GCE A LEVEL MARKING SCHEME

SUMMER 2024

A LEVEL
PHYSICS – COMPONENT 2
A420U20-1

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About this marking scheme

The purpose of this marking scheme is to provide teachers, learners, and other interested parties, with an understanding of the assessment criteria used to assess this specific assessment.

This marking scheme reflects the criteria by which this assessment was marked in a live series and was finalised following detailed discussion at an examiners' conference. A team of qualified examiners were trained specifically in the application of this marking scheme. The aim of the conference was to ensure that the marking scheme was interpreted and applied in the same way by all examiners. It may not be possible, or appropriate, to capture every variation that a candidate may present in their responses within this marking scheme. However, during the training conference, examiners were guided in using their professional judgement to credit alternative valid responses as instructed by the document, and through reviewing exemplar responses.

Without the benefit of participation in the examiners' conference, teachers, learners and other users, may have different views on certain matters of detail or interpretation. Therefore, it is strongly recommended that this marking scheme is used alongside other guidance, such as published exemplar materials or Guidance for Teaching. This marking scheme is final and will not be changed, unless in the event that a clear error is identified, as it reflects the criteria used to assess candidate responses during the live series.

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GCE A LEVEL PHYSICS

COMPONENT 2 – ELECTRICITY AND THE UNIVERSE

SUMMER 2024 MARK SCHEME

GENERAL INSTRUCTIONS

Recording of marks

Examiners must mark in red ink.

One tick must equate to one mark (except for the extended response question).

Question totals should be written in the box at the end of the question.

Question totals should be entered onto the grid on the front cover and these should be added to give the script total for each candidate.

Marking rules

All work should be seen to have been marked.

Marking schemes will indicate when explicit working is deemed to be a necessary part of a correct answer.

Crossed out responses not replaced should be marked.

Credit will be given for correct and relevant alternative responses which are not recorded in the mark scheme.

Extended response question

A level of response mark scheme is used. Before applying the mark scheme please read through the whole answer from start to finish. Firstly, decide which level descriptor matches best with the candidate's response: remember that you should be considering the overall quality of the response. Then decide which mark to award within the level. Award the higher mark in the level if there is a good match with both the content statements and the communication statement.

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Marking abbreviations

The following may be used in marking schemes or in the marking of scripts to indicate reasons for the marks awarded.

cao = correct answer only
ecf = error carried forward
bod = benefit of doubt

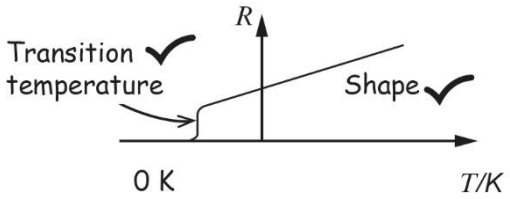
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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
1	(a)		[For a metal **conductor] at constant temperature** (1) the **current is** directly **proportional to** the applied **pd** (1) Accept $I \propto V$ for second mark $V = IR$ award 1 mark only	2			2		
	(b)	(i)	Graph is straight line <u>through origin</u> from 0 – 0.5 V **OR** use of data from the graph to show R is constant (1) {Line is not straight / gradient changes / gradient reduces / no longer proportional} for full range of voltage **OR** beyond 0.5 or 1 V (1)			2	2		
		(ii)	Correct values of I from graph at both 2.5 V and 5.0 V (1) i.e. 0.33 A and 0.45 A Application of $R = \frac{V}{I}$ at 2.5 V, R = 7.6 Ω **and** at 5.0 V, R = 11.1 Ω (**ecf** on values of I from graph) (1) Concept of {electrons / free charges} colliding with {lattice / atoms} (1) accept particles At higher voltage (or at 5 V) or increasing voltage, collisions become 'harder' / more frequent / lead to increased [amplitude] vibrations [of lattice / atoms] / transfer some of their KE (1) **For the 5th mark either:** - leading to increased resistance **OR** - leading to current increasing but not at same rate as voltage. Don't accept decreased current. - so leading to electrons losing more energy Treat as neutral reference to temperature	1 1 1	1 1		5	2	

