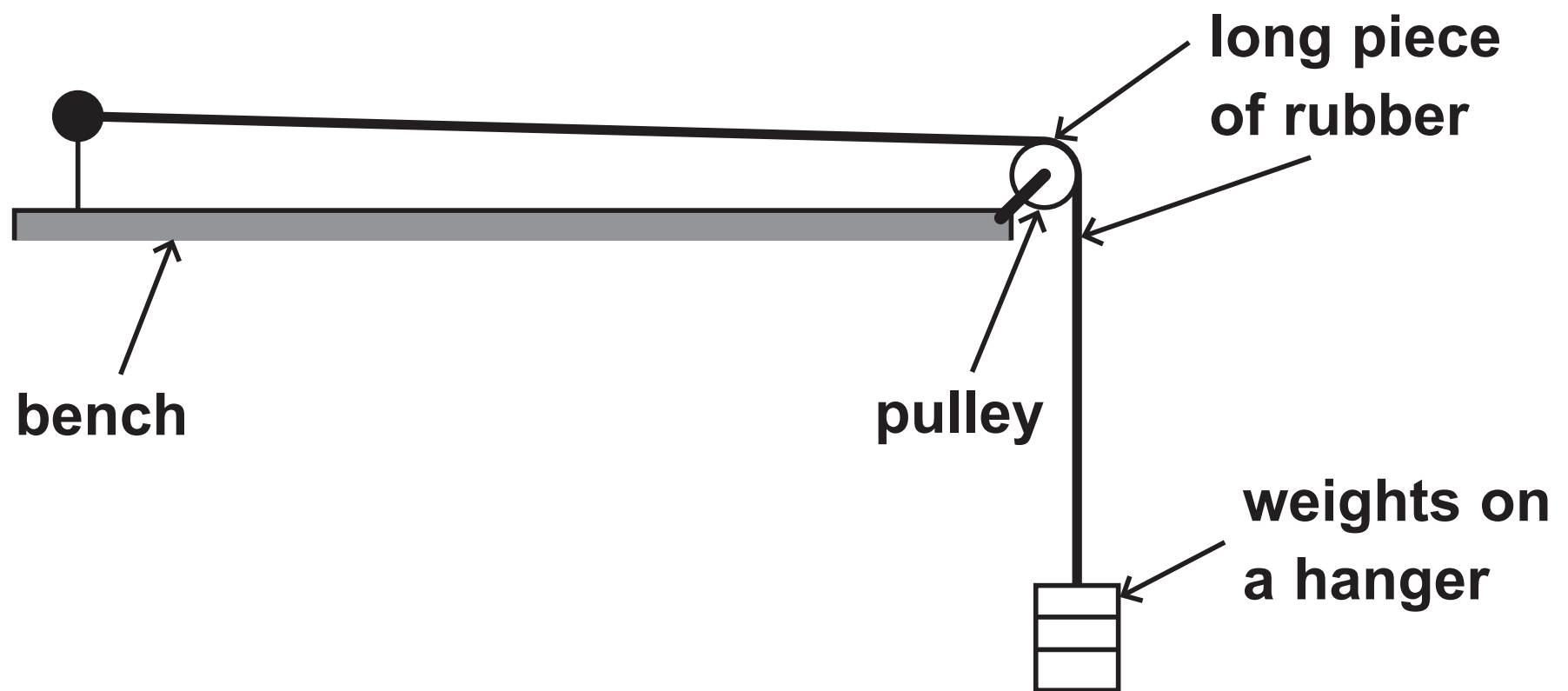


Figure 15

The student puts just enough weight on the weight hanger to make the piece of rubber just tight.

The student wants to plot a graph to show how the extension of the piece of rubber varies with the force used to stretch it.

The student adds a known weight to the weight hanger.

(Question continues on next page)

(Turn over)

- (i) Describe how the student could measure the extension of the rubber when he adds another weight to the weight hanger. (2 marks)

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(Question continues on next page)

- (ii) The student obtains a series of values of force and extension while loading the piece of rubber and then unloading it.

Figure 16 shows the graph of the student's values.

