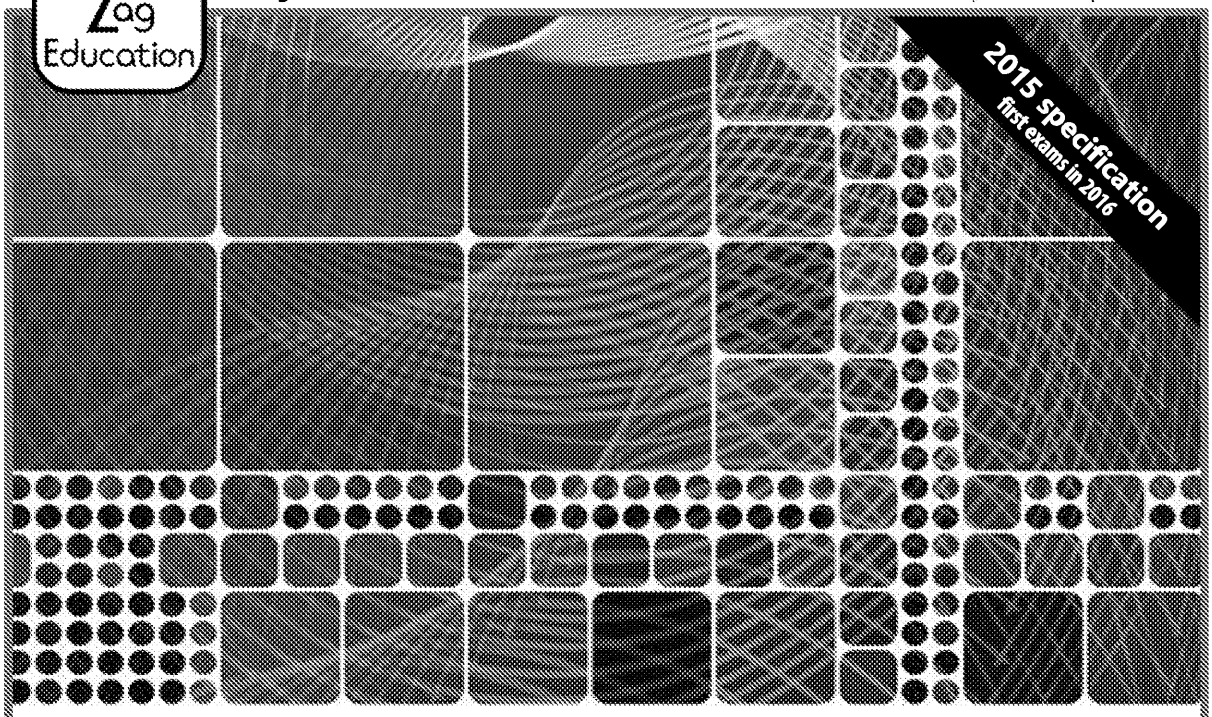
Zig Zag Education

Physics

AS | OCR | H156



Practice Papers

for AS OCR Physics A: Paper 2

A C Shaw

zigzageducation.co.uk

POD 7251

Contents

Teacher's Introduction

This collection of four practice papers has been written to support the OCR AS Physics specification H156 (first examination 2016) for Paper 2.

Each paper follows the same format as the specimen paper released by the exam board. Every item listed in the specification is covered, with most aspects visited several times in the pack. All the papers meet the minimum 40% mathematical skills required by the specification.

The mark schemes are written in a similar format to those written by OCR. The individual marking points are on separate lines and the type of mark (independent (B), method (M), compensatory (C) and answer (A)) is indicated. There is additional guidance to clarify points and indicate alternative acceptable answers.

Remember!
Always check the exam board website for new information, including changes to the specification and sample assessment material.

