

Cambridge International AS & A Level

PHYSICS**9702/21**

Paper 2 AS Level Structured Questions

October/November 2024

MARK SCHEME

Maximum Mark: 60

Published

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GENERIC MARKING PRINCIPLE 1:

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

GENERIC MARKING PRINCIPLE 2:

Marks awarded are always **whole marks** (not half marks, or other fractions).

GENERIC MARKING PRINCIPLE 3:

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
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- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

GENERIC MARKING PRINCIPLE 4:

Rules must be applied consistently, e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

GENERIC MARKING PRINCIPLE 5:

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

GENERIC MARKING PRINCIPLE 6:

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

Science-Specific Marking Principles

1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.

2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.

3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).

4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance

For questions that require ***n*** responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided.
- Any response marked *ignore* in the mark scheme should not count towards ***n***.
- Incorrect responses should not be awarded credit but will still count towards ***n***.
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.
- Non-contradictory responses after the first ***n*** responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

Abbreviations

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Mark categories

B marks	These are <u>independent</u> marks, which do not depend on other marks. For a B mark to be awarded, the point to which it refers must be seen specifically in the candidate's answer.
M marks	These are <u>mandatory</u> marks upon which A marks later depend. For an M mark to be awarded, the point to which it refers must be seen specifically in the candidate's answer. If a candidate is not awarded an M mark, then the later A mark cannot be awarded either.
C marks	These are <u>compensatory</u> marks which can be awarded even if the points to which they refer are not written down by the candidate, providing subsequent working gives evidence that they must have known them. For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct working which shows the candidate knew the equation, then the C mark is awarded. If a correct answer is given to a numerical question, all of the preceding C marks are awarded automatically. It is only necessary to consider each of the C marks in turn when the numerical answer is not correct.
A marks	These are <u>answer</u> marks. They may depend on an M mark or allow a C mark to be awarded by implication.

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Question	Answer	Marks
1(a)	mass per unit volume	B1
1(b)(i)	density = $0.243 / (0.0541 \times 0.1109 \times 0.0162)$	C1
	= 2500 kg m^{-3}	A1
1(b)(ii)	($0.001 / 0.243$) or ($0.01 / 5.41$) or ($0.01 / 11.09$) or ($0.01 / 1.62$)	C1
	$(\Delta\rho / \rho) = (\Delta m / m) + (\Delta x / x) + (\Delta y / y) + (\Delta z / z)$ $= (0.001 / 0.243) + (0.01 / 5.41) + (0.01 / 11.09) + (0.01 / 1.62)$ $(= 0.013)$	C1
	percentage uncertainty in $\rho = 0.013 \times 100$ $= 1.3\%$ (allow 1 s.f. answer of 1%)	A1
1(c)	zero error (on calipers / balance) or incorrect calibration (of calipers / balance)	B1

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Question	Answer	Marks
2(a)	product of mass and velocity	B1
2(b)(i)	maximum speed $= 7.2 \times 10^4 / 1800$ $= 40 \text{ m s}^{-1}$	A1
2(b)(ii)	kinetic energy $= \frac{1}{2}mv^2$	C1
	$= \frac{1}{2} \times 1800 \times 40^2$ $= 1.4 \times 10^6 \text{ J}$	A1
2(b)(iii)	$a = \text{gradient of line} / \text{mass}$ or $a = (v - u) / t$ or $a = \Delta v / t$	C1
	$a = \text{e.g. } (3.6 \times 10^4) / (4.0 \times 1800) = 5.0 \text{ m s}^{-2}$ or $a = \text{e.g. } 20 (-0) / 4 = 5.0 \text{ m s}^{-2}$ or $F = \text{e.g. } 3.6 \times 10^4 / 4.0 = 9.0 \times 10^3$ and $a = 9.0 \times 10^3 / 1800 = 5.0 \text{ m s}^{-2}$	A1
2(b)(iv)	distance $= \frac{1}{2} \times 40 \times (8 + 4)$ or distance $= \frac{1}{2} \times 72\,000 \times (8 + 4) / 1800$ or distance $= [40^2 / (2 \times 5)] + [40^2 / (2 \times 10)]$ or distance $= \frac{1}{2} \times 5 \times 8^2 + (40 \times 4 - \frac{1}{2} \times 10 \times 4^2)$	C1
	distance $= 240 \text{ m}$	A1

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Question	Answer	Marks
2(c)	stepped shape, showing one constant value up to 8.0 s then stepping to a different constant value from 8.0 s with no time delay	B1
	horizontal straight line from (0, 5.0) to (8.0, 5.0)	B1
	horizontal straight line from (8.0, –10.0) to (12.0, –10.0)	B1

