Paper Reference(s) **1SC0/2PH**

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

Combined Science

Paper 6: Physics 2
Higher Tier

Friday 14 June 2019 – Morning

Time: 1 hour 10 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.

Centre No.							
Candidate No.							
Surname							
Other names							
Signature							
Paper Reference	1	S	C	0	/	2	P	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 60.
- 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)

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 ☒.

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

☐ **A** work done = force ÷ distance moved in direction of force

☐ **B** work done = force × distance moved in direction of force

☐ **C** work done = force ÷ distance moved at right angles to direction of force

☐ **D** work done = force × 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

$$\Delta GPE = m \times g \times \Delta h$$

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)

(iii) The ball bounces several times.

Figure 1 shows how the height of the ball above the floor changes with time.

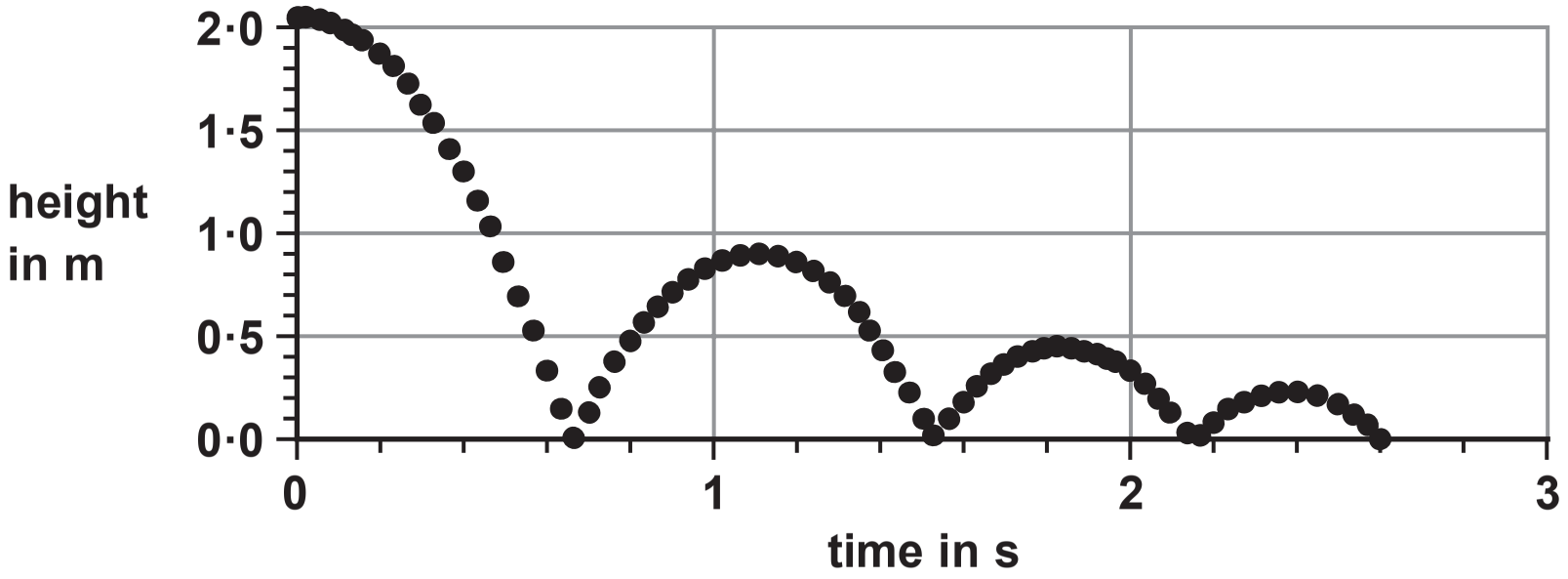


Figure 1

Use Figure 1 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)

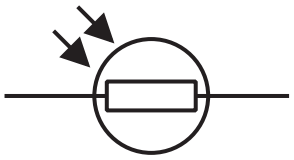
(iv) Explain why the ball does not bounce back to its starting height of 2·05 m. (2 marks)

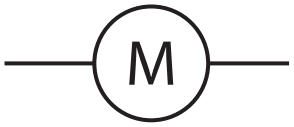
(TOTAL FOR QUESTION 1 = 9 MARKS)

(Questions continue on next page)

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

☐ A 

☐ B 

☐ C 

☐ D 

(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 2.

potential difference in V	current in A	resistance in Ω
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 2

(Question continues on next page)

(i) One value of resistance is missing from the table in Figure 2.

