

Pearson Edexcel International Advanced Level

Monday 18 May 2026

Morning (Time: 1 hour 20 minutes)

Paper

reference

WPH13/01A

Physics

International Advanced Subsidiary/Advanced Level

UNIT 3: Practical Skills in Physics I

Question Paper

You must have:

Scientific calculator, ruler and Answer Book (sent separately).

Do not return this question paper with the Answer Book.

- The list of data, formulae and relationships is printed at the end of this Question Paper.

Turn over ►

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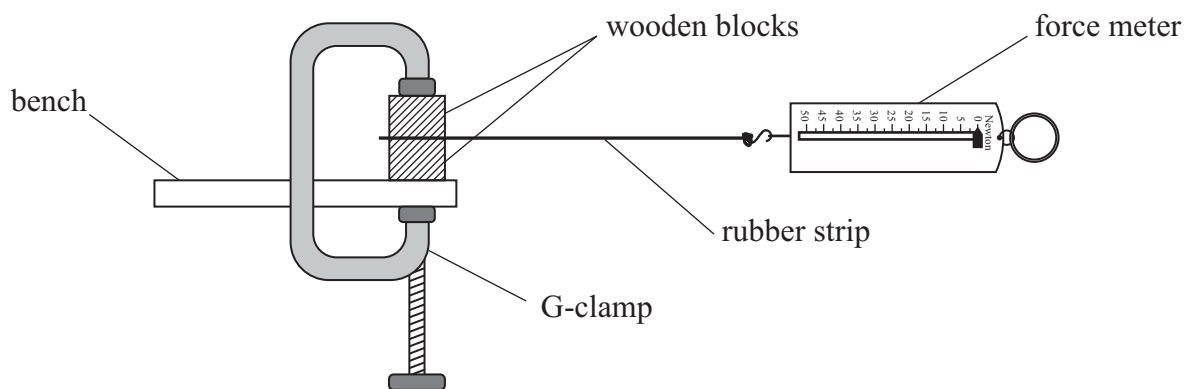
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Pearson

Answer ALL questions.

- 1 A student investigated the tensile strength of rubber. She clamped a strip of rubber between two wooden blocks. She tied the other end of the strip of rubber to a force meter, as shown.

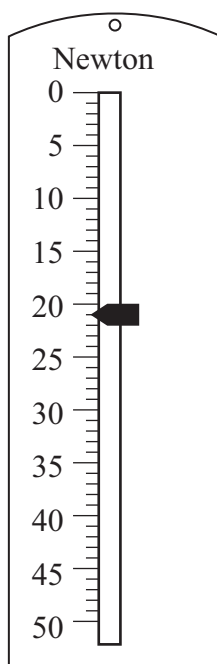


The student pulled on the force meter until the rubber broke and she observed the maximum breaking force F shown on the force meter.

- 1 (a) Identify a health and safety issue with this method and how the issue may be dealt with.

(2)

- 1 (b) A reading on the force meter is shown below.



- 1 (b) (i) State the resolution of the force meter.

(1)

- 1 (b)(ii) Determine the percentage uncertainty in the reading on the force meter.

(2)

- 1 (c) The student cut strips of different widths w from a rubber sheet.
She measured F for each strip. Her results are shown in the table below.

w/cm	F/N
0.5	12
1	25
1.5	37
2	49.5

- 1 (c) (i) Criticise the data recorded by the student. (2)

- 1 (c)(ii) Calculate the maximum breaking stress of the strip of rubber with $w = 0.5\text{ cm}$.

