



Mark Scheme (Results)

Summer 2025

Pearson Edexcel GCE Advanced Subsidiary
In Physics (8PH0)
Paper 01 Core Physics I

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Summer 2025

Question Paper Log Number P78523A

Publications Code 8PH0_01_2506_MS

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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Mark scheme notes

Underlying principle

The mark scheme will clearly indicate the concept that is being rewarded, backed up by examples. **It is not a set of model answers.**

1. Mark scheme format

- 1.1 You will not see 'wtte' (words to that effect). Alternative correct wording should be credited in every answer unless the MS has specified specific words that must be present. Such words will be indicated by underlining e.g. 'resonance'
- 1.2 Bold lower case will be used for emphasis e.g. '**and**' when two pieces of information are needed for 1 mark.
- 1.3 Round brackets () indicate words that are not essential e.g. "(hence) distance is increased".
- 1.4 Square brackets [] indicate advice to examiners or examples e.g. [Do not accept gravity] [ecf].

2. Unit error penalties

- 2.1 A separate mark is not usually given for a unit but a missing or incorrect unit will normally mean that the final calculation mark will not be awarded.
- 2.2 This does not apply in 'show that' questions or in any other question where the units to be used have been given, for example in a spreadsheet.
- 2.3 The mark will not be awarded for the same missing or incorrect unit only once within one clip in epen.
- 2.4 Occasionally, it may be decided not to insist on a unit e.g. the candidate may be calculating the gradient of a graph, resulting in a unit that is not one that should be known and is complex.
- 2.5 The mark scheme will indicate if no unit error is to be applied by placing brackets around the unit.

3. Significant figures

- 3.1 Use of too many significant figures in the theory questions will not prevent a mark being awarded if the answer given rounds to the answer in the MS.
- 3.2 Too few significant figures will mean that the final mark cannot be awarded in 'show that' questions where one more significant figure than the value in the question is needed for the candidate to demonstrate the validity of the given answer.
- 3.3 The use of one significant figure might be inappropriate in the context of the question e.g. reading a value off a graph. If this is the case, there will be a clear indication in the MS.
- 3.4 The use of $g = 10 \text{ m s}^{-2}$ or 10 N kg^{-1} instead of 9.81 m s^{-2} or 9.81 N kg^{-1} will be penalised by one mark (but not more than once per clip). Accept 9.8 m s^{-2} or 9.8 N kg^{-1}
- 3.5 In questions assessing practical skills, a specific number of significant figures will be required e.g. determining a constant from the gradient of a graph or in uncertainty calculations. The MS will clearly identify the number of significant figures required.

4. Calculations

- 4.1 **use of** the formula means that the candidate demonstrates substitution of physically correct values, although there may be conversion errors e.g. power of 10 error.
- 4.2 If a 'show that' question is worth 2 marks, then both marks will be available for a reverse working. If the question is worth 3 marks then only 2 marks will be available.
- 4.3 The mark scheme will show a correctly worked answer for illustration only.

5. Quality of Written Expression

- 5.1 Questions that assess the ability to show a coherent and logically structured answer are marked with an asterisk.
- 5.2 Marks are awarded for indicative content and for how the answer is structured.
- 5.3 Linkage between ideas, and fully-sustained reasoning is expected.

Question Number	Answer	Mark
1	A – The resultant force decreases as the ball-bearing falls.	1
	Incorrect Answers: B – resultant force = weight – drag force, drag force increases with speed, so the resultant force decreases C – resultant force = weight – drag force, drag force increases with speed, so the resultant force decreases D – resultant force = weight – drag force, drag force increases with speed, so the resultant force decreases	
2	C - Resistance decreases as the number of conduction electrons increases.	1
	Incorrect Answers: A – vibration of lattice ions is not the deciding factor for a semi conductor B – vibration of lattice ions is not the deciding factor for a semi conductor D – increasing temperature increases the number of conduction electrons	
3	B - kg m s^{-2}	1
	Incorrect Answers: A – this is the unit of momentum C – this is the unit of work done D – this is the unit of power	
4	A – $(1.50-1.45) \times 100 / 1.45$	1
	Incorrect Answers: B – this gives the total resistance of the fixed resistor and the internal resistance C – the denominator should be the potential difference across the 100Ω resistor D – the denominator should be the potential difference across the 100Ω resistor	
5	B -	1
	Incorrect Answers: A – the second section of the graph is constant velocity so acceleration = 0 C - the second section of the graph is constant velocity so acceleration = 0 D – the gradient is decreasing for the first section of the graph, so velocity is decreasing and so it is has negative acceleration	