Question	Answer	Marks
3(a)	product of force and displacement in direction of force	B1
3(b)	weight/force = mg , and g identified as acceleration of free fall	B1
	ΔE_P identified as work (done by lifting force/weight), and so = $mg \times \Delta h$	B1
3(c)(i)	$240 \times 150 = 36 \text{ kJ}$	A1
3(c)(ii)	$P = W / t$	C1
	$= 36\,000 / 60$	A1
	$= 600 \text{ W}$	
3(c)(iii)	efficiency = <u>useful</u> output power / total input power	C1
	$= 600 / 900$	A1
	$= 0.67$	
3(c)(iv)	$P = I^2 R$ and $R = \rho L / A$	C1
	$280 = I^2 \times (1.7 \times 10^{-8} \times 23) / (2.6 \times 10^{-8})$	C1
	$I = 4.3 \text{ A}$	A1

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Question	Answer	Marks
4(a)	stress per unit strain	B1
4(b)(i)	straight line with positive gradient passing through origin	B1
4(b)(ii)	spring constant	B1
4(b)(iii)	elastic potential energy (stored in wire)	B1
4(c)	length (of Q) is half (the length of P)	B1
	extension is proportional to length, and inversely proportional to area and Young modulus	B1
	extension of Q is $= \frac{1}{2} / (2 \times 2)$ $= \frac{1}{8}$ times the extension of P	B1

Question	Answer	Marks
5(a)(i)	$P = 40$ and $R = 0$	A1
	$Q = 20$ and $S = -1$	A1
5(a)(ii)	(electron) antineutrino	B1
5(a)(iii)	leptons	B1
5(b)	(alpha particle consists of) 2 protons and 2 neutrons	C1
	quark composition of proton = up up down or quark composition of neutron = up down down	C1
	quark composition (of alpha particle) = 6 up, 6 down	A1

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Question	Answer	Marks
6(a)(i)	for maximum intensity, waves must be in phase (at detection)	B1
	(phase difference at source means) waves are not in phase / have a 90° phase difference <u>at O</u>	B1
6(a)(ii)	point B labelled on the line PQ below O	M1
	distance OB = distance OA	A1
6(b)(i)	$v = f\lambda$	C1
	$\lambda = (3.00 \times 10^8) / (2.5 \times 10^{10}) = 0.012 \text{ m}$	A1
6(b)(ii)	$\Delta x = 0.012 / 4$ $= 0.0030 \text{ m}$	A1
6(b)(iii)	$\lambda = ax / D$	C1
	distance $= \lambda D / a = 0.012 \times 2.3 / 0.18$ $= 0.15 \text{ m}$	A1

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Question	Answer	Marks
7(a)(i)	$(V =) 1.50 - 1.36$ $(= 0.14 \text{ V})$	B1
	current $= V / R$ $= 0.14 / 0.28 = 0.50 \text{ A}$	A1
7(a)(ii)	resistance $= V / I$	C1
	$= 1.36 / 0.50$ $= 2.7 \Omega$	A1
7(a)(iii)	$R = 2.7 - 1.0$ $= 1.7 \Omega$	A1
7(b)(i)	two resistors correctly shown in parallel with cell and no other components	B1
7(b)(ii)	(external) resistance is now smaller and (so) current (in cell) is greater / (external) resistance smaller fraction of total resistance / internal resistance larger fraction of total resistance	B1
	(greater p.d. across internal resistance so) terminal p.d. is less	B1

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1(a)	a quantity with magnitude and direction	B1
1(b)(i)	SI base units of D : kg m s^{-2}	C1
	SI base units of r : m and v : m s^{-1}	C1
	base units of η : $\text{kg m s}^{-2} / (\text{m} \times \text{m s}^{-1})$ $= \text{kg m}^{-1} \text{s}^{-1}$	A1
1(b)(ii)	$W = U + D$	A1
1(b)(iii)	$U = 830 \times 9.81 \times 4.6 \times (10^{-2})^3$ $(= 0.037 \text{ N})$	C1
	$W = 0.037 + 0.32$ $= 0.36 \text{ N}$	A1