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

missing resistance = _____ Ω

(Question continues on next page)

(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 2 in your answer.
(3 marks)

(Question continues on next page)

(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)

(TOTAL FOR QUESTION 2 = 9 MARKS)

(Questions continue on next page)

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

Figure 3 shows the wire going straight through a card.

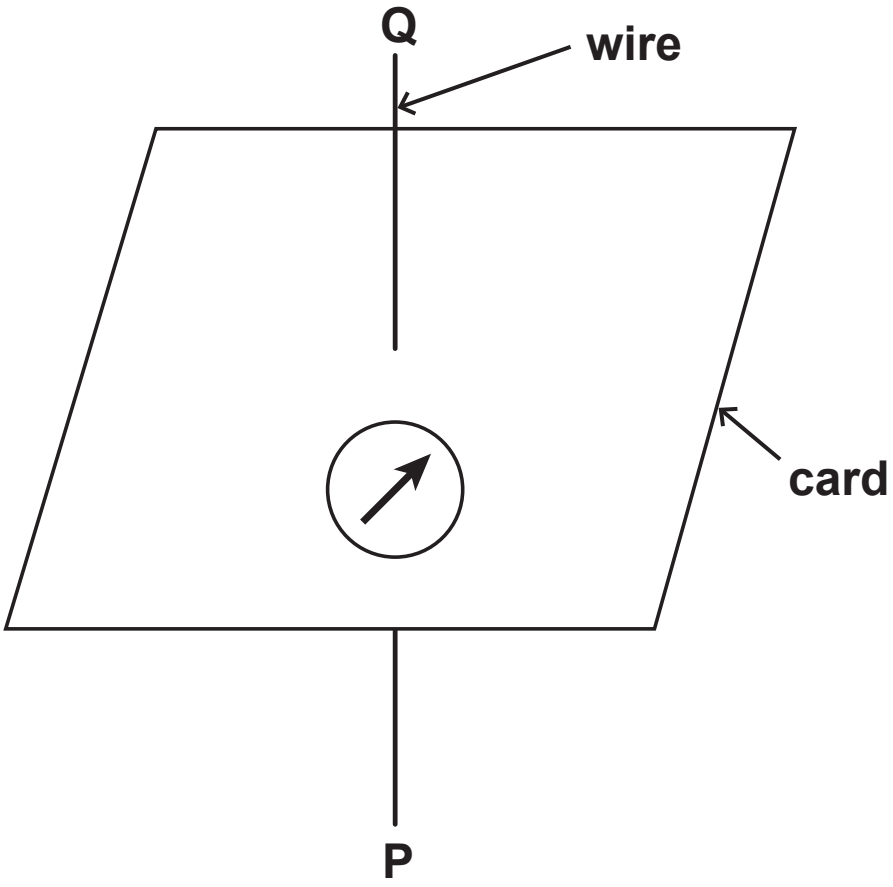
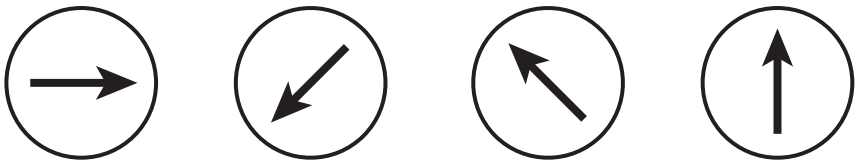


Figure 3

Figure 3 shows the compass needle when there is no current in the wire.

(Question continues on next page)

(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)

(Question continues on next page)

(b) Figure 4 shows a copper wire between two magnetic poles.