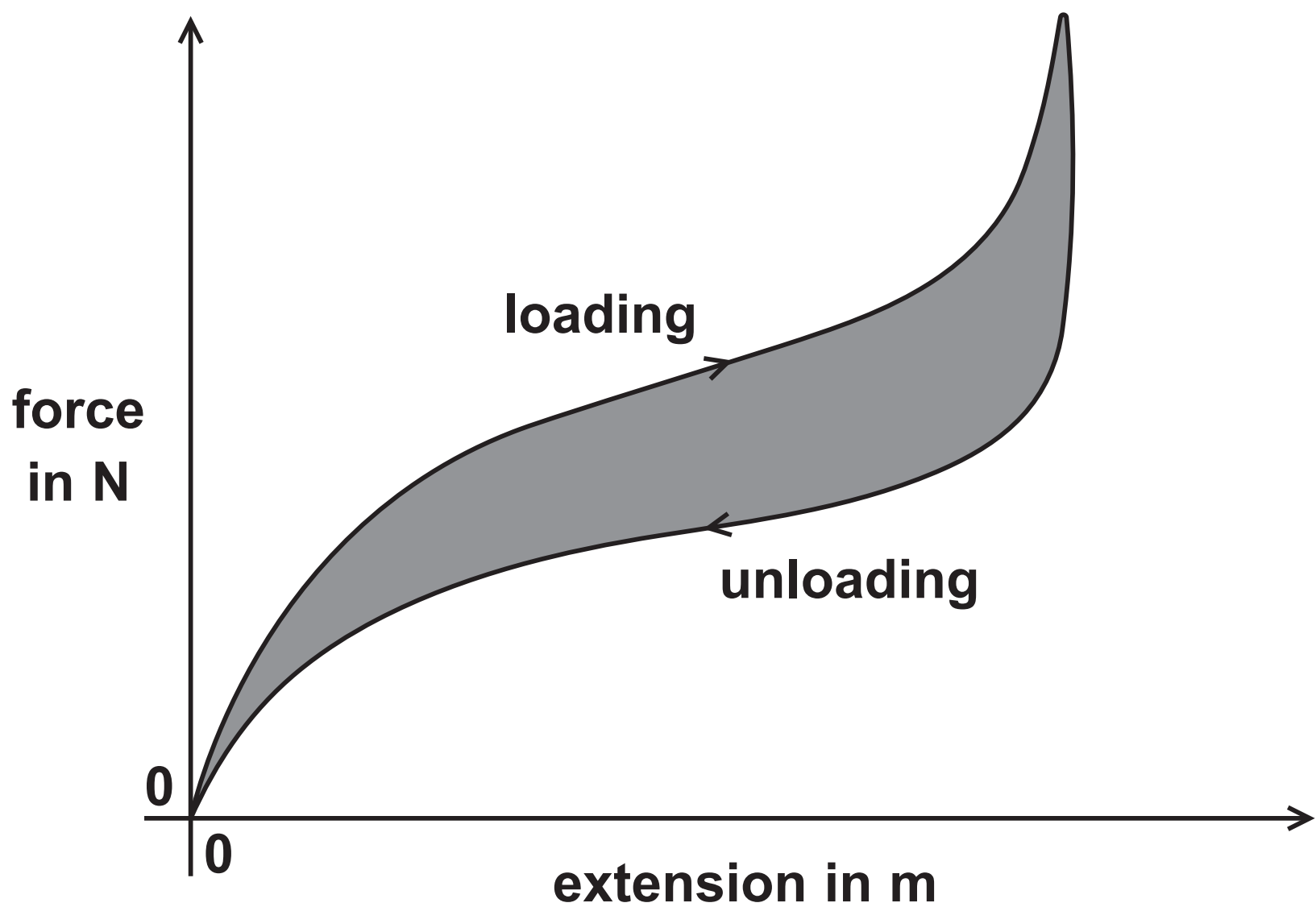


Figure 16

(Question continues on next page)



**Explain how the shape of this graph shows that the distortion of the piece of rubber being stretched is different from the distortion of a spring being stretched. (2 marks)**

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**(Question continues on next page)**

- (c) The area between the curve and the extension axis of a force/extension graph corresponds to work done or energy transferred.