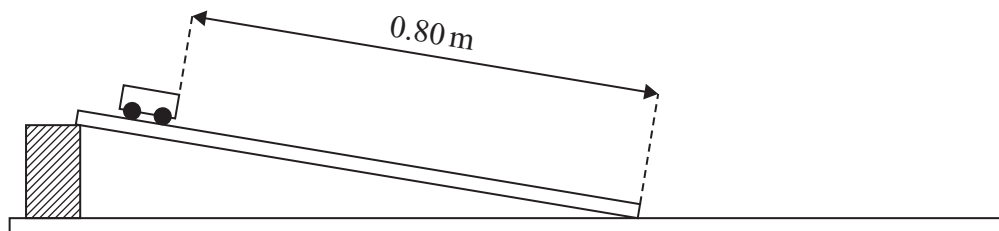
thickness of the rubber sheet at breaking point = 1.0 mm

maximum breaking force = 12 N

(2)

(Total for Question 1 = 9 marks)

- 2 Two students measured the time t for a trolley to travel 0.80 m from rest down an inclined ramp, as shown.



Student A held the trolley at the top of the ramp. He counted down: “three – two – one – zero” and released the trolley on “zero”.

Student B started a stopwatch on “zero”. She stopped the stopwatch as the front of the trolley passed the end of the ramp.

They repeated this method to measure several values of t .

- 2 (a) Explain an improvement to the method used by the two students, using the same apparatus.

(2)

- 2 (b) The students recorded the following data.

t / s	0.30	0.28	0.33	0.34
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- 2 (b) (i) Determine the mean value of t .

(2)

- 2 (b)(ii) Determine the percentage uncertainty in the mean value of t .

(2)

- 2 (b)(iii) The students used a position sensor connected to a data logger to determine t . The data logger recorded values of position and time.

Explain how using the sensor and data logger would improve this experiment.

(2)

(Total for Question 2 = 8 marks)

- 3 A pencil 'lead' is made of a mixture of graphite and clay. The percentage of graphite in the pencil lead determines the resistivity of the 'lead'.



Image from MS Word stock 3D models

A student was given a packet of pencil leads. These are not surrounded by the wooden casing of the pencil.



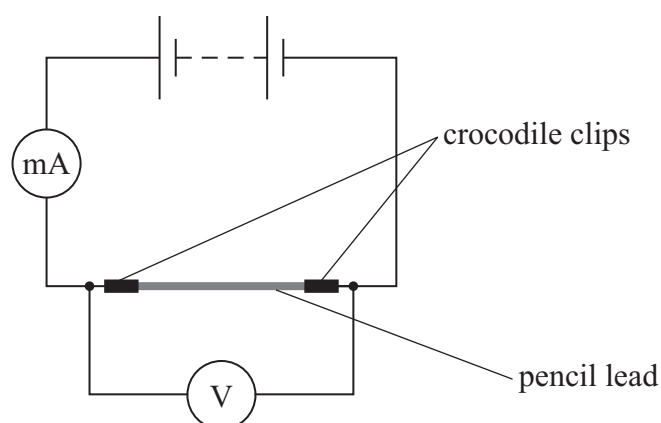
The student investigated the resistivity of different pencil leads.

He measured the diameter d of each pencil lead using a micrometer screw gauge. He measured d in several places along each pencil lead and at different orientations.

- 3 (a) Explain another technique the student should use when measuring d .

(2)

- 3 (b) The student connected a pencil lead in the circuit shown.



The student measured the potential difference V across the pencil lead and the current I through the pencil lead. He calculated the resistance R of the pencil lead. He also calculated the resistivity ρ of the pencil lead.

He repeated this for four other pencil leads containing different percentages of graphite.

The student recorded the following data.

% of graphite	V/V	I/mA	R/Ω	$\rho/10^{-3}\Omega\text{m}$
40	5.96	37.6	159	4.16
45	5.95	45.4	131	3.43
50	5.94	54.3		2.85
65	5.92	77.9	76	1.99
80	5.90	105.4	56	

- 3 (b) (i) Calculate the missing value in the table for R .

Write your answer in the space provided in the Answer Book.

