Pearson Edexcel International Advanced Level

Wednesday 10 June 2026

Morning (Time: 1 hour 20 minutes)

Paper reference **WPH16/01A**

Physics

International Advanced Level

UNIT 6: Practical Skills in Physics II

Question Paper

You must have:
Scientific calculator, ruler and Answer Book (sent separately).
Do not return this question paper with the Answer Book.

Information

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

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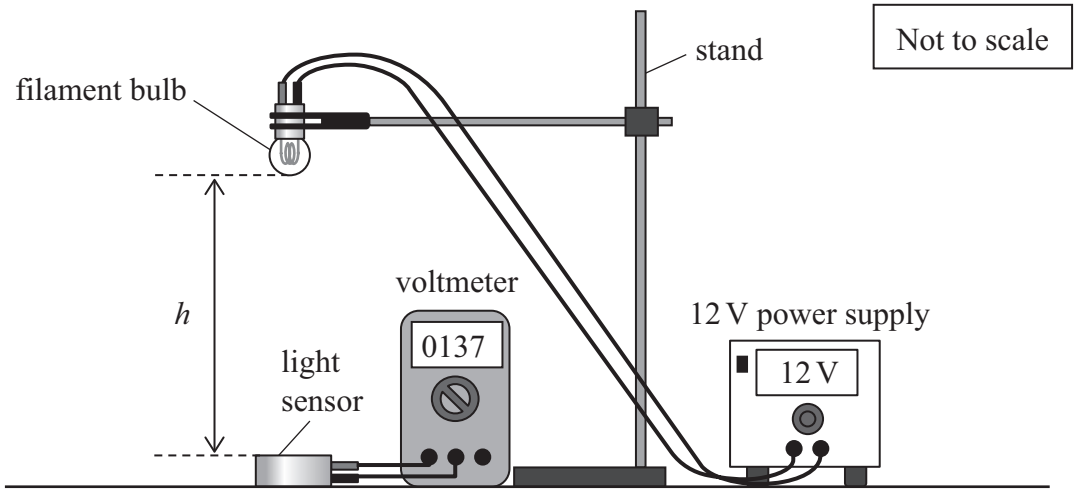
Pearson

Answer ALL questions.

1 A student investigated the inverse square law using the apparatus shown.



The student placed a filament bulb at a height h from a light sensor.

1 (a) The student used a metre rule to measure a single value of h.

1 (a) (i) Describe a method to determine an accurate value for this single measurement of h.

(3)

1 (a) (ii) The student recorded that h was 368 mm ± 1 mm.

Explain why it was appropriate to record an uncertainty of 1 mm for h.

(3)

1 (b) The student recorded the voltmeter reading V.

He changed the height h and recorded the corresponding value of V.

He recorded the following results.

h / mm	V / mV
368	137
302	203
259	277

The student predicted that the relationship between V and h is

$$V = \frac{k}{h^2}$$

where k is a constant.

The student plotted a graph of V against $\frac{1}{h^2}$

Explain why the student's results may **not** be used to test the student's prediction.

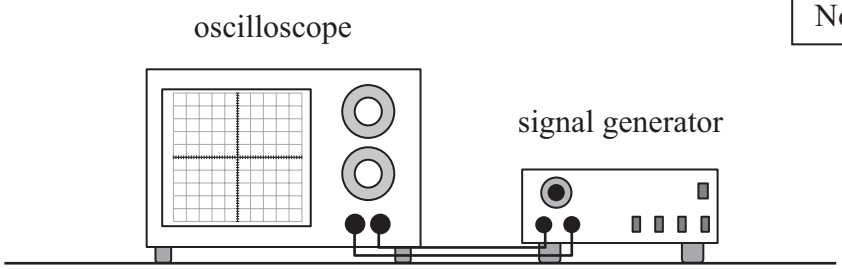
You do not need to do any calculations.