Suggested Uses

1. Set as a mock examination under exam conditions, marked by the teacher. This provides the most reliable summative assessment.
2. Set as a complete paper under exam conditions which is then marked by the student. This provides a good formative assessment as the student gets a good understanding of how the mark schemes work and what they need to do to score. Such a session could be reinforced by a lesson on exam technique.
3. Set as a complete paper under exam conditions which is then peer-marked. This could be by the teacher assigning scripts to students to mark or by students swapping among themselves. Group marking can be particularly helpful as the students get the chance to develop their ideas by discussing why things do and don't score.
4. Go through one question at a time in a lesson. Get students to discuss their answers before revealing the mark scheme for that question.
5. Set a paper as a homework for the student to answer and mark. This would be an ideal activity for study leave, when the student could come to a tutorial to go through their script. They should be briefed to list questions that need addressing as a result of their marking of their script.

A C Shaw, March 2017

Physics A

Practice Paper 2B

Name	

Time allowed
1 hour

Instructions
Answer **all** of the questions and use the space provided.

Information
The total marks available for this paper is **70** The number of marks available for each question is shown below on the right.

For this paper, you will need:
- Data, Formulae and Relationships Booklet

Additional materials required
- Electronic calculator
- Ruler (cm/mm)

1. New cars undergo extensive performance testing, particularly of their ma

a) State what is meant by 'velocity'.

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b) A car accelerates from 10 m s^{-1} to 27 m s^{-1} in 6.8 s.

Calculate its displacement in that time.

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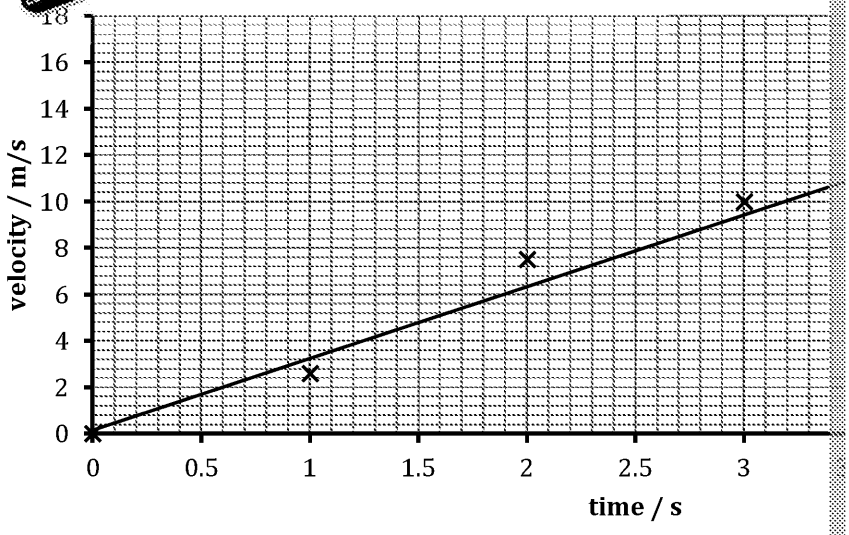
c) T... ...time graph of an acceleration test is shown in Figure 1.



Use Figure 1.1 to determine the acceleration of the car.

By adding worst fit lines, estimate a value for the uncertainty in the

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d) In a stopping test, the thinking distance was measured to be 22 ± 1 m
measured to be 45 ± 3 m.

State the absolute uncertainty in the stopping distance.

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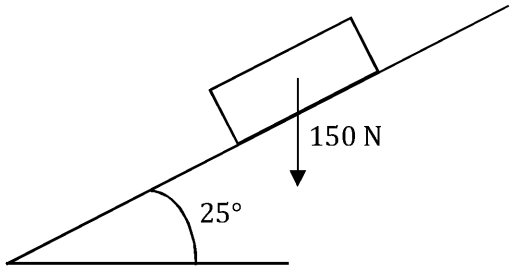
2. a) A 150 N block rests on a ramp as shown in Figure 2.1.



i) Mark the normal contact force on the diagram.

ii) Determine the magnitude of the friction preventing the block sl

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b) State Newton's Second Law of Motion in terms of momentum.

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c) Explain how F = ma is a special case of Newton's Second Law of Mot

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d) If the slope were oiled so that friction could be neglected, calculate t
block. Give your answer to an appropriate number of significant figu

State the units of your answer.

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e) A block gets faster, the acceleration would get less. Explain why

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3. It is illegal to drive a car while under the influence of alcohol or other dru

a) Explain how these substances make a crash more likely.

