

Write your name here

Surname	Other names
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Pearson Edexcel
International
Advanced Level

Centre Number

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 Candidate Number

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Physics
Advanced Subsidiary
Unit 3: Exploring Physics

Sample Assessment Material Time: 1 hour 20 minutes	Paper Reference WPH03/01
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You must have: Ruler	Total Marks
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Instructions

- Use **black** ink or ball-point pen.
- **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.*

Information

- The total mark for this paper is 40.
- 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 this booklet.
- Candidates may use a scientific calculator.

Advice

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

Turn over ►

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SECTION A

Answer ALL questions.

For questions 1–5, in Section A, select one answer from A to D and put a cross in the box .
If you change your mind put a line through the box and then
mark your new answer with a cross .

1 Which of the following is the correct unit for resistivity?

- A Ω
 B $\Omega \text{ m}$
 C $\Omega \text{ m}^{-1}$
 D $\Omega \text{ m}^{-2}$

(Total for Question 1 = 1 mark)

2 In an experiment to find the resistivity of a wire, the following three measurements of the diameter were recorded.

0.71 mm, 0.72 mm, 0.69 mm

How should the average measurement be stated?

- A $(7.06 \pm 0.13) \times 10^{-3} \text{ m}$
 B $(7.1 \pm 0.2) \times 10^{-3} \text{ m}$
 C $(7.06 \pm 0.13) \times 10^{-4} \text{ m}$
 D $(7.1 \pm 0.2) \times 10^{-4} \text{ m}$

(Total for Question 2 = 1 mark)

3 A falling ball is used in an experiment to determine the acceleration of free fall.

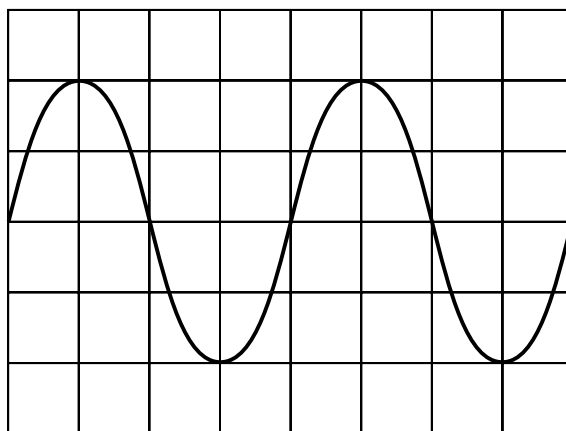
Which of the following measurements would **not** be needed?

- A distance fallen
 B initial velocity
 C mass of the ball
 D time taken

(Total for Question 3 = 1 mark)

- 4 A computer screen is used to display a sound wave. On the horizontal axis 1 division represents 1 ms.

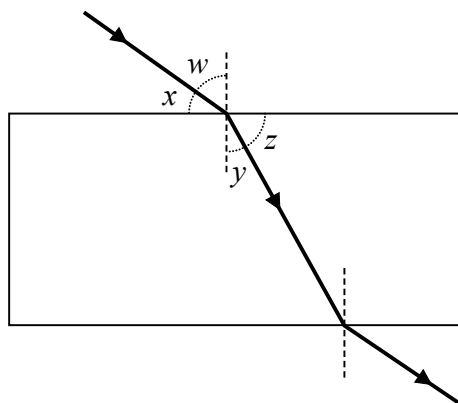
What is the frequency of the wave?



- A 100 Hz
- B 250 Hz
- C 500 Hz
- D 1000 Hz

(Total for Question 4 = 1 mark)

- 5 The refractive index of glass can be found by tracing a ray of light through a block of glass.



A student uses the equation ${}_1\mu_2 = \frac{\sin i}{\sin r}$ to calculate the refractive index.

Which of the following pairs of angles could the student measure and substitute directly into the equation?

- A x and y
- B x and z
- C w and y
- D w and z

(Total for Question 5 = 1 mark)

TOTAL FOR SECTION A = 5 MARKS

7 A student is asked to determine the spring constant of a spiral spring.

Write a plan for an experiment to do this using standard laboratory apparatus and a graphical method.