6	A – $(9.81 \times 3.5^2) / 2$ this is from using $s = ut + \frac{1}{2} at^2$	1
	Incorrect Answers: B – this gives v , not s , using $v = u + at$, C – this uses $s = ut + \frac{1}{2} at^2$ incorrectly D - this rearranges $s = ut + \frac{1}{2} at^2$ incorrectly	
7	C – current is the same, drift velocity is higher	1
	Incorrect Answers: A – current is constant B – current is constant D – as cross-sectional area decreases, drift velocity increases as current is constant	
8	D $\frac{v}{6}$ using conservation of momentum	1
	Incorrect Answers: A – as the mass of the stack is greater than the mass of a trolley, then the velocity of the stack must be less than v . B – as the mass of the stack is greater than the mass of a trolley, then the velocity of the stack must be less than v . C – when the trolley combines with the stack, the stack then contains 6 trollies.	

(Total for Multiple Choice Questions = 8 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
9	An explanation that makes reference to the following points: - Equal increases in potential difference produce gradually decreasing increases in current (1) - So resistance of component increases with potential difference Or - So resistance of component increases with current (1) - Component is a filament bulb (1)	Accept: As potential difference on graph increases, current increases at decreasing rate	3

(Total for Question 9 = 3 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
10(a)	- Use of horizontal component of force (1) - Use of $\Delta W = F\Delta s$ (1) $\Delta W = 1.1 \times 10^4 \text{ J}$ (1)	<u>Example of calculation</u> Horizontal component of force = $35 \text{ N} \times \cos 50^\circ = 22 \text{ N}$ $\Delta W = 22 \text{ N} \times 500 \text{ m} = 1.1 \times 10^4 \text{ J}$	3
10(b)	An explanation that makes reference to the following points: - Force is in the direction of motion Or Force is parallel to the direction of motion Or there is a greater proportion of the force in the direction of motion (1) - So lower applied force Or Force is now 22 N (1)		2

(Total for Question 10 = 5 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
11(a)	- Use of $R = \frac{V}{I}$ for the $45\ \Omega$ resistor (1) - Use of $R = \frac{V}{I}$ for the whole circuit Or Use of $R = \frac{V}{I}$ for the resistor R (1) $R_{\text{variable resistor}} = 80\ (\Omega)$ (1) OR - Applies the principles of a potential divider circuit (1) - Use of $R_{\text{total}} = R_{\text{variable resistor}} + 45\ \Omega$ Or Use of $15\ \text{V} = V_{\text{variable resistor}} + 5.5\ \text{V}$ (1) $R_{\text{variable resistor}} = 80\ (\Omega)$ (1)	Example of calculation $I = 5.5\ \text{V} / 45\ \Omega = 0.12\ \text{A}$ $R_{\text{total}} = 15\ \text{V} / 0.12\ \text{A} = 125\ \Omega$ $R_{\text{variable resistor}} = 125\ \Omega - 45\ \Omega = 80\ \Omega$ e.g. ratio of resistances equated to ratio of p.d.s	3