(4)

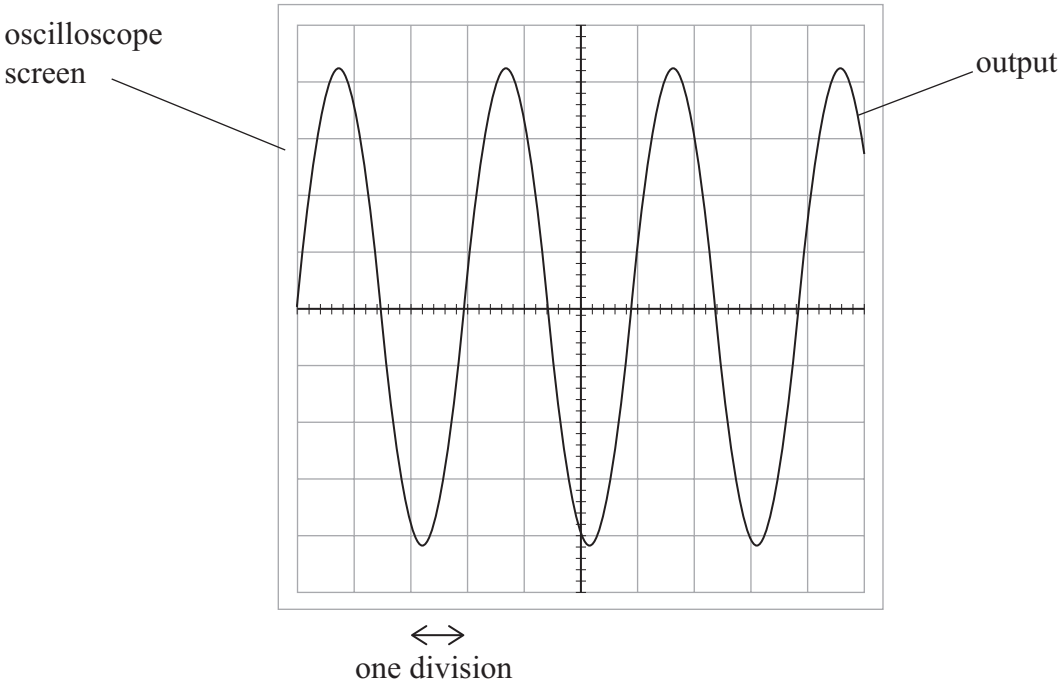
(Total for Question 1 = 10 marks)

2 A student investigated the use of a signal generator in electric circuits. She connected a signal generator to an oscilloscope, as shown.

Not to scale



2 (a) The student switched on the signal generator. The oscilloscope screen displayed the output from the signal generator, as shown below.



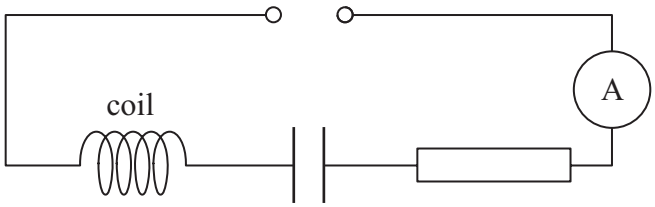
The horizontal scale was set to 0.5 ms per division.

Show that the frequency of the output from the signal generator is about 700 Hz.
You may add to the diagram in the Answer Book.

(4)

2 (b) The student connected the signal generator to a coil, a capacitor with known capacitance C and a resistor, as shown. The signal generator is still connected to the oscilloscope.

signal generator and oscilloscope



The student increased the frequency of the output from the signal generator. The reading on the ammeter increased to a maximum value then decreased.

When the reading on the ammeter is at a maximum, the frequency of the output from the signal generator is f. The relationship between f and C is

$$f^2 = \frac{X}{C}$$

where X is a constant.

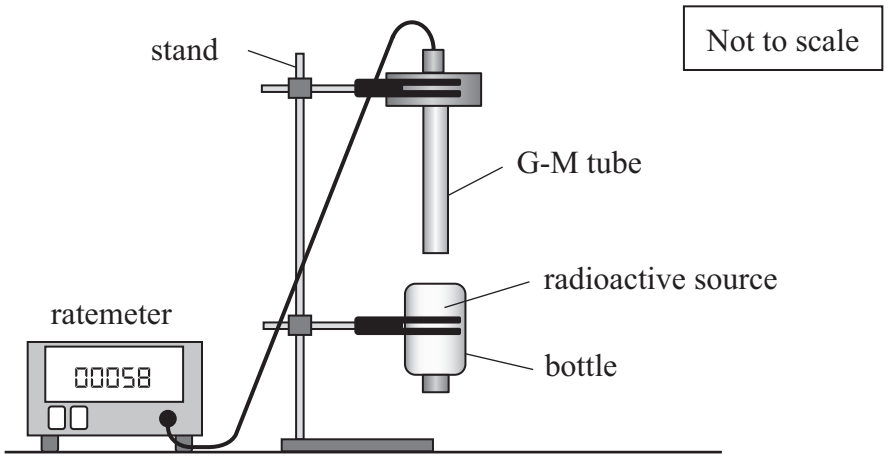
Devise a plan the student could use to determine the value of X.