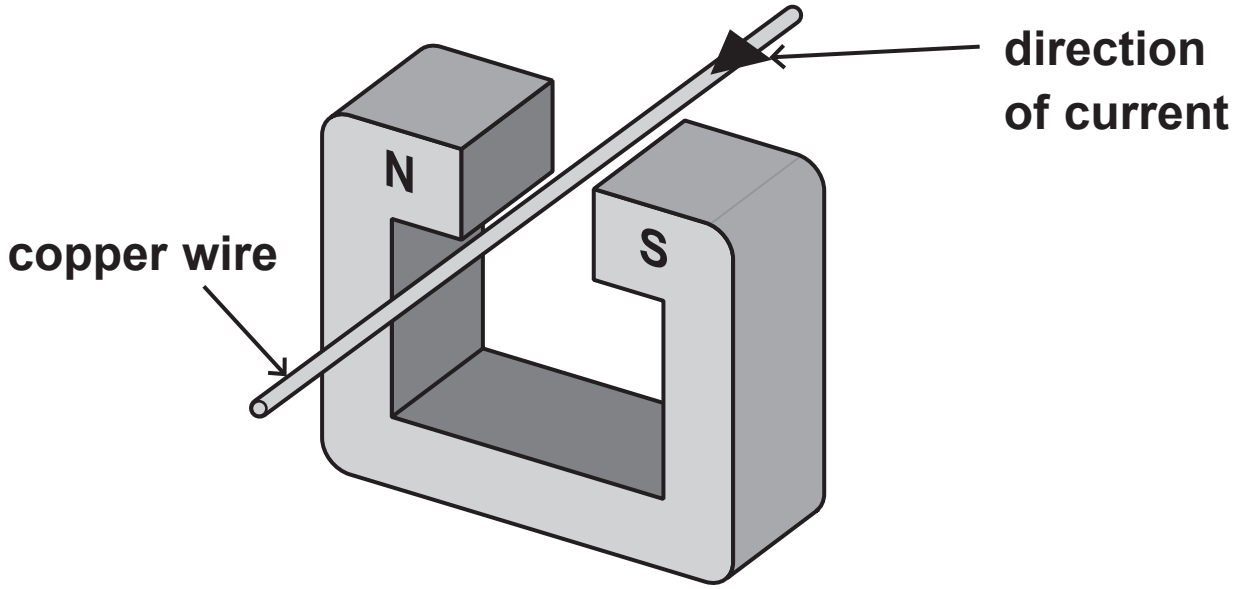


Figure 4

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)

(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)

(Question continues on next page)

(iii) Figure 5 shows a different wire inside a uniform magnetic field.

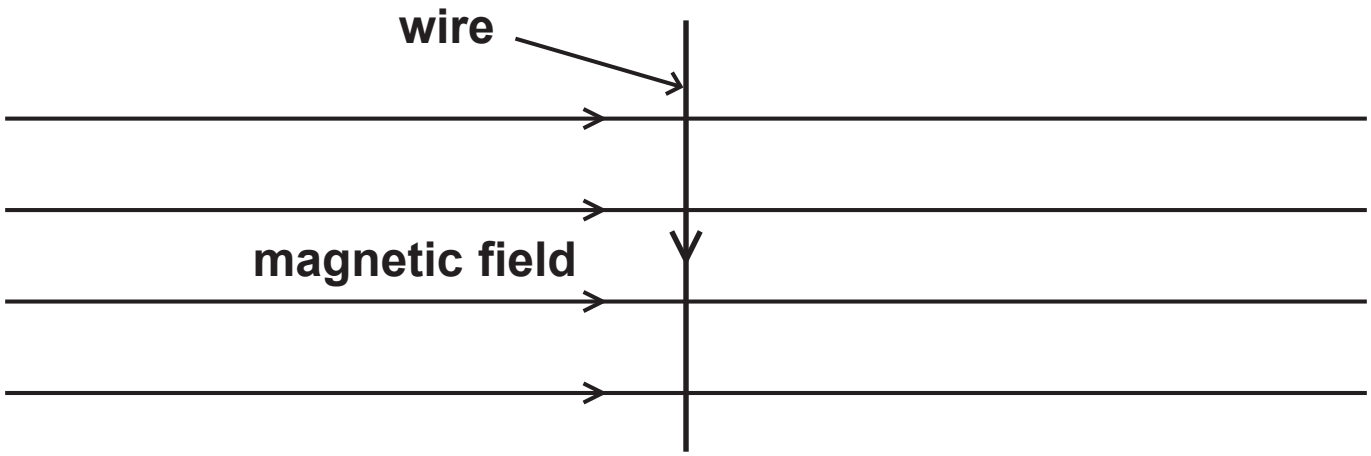


Figure 5

The magnetic flux density of the magnetic field is 0·72 N/Am.
The length of the wire inside the field is 30 mm.
The size of the force due to the magnetic field on the wire is 0·045 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 3 = 9 MARKS)

(Questions continue on next page)

4 (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)

(Continue your answer on next page)

(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 °C).
The specific heat capacity of water is 4200 J / kg °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 = _____ °C

(Question continues on next page)

(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

(Question continues on next page)

(iii) The graph in Figure 6 shows how the VOLUME of 1 kg of water changes with temperature.