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(c)		I = 0.36 [A] (1) Substitution into: $V = E - Ir$ or by implication e.g. 3.0 = 3.6 – (0.36)r (1) **ecf** on I r = 1.67 [Ω] and $\frac{r}{3}$ = 0.55 [Ω] seen (1) **Alternative:** R = 8.3[3 Ω] (1) $E = I(R + r)$ or by implication e.g. 3.6 = 0.36 (8.3[3] + r) (1) **ecf** on I r = 1.67 [Ω] and $\frac{r}{3}$ = 0.55 [Ω] seen (1) **Alternative (working backwards):** Total $R = \frac{3.6}{0.36}$ = 10 [Ω] (1) [Note- I obtained from graph at bulb R of 3.0 V] If total r = 1.5 [Ω], then R_{bulb} = 8.5 [Ω] (1) Then V_{bulb} = 0.36 **ecf** × 8.5 = 3.06 [V] (1)	1	1 1		3	2	
	(d)	(i)	[A material / conductor with] zero / negligible resistance or resistivity	1			1		

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	 Overall shape with sudden drop in temp seen (1) Transition temperature labelled clearly (as shown) (1) accept critical temperature **or** temperature at which superconductivity occurs Axes – For RT axes with units of T in either K or °C with an appropriate value for T correctly positioned (1) (Note - position of vertical R axis must be consistent with temperature axis)	3			3		
			Question 1 total	**10**	**4**	**2**	**16**	**4**	**0**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
2	(a)		**Either:** 9 = 0.5R_{Total} **or** R_{Total} shown to be 18 Ω **and** R_1 = (18 – 6) = 12 [Ω] (1) **Or:** $I = \frac{9}{18}$ = 0.5 [A] (1) **Or:** V across 6 Ω resistor = 0.5 × 6 [= 3 V] and $R_1 = \frac{(9-3)}{0.5}$ = 12 [Ω] (1)		1		1	1	
	(b)	(i)	**Either:** Assuming R_2 = R_1 total circuit R = 12 Ω (1) - must be shown clearly Then $I = \frac{9}{12}$ = 0.75 [A] – consistent (1) **Or:** For a current of 0.75 A, total circuit R shown to be 12 Ω so R = $\frac{9}{0.75}$ seen (1) Clear algebra to show that R_2 also = 12 Ω e.g. parallel combination = (12 – 6) and $\frac{1}{6} = \frac{1}{12} + \frac{1}{R_2}$ etc - consistent (1) **Or:** Assuming R_2 = R_1 total circuit R = 12 Ω (1) - must be shown clearly Then, for a current of 0.75 A, V = 0.75 × 12 [= 9 V] shown – consistent (1) **Or:** V across 6 Ω = 4.5 V (i.e. 0.75 × 6) so V across R_2 = 4.5 [V], I = 0.375 [A] (1) $R = \frac{4.5}{0.375}$ [=12 Ω] – consistent (1)		2		2	2	