11(b)	EITHER - Decreased resistance for parallel combination of motor with $45\ \Omega$ resistor (1) - So lower (proportion of the total) potential difference across motor, (1) - hence potential difference is too low and motor runs slowly (1) OR - higher total current in circuit/battery (1) - potential difference across R increases, so potential difference across motor decreases (1) - hence potential difference is too low and motor runs slowly (1)		3
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(Total for Question 11 = 6 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
12(a)	- Use of $W = mg$ (1) - Use of Moment of force = Fx (1) EITHER - Application of the principle of moments about A (1) $F_A + F_B = W$ (1) Or Application of the principle of moments about B $F_A = 155 \text{ N}$ and $F_B = 90 \text{ N}$ (1) OR - Application of the principle of moments about B (1) $F_A + F_B = W$ (1) Or Application of the principle of moments about A $F_A = 155 \text{ N}$ and $F_B = 90 \text{ N}$ (1)	<u>Example of calculation</u> $W = 25 \text{ kg} \times 9.81 \text{ m s}^{-2} = 245 \text{ N}$ Taking moments about A $245 \text{ N} \times 0.55 \text{ m} = F_B \times 1.50 \text{ m}$ $F_B = 90 \text{ N}$ $F_A = 245 \text{ N} - 90 \text{ N} = 155 \text{ N}$	5