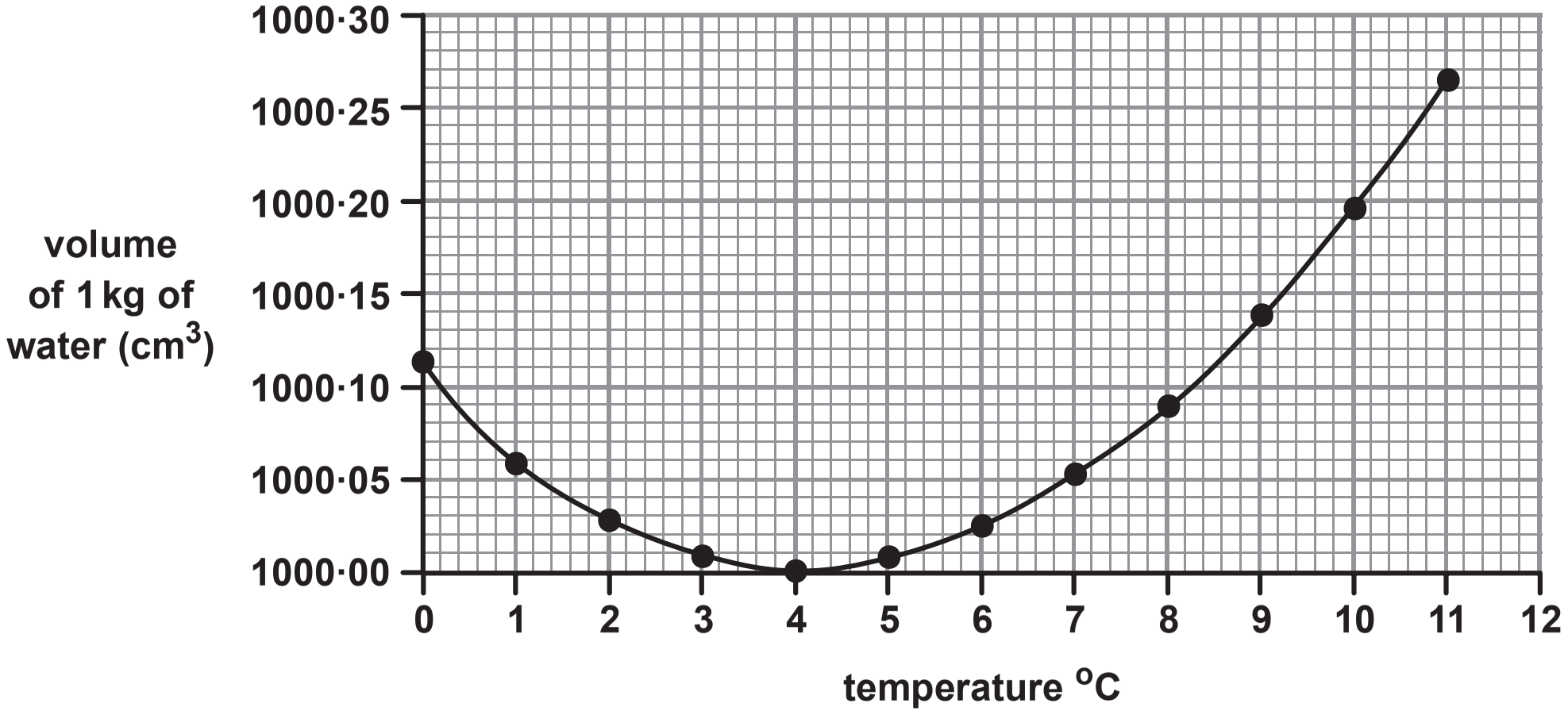


Figure 6

(Question continues on next page)

Describe how the DENSITY of water changes with temperature over the range of temperature shown in Figure 6.