(2)

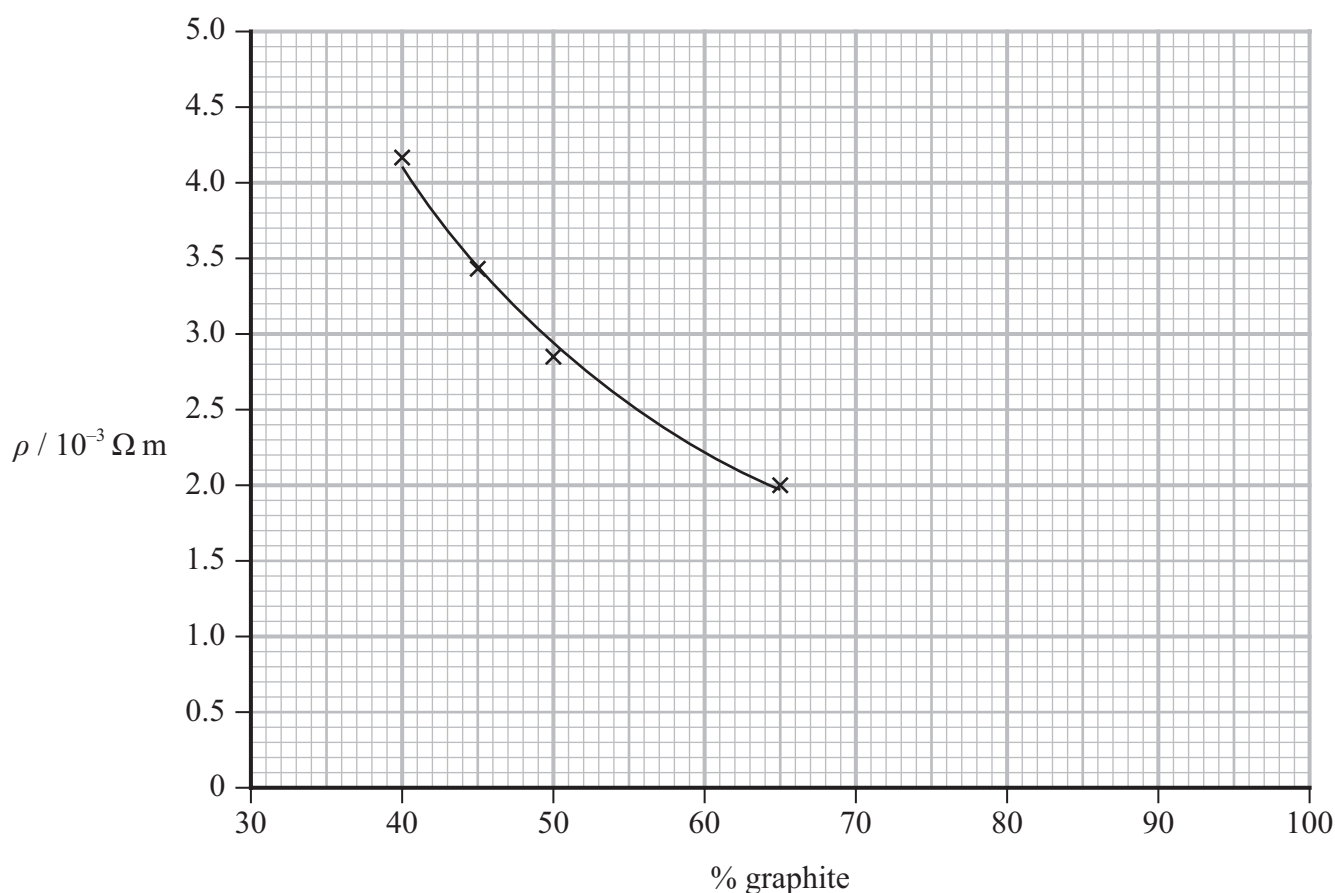
- 3 (b)(ii) Show that the resistivity of the pencil lead with 80% graphite is about $1.5 \times 10^{-3}\Omega\text{m}$.

length of pencil lead = 120 mm

mean diameter of pencil lead = 2.00 mm

(3)

- 3 (b)(iii) The student used his results to plot a graph of ρ against % graphite as shown.



Estimate the resistivity of a pencil lead with 100% graphite by making additions to the graph in the Answer Book.