12(b)	An explanation that makes reference to the following points: • Horizontal distance of weight (from A) increases (1) • Clockwise moment (about A) increases Or Moment of weight (about A) increases (1) • So anticlockwise moment (about A) increases Or moment of F_B (about A) increases (1) • And horizontal distance of F_B (from A) decreases (1) • So F_B increases and F_A decreases (1)		5
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(Total for Question 12 = 10 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark																																																				
*13(a)	This question assesses a student’s ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Total marks awarded is the sum of marks for indicative content and the marks for structure and lines of reasoning. <table><tr><th>IC points</th><th>IC mark</th><th>Max linkage mark</th><th>Max final mark</th></tr><tr><td>6</td><td>4</td><td>2</td><td>6</td></tr><tr><td>5</td><td>3</td><td>2</td><td>5</td></tr><tr><td>4</td><td>3</td><td>1</td><td>4</td></tr><tr><td>3</td><td>2</td><td>1</td><td>3</td></tr><tr><td>2</td><td>2</td><td>0</td><td>2</td></tr><tr><td>1</td><td>1</td><td>0</td><td>1</td></tr><tr><td>0</td><td>0</td><td>0</td><td>0</td></tr></table> Indicative content: IC1 There is a constant horizontal distance moved in each time interval on the diagram IC2 So the horizontal (component of) velocity is constant Or Horizontal (component of) acceleration is zero IC3 And there is no horizontal force on the projectile IC4 The vertical distance moved in each equal time interval changes IC5 So there is a change in vertical (component of) velocity Or There is a vertical (component of) acceleration IC6 So there is a vertical force on the projectile (which is weight)	IC points	IC mark	Max linkage mark	Max final mark	6	4	2	6	5	3	2	5	4	3	1	4	3	2	1	3	2	2	0	2	1	1	0	1	0	0	0	0	Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content. <table><tr><th>Number of indicative points seen in answer</th><th>Number of marks awarded for indicative points</th></tr><tr><td>6</td><td>4</td></tr><tr><td>5-4</td><td>3</td></tr><tr><td>3-2</td><td>2</td></tr><tr><td>1</td><td>1</td></tr><tr><td>0</td><td>0</td></tr></table> <table><tr><th></th><th>Number of marks awarded for structure and lines of reasoning</th></tr><tr><td>Answer shows a coherent and logical structure with linkage and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr><tr><td>Answer is partially structured with some linkages and lines of reasoning</td><td>1</td></tr><tr><td>Answer has no linkage between points and is unstructured</td><td>0</td></tr></table>	Number of indicative points seen in answer	Number of marks awarded for indicative points	6	4	5-4	3	3-2	2	1	1	0	0		Number of marks awarded for structure and lines of reasoning	Answer shows a coherent and logical structure with linkage and fully sustained lines of reasoning demonstrated throughout	2	Answer is partially structured with some linkages and lines of reasoning	1	Answer has no linkage between points and is unstructured	0	6
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6	4	2	6																																																				
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4	3	1	4																																																				
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2	2	0	2																																																				
1	1	0	1																																																				
0	0	0	0																																																				
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13(b)	• Use of $s = ut + \frac{1}{2}at^2$ for vertical motion Or Use of $v = u + at$ with $v = 0$, and $t = 7.5/2$ s • Use of $s = ut$ for horizontal motion • Use of $\tan\theta = \frac{\sin\theta}{\cos\theta}$ Or Use of pythoagoras theorem • Use of a trigonometric function • $\theta = 48^\circ$ and $u = 50 \text{ m s}^{-1}$	<u>Example of calculation</u> Vertically $0 = (u_v \times 7.5 \text{ s}) + (0.5 \times -9.81 \text{ m s}^{-2} \times 7.5^2)$ $u_v = u \sin\theta = 36.8 \text{ m s}^{-1}$ Horizontally $250 \text{ m} = u_H \times 7.5 \text{ s}$ $u_H = u \cos\theta = 33.3 \text{ m s}^{-1}$ $\frac{u \sin\theta}{u \cos\theta} = \tan\theta = \frac{36.8}{33.3} = 1.11$ $\theta = 47.9^\circ$ $250 \text{ m} = u \cos 48^\circ \times 7.5$ $u = 49.6 \text{ m s}^{-1}$	5
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(Total for Question 13 = 11 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
14(a)(i)	- Use of $\Delta E_{\text{grav}} = mg\Delta h$ and $P = \frac{E}{t}$ (1) $P = 1.6 \times 10^5 \text{ W}$ (1)	<u>Example of calculation</u> E_{grav} per second = $130 \text{ kg} \times 9.81 \text{ m s}^{-2} \times 124 \text{ m}$ $P = 1.6 \times 10^5 \text{ W}$	2
14(a)(ii)	An explanation that makes reference to the following points: - Frictional forces between water and pipe (1) - Do work transferring energy to the surroundings (1)	Allow reference to process is less than 100% efficient for MP1	2
14(b)	EITHER - Use of $V = \frac{W}{Q}$ (1) - Use of $P = \frac{E}{t}$ (1) $t = 11 \text{ h}$ (1) OR - Use of $P = VI$ (1) - Use of $I = Q/t$ or $W = VIt$ (1) $t = 11 \text{ h}$ (1)	<u>Example of calculation</u> $Q = 4400 \times 3600 = 1.6 \times 10^7 \text{ C}$ $W = 1.6 \times 10^7 \text{ C} \times 48 \text{ V} = 7.6 \times 10^8 \text{ J}$ $t = 7.6 \times 10^8 \text{ J} / 20 \times 10^3 \text{ W} = 3.8 \times 10^4 \text{ s}$ $t = 3.8 \times 10^4 \text{ s} / 3600 = 10.6 \text{ h}$ Or $W = 4400 \text{ Ah} \times 48 \text{ V} = 2.1 \times 10^5 \text{ V A h}$ $t = 2.1 \times 10^5 \text{ V A h} / 20 \times 10^3 \text{ W} = 10.6 \text{ h}$	3