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2(a)	product of mass and velocity	B1
2(b)	$F = m\Delta v / \Delta t$ $= 16 \times 0.60 / 1.1$	C1
	$= 8.7 \text{ N}$	A1
2(c)	$x = ut + \frac{1}{2}at^2$ $x = 0.60 \times 3.7 + \frac{1}{2} \times 0.85 \times 3.7^2$	C1
	or	
	$v = 0.60 + 0.85 \times 3.7 (= 3.75 \text{ m s}^{-1})$ $x = 3.75 \times 3.7 - 0.5 \times 0.85 \times 3.7^2$ or $x = \frac{1}{2} \times (0.60 + 3.75) \times 3.7$ or $x = (3.75^2 - 0.60^2) / (2 \times 0.85)$	(C1)
	$x = 8.0 \text{ m}$	A1
2(d)(i)	$F = W / s$	C1
	$= 250 / 18$	A1
	$= 14 \text{ N}$	
2(d)(ii)	any line starting at distance = 0 and a positive non-zero value of kinetic energy	B1
	a straight line from distance = 0 to distance = x with positive gradient	B1
	a straight horizontal line at a non-zero value of kinetic energy starting at distance = x and ending at distance = x + 18 m that is continuous with the previous line	B1

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Question	Answer	Marks
3(a)(i)	$E = \sigma / \varepsilon$ or $E = \text{gradient}$	C1
	$E = \text{e.g. } 12 \times 10^7 / 0.0050$ $= 2.4 \times 10^{10} \text{ Pa}$	A1
3(a)(ii)	cross drawn at (1.0%, $24 \times 10^7 \text{ Pa}$), labelled Q	B1
3(b)	resultant force (in any direction) is zero	B1
	resultant moment / torque (about any point) is zero	B1
3(c)(i)	(moment =) $33 \times 0.65 / 2$ or $1.5 \times (0.65 - 0.12)$ or $T \sin 50^\circ \times (0.65 / 2)$	C1
	sum of clockwise moments = sum of anticlockwise moments $33 \times (0.65 / 2) + 1.5 \times (0.65 - 0.12) = T \sin 50^\circ \times (0.65 / 2)$	C1
	tension = 46 N	A1
3(c)(ii)	$\sigma = F / A$	C1
	$\pi r^2 = 46 / (1.5 \times 10^7)$ $r = 9.9 \times 10^{-4} \text{ m}$	A1

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Question	Answer	Marks
3(c)(iii)	elastic limit is not reached or (new) stress is less than (stress at) elastic limit or (new) strain is less than (strain at) elastic limit	M1
	(so the wire behaves) elastically	A1

Question	Answer	Marks
4(a)	longitudinal waves have oscillations <u>parallel</u> to the (direction of) transfer of energy	B1
	transverse waves have oscillations <u>perpendicular</u> to the (direction of) transfer of energy	B1
4(b)(i)	A marked at the open end of the pipe	B1
4(b)(ii)	$f = v / \lambda$	C1
	$\lambda = 4 \times 4.5 \times 10^{-2}$	C1
	$f = 340 / (4 \times 4.5 \times 10^{-2})$ = 1900 Hz	A1
4(b)(iii)	the node–antinode distance is longer or the wavelength (of the wave) is longer	M1
	(the speed of sound is constant so) the frequency (of the wave) is lower	A1

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Question	Answer	Marks
5(a)	energy transferred per unit charge (from electrical to other forms)	B1
5(b)(i)	heater	A1
5(b)(ii)	$(V =) 7.0 \times 0.86 = 6.0 \text{ (V)}$	A1
5(b)(iii)	$I = (230 - 6.0) / 170$ $(= 1.3 \text{ A})$	C1
	$I_1 = 7.0 - 1.3$ $= 5.7 \text{ A}$	A1
5(b)(iv)	$V = 230 - 6.0 - (5.7 \times 2.4)$	C1
	$= 210 \text{ V}$	A1
	or	
	$R = ((230 - 6.0) / 5.7) - 2.4$ $(= 36.9 \Omega)$	(C1)
	$V = 5.7 \times 36.9$ $= 210 \text{ V}$	(A1)

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Question	Answer	Marks
5(b)(v)	$P = IV$ or $P = I^2R$ or $P = V^2 / R$	C1
	$P = 5.7 \times 210$ or $P = 5.7^2 \times (210 / 5.7)$ or $P = 210^2 / (210 / 5.7)$ $P = 1200 \text{ W}$	A1
5(b)(vi)	% efficiency = <u>useful</u> power out / (total) power in ($\times 100$)	C1
	$= 1200 / (230 \times 7.0) (\times 100)$ $= 0.75 (\times 100)$ $= 75\% \text{ or } 74\% \text{ (using 3 s.f. value from (v) gives 74\%)}$	A1
5(b)(vii)	(current) decreases	A1