(2)



- 3 (b)(iv) The student concluded that the resistivity of the pencil lead is inversely proportional to the % graphite.

Assess the validity of the student's conclusion.

(3)

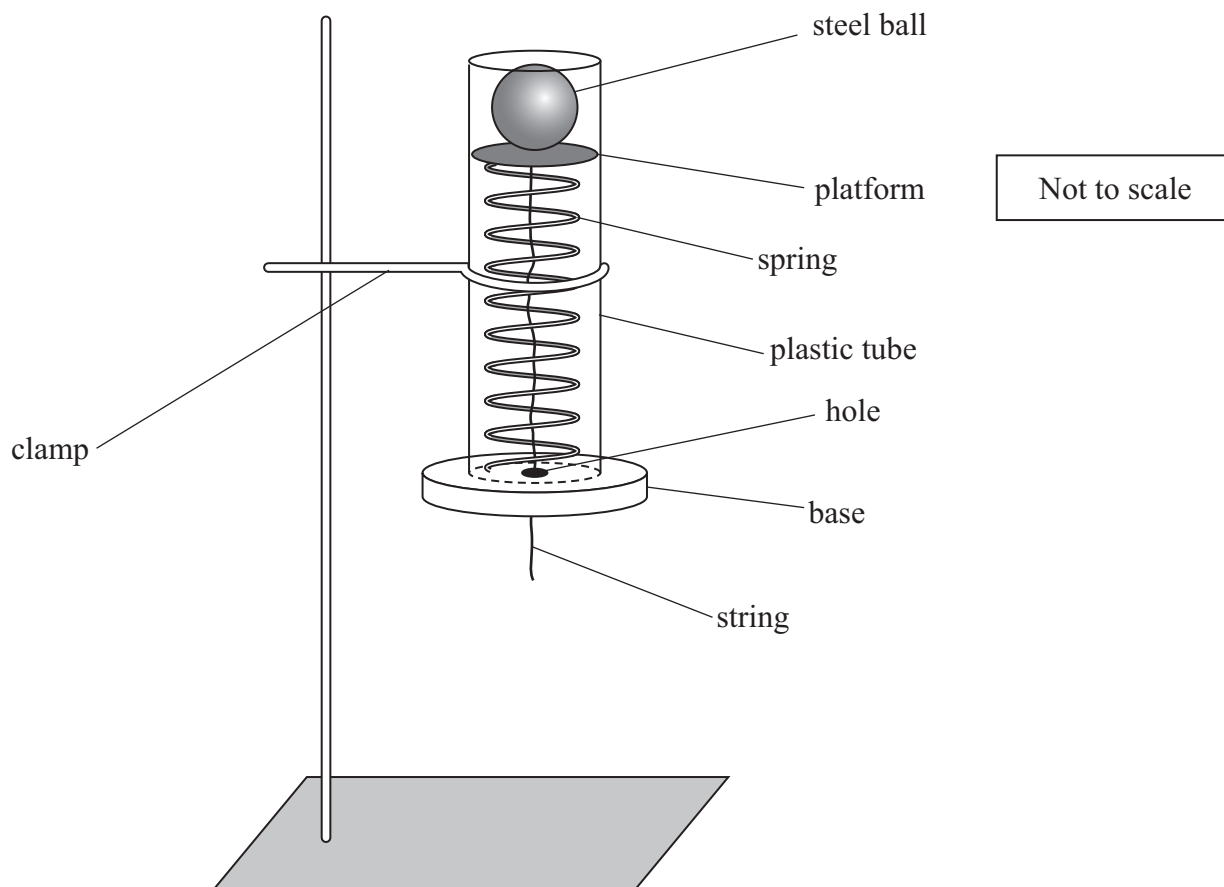
- 3 (c) The student noted that the potential difference across the pencil lead decreased as the resistance of the pencil lead decreased.

Explain this trend.

(3)

(Total for Question 3 = 15 marks)

- 4 A student designed a simple projectile launcher. The projectile launcher consists of a clear plastic tube with a spring inside. On top of the spring, there is a platform that is attached to a piece of string. She placed a steel ball on a platform at the top of the spring, as shown.