Calculations are not required. (2 marks)

(TOTAL FOR QUESTION 4 = 11 MARKS)

(Questions continue on next page)

5 (a) Figure 7 shows an athlete using a fitness device.

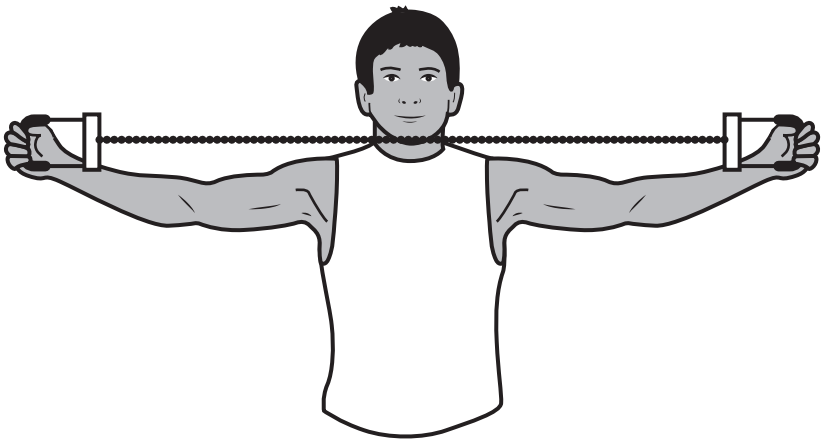


Figure 7

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

The spring constant of the spring is 140 N/m.

The athlete does 45 J of work to extend the spring.

The athlete takes 0·6 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)

(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)

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

Figure 8 shows the apparatus to be used.

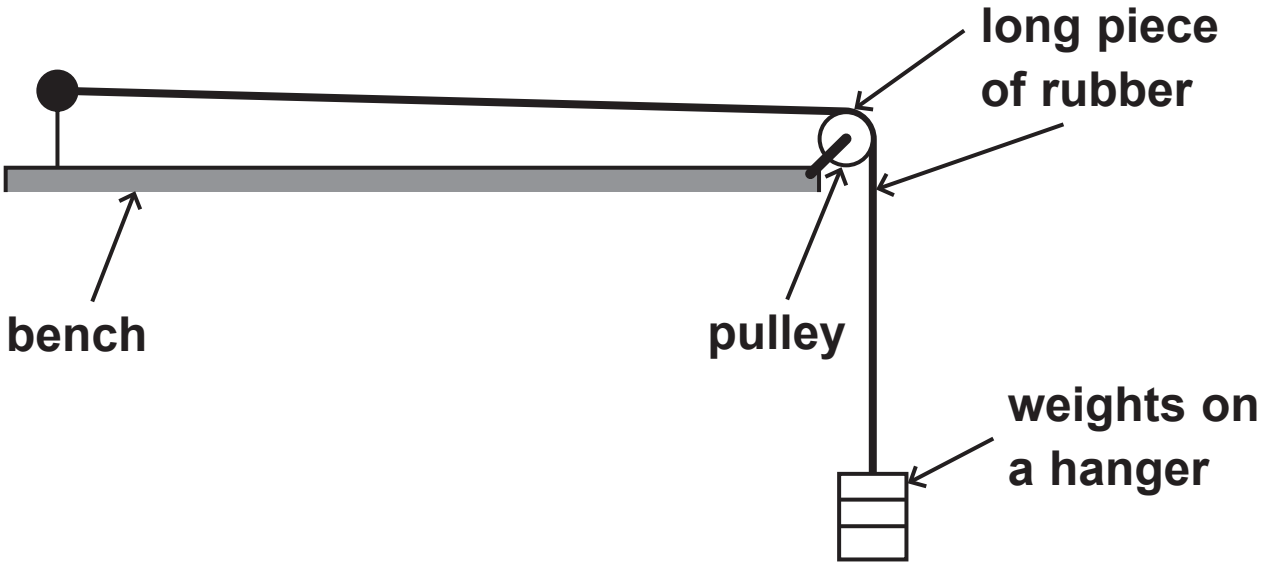


Figure 8

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)

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

(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 9 shows the graph of the student's values.

