

Write your name here

Surname

Other names

Centre Number

Candidate Number

**Edexcel GCE**

**Physics**

**Advanced Subsidiary**

**Unit 3B: Exploring Physics**

**International Alternative to Internal Assessment**

Friday 11 May 2012 – Morning

**Time: 1 hour 20 minutes**

Paper Reference

**6PH07/01**

**You must have:**

Ruler

Total Marks

### 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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**PEARSON**

## 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 A student is measuring the diameter of a piece of wire with a micrometer. Her readings are  
0.27 mm, 0.29 mm, 0.26 mm, 0.42 mm, 0.26 mm.

Which of the following is the best mean value for the diameter of the wire, stated with a suitable uncertainty?

- A  $0.30 \pm 0.08$  mm  
 B  $0.27 \pm 0.08$  mm  
 C  $0.27 \pm 0.02$  mm  
 D  $0.267 \pm 0.015$  mm

(Total for Question 1 = 1 mark)

- 2 Which of the following is a unit for viscosity?

- A  $\text{N m s}^{-2}$   
 B  $\text{N m}^{-2} \text{s}^{-1}$   
 C  $\text{N m}^{-1} \text{s}^{-1}$   
 D  $\text{N m}^{-2} \text{s}$

(Total for Question 2 = 1 mark)



- 3 A student is asked to do an experiment to find the acceleration due to gravity using a simple pendulum. He is told to vary the length  $l$  and determine the time  $T$  for one oscillation.

He is given the equation  $T = 2\pi\sqrt{\frac{l}{g}}$  and told to draw a suitable graph.

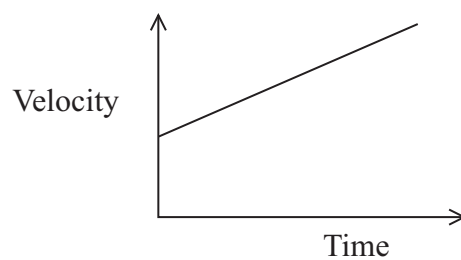
Which of the following would give a straight line graph?

		<b>y-axis</b>	<b>x-axis</b>
<input type="checkbox"/>	<b>A</b>	$T$	$l$
<input type="checkbox"/>	<b>B</b>	$T^2$	$1/l$
<input type="checkbox"/>	<b>C</b>	$\sqrt{T}$	$l$
<input type="checkbox"/>	<b>D</b>	$T^2$	$l$

(Total for Question 3 = 1 mark)



Questions 4 and 5 refer to the graph below.



4 Which of the following would give the distance travelled?

- A area under the graph
- B gradient of the graph
- C intercept on the  $x$ -axis
- D intercept on the  $y$ -axis

(Total for Question 4 = 1 mark)

5 Which of the following would give the acceleration?

- A area under the graph
- B gradient of the graph
- C intercept on the  $x$ -axis
- D intercept on the  $y$ -axis

(Total for Question 5 = 1 mark)

**TOTAL FOR SECTION A = 5 MARKS**



**SECTION B**

**Answer ALL questions in the spaces provided.**

**6** When doing experiments students are often advised to repeat readings and use a graphical method.

(a) Explain how repeating readings helps to improve reliability.

(2)

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(b) Discuss the advantages of using a graph.

(3)

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**(Total for Question 6 = 5 marks)**



7 A student is asked to determine the emf and internal resistance of a 1.5 V cell. Write a plan for an experiment which could be used to do this using standard laboratory apparatus and a graphical method.

You should:

- (a) draw a diagram of the circuit to be used, (2)
- (b) state the quantities to be measured, (1)
- (c) for **two** of these quantities state and explain your choice of measuring instrument, (4)
- (d) explain how the data collected will be used to find the emf and the internal resistance, (3)
- (e) identify the main sources of uncertainty and/or systematic error, (2)
- (f) comment on safety. (1)

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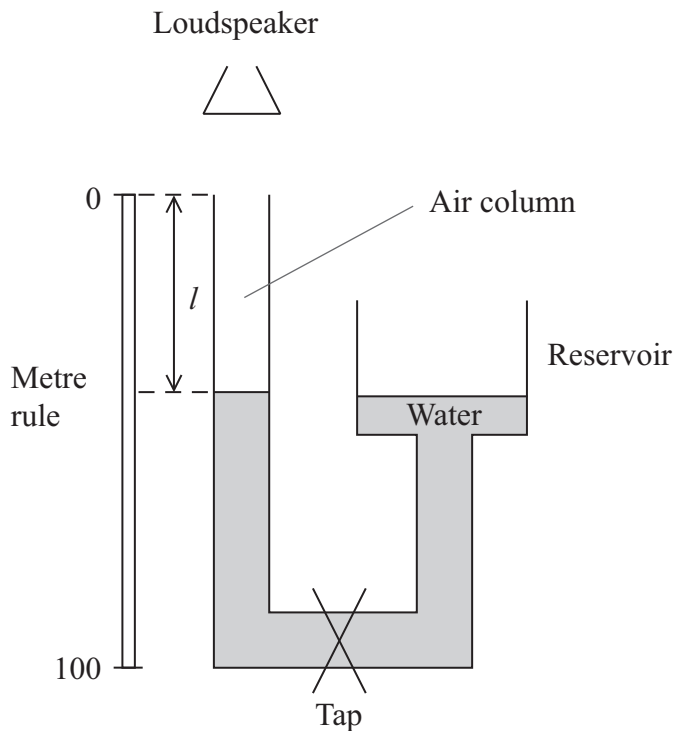
Handwriting practice area with 25 horizontal dotted lines.