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b) State two things, other than the influence of alcohol or drugs, which distance of a car.

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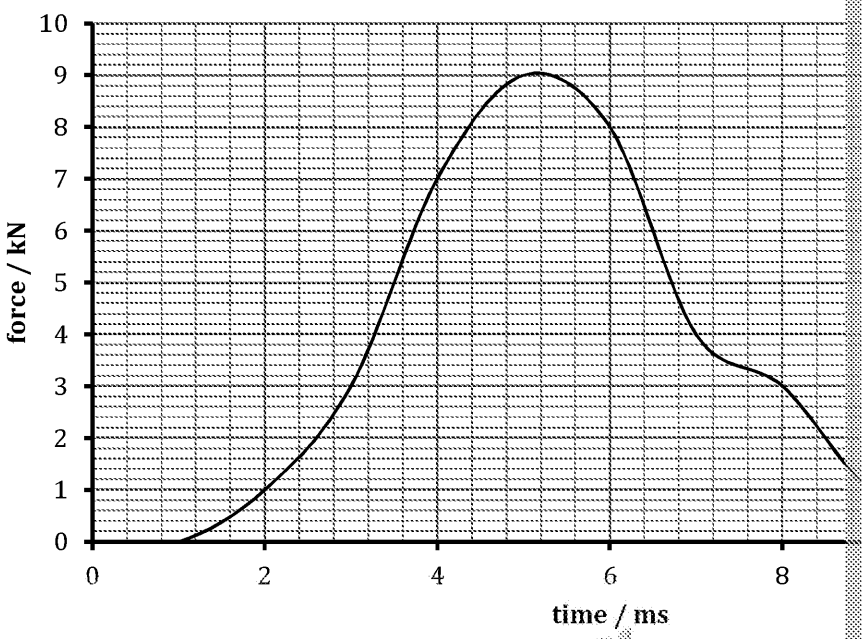
A l... work goes into testing cars to ensure they are as safe as poss

c) A sensor mounted in a crash test dummy produced a graph of force Figure 3.1.



Estimate the impulse on the crash test ... during the crash.

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d) Ex... in terms of momentum, how an airbag reduces the chance o

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In some tests, cars are crashed into other cars. An example is shown in F

e) State and explain whether collisions are elastic or inelastic.

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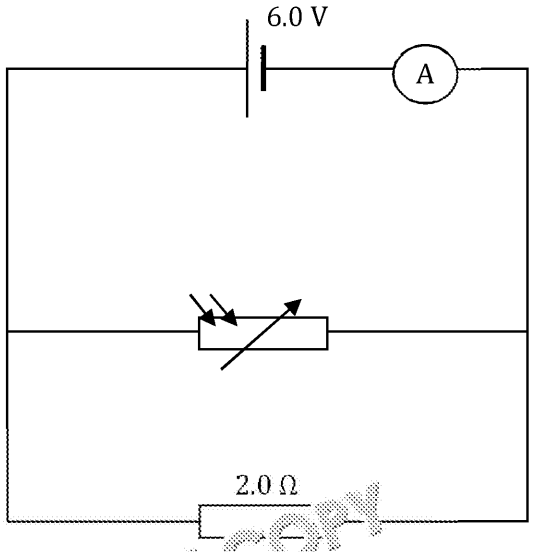
4. A student connects up the circuit shown in Figure 4.1.



The LDR is placed in a dark box and the ammeter reads 13 A.

a) Determine the current through the LDR.

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b) Calculate the resistance of the LDR.

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c) The wire in the resistor has a cross-sectional area of 1.6×10^{-10} m^2. T
carriers is 2.4×10^{-4} m s^{-1}.

Calculate the number density of charge carriers in the resistor wire.

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d) Th istor and the LDR are tested in separate circuits.

Compare how the number density of charge carriers in the resistor
shining light on them.

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e) A particular section of a circuit has 10^{20} electrons in it. It is, howev

Calculate the total charge of the protons in that section.

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f) State whether it is the electrons or the protons moving in the resisto

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5. a) A scientist wants to check that th a. ufacturer's claim for the char
correct. She carries out a e er i ent and finds that the charge use
manufacturer cla d h t t only used 27 C ± 10 %.

i) cu e the percentage uncertainty in her result.