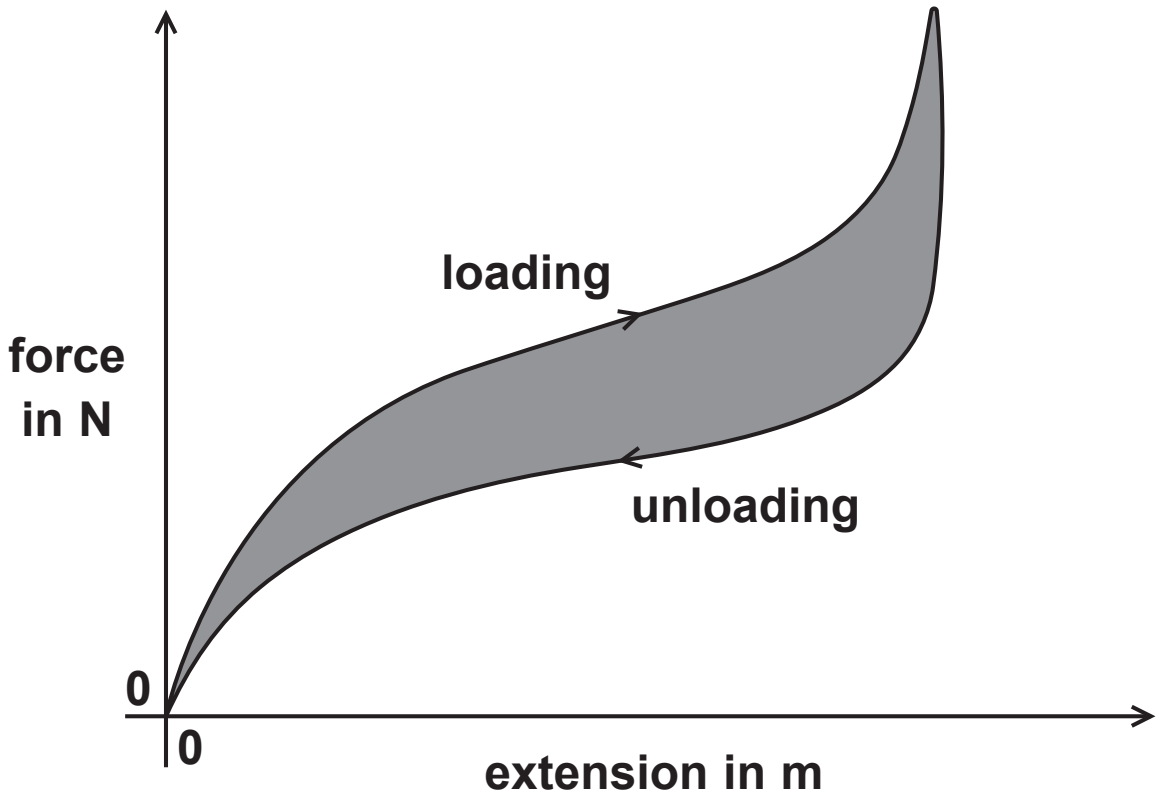


Figure 9

(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)

(Question continues on next page)