Suggest what the shaded area of the graph in Figure 16 represents. (2 marks)

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**(TOTAL FOR QUESTION 8 = 11 MARKS)**

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**(Questions continue on next page)**

**(Turn over)**

- 9 Figure 17 shows a crane lifting a concrete block from the bottom of a deep pool of water. The top of the block is a distance,  $h$ , below the surface of the water.

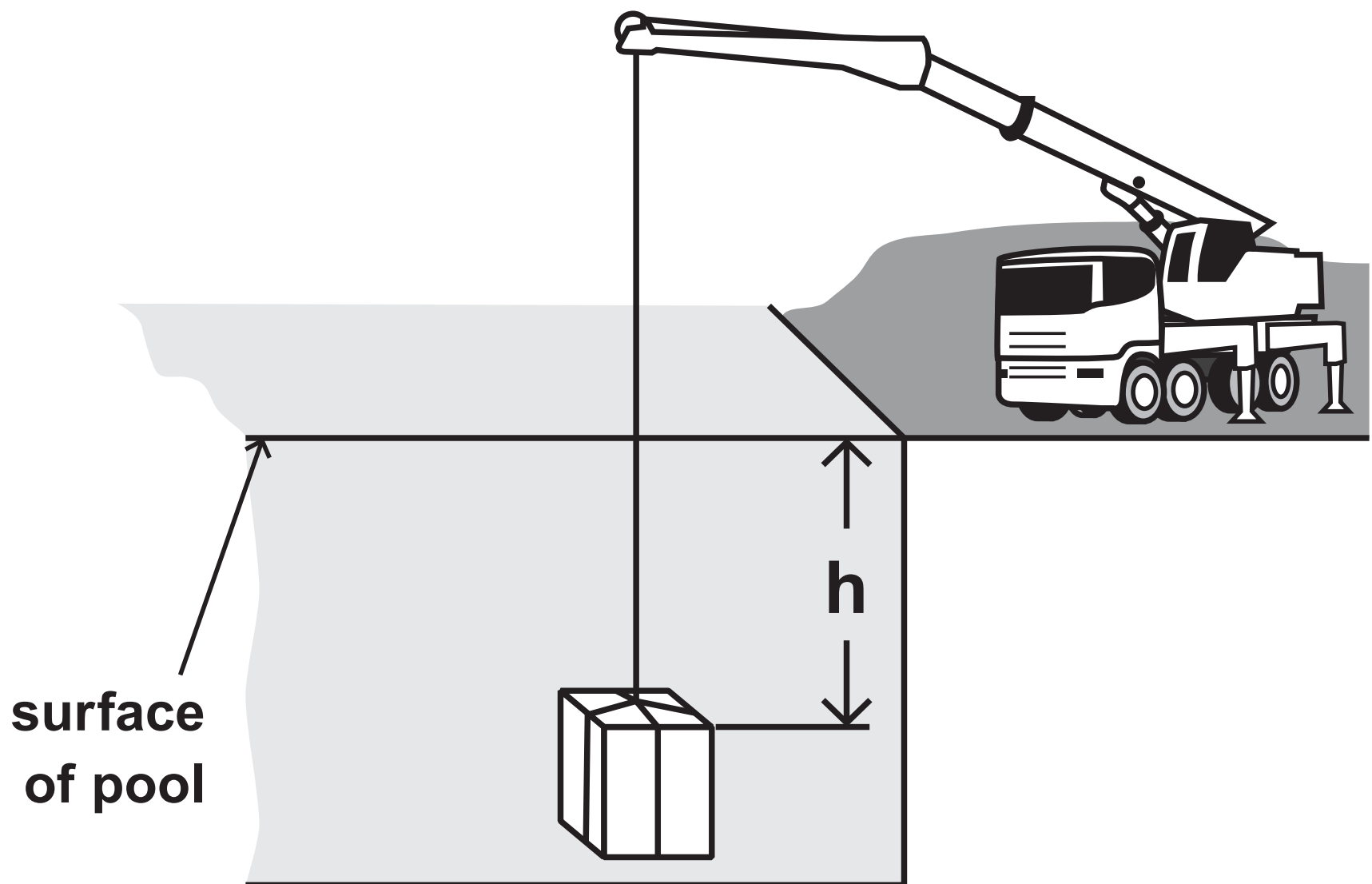


Figure 17

- (a) The force on the top of the block due to the water above it is 41 000 N.