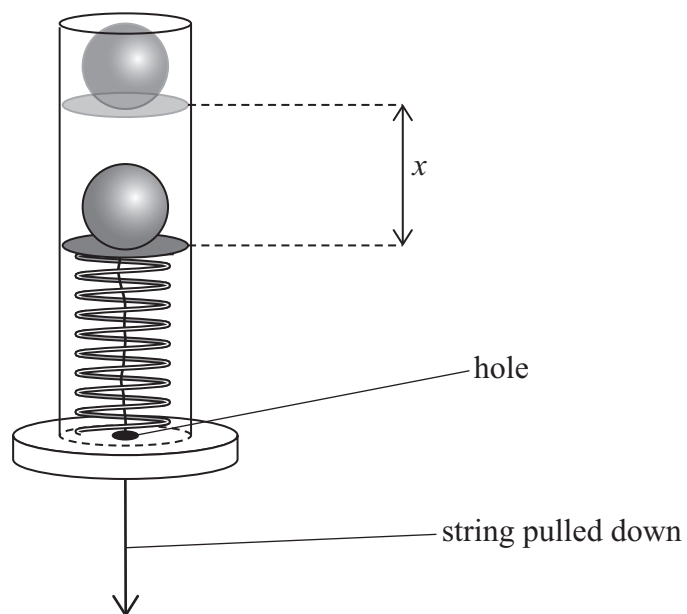


The projectile launcher was clamped so that the student could pull the string through a hole in the base.

- 4 (a) (i) Describe how the student made sure that the plastic tube was vertical.

(1)

- 4 (a)(ii) The student pulled the string and this compressed the spring by a distance x .



She released the string and the steel ball was launched into the air. The ball reached a maximum height h .

Describe a method she could use to get an accurate value for h .

(2)

- 4 (b) The student varied x and measured the corresponding values for h .

The relationship between h and x is given by

$$h = \frac{kx^2}{2mg}$$

where k is the stiffness of the spring and m is the mass of the ball.

- 4 (b) (i) Explain how a graph of h against x^2 can be used to determine the value of k . (2)

- 4 (b)(ii) The student recorded the results as shown in the table in the Answer Book.
Complete the additional column in the table in the Answer Book with corresponding values of x^2 in units of cm^2 . (2)

- 4 (b)(iii) Plot a graph of h on the y -axis against x^2 on the x -axis on the grid in the Answer Book. (5)

- 4 (b)(iv) Determine a value for k from the graph.
 $m = 0.015 \text{ kg}$ (4)

- 4 (b)(v) The student estimated that the value of k determined from the graph has a percentage uncertainty of 5%.
The manufacturer's value for the stiffness of the spring = 490 N m^{-1} .
Deduce whether the student's value of k agrees with the manufacturer's value. (2)

(Total for Question 4 = 18 marks)

TOTAL FOR PAPER = 50 MARKS



List of data, formulae and relationships

Acceleration of free fall	$g = 9.81 \text{ m s}^{-2}$	(close to Earth's surface)
Electron charge	$e = -1.60 \times 10^{-19} \text{ C}$	
Electron mass	$m_e = 9.11 \times 10^{-31} \text{ kg}$	
Electronvolt	$1 \text{ eV} = 1.60 \times 10^{-19} \text{ J}$	
Gravitational field strength	$g = 9.81 \text{ N kg}^{-1}$	(close to Earth's surface)
Planck constant	$h = 6.63 \times 10^{-34} \text{ J s}$	
Speed of light in a vacuum	$c = 3.00 \times 10^8 \text{ m s}^{-1}$	