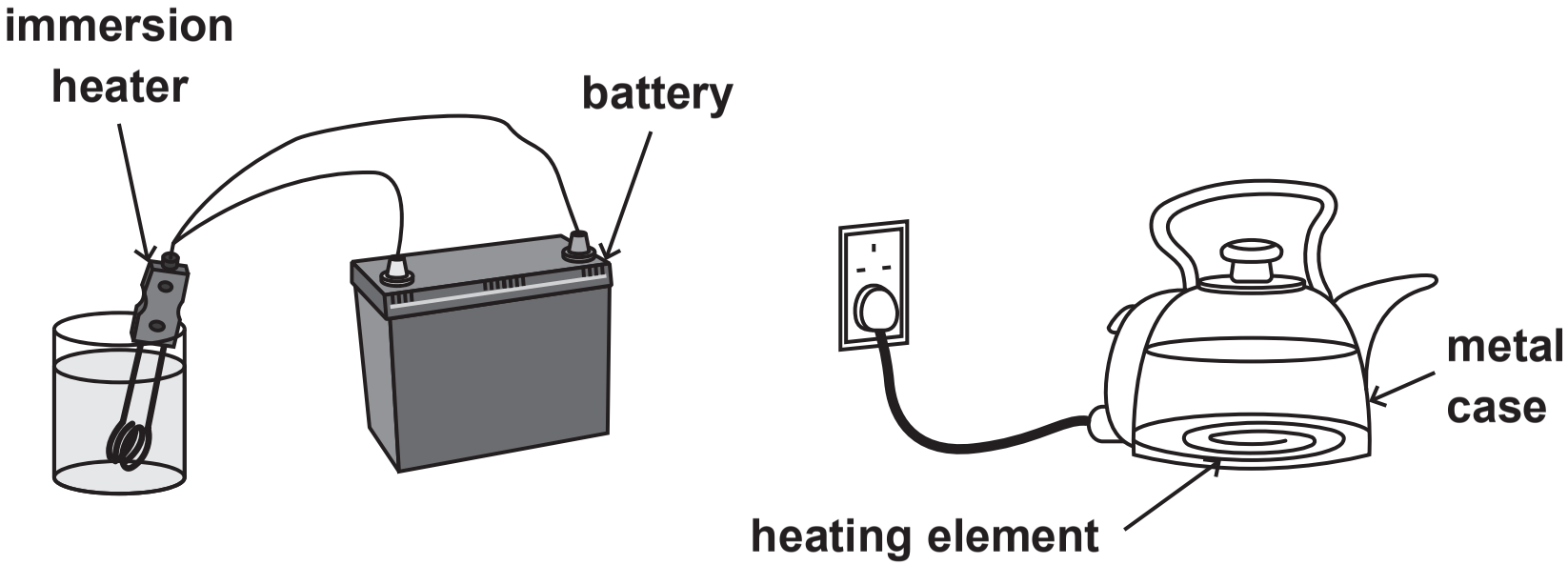
(c) The area between the curve and the extension axis of a force / extension graph corresponds to work done or energy transferred.

Suggest what the shaded area of the graph in Figure 9 represents. (2 marks)

(TOTAL FOR QUESTION 5 = 11 MARKS)

(Questions continue on next page)

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



immersion heater connected to a battery

kettle connected to domestic mains supply

Figure 10

(Question continues on next page)

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

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 = _____ Ω

(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 11 shows the three-pin plug used to connect the kettle to the mains.

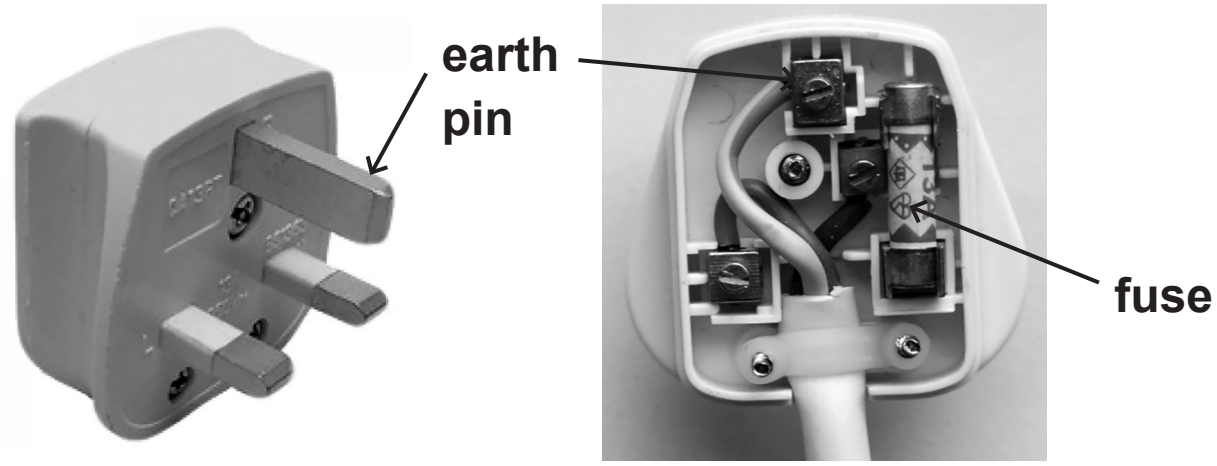


Figure 11

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)

(Continue your answer on next page)

(Continue your answer on next page)

(TOTAL FOR QUESTION 6 = 11 MARKS)

TOTAL FOR PAPER = 60 MARKS

END