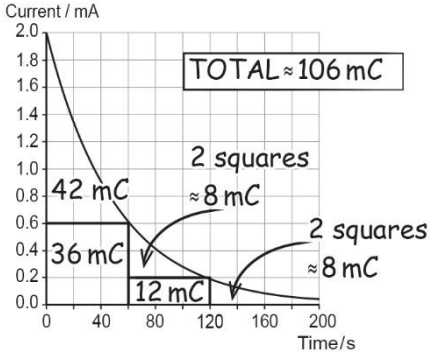
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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	For I = 1.2 A, total parallel resistance shown = 1.5 [Ω] (1) Application of resistance in parallel formula: $\frac{1}{1.5} = n\left(\frac{1}{12}\right)$ **or** $1.5 = \frac{12}{n}$ (1) n = 8 (1) **Alternative:** pd across 6 Ω = [6 × 1.2 =] 7.2 [V], so pd across parallel combination = 1.8 [V], so $R_{\text{parallel}} = \frac{1.8}{1.2}$ = 1.5 [Ω] (1) $\frac{12}{n} = 1.5$ (1) n = 8 (1) **Alternative:** $9 = 1.2\left(6 + \frac{12}{n}\right)$ (1) $1.5 = \frac{12}{n}$ (1) n = 8 (1)		3		3	2	
		(iii)	Total parallel $R \rightarrow 0$ [as more resistors are added] **OR** circuit resistance → 6 Ω (1) Hence max current (or 1.5 A seen) (1)			2	2	1	
			Question 2 total	**0**	**6**	**2**	**8**	**6**	**0**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
3	(a)	(i)	**Any two × (1) from:** • Zero error in ohmmeter • Resistance of crocodile clips or resistance [of connecting] wires or contact resistance • Measured length < actual length or by implication e.g. kinks in wire. Accept inaccurate measure of length. Don't accept measured length > actual length			2	2		2
		(ii)	Gradient will remain unchanged (ρ depends on gradient)			1	1		1
	(b)		Max calculated = 24.5 ± 0.2 **and** min calculated = 21.8 ± 0.2 (1) Mean gradient = 23.2 **(ecf)** (1) Absolute uncertainty determined = 1.4 **(ecf) or** % uncertainty = 5.8% (1) Resistivity = 23.2 **(ecf)** $\times$ 4.8 $\times$ 10^{-8} = 1.1 $\times$ 10^{-6} [Ωm] (1) % uncertainties added (**ecf** in uncertainty for gradient) = 5.8 % + 8.3 % = 14.1 [%] (1) Absolute uncertainty = 0.16 $\times$ 10^{-6} [Ωm] (1) **ecf** from incorrect % uncertainties Final answer: (1.1 ± 0.2) $\times$ 10^{-6} Ωm or (1.11 ± 0.16) $\times$ 10^{-6} Ωm value for absolute uncertainty to 1 or 2 sig figs and consistent dps with ρ (1) **UNIT MARK ecf**			7	7	7	7
			Question 3 total	**0**	**0**	**10**	**10**	**7**	**10**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
4	(a)		**Either:** Any reasonable attempt at area under graph (1) Good and valid attempt to show $Q \approx 100$ mC e.g. One square represents 4 mC ($0.2 \times 10^{-3} \times 20$) Approx 25 squares where half of the square or more under graph (1) **Or:** Breakdown of area into squares / rectangles / triangles: e.g.  **Or:** Tangent from initial (or any) current drawn and CR determined (50 s) (1) Clear algebra ($Q = 2 \times 10^{-3} \times 50$) seen (1) **Or:** Diagonal straight line from I = 1.0 mA to t = 200 s (1) $\frac{1}{2} \times 1 \times 10^{-3} \times 200$ [= 0.1 C] (1) **OR** $2 \times 10^{-3} \times 0.37 = 0.74$ mA, which corresponds to 50 s (1) $2 \times 10^{-3} \times 50 = 100$ mC (1) **OR** $2 \times 10^{-3} \times 0.37 = 0.74$ mA, which corresponds to 50 s (1)		2		2	2	

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
			Then $50 = \frac{10}{2 \times 10^{-3}} C$ so C = 0.01 [F] then $Q = CV$ = 0.01 × 10 = 0.1 [C] (1)						
	(b)	(i)	V_0 = 10 V (1) $C = \frac{Q}{V} = \frac{0.1}{10}$ = 0.01 [F] (substitution and answer) (1) $R = \frac{V}{I} = \frac{10}{2 \times 10^{-3}}$ = 5000 [Ω] (substitution and answer) (1) **Alternative for last two marks:** Find CR = 50 s from graph C or R found from above methods (1) and CR used to find other value (1) **Alternative:** V_0 = 10 V (from the diagram) (1) I_0 = 2.0 mA (from the graph) $\rightarrow R = \frac{V_0}{I_0} = \frac{10}{2.0}$ = 5.0 k[Ω] (1) From the graph the time constant is 50 seconds (the time for the current to drop to 0.37 of its original value, i.e. 0.74 mA) [Note: you can do this from the current graph because the exponential variation is the same as for the voltage] $\therefore\ RC = 50\,\text{s} \rightarrow C = \frac{50}{5.0}$ = 10 m[F] (1)	1	1 1		3	2	