You should include the use of a suitable graph.

(6)

(Total for Question 2 = 10 marks)

3 A student investigated the decay of a radioactive source using the apparatus shown.



The radioactive source was in the form of a liquid kept in a bottle. The bottle was placed a short distance away from the G-M tube.

The radioactive source emitted beta particles.

3 (a) Describe **two** safety precautions the student should take when doing this investigation.

(2)

3 (b) The ratemeter displayed the count rate of radiation detected by the G-M tube.

The student started a stopwatch and recorded the count rate every 30 s.

Describe what the student should do to obtain the count rate from the radioactive source.

(2)

3 (c) The count rate C from the radioactive source varies with time t as

$$C = C_0 e^{-\lambda t}$$

where C_0 is the count rate at $t = 0$ and λ is the decay constant.

3 (c) (i) Explain how a graph of ln C against t can be used to determine a value for λ.

(2)

3 (c)(ii) The student recorded the following results.

t / s	C / s^{-1}
0	118
30	89
60	66
90	49
120	39

Plot a graph of ln C against t on the grid in the Answer Book.

Use the table in the Answer Book to record your processed data.

(5)

3 (c)(iii) Determine the value of λ from the graph.

(3)

3 (c)(iv) Explain how using a radioactive source with a shorter half-life affects the graph.

(3)

(Total for Question 3 = 17 marks)

4 A student has an L-shaped metal rod. The metal rod has a circular cross-section with a diameter *d* as shown.

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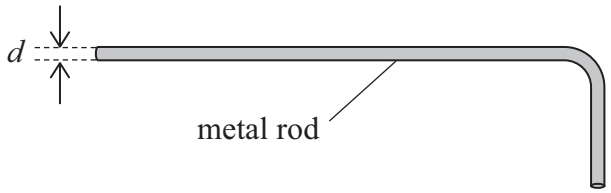
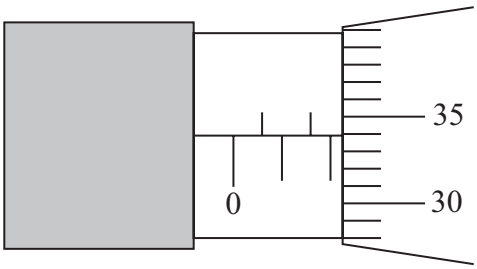


4 (a) The student used a micrometer screw gauge to measure *d*. The reading on the micrometer is shown below.

Not to scale



4 (a) (i) Determine the percentage uncertainty in this reading.

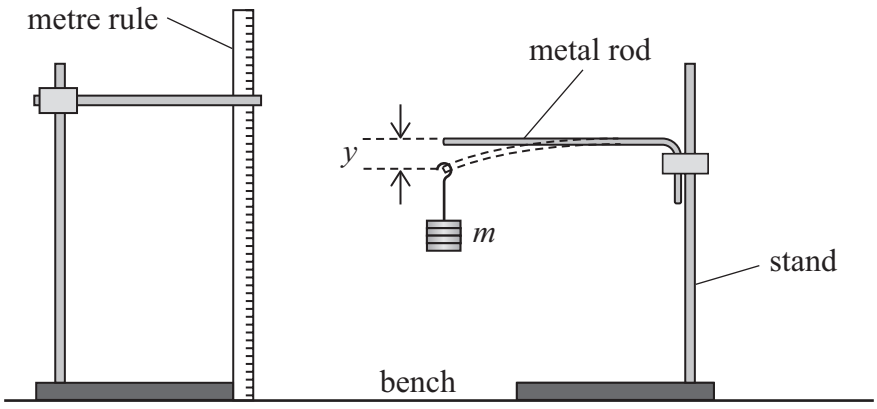
(2)

4 (a) (ii) The student checked and corrected for zero error before taking the reading.

Explain one other technique the student should use to reduce the error in *d*.

(2)

4 (b) The student clamped the metal rod into a stand, as shown.



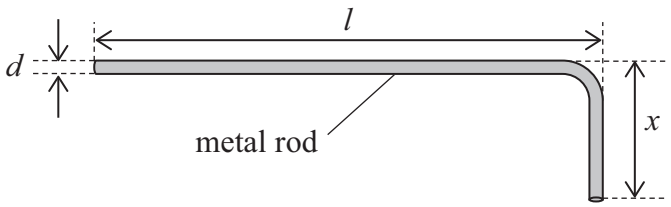
The student attached a mass *m* to the end of the metal rod. The metal rod bent so that the end of the metal rod moved a vertical distance *y* towards the bench.