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Question	Answer	Marks
6(a)	mass of α (particle) is <u>much</u> greater (than β^+ particle)	B1
	both particles are positively charged	B1
	(magnitude of) charge on α (particle) is twice the charge (on β^+ particle)	B1
6(b)(i)	cross labelled Q at (82, 212)	B1
6(b)(ii)	particles emitted are: • beta-minus (particle) / electron • (electron) antineutrino either particle named	B1
	both particles named and no incorrect particles named	B1
6(c)(i)	$212(u) \times 1.3 (\times 10^5) \sin 68^\circ$ or $4(u) \times 150 (\times 10^5) \sin \theta$	C1
	$4(u) \times 150 (\times 10^5) \times \sin \theta = 212(u) \times 1.3 (\times 10^5) \times \sin 68^\circ$	C1
	$\sin \theta = 0.426$ $\theta = 25^\circ$	A1
6(c)(ii)	$E = \frac{1}{2}mv^2$	C1
	$= \frac{1}{2} \times 4 \text{ u} \times (150 \times 10^5)^2$ $= \frac{1}{2} \times 4 \times 1.66 \times 10^{-27} \times (150 \times 10^5)^2$ $= 7.5 \times 10^{-13} \text{ J}$	A1

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Abbreviations

/	Alternative and acceptable answers for the same marking point.
()	Bracketed content indicates words which do not need to be explicitly seen to gain credit but which indicate the context for an answer. The context does not need to be seen but if a context is given that is incorrect then the mark should not be awarded.
—	Underlined content must be present in answer to award the mark. This means either the exact word or another word that has the same technical meaning.

Mark categories

B marks	These are <u>independent</u> marks, which do not depend on other marks. For a B mark to be awarded, the point to which it refers must be seen specifically in the candidate's answer.
M marks	These are <u>mandatory</u> marks upon which A marks later depend. For an M mark to be awarded, the point to which it refers must be seen specifically in the candidate's answer. If a candidate is not awarded an M mark, then the later A mark cannot be awarded either.
C marks	These are <u>compensatory</u> marks which can be awarded even if the points to which they refer are not written down by the candidate, providing subsequent working gives evidence that they must have known them. For example, if an equation carries a C mark and the candidate does not write down the actual equation but does correct working which shows the candidate knew the equation, then the C mark is awarded. If a correct answer is given to a numerical question, all of the preceding C marks are awarded automatically. It is only necessary to consider each of the C marks in turn when the numerical answer is not correct.
A marks	These are <u>answer</u> marks. They may depend on an M mark or allow a C mark to be awarded by implication.

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Question	Answer	Marks
1(a)	rate of change of velocity	B1
1(b)(i)	curved path from aircraft to ground, starting horizontal at aircraft and then with increasing negative gradient as it moves towards the ground	B1
1(b)(ii)	$s = ut + \frac{1}{2}at^2$ $63 = \frac{1}{2} \times 9.81 \times t^2$	C1
	time = 3.6 s	A1
1(b)(iii)	$v^2 = 2 \times 9.81 \times 63$ or $v = 0 + (9.81 \times 3.6)$ or $63 = (v \times 3.6) - (\frac{1}{2} \times 9.81 \times 3.6^2)$ or $63 = \frac{1}{2} \times (0 + v) \times 3.6$ $v = 35 \text{ m s}^{-1}$	A1
1(b)(iv)	speed ² = 35 ² + 42 ²	C1
	speed = 55 m s ⁻¹	A1

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Question	Answer	Marks
2(a)	<u>sum / total</u> momentum (of a system of bodies) is constant or <u>sum / total</u> momentum before = <u>sum / total</u> momentum after	M1
	for an isolated system / no (resultant) <u>external</u> force	A1
2(b)(i)	$240 \times 16 = 480v$ and so $v = 8.0 \text{ m s}^{-1}$ or (initial momentum =) $240 \times 16 (= 3840 \text{ g m s}^{-1})$ and $v = 3840 / 480 = 8.0 \text{ m s}^{-1}$	A1
2(b)(ii)	$(E_k =) \frac{1}{2} mv^2$	C1
	$\Delta E_k = \frac{1}{2} [(0.24 \times 16^2) - (0.48 \times 8.0^2)]$	C1
	$= 15 \text{ J}$	A1
2(c)(i)	$F = (0.24 \times 16) / (2.0 \times 10^{-3})$ or $F = (0.48 \times 8) / (2.0 \times 10^{-3})$	C1
	$= 1900 \text{ N}$	A1
	direction: to the left	B1
2(c)(ii)	equal (magnitude)	B1
	opposite (direction)	B1