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ii) Calculate the percentage difference between her result and the

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iii) Discuss whether her result proves or disproves the manufactur

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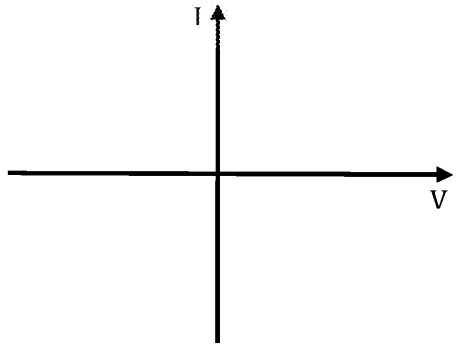
Another tool used t... components is an IV characteristic graph.

b) S... the IV graph for a thermistor.



c) A technician is asked by the manufacturer to produce an IV characteri...

Describe how this could be done.

Suggest why the manufacturer would include this information with ...

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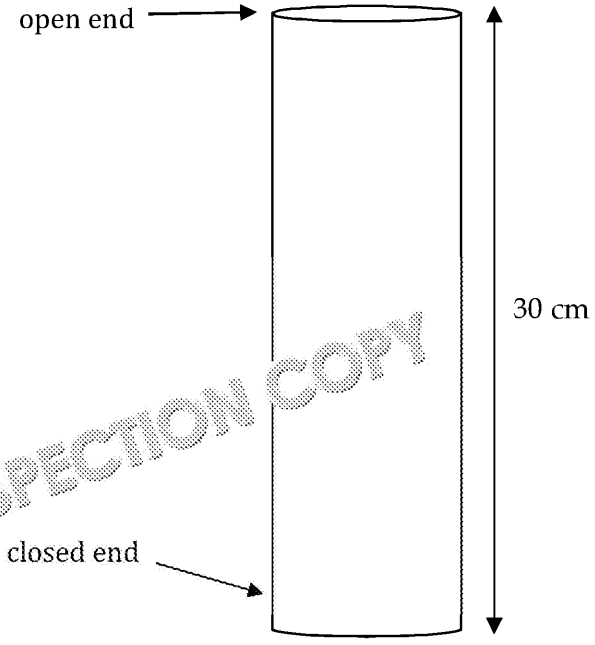
6. a) A bottle can be modelled as a 30 cm tall cylinder with one end closed
Figure 6.1.



Blowing over the top of the bottle generates a note.

i) Sketch the stationary wave pattern for the fundamental mode o

ii) Calculate the wavelength of the third harmonic.

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b) A TV aerial consists of a set of antennae evenly spaced along a central support, as shown in the image on the right.

Suggest and explain a suitable separation for the antennae on an aer tuned to receive a 506 MHz radio wave.

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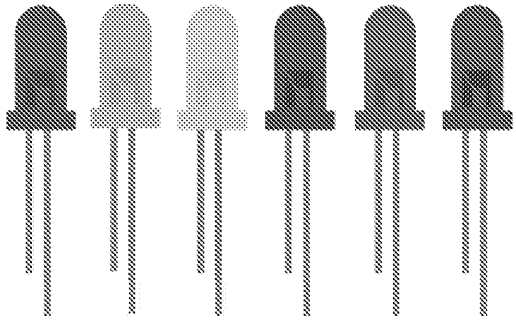
7. An LED has an activation voltage of 6.2 V.



a) Calculate the wavelength of the EM wave e[illegible]a

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b) State what kind of EM wave is emitted.

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Lasers also emit light of very specific wavelengths.

c) Explain how the wavelength of a laser could be determined using a [illegible] measurements you would have to take.

Discuss the difference in the fringe pattern when using a diffraction [illegible]

State and explain which method is more accurate.