**(Total for Question 7 = 13 marks)**



8 A student determines the speed of sound using standing waves in an air column.

A diagram of the apparatus is shown.



He moves the reservoir up and down to change the length  $l$  of the air column.

When a standing wave is formed a louder sound is heard. He records the readings on the metre rule when this happens.

Reading on metre rule /mm	36	192	356	516
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(a) Criticise these results.

(2)

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(b) The distance between successive readings on the metre rule should be half the wavelength.

Calculate a mean value for the wavelength of the sound with a suitable uncertainty. (4)

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Wavelength = .....  $\pm$  ..... mm

(c) Use your value of the mean wavelength to calculate a value for the velocity of sound in air.

The frequency of the sound is 1024 Hz. (2)

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Velocity = .....

**(Total for Question 8 = 8 marks)**



- 9 A student is investigating the energy stored in a stretched spring. She hangs weights on the end of the spring and measures the length of the spring. Her results are shown below.

Force / N	Length of spring / mm	
0.00	400	
0.20	416	
0.40	432	
0.60	448	
0.80	455	
1.20	487	
1.60	520	

- (a) On the grid opposite plot a graph of force on the  $y$ -axis against extension on the  $x$ -axis.

Use the blank column in the table for your processed data.

(5)

- (b) Use your graph to determine the energy stored in the stretched spring when it is extended by 100 mm. Show all your working.

(4)

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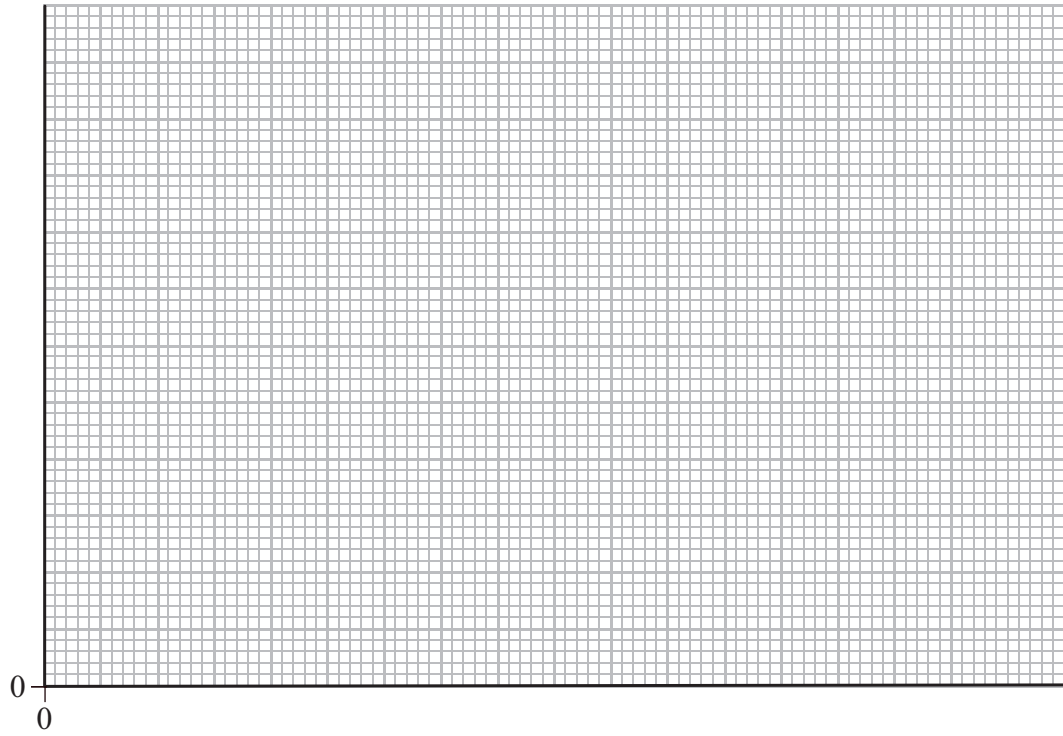
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Energy stored in spring = ..... J





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**(Total for Question 9 = 9 marks)**

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**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	$E = \sigma/\varepsilon$ where Stress $\sigma = F/A$ Strain $\varepsilon = \Delta x/x$
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

$$P = VI$$
$$P = I^2R$$
$$P = V^2/R$$
$$W = VI t$$

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

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

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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