The student used the metre rule to determine *y*.

It is suggested that the modulus G of a material is given by

$$G = \frac{32mglx^2}{\pi yd^4}$$

where l and x are the lengths as shown below.



The student recorded the following measurements.

***d* / mm**	2.34	2.35	2.37	2.33

$m = 100\,\text{g}$ with negligible uncertainty
$l = 58.9\,\text{cm} \pm 0.1\,\text{cm}$
$x = 10.3\,\text{cm} \pm 0.1\,\text{cm}$
$y = 26\,\text{mm} \pm 1\,\text{mm}$

4 (b) (i) Show that G is about $8 \times 10^{10}\,\text{Pa}$.

(3)

4 (b)(ii) Show that the percentage uncertainty in G is about 9%.

(4)

4 (b)(iii) The value of G for carbon steel is $7.70 \times 10^{10}\,\text{Pa}$.

Deduce whether the metal rod could be made from carbon steel.

(2)

(Total for Question 4 = 13 marks)

TOTAL FOR PAPER = 50 MARKS

List of data, formulae and relationships

Acceleration of free fall	$g = 9.81$ m s^{-2}	(close to Earth's surface)
Boltzmann constant	$k = 1.38 \times 10^{-23}$ J K^{-1}	
Coulomb's law constant	$k = 1/4\pi\varepsilon_0$	
	$= 8.99 \times 10^{9}$ N m^2 C^{-2}	
Electron charge	$e = -1.60 \times 10^{-19}$ C	
Electron mass	$m_e = 9.11 \times 10^{-31}$ kg	
Electronvolt	1 eV $= 1.60 \times 10^{-19}$ J	
Gravitational constant	$G = 6.67 \times 10^{-11}$ N m^2 kg^{-2}	
Gravitational field strength	$g = 9.81$ N kg^{-1}	(close to Earth's surface)
Permittivity of free space	$\varepsilon_0 = 8.85 \times 10^{-12}$ F m^{-1}	
Planck constant	$h = 6.63 \times 10^{-34}$ J s	
Proton mass	$m_p = 1.67 \times 10^{-27}$ kg	
Speed of light in a vacuum	$c = 3.00 \times 10^{8}$ m s^{-1}	
Stefan-Boltzmann constant	$\sigma = 5.67 \times 10^{-8}$ W m^{-2} K^{-4}	
Unified atomic mass unit	$u = 1.66 \times 10^{-27}$ kg	

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

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	$hf = \phi + \frac{1}{2}mv^2_{max}$
de Broglie wavelength	$\lambda = \frac{h}{p}$

Unit 4

Further mechanics

Impulse	$F\Delta t = \Delta p$
Kinetic energy of a non-relativistic particle	$E_k = \frac{p^2}{2m}$
Motion in a circle	$v = \omega r$
	$T = \frac{2\pi}{\omega}$
	$a = \frac{v^2}{r}$
	$a = r\omega^2$
Centripetal force	$F = ma = \frac{mv^2}{r}$
	$F = mr\omega^2$

Electric and magnetic fields

Electric field	$E = \frac{F}{Q}$
Coulomb's law	$F = \frac{Q_1 Q_2}{4\pi\varepsilon_0 r^2}$
	$E = \frac{Q}{4\pi\varepsilon_0 r^2}$
	$E = \frac{V}{d}$
Electrical potential	$V = \frac{Q}{4\pi\varepsilon_0 r}$
Capacitance	$C = \frac{Q}{V}$
Energy stored in capacitor	$W = \frac{1}{2}QV$
	$W = \frac{1}{2}CV^2$
	$W = \frac{1}{2}\frac{Q^2}{C}$
Capacitor discharge	$Q = Q_0 e^{-t/RC}$