Unit 1

Mechanics

Kinematic equations of motion	$s = \frac{(u + v)t}{2}$ $v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$
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Forces

$$\Sigma F = ma$$

$$g = \frac{F}{m}$$

$$W = mg$$

Momentum

$$p = mv$$

Moment of force

$$\text{moment} = Fx$$

Work and energy

$$\Delta W = F\Delta s$$

$$E_k = \frac{1}{2}mv^2$$

$$\Delta E_{\text{grav}} = mg\Delta h$$

Power

$$P = \frac{E}{t}$$

$$P = \frac{W}{t}$$

Efficiency

$$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

$$\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$$

Materials

Density

$$\rho = \frac{m}{V}$$

Stokes' law

$$F = 6\pi\eta r v$$

Hooke's law

$$\Delta F = k\Delta x$$

Elastic strain energy

$$\Delta E_{\text{el}} = \frac{1}{2} F \Delta x$$

Young modulus

$$E = \frac{\sigma}{\varepsilon} \text{ where}$$

$$\text{Stress } \sigma = \frac{F}{A}$$

$$\text{Strain } \varepsilon = \frac{\Delta x}{x}$$



Unit 2

Waves

Wave speed

$$v = f\lambda$$

Speed of a transverse wave on a string

$$v = \sqrt{\frac{T}{\mu}}$$

Intensity of radiation

$$I = \frac{P}{A}$$

Refractive index

$$n_1 \sin \theta_1 = n_2 \sin \theta_2$$

$$n = \frac{c}{v}$$

Critical angle

$$\sin C = \frac{1}{n}$$

Diffraction grating

$$n\lambda = d \sin \theta$$

Electricity

Potential difference

$$V = \frac{W}{Q}$$

Resistance

$$R = \frac{V}{I}$$

Electrical power, energy

$$P = VI$$

$$P = I^2 R$$

$$P = \frac{V^2}{R}$$

$$W = VIt$$

Resistivity

$$R = \frac{\rho l}{A}$$

Current

$$I = \frac{\Delta Q}{\Delta t}$$

$$I = nqvA$$

Resistors in series

$$R = R_1 + R_2 + R_3$$

Resistors in parallel

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}$$

Particle nature of light

Photon model

$$E = hf$$

Einstein's photoelectric equation

$$hf = \phi + \frac{1}{2}mv_{\max}^2$$

de Broglie wavelength

$$\lambda = \frac{h}{p}$$



Please check the examination details below before entering your candidate information

Candidate surname		Other names	
Centre Number		Candidate Number	

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Morning (Time: 1 hour 20 minutes) **Paper reference** **WPH13/01A**

Physics

International Advanced Subsidiary/Advanced Level

UNIT 3: Practical Skills in Physics I

Answer Book

You must have:
Scientific calculator, ruler and question paper (sent separately)

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
– *there may be more space than you need.*
- **Show all your working out** in calculations and **include units** where appropriate.

Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
– *use this as a guide as to how much time to spend on each question.*
- The list of data, formulae and relationships is printed at the end of the Question Paper.

Advice

- 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.

Turn over ►

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Answer ALL questions.

1 (a)

(2)

1 (b) (i)

(1)

1 (b) (ii)

(2)

Percentage uncertainty =

1 (c) (i)

(2)

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1 (c) (ii)

(2)

Maximum breaking stress =

(Total for Question 1 = 9 marks)



2 (a)

(2)

2 (b) (i)

(2)

Mean value of t =

2 (b) (ii)

(2)

Percentage uncertainty =



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2 (b) (iii)

(2)

(Total for Question 2 = 8 marks)



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3 (a)

(2)

3 (b) (i)

(2)