The pressure due to the water on the top surface of the block is 66 000 Pa.

(Question continues on next page)

(Turn over)

- (i) Calculate the area of the top surface of the block. (2 marks)

area of the top surface of the block = \_\_\_\_\_ m<sup>2</sup>

(Question continues on next page)

- (ii) The density of water is  $1000 \text{ kg/m}^3$ .

Calculate the distance,  $h$ , between the top of the block and the surface of the water.

Gravitational field strength,  $g$ , is  $10 \text{ N/kg}$ .

Use an equation selected from the Equations Booklet supplied with this paper. (2 marks)

$h = \underline{\hspace{2cm}} \text{ m}$

(Question continues on next page)

(Turn over)

- (iii) Explain why there is an upthrust produced by the water on the block. (2 marks)**

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- \*(iv) The crane raises the block until it is high enough out of the water to be loaded on to a lorry.**

**The block moves upwards at a constant speed even though the lifting force in the cable changes.**

**On page 55 Figure 18 shows the graph of how the lifting force changes while the block is being raised.**

**(Question continues on next page)**

**(Turn over)**

lifting force  
in kN

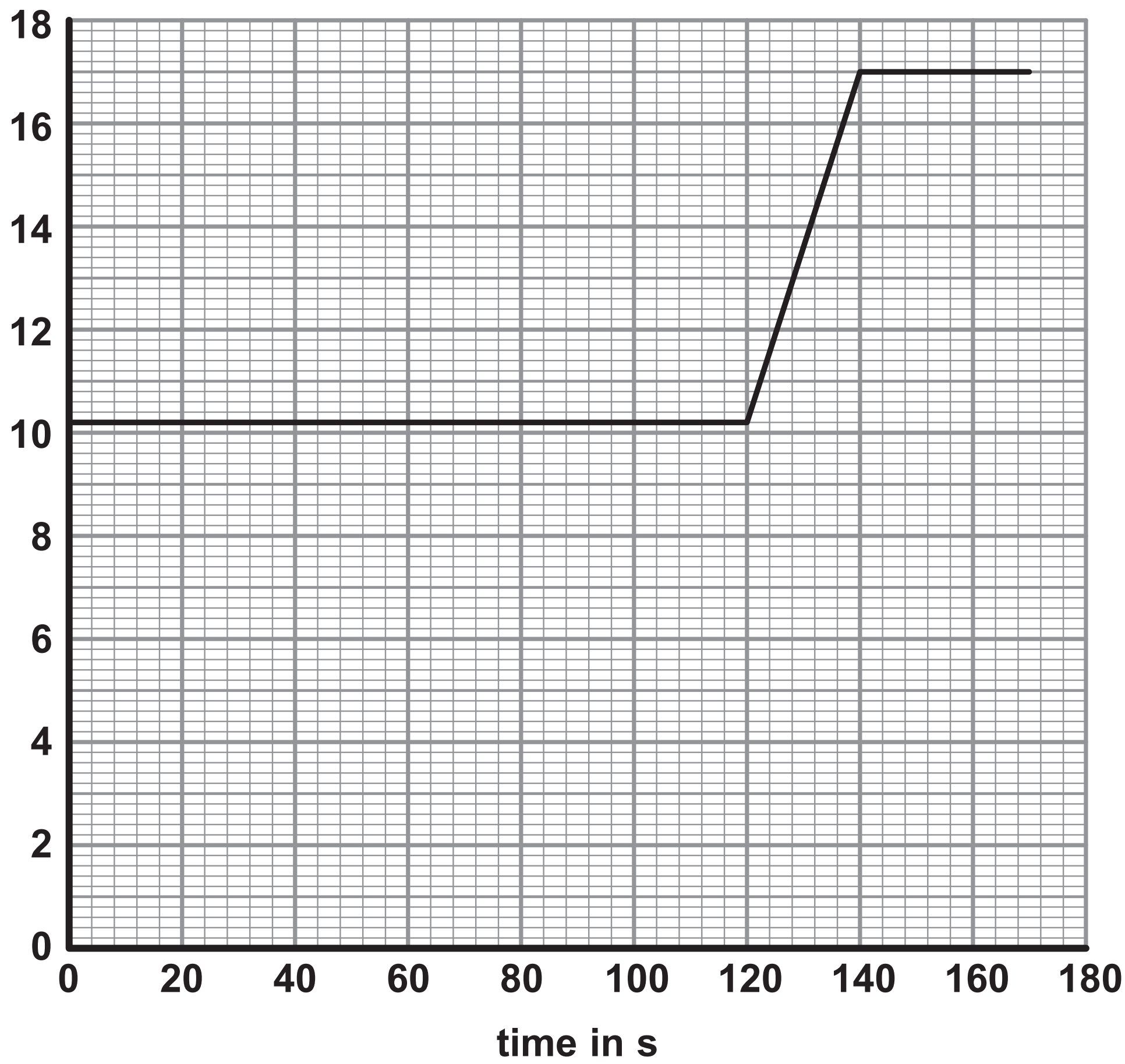


Figure 18

(Question continues on next page)

**Explain why the lifting force changes as shown on the graph in Figure 18. Include calculation(s) in your answer. (6 marks)**

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**(Continue your answer on next page)**

**(Turn over)**



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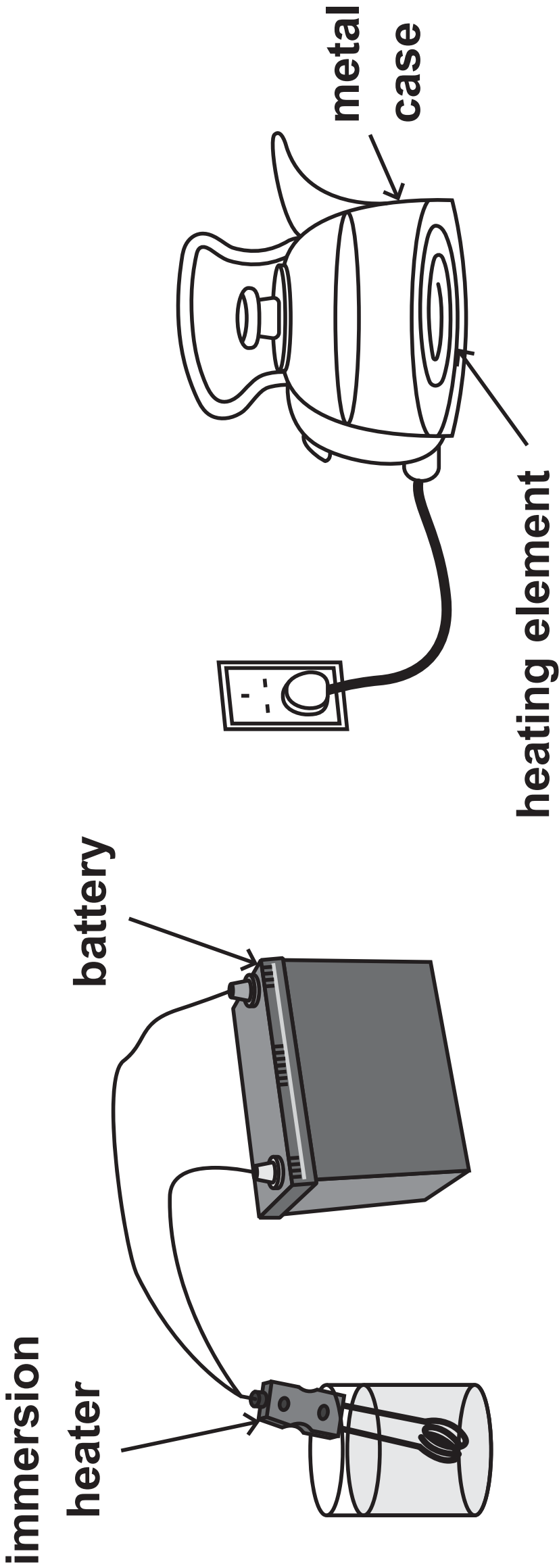
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**(TOTAL FOR QUESTION 9 = 12 MARKS)**

**(Questions continue on next page)**

10 (a) Figure 19 shows two electrical devices for heating water.



immersion heater  
connected to a battery

kettle connected to  
domestic mains supply

Figure 19

(Question continues on next page)

- (i) The current in the element of the immersion heater is 14A.