Resistor-capacitor discharge $I = I_0 e^{-t/RC}$

$V = V_0 e^{-t/RC}$

$\ln Q = \ln Q_0 - \frac{t}{RC}$

$\ln I = \ln I_0 - \frac{t}{RC}$

$\ln V = \ln V_0 - \frac{t}{RC}$

In a magnetic field $F = Bqv \sin \theta$

$F = BIl \sin \theta$

Faraday's and Lenz's laws $\mathscr{E} = \frac{-\mathrm{d}(N\phi)}{\mathrm{d}t}$

Nuclear and particle physics

In a magnetic field $r = \frac{p}{BQ}$

Mass-energy $\Delta E = c^2 \Delta m$

Unit 5

Thermodynamics

Heating

$$\Delta E = mc\Delta\theta$$

$$\Delta E = L\Delta m$$

Ideal gas equation

$$pV = NkT$$

Molecular kinetic theory

$$\tfrac{1}{2}m\langle c^2\rangle = \tfrac{3}{2}kT$$

Nuclear decay

Mass-energy

$$\Delta E = c^2\Delta m$$

Radioactive decay

$$A = \lambda N$$

$$\frac{\mathrm{d}N}{\mathrm{d}t} = -\lambda N$$

$$\lambda = \frac{\ln 2}{t_{1/2}}$$

$$N = N_0 \mathrm{e}^{-\lambda t}$$

$$A = A_0 \mathrm{e}^{-\lambda t}$$

Oscillations

Simple harmonic motion

$$F = -kx$$

$$a = -\omega^2 x$$

$$x = A\cos\omega t$$

$$v = -A\omega\sin\omega t$$

$$a = -A\omega^2\cos\omega t$$

$$T = \frac{1}{f} = \frac{2\pi}{\omega}$$

$$\omega = 2\pi f$$

Simple harmonic oscillator

$$T = 2\pi\sqrt{\frac{m}{k}}$$

$$T = 2\pi\sqrt{\frac{l}{g}}$$

Astrophysics and cosmology

Gravitational field strength	$g = \frac{F}{m}$
Gravitational force	$F = \frac{Gm_1m_2}{r^2}$
Gravitational field	$g = \frac{Gm}{r^2}$
Gravitational potential	$V_{grav} = \frac{-Gm}{r}$
Stefan-Boltzmann law	$L = \sigma AT^4$
Wien's law	$\lambda_{max}T = 2.898 \times 10^{-3}\,\text{m K}$
Intensity of radiation	$I = \frac{L}{4\pi d^2}$
Redshift of electromagnetic radiation	$z = \frac{\Delta\lambda}{\lambda} \approx \frac{\Delta f}{f} \approx \frac{v}{c}$
Cosmological expansion	$v = H_0d$

Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

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Wednesday 10 June 2026

Morning (Time: 1 hour 20 minutes)

Paper reference **WPH16/01A**

Physics

International Advanced Level
UNIT 6: Practical Skills in Physics II
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 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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Answer ALL questions.

1 (a) (i)

(3)

1 (a) (ii)

(3)

1 (b)

(4)

(Total for Question 1 = 10 marks)

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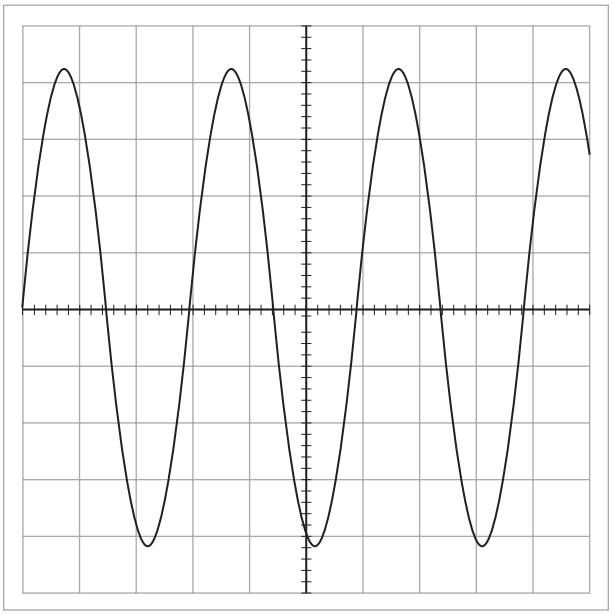
2 (a)



(4)

2 (b)

(6)

(Total for Question 2 = 10 marks)

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3 (a)

(2)

3 (b)

(2)

3 (c) (i)

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3 (c) (ii)

(5)

0	118	
30	89	
60	66	
90	49	
120	39	

3 (c)(iii)

(3)

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$\lambda =$ .....

3 (c)(iv)

(3)

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(Total for Question 3 = 17 marks)

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4 (a) (i)

(2)

percentage uncertainty = ...

4 (a) (ii)

(2)

4 (b) (i)

(3)

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4 (b)(ii)

(4)

4 (b)(iii)

(2)

(Total for Question 4 = 13 marks)

TOTAL FOR PAPER = 50 MARKS

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