 $R =$

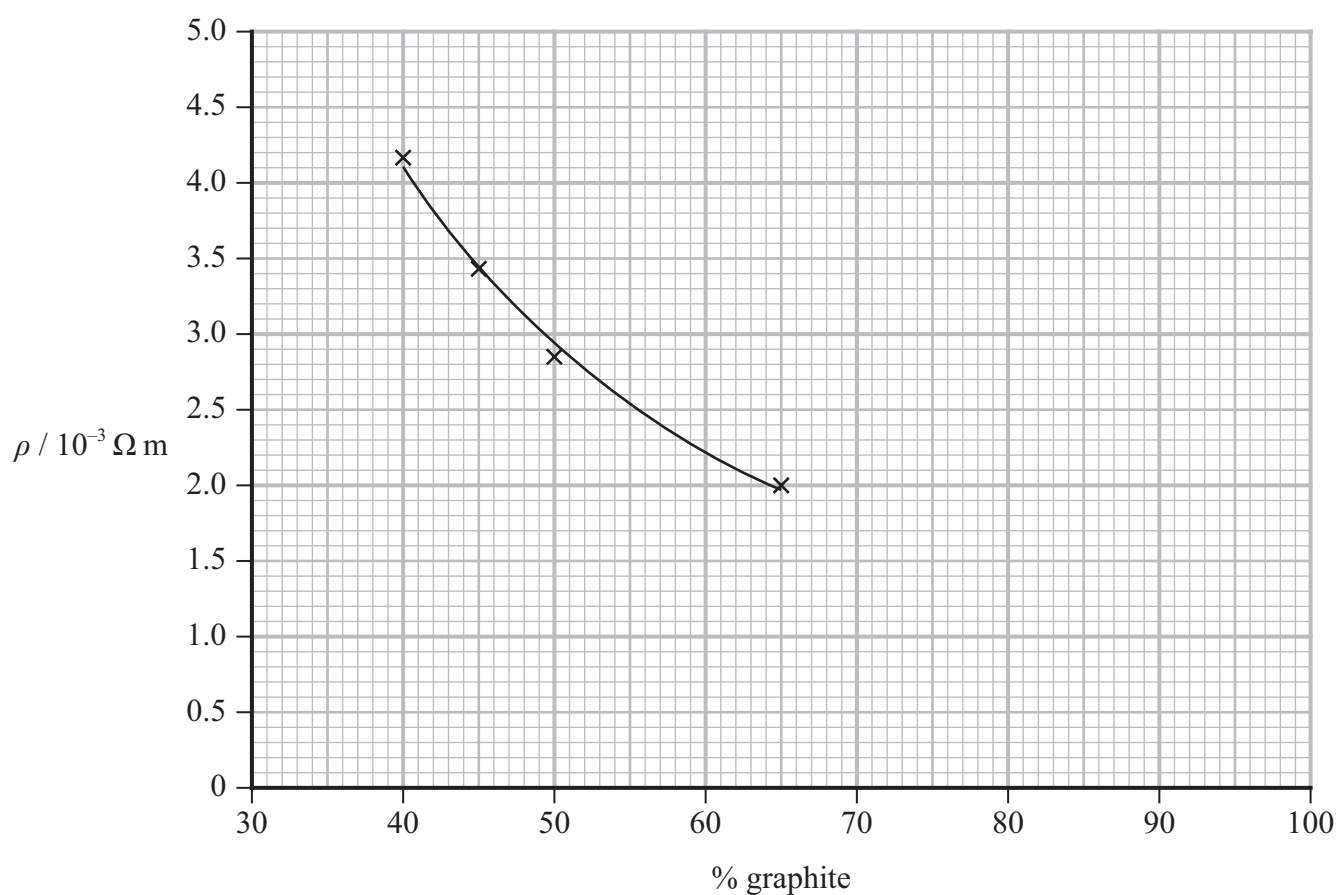
3 (b) (ii)

(3)



3 (b) (iii)

(2)



Resistivity =

3 (b) (iv)

(3)

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3 (c)

(3)

(Total for Question 3 = 15 marks)



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4 (a) (i)

(1)

4 (a) (ii)

(2)

4 (b) (i)

(2)



4 (b) (ii)

(2)

x/cm	h/m	
1.0	0.20	
1.5	0.35	
2.0	0.67	
2.5	1.09	
3.0	1.55	
3.5	1.96	

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4 (b) (iii)

(5)



4 (b) (iv)

(4)

$k =$

4 (b) (v)

(2)

(Total for Question 4 = 18 marks)

(TOTAL FOR PAPER = 50 MARKS)



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