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	Time constant identified as 50 s **(ecf if found from (b)(i))** or use of e^{-1} (1) V calculated = 3.6[7 V] (1) $I = \frac{3.67}{5\,000}$ = 0.73 mA and statement that this agrees with graph value at t = 50 s (1) **Alternative:** Pd across capacitor when $t = RC$ = 0.37 (1) × 10 V = 3.7 V (1) ∴ current = $\frac{3.7}{5.0}$ = 0.74 mA		3		3	2	
	(c)	(i)	$Q = CV$ seen (1) Substitution (1) Accept ½ QV = ½ × 100 × 10^{-3} × 10 = 0.55 **and** ½ CV^2 = ½ × 0.01 × 10^2 = 0.55 (1) Therefore equivalent formulae (1)	2			2	1	
		(ii)	V at t = 60 s calculated: (= 3 V) (1) Substitution: U = ½ × 0.01 **ecf** × $(3)^2$ = 0.045 [J] (1) **Or:** Use of other energy formulae with Q approx. = 30 mC (1) Substitution and answer (1) e.g. $\frac{(30 \times 10^{-3}\ \textbf{ecf})^2}{2 \times 0.01\,\textbf{ecf}}$ **or** (0.5 × 30 × 10^{-3} **ecf** × 3)		2		2	2	
			Question 4 total	**3**	**9**	**0**	**12**	**9**	**0**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
5	(a)		**Indicative content:** **Common features:** • Gravitational and electric fields are both vectors. • Gravitational and electric potentials are both scalars. • Both gravitational force (between masses) and electrostatic force (between charges) vary inversely with square of separation. • Both gravitational force between masses and electrostatic force between charges are directly proportional to product of masses or charges. • Both g and E fields can be represented by field lines which show direction of force on a point mass (g field) or point positive charge (E field). • Field strength at a point is given by the negative slope of the V-r graph at that point for both electric and gravitational fields • The separation of the field lines indicates the strength of the field in both cases. • Both gravitational field strength (due to a point mass) and electric field strength (due to a point charge) vary inversely with the square of the distance from the mass and charge respectively. • Gravitational potential at a point in a gravitational field is the work done in bringing unit mass from infinity to the point. Electric potential at a point in an electric field is the work done in bringing a positive unit charge from infinity to that point. • Both gravitational potential and electric potential are inversely proportional to the distance from the source of the field. • Equipotential surfaces/lines can be used to represent potential in both gravitational and electric fields.	6			6		

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
			Differences • There are positive and negative charges, but only positive masses. • The gravitational force is always attractive, whereas the electric force can be attractive or repulsive, depending on the sign of the charges. • The electric force between two charges is affected by the medium of the material between them, whereas the gravitational force is independent of the medium between the masses. • Scale: Gravitational fields are on galactic scale, whereas electric fields are on atomic/much smaller scale **5-6 marks** Responses include reference to forces, field strength and potential. At least two differences are identified. *There is a sustained line of reasoning which is coherent, relevant, substantiated and logically structured*. **3-4 marks** Responses include reference to two of force, field strength and potential. At least one difference is identified. *There is a line of reasoning which is partially coherent, largely relevant, supported by some evidence and with some structure.* **1-2 marks** Responses refer to one from force, field strength or potential. *There is a basic line of reasoning which is not coherent, largely irrelevant, supported by limited evidence and with very little structure.* **0 marks** No attempt made or no response worthy of credit.						