The power of the immersion heater is 130 W.

Calculate the resistance of the immersion heater.

Give your answer to two significant figures.  
(3 marks)

resistance of immersion heater = \_\_\_\_\_  $\Omega$

(Question continues on next page)

- (ii) The current in the heating element of the kettle is 8.3 A.

State TWO differences between the movement of charge in the heating element of the kettle and the movement of charge in the immersion heater. (2 marks)

1 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

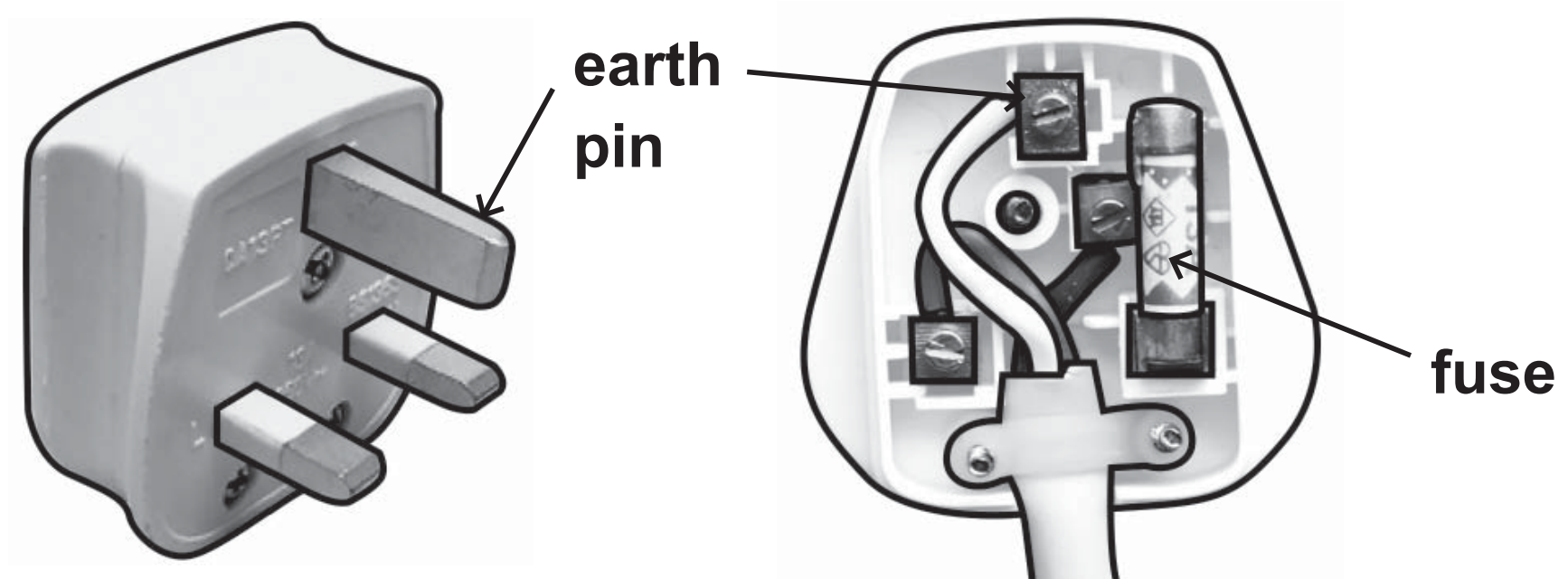
2 \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

(Question continues on next page)

**\* (b) Figure 20 shows the three-pin plug used to connect the kettle to the mains.**



**Figure 20**

**A fault occurs in the kettle causing the live wire to touch the metal case of the kettle.**

**Explain how the safety features of the plug operate when this fault occurs. (6 marks)**

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**(Continue your answer on next page)**

**(Turn over)**

**(Turn over)**

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**(TOTAL FOR QUESTION 10 = 11 MARKS)**

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**TOTAL FOR PAPER = 100 MARKS**  
**END**