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Physics A

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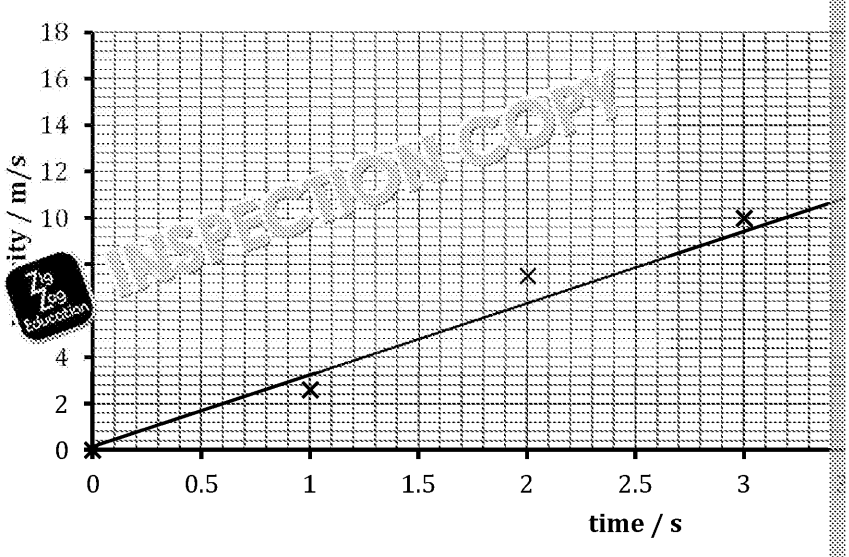
a) State what is meant by 'velocity'.

b) A car accelerates from 10 m s^{-1} to 27 m s^{-1} in 6.8 s.

Calculate its displacement in that time.

c) The velocity–time graph of an acceleration test is shown in Figure 1.



Use Figure 1.1 to determine the acceleration of the car.

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d) In a stopping test, the thinking distance was measured to be 22 ± 1 m measured to be 45 ± 3 m.

State the absolute uncertainty in the stopping distance.

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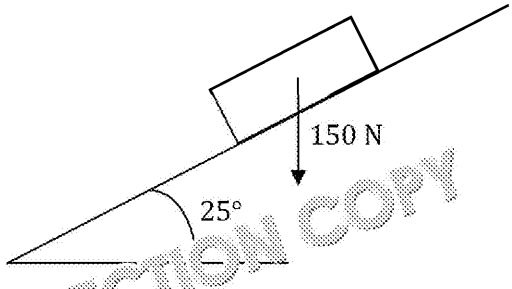

i) Mark the normal contact force on the diagram.

ii) Determine the magnitude of the friction preventing the block sl

b) State Newton's Second Law of Motion in terms of momentum.

c) Explain how F = ma is a special case of Newton's Second Law of Mot

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State the units of your answer.

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3. It is illegal to drive a car while under the influence of alcohol or other dru

a) Explain how these substances make a crash more likely.

b) State two things, other than the influence of alcohol or drugs, which
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A lot of work goes into testing cars to ensure they are as safe as poss

c) A sensor mounted in a crash test dummy produced a graph of force
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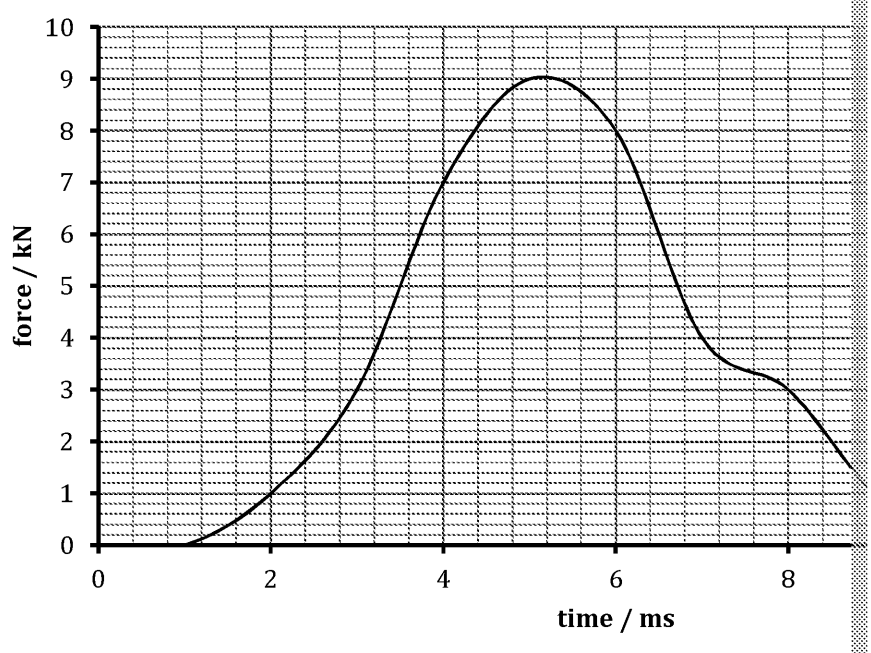


