GradeMax

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International Advanced Level

Monday 18 May 2026

Morning (Time: 1 hour 20 minutes)

Paper reference **WPH13/01**

Physics

International Advanced Subsidiary/Advanced Level
UNIT 3: Practical Skills in Physics I

You must have:
Scientific calculator, ruler

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 this booklet.

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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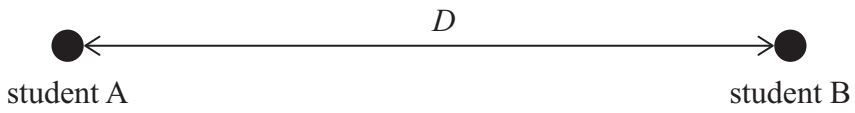
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Pearson

Answer ALL questions.

1 Two students carried out an experiment to determine the speed of sound in air.

(a) The students stood a large distance *D* apart, as shown.



(i) Describe how the students should make a single measurement of *D* that is as accurate as possible.

(2)

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(ii) The students repeated the experiment with a larger value of *D*.

Explain how this would change the percentage uncertainty in the measurement.

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(b) Student A hit two blocks of wood together.

Student B started a stopwatch when he saw the blocks make contact. He stopped the stopwatch when he heard the sound of the blocks making contact.

The students repeated the experiment several times.

(i) Explain why repeat readings for the measurement of time are appropriate.

(2)

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(ii) Describe how the experiment could be modified to improve the accuracy of the measured time.

You may include the use of additional equipment.

(2)

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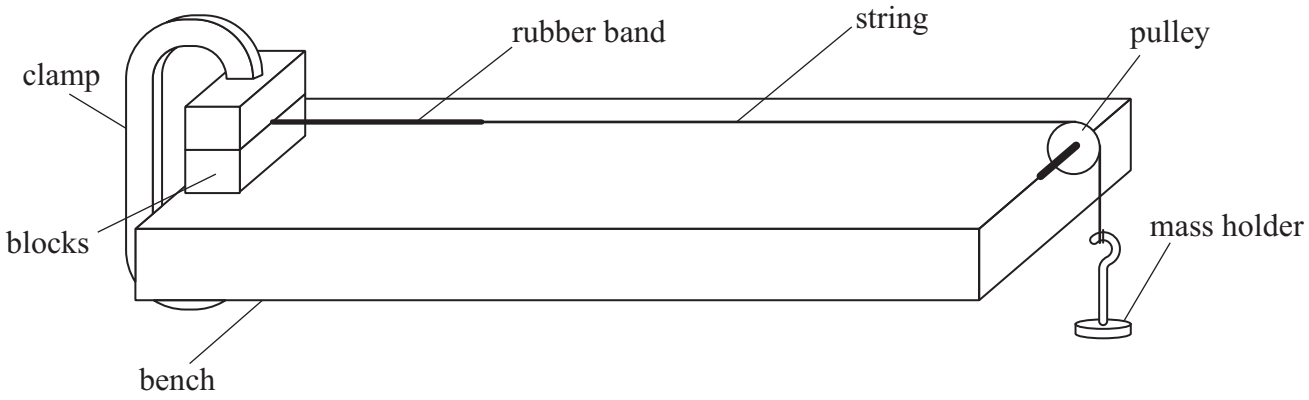
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(Total for Question 1 = 8 marks)

2 A student investigated the energy stored in a rubber band. She attached the rubber band to a length of string and a mass holder, as shown.



(a) The student placed a mark on the bench, vertically below the point where the rubber band was attached to the string.

She then added a mass to the mass holder and placed another mark on the bench.

(i) Identify a health and safety issue with this investigation and how this issue may be dealt with.

(2)

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(ii) The student used a digital caliper to measure the distance x between the two marks.

The photograph shows the reading on the digital caliper.



Determine the percentage uncertainty in this reading.

(2)

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Percentage uncertainty = ...

(iii) Explain **two** techniques she should use to reduce error when measuring x.