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Question	Answer	Marks
3(a)	(for a system in equilibrium,) sum of clockwise moments (about a point) equals sum of anticlockwise moments (about the same point)	B1
3(b)(i)	2.6×0.40 or $F \times 0.40$ (any one moment)	C1
	$U = 4.0 - F$ $= 4.0 - (2.6 \times 0.40 / 0.40) = 1.4 \text{ N}$	A1
	or	
	2.6×0.4 or $(4.0 - U) \times 0.4$	(C1)
	$2.6 \times 0.4 = (4.0 - U) \times 0.4$ hence $U = (4.0 - 2.6) = 1.4 \text{ N}$	(A1)
3(b)(ii)	$U = \rho g V$ and $A = V / h$ or $p = h \rho g$ and $A = U / p$ or $A = U / h \rho g$	C1
	$A = 1.4 / (0.10 \times 1.0 \times 10^3 \times 9.81)$	C1
	$= 1.4 \times 10^{-3} \text{ m}^2$	A1
3(c)	line starting at (0.10, 0.40)	B1
	straight line with negative gradient	B1
	line ending at (0.29, 0)	B1

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Question	Answer	Marks
4(a)(i)	(normal) force per unit cross-sectional area	B1
4(a)(ii)	extension per unit unstretched length	B1
4(b)(i)	$E = FL / Ax$	C1
	$A = (9.0 \times 0.84) / (1.9 \times 10^9 \times 0.47 \times 10^{-3})$	C1
	$= 8.5 \times 10^{-6} \text{ m}^2$	A1
4(b)(ii)	F , L and x are all the same (for both wires / as in X) or F and strain are the same	B1
	A is greater (for Y), so the Young modulus (for Y) is less than $1.9 \times 10^9 \text{ Pa}$ or less than that of wire X	B1

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Question	Answer	Marks
5(a)(i)	cross labelled N marked at the intersection of the solid and dashed lines or at X or Y and cross labelled A marked at a peak or a trough	B1
5(a)(ii)	(XY is 1.5 wavelengths, so) wavelength = $0.48 \times (2 / 3) = 0.32$ m or (wavelength is twice node–node distance so) $\lambda / 2 = 0.48 / 3 = 0.16$ m and wavelength = $0.16 \times 2 = 0.32$ m	B1
5(a)(iii)	$v = f\lambda$	C1
	frequency = $1400 / 0.32$ = 4400 Hz	A1
5(b)(i)	$f_o = f_s v / (v - v_s)$ $f_o = (780 \times 320) / (320 - 39)$	C1
	maximum frequency = 890 Hz	A1
5(b)(ii)	line showing f varying both above and below a mean frequency and returning to the original start value of f	B1
	a single cycle of a smoothly oscillating curve of correct phase (starting at mean position, falling to a trough, then rising to a peak, ending at mean position)	B1

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Question	Answer	Marks
6(a)	potential difference per unit current	B1
6(b)(i)	$\rho = RA / L$	C1
	$= (0.33 \times 8.0 \times 10^{-6}) / 2.4$	A1
	$= 1.1 \times 10^{-6} \Omega \text{ m}$	
6(b)(ii)	$Q = It$	C1
	$= 4.7 \times 5.0 \times 60$	A1
	$= 1400 \text{ C}$	
6(b)(iii)	$I = nAvq$	C1
	$n = 4.7 / (8.0 \times 10^{-6} \times 0.16 \times 10^{-3} \times 1.60 \times 10^{-19})$	
	$= 2.3 \times 10^{28} \text{ m}^{-3}$	A1
6(c)(i)	correct symbols for resistor and thermistor, shown correctly connected in series with the battery	B1
6(c)(ii)	(as temperature increases) resistance of thermistor decreases	M1
	(total resistance decreases so) greater current (in circuit/wire) so power (dissipated in the wire) increases or (total resistance decreases so) greater (share of) p.d. across wire so power (dissipated in the wire) increases	A1

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Question	Answer	Marks
7(a)	up quark charge = $(+) \frac{2}{3}$ and down quark charge = $-1/3$	B1
	strange quark charge = $-1/3$	B1
	up antiquark charge = $-2/3$ and down antiquark charge = $(+) \frac{1}{3}$ and strange antiquark charge = $(+) \frac{1}{3}$	B1
7(b)(i)	hadron(s)	B1
7(b)(ii)	baryons composed of three quarks or baryons composed of three antiquarks	B1
	mesons composed of one quark and one antiquark	B1
7(c)	up quark changes to a down quark	B1
	positron and (electron) neutrino (emitted)	B1