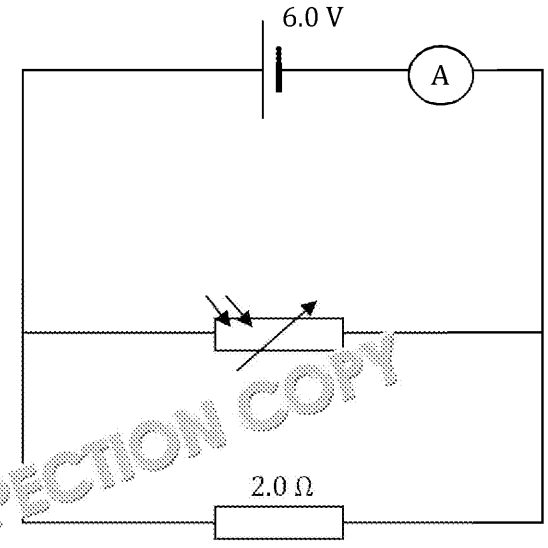
Estimate the impulse on the crash test dummy during the crash.

d) Explain, in terms of momentum, how a crumple zone reduces the chance of

In some tests, cars are crashed into other cars. An example is shown in F

e) State and explain whether the collisions are elastic or inelastic.

4. A student connects up the circuit shown in Figure 4.1.



The LDR is placed in a dark box and the ammeter reads 13 A.

a) Determine the current through the LDR.

b) Calculate the resistance of the LDR.

c) The wire in the resistor has a cross-sectional area of 1.6×10^{-10} m^2. T
carriers is 2.4×10^{-4} m s^{-1}.

Calculate the number density of charge carriers in the resistor wire.

d) The resistor and the LDR are tested in separate circuits.

Compare how the number density of charge carriers in the resistor a
shining light on them.

e) A particular section of a circuit has 10^{20} electrons in it. It is, howev

Calculate the total charge of the protons in that section.

f) State whether it is the electrons or the proton[illegible]ving in the resisto

5. a) A scientist wants to check that the manufacturer's claim for the char correct. She carries out an experiment and finds that the charge use manufacturer claimed that it only used 27 C ± 10 %.

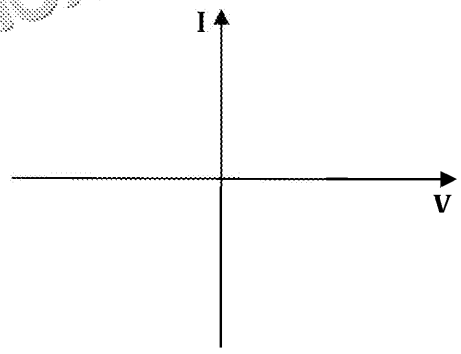
i) Calculate the percentage uncertainty in her result.

ii) Calculate the percentage difference between her result and the

iii) Discuss whether her result proves or disproves the manufactur

Another tool used to study components is an IV characteristic graph.

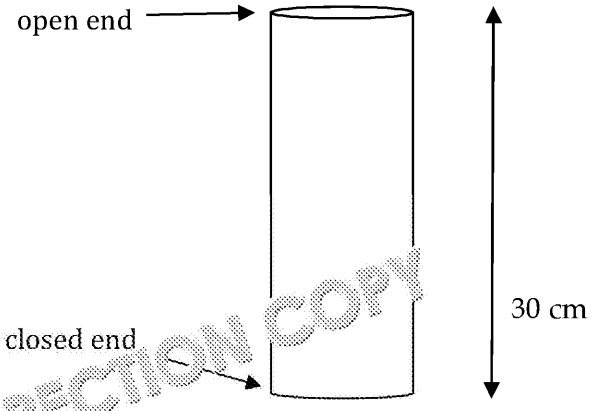
b) Sketch the IV graph for a thermistor o a set o axes as below.



c) A technician is asked by the manufacturer to produce an IV character

Describe how this could be done.
Suggest why the manufacturer would include this information with

6. a) A bottle can be modelled as a 30 cm tall cylinder with one end close Figure 6.1.