(4)

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(b) The student repeated the experiment and recorded the following values of x.

x / mm	22.1	22.5	22.3	22.4	22.6

(i) Determine the mean value of x.

(2)

Mean x = ...

(ii) Determine the percentage uncertainty in the mean value of x.

(2)

Percentage uncertainty = ...

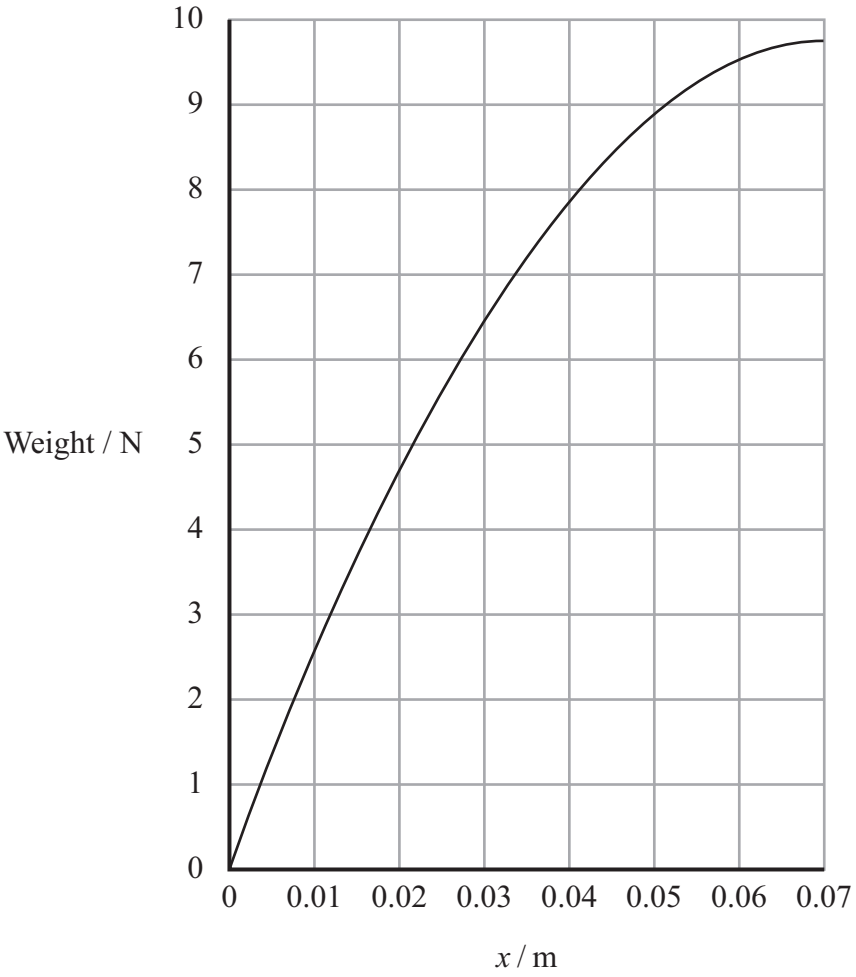
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(c) The student calculated the combined weight of the mass and the mass holder.

She determined the combined weight and mean value of x for a range of masses.

She plotted her results on a graph as shown.



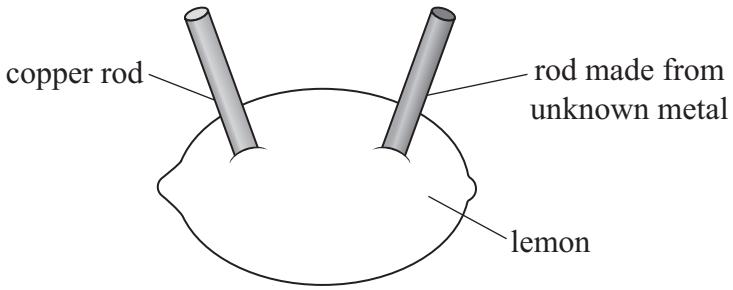
Determine the energy stored in the rubber band when the weight is 8.0 N.

(3)

Energy stored = ...