14(c)(i)	• Use of $P = IV$ • $I = 21.7 \text{ (A)}$	(1) <u>Example of calculation</u> $I = 5 \times 10^3 \text{ W} / 230 \text{ V} = 21.7 \text{ A}$ (1)	2
14(c)(ii)	• Use of $P = I^2 R$ • Use of $R = \frac{\rho l}{A}$ • Use of $V = Al$ and the cost per m^3 • Cost of copper per m = £12.54 Or Cost of aluminium per m = £1.56 • The cost reduction is 88% which is close to 90% so the claim is correct (ecf from (c)(i)) (Conclusion consistent with calculated percentage)	(1) <u>Example of calculation</u> $R_{1 \text{ m of cable}} = 0.05 \text{ W} / (22 \text{ A})^2 = 1.03 \times 10^{-4} \Omega$ (1) For 1 m of copper cable $A = (1.68 \times 10^{-8} \Omega \text{ m} \times 1) / 1.03 \times 10^{-4} \Omega = 1.63 \times 10^{-4} \text{ m}^2$ $V = 1.63 \times 10^{-4} \text{ m}^2 \times 1 \text{ m} = 1.63 \times 10^{-4} \text{ m}^3$ Cost = $1.63 \times 10^{-4} \text{ m}^3 \times £77\,090 = £12.54$ (1) For 1 m of aluminium cable $A = (2.65 \times 10^{-8} \Omega \text{ m} \times 1) / 1.03 \times 10^{-4} \Omega = 2.57 \times 10^{-4} \text{ m}^2$ $V = 2.57 \times 10^{-4} \text{ m}^2 \times 1 \text{ m} = 2.57 \times 10^{-4} \text{ m}^3$ Cost = $2.57 \times 10^{-4} \text{ m}^3 \times £6070 = £1.56$ (1) Cost reduction using Al = $(£12.54 - £1.56) / £12.54 = 88\%$	5

(Total for Question 14 = 14 marks)

(Total for Section A = 57 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
15(a)	- Use of $P = \frac{1}{f}$ (1) $P = 6.0 \text{ D}$ (1)	<u>Example of calculation</u> $P = \frac{1}{0.167} = 6.0 \text{ D}$	2
15(b)	- Refractive index of the oil has decreased (1) - Light refracts less (at boundaries of the lens) (1) - Focal length increases (1) - So light intensity at F decreases (1) - The resistance of the LDR increases (1)	MP4 dependent on MP2 or MP3 MP5 dependent on MP4	5

(Total for Question 15 = 7 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
16(a)	An explanation that makes reference to the following points: - Measure across n fringe separations and divide by n (1) Or - Accept increase D (so w is larger) (1) - The uncertainty stays the same but the measurement is larger (so the percentage uncertainty in w is decreased) (1)		2

16(b)(i)

- Values of $1/w$ given to 3 sf
- Axes with labels & units
- Scales
- Plots
- Line of best fit

s / mm	w / m	$1/w / \text{m}^{-1}$
0.10	0.0643	15.6
0.20	0.0301	33.2
0.30	0.0204	49.0
0.40	0.0159	62.9
0.50	0.0131	76.3

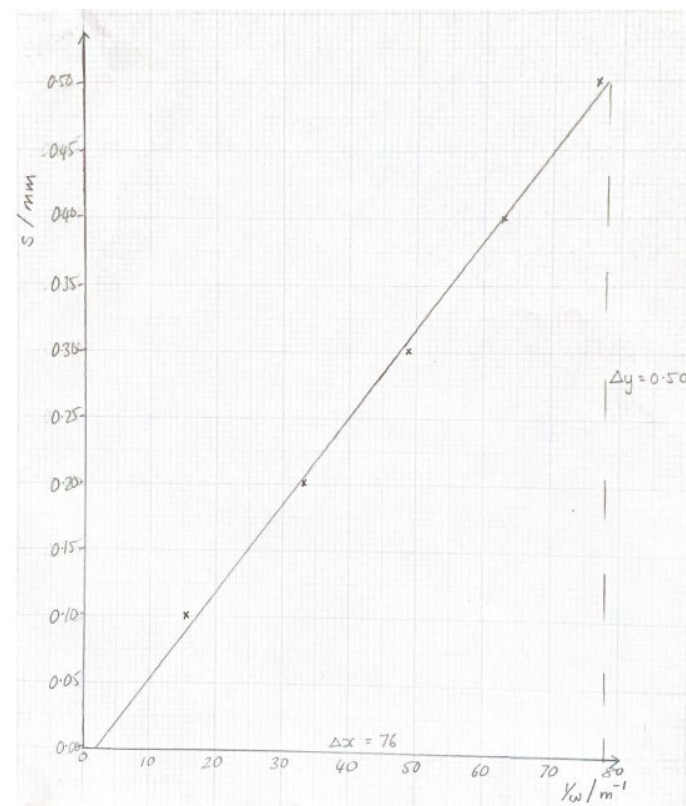
(1)

(1)

(1)

(1)

(1)



MP3 scales only in 1,2 and 5, and must cover at least half the grid

MP4 tolerance of $\frac{1}{2}$ graph square, check all points.