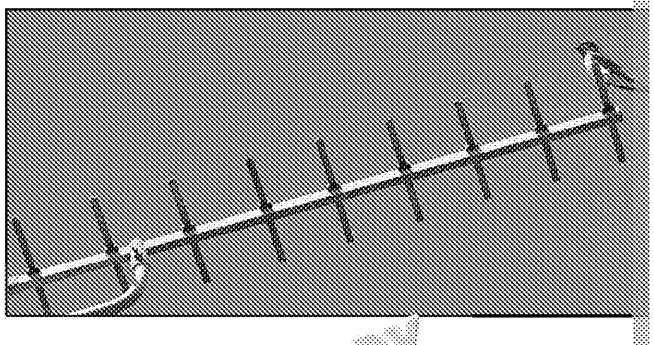


B over the top of the bottle generates a note.

i) Copy Figure 6.1 and sketch the stationary wave pattern for the

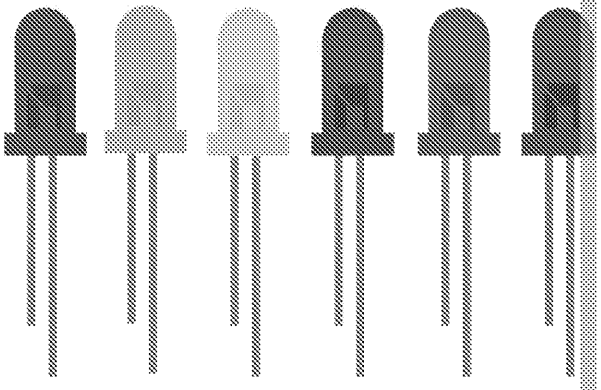
ii) Calculate the wavelength of the third harmonic.

b) A TV aerial consists of a set of antennae evenly spaced along a central
below.



Suggest and explain a suitable [illegible] for the antennae on an aer
radio wave.

7. An LE[illegible] an [illegible]ation voltage of 6.2 V.



a) Calculate the wavelength of the EM wave emitted.

b) State what kind of EM wave is emitted.

Lasers also emit light of very specific wavelengths.

c) Explain how the wavelength of a laser could be determined using a d
measurements you would have to take.

Discuss the difference in the fringe pattern when using a diffraction

State and explain which method is mor[illegible]te.

Preview of Questions Ends Here

Paper 2A Mark Scheme

Types of mark

B – An independent mark.
A – An answer mark, for the end of a calculation.
C – A compensatory mark. If the A mark is awarded, any C marks are automatically mark may be scored even if the A mark isn't.
M – A method mark that must be seen for a mark. This is not automatically awarded

Terms used in mark schemes

bald – an answer given without any other accompanying information
owtte – or words to that effect
ora – or reverse argument

Significant figures

Answers should be given to the same number of significant figures as the question. I students for every occurrence to get them ... habits ready for the real exams.

Question		Answer	Marks	
1	a	$v_x = 50 \cos 20$ $v_x = 46.98$ (m s^{-1})	C1 A1	Mus ans
	b	$6.0 = (0+)\frac{1}{2} \times 9.81 \times t^2$ $t = \sqrt{\frac{6.0}{\frac{1}{2} \times 9.81}}$ $t = 1.1$ (s)	C1 C1 A1	
	c	s = 1.1 × 47 s = 52 (m)	C1 A1	
		Total	/7	
2	a	Equal size and opposite direction And not acting through one point	B1 B1	
	b	T = 400 × 2.4 T = 960 Nm	C1 A1 A1	
	c	F = 960/0.30 F = 3200 (N)	C1 A1	
	d	P = 3200/0.05 P = 64000 (Nm^{-2})	C1 A1	
	e	Longer lever arm To increase torque/moment	B1 B1	OR: So a
		Total	/11	
3	a	WD = F × h F = mg	B1 B1	
	b	mgh = ½ × = ½ v^2 $v = \sqrt{2 \times 0.81 \times 3.0}$ $v = 7.7$ (m s^{-1})	C1 C1 C1 A1	
	c	20 J	B1	Uni
	d	P = 20/3.5 P = 5.7 (W)	C1 A1	
	e	WD = Fd, so yes Hard to read scales while pushing Possibility of parallax error	B1 B1 B1	
		Total	/12	