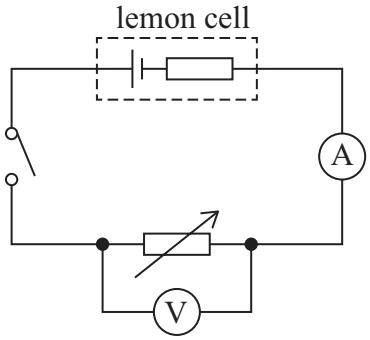
(Total for Question 2 = 15 marks)

3 A student made an electrical cell by inserting two rods into a lemon, as shown.



One rod was made from copper. The other rod was made from an unknown metal.

The student placed the cell in a circuit, as shown.



The student adjusted the resistance of the variable resistor to its maximum value. He closed the switch and recorded corresponding values of potential difference and current.

He repeated this procedure for different settings of the variable resistor.

(a) Explain why the student started with the variable resistor at its maximum value.

(2)

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(b) (i) The student recorded the following data to plot a graph.

Potential difference / V	Current / mA
0.37	0.37
0.55	0.275
0.66	0.22
0.74	0.81

Criticise the recording of the data.

(3)

(ii) The student determined that the e.m.f. ε of the lemon cell was 1.13 V.
He estimated that the uncertainty in his value of ε was 5%.

ε is given by

$$\varepsilon = 0.30 - C$$

where C is a constant that depends on the metal of the rod.

C for zinc is – 0.74 V.

Deduce whether the unknown metal could be zinc.

(3)

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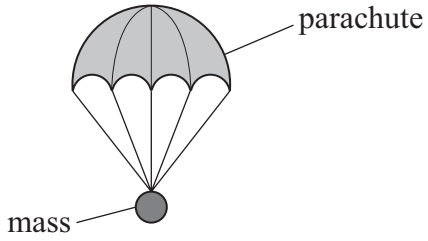
(Total for Question 3 = 8 marks)

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4 A student investigated the motion of a toy parachute as it fell through the air. She attached a mass to the parachute as shown.



The student dropped the parachute from a fixed height and determined the terminal velocity v.

(a) Describe a method to determine a value for v.

You should include any measurements needed and how the student should ensure that the parachute has reached terminal velocity.

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(b) The relationship between the mass m and terminal velocity v is given by

$$m = \frac{C\rho A v^2}{2g}$$

where

C is a constant that does not have any units

ρ is the density of air

A is the cross-sectional area of the parachute

(i) Explain how a graph of m against v^2 can be used to determine C.

(2)

(ii) The student recorded corresponding values of m and v as shown.

m / kg	v / m s^{-1}	
0.23	7.1	
0.55	10.9	
0.90	13.8	
1.24	16.3	
1.44	17.6	
1.74	19.3	

Complete the table with the corresponding values of v^2

(2)

(iii) Plot a graph of m on the y-axis against v^2 on the x-axis on the grid opposite.

(5)

(iv) Determine the value of C using the graph.

$A = 0.0704\,\text{m}^2$
$\rho = 1.21\,\text{kgm}^{-3}$

(3)

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$C =$ .....

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(c) The student repeated the experiment using a parachute with double the cross-sectional area.

Explain the effect that **doubling** the cross-sectional area would have on the terminal velocity of the parachute.

(3)

(Total for Question 4 = 19 marks)

TOTAL FOR PAPER = 50 MARKS

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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

$$s = \frac{(u + v)t}{2}$$

$$v = u + at$$

$$s = ut + \frac{1}{2}at^2$$

$$v^2 = u^2 + 2as$$

Forces

$$\Sigma F = ma$$

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

$$W = mg$$

Momentum

$$p = mv$$

Moment of force

$$\text{moment} = Fx$$

Work and energy

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

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

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

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

Young modulus $E = \frac{\sigma}{\varepsilon}$ where

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

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

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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	$P = VI$
	$P = I^2R$
	$P = \frac{V^2}{R}$
	$W = VIt$
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	$\lambda = \frac{h}{p}$

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