You should:

- (a) draw a labelled diagram of the experimental set-up to be used, (2)
- (b) list any additional apparatus you might need, (1)
- (c) state what quantity is the independent variable and what quantity is the dependent variable, (2)
- (d) describe how you would take your measurements and explain your choice of measuring instruments, (4)
- (e) explain how the data collected will be used to find the spring constant, (2)
- (f) identify the main sources of uncertainty and/or systematic error, (1)
- (g) comment on safety. (1)

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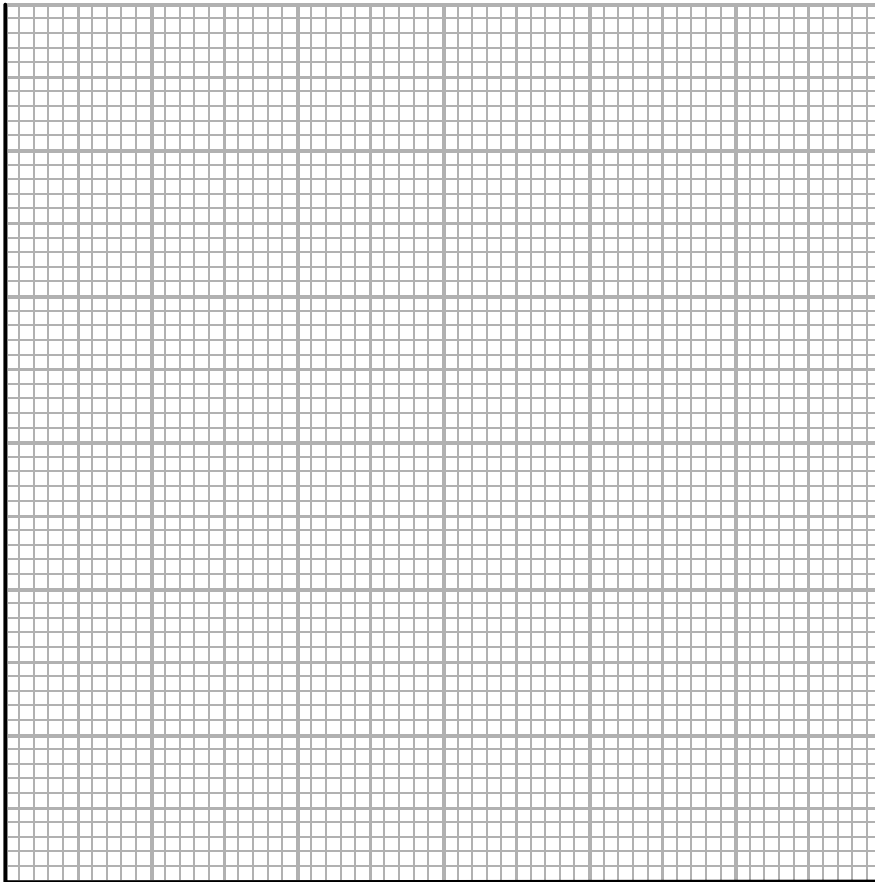
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Area with horizontal dotted lines for writing.

(Total for Question 7 = 13 marks)

(c) Plot the graph on the grid provided and draw a line of best fit.

(5)



TURN OVER FOR QUESTION 8(d).

(e) The accepted value for h is 6.63×10^{-34} J s.

Assuming your calculations are correct, suggest why there is a difference between your value for h and the accepted value.

(1)

(Total for Question 8 = 18 marks)

TOTAL FOR SECTION B = 35 MARKS

TOTAL FOR PAPER = 40 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	$v = u + at$ $s = ut + \frac{1}{2}at^2$ $v^2 = u^2 + 2as$
Forces	$\Sigma F = ma$ $g = F/m$ $W = mg$
Work and energy	$\Delta W = F\Delta s$ $E_k = \frac{1}{2}mv^2$ $\Delta E_{\text{grav}} = mg\Delta h$

Materials

Stokes' law	$F = 6\pi\eta rv$
Hooke's law	$F = k\Delta x$
Density	$\rho = m/V$
Pressure	$p = F/A$
Young modulus	$E = \sigma/\epsilon$ where Stress $\sigma = F/A$ Strain $\epsilon = \Delta x/x$
Elastic strain energy	$E_{\text{el}} = \frac{1}{2}F\Delta x$

Unit 2*Waves*

Wave speed $v = f\lambda$

Refractive index ${}_1\mu_2 = \sin i / \sin r = v_1 / v_2$

Electricity

Potential difference $V = W/Q$

Resistance $R = V/I$

Electrical power, energy and efficiency
 $P = VI$
 $P = I^2R$
 $P = V^2/R$
 $W = VIt$

$$\% \text{ efficiency} = \frac{\text{useful energy output}}{\text{total energy input}} \times 100$$

$$\% \text{ efficiency} = \frac{\text{useful power output}}{\text{total power input}} \times 100$$

Resistivity $R = \rho l/A$

Current $I = \Delta Q / \Delta t$
 $I = nqvA$

Resistors in series $R = R_1 + R_2 + R_3$

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

Quantum physics

Photon model $E = hf$

Einstein's photoelectric equation $hf = \phi + \frac{1}{2}mv_{\max}^2$

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