Question		Answer	Marks	
4	a	0.20×50 $= v_t \times 50 + v_c \times 10$	B1 B1	
	b	$\frac{1}{2} \times 50 \times 0.20^2$ $= \frac{1}{2} \times 50 \times v_t^2 + \frac{1}{2} \times 10 \times v_c^2$	B1 B1	
	c	$(v=)v_t = v_c$ $0.20 \times 50 = v \times 60$ $v = 0.17$ (m s^{-1})	C1 C1 A1	OR: v =
	d	**Level 3 (6 marks)** Gives all 5 points from guidance and suggests repeating and averaging. *Answer discusses both effect on final speed AND experimental study. The answer is well-structured and presented in a logical order.* **Level 2 (3–4 marks)** Gives 3 or 4 points from guidance. *Answer discusses both effect on final speed AND experimental study. The answer is well-structured and presented in a logical order.* **Level 2 (3–4 marks)** Gives 3 or 4 points from guidance. *Answer discusses both effect on final speed AND experimental study. The answer lacks clear structure or is not presented in a logical order.* **Level 1 (1–2 marks)** Gives one or two points from guidance. *Answer may only discuss effect on final speed OR experimental study, but not both.* **0 marks** No answer worth crediting.	B1 × 6	**Effe** Red Som **Exp** Ligh With Mea
			Total /13	
5	a	source internal	B1 B1	
	b	1.0 V Sum of all pd rises and falls round a closed loop = 0	B1 B1	
	c	$\frac{5.2}{12} = \frac{4}{4+x}$ $x = \frac{12 \times 4}{5.2} - 4$ $x = 5.2$ (Ω)	C1 C1 A1	
	d	$P = \frac{5.2^2}{5.2}$ P = 5.2 (W)	C1 A1	
			Total /9	

Question		Answer	Marks	
6	a	i=34° r=10° sin34 = n sin10 n = 3.2	C1 C1 A1	All Or
	b	$\frac{3.00\times10^{8}}{c} = \frac{3.2}{1}$ c = 9.4 × 10^{7} (m s^{-1})	C1 A1	EC
	c	**Level 3 (5–6 marks)** Gives 5 or 6 points from guidance. *Answer includes points from all three categories. The answer is well-structured and presented in a logical order.* **Level 2 (3–4 marks)** Gives 3 or 4 points from guidance. *Answer includes points from two or three categories. The answer lacks clear structure or is not presented in a logical order.* **Level 1 (1–2 marks)** Gives one or two points from guidance. *The answer lacks clear structure or is not presented in a logical order.* **0 marks** No answer worth crediting.	B1 × 6	**Eq** Ra Pr **Me** Sh Ch Un (1) Tr An bo **Re** Re Sh
			Total /11	
7	a	Smallest amount of light energy (for a given frequency)	B1	Ac se
	b	**Level 3 (5–6 marks)** Gives 5 or 6 points from guidance. *Answer includes both supporting and contradicting points. The answer is well-structured and presented in a logical order.* **Level 2 (3–4 marks)** Gives 3 or 4 points from guidance. *Answer includes both supporting and contradicting points. The answer lacks clear structure or is not presented in a logical order.* **Level 1 (1–2 marks)** Gives one or two points from guidance. *Answer may only address supporting or contradicting points. The answer lacks clear structure or is not presented in a logical order.* **0 marks** No answer worth crediting.	B1 × 6	**Su** Ph Pr Su **Co** Lig Wh slit Wh
			Total /7	

Preview of Answers Ends Here