5

16(b)(ii)	• Use of large triangle (1) • Use of gradient = λD (1) • λ in range $6.9 - 7.7 \times 10^{-7}$ m to 2 or 3 significant figures (1)	<u>Example of calculation</u> Gradient = $(0.50 - 0) \times 10^{-3} / (78 - 2) = 6.6 \times 10^{-6}$ $\lambda = 6.6 \times 10^{-6} / 9.00 = 7.3 \times 10^{-7}$ m	3
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16(c)(i)	- Use of $\frac{1}{2}$ range Or Use of furthest from mean $\%U_f = 9\%$	<u>Example of calculation</u> $\%U_f = \frac{1}{2}(24 - 20) \times 100 / 22 = 9\%$	2
16(c)(ii)	EITHER - Use of $s = \frac{\lambda D}{w}$ - Percentage uncertainty calculated for D - Percentage uncertainties for D, s and w added (ecf from (c)(i)) - Upper limit of $\lambda = 5.52 \times 10^{-7}$ m which is greater than 520 nm so student's results are consistent with value on label Or Comparison of calculated value of relevant limit of wavelength with 520 nm and valid conclusion OR - Maximum or minimum value calculated for s or w - Calculation of upper or lower limit using maximum/minimum values - Calculation of both limits using maximum and minimum values - Upper limit of $\lambda = 5.55 \times 10^{-7}$ m which is greater than 520 nm and lower limit of $\lambda = 4.26 \times 10^{-7}$ m which is less than 520 nm so student's results are consistent with value on label	<u>Example of calculation</u> $\lambda = (22 \times 10^{-3} \text{ m} \times 0.20 \times 10^{-3} \text{ m}) / 9.00 = 4.89 \times 10^{-7} \text{ m}$ $\%U_D = 0.01 \times 100 / 9.00 = 0.1 \%$ $\%U_\lambda = \%U_D + \%U_s + \%U_w$ $\%U_\lambda = 9\% + 0.1\% + 4\% = 13\%$ $U_\lambda = 0.13 \times 4.89 \times 10^{-7} \text{ m} = 6.36 \times 10^{-8} \text{ m}$ Upper limit of $\lambda = 4.89 \times 10^{-7} \text{ m} + 6.36 \times 10^{-8} \text{ m}$ Upper limit of $\lambda = 5.52 \times 10^{-7} \text{ m}$ MP3 – accept ecf from c(i) <u>Example of Calculation</u> $s_{\max} = 0.20 \times 10^{-3} \text{ m} \times 1.04 = 2.08 \times 10^{-4} \text{ m}$ $w_{\max} = 22 \times 10^{-3} \text{ m} \times 1.09 = 0.024 \text{ m}$ $\lambda_{\max} = (0.024 \text{ m} \times 2.08 \times 10^{-4} \text{ m}) / (9.00 - 0.01) \text{ m}$ $\lambda_{\max} = 5.55 \times 10^{-7} \text{ m}$ $s_{\min} = 0.20 \times 10^{-3} \text{ m} \times 0.96 = 1.92 \times 10^{-4} \text{ m}$ $w_{\min} = 22 \times 10^{-3} \text{ m} \times 0.91 = 0.020 \text{ m}$ $\lambda_{\min} = (0.020 \text{ m} \times 1.92 \times 10^{-4} \text{ m}) / (9.00 + 0.01) \text{ m}$ $\lambda_{\min} = 4.26 \times 10^{-7} \text{ m}$ MP3 – accept ecf from c(i)	4

(Total for Question 16 = 16 marks)

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(Total for Section B = 23 marks)
TOTAL FOR PAPER = 80 MARKS