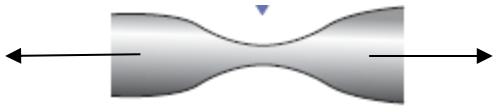
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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
	(b)	(i)	Substitution into $E = \frac{V}{d}$ with correctly converted units for V and d i.e - $\left(\frac{1000\text{ V}}{0.1}\right)$ **or** $\left(\frac{1\text{ kV}}{0.1}\right)$ (1) Do not award mark for $\frac{V}{d}$ and 10 000 N C^{-1} only		1		1	1	
		(ii)	Weight arrow vertically downwards Electric force arrow horizontal and to the right Tension arrow diagonally upwards along (or parallel to) string [2 marks for all three correct arrows, 1 mark for two correct arrows, 0 for only one or no correct arrows]. Ignore positioning of arrows. **Labelling:** Accept: weight or mg or $24 \times 10^{-6} \times g$ **or** 2.3[5] $\times 10^{-4}$ N **or** F_g Electric force, or F_E or equivalent Tension or T [All needed for 1 mark]		3		3		

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(iii)	Vertical: mg = Tcos15° (or equivalent e.g. 0.00024 = T) (1) Horizontal: 10 000q = Tsin15° (or equivalent e.g. 38 637q = T) (1) Substitution and convincing algebra: e.g. 0.00024 = 38 637q **ecf** **or** $q = \frac{mg \text{ x } \tan 15}{10 \text{ x } 10^3}$ (1) q = (-) 6.3 × 10^{-9} C ((-) 6.3 nC) **UNIT MARK** (1) Deduct 1 mark only for power of 10 slips		4		4	4	
	(c)		$\frac{6.3 \text{ x } 10^{-9}}{1.6 \text{ x } 10^{-19}}$ seen (= 3.9 × 10^{10}) – not justified (1) **Ecf** on q and appropriate consequent response			1	1	1	
			Question 5 total	**6**	**8**	**1**	**15**	**6**	**0**

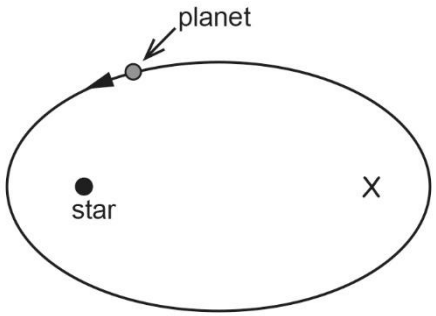
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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
6	(a)	(i)	Diagram as shown below, can be any orientation. Force arrows must be included but labelling isn't required. 	1			1		
		(ii)	CSA decreased / minimum / smallest (1) Link to stress = $\frac{F}{A}$ smallest A, gives largest stress (1)	2			2		
	(b)	(i)	Realisation that l, A and e are the same for both wires e.g. $E_{\text{steel}} = \frac{F_{\text{steel}} \times l}{Ae}$ **or** $E_{\text{titanium}} = \frac{F_{\text{titanium}} \times l}{Ae}$ seen (1) Convincing algebra (1) **Alternative:** $F = AEe$ and area and strain are constant then $F \propto E$ (1) E_t is twice E_s then F_t is twice F_s (1)		2		2	2	

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	F_{steel} = 10 N **or** $F_{titanium}$ = 20 N determined (1) **For steel:** $e = \frac{(10 \times 1.2)}{(\pi \times (0.7 \times 10^{-3})^2 \times 200 \times 10^9)}$ Substitute and rearrange **For titanium:** $e = \frac{(20 \times 1.2)}{(\pi \times (0.7 \times 10^{-3})^2 \times 400 \times 10^9)}$ Substitute and rearrange (1) $e = 3.9 \times 10^{-5}$ [m] (1) Award 1 mark for use of 30 N leading to $e = 5.85 \times 10^{-5}$ [m] for titanium or 1.17×10^{-4} [m] for steel		3		3	3	
		(iii)	Reference to ½ $F\Delta l$ **or** ½$k\Delta l^2$(1) and $F_{titanium} \neq F_{steel}$ **or** k is different for different materials (1) so incorrect Don't allow ecf for the 2nd mark if 30 N used in (ii)			2	2		
			Question 6 total	**3**	**5**	**2**	**10**	**5**	**0**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
7	(a)	(i)	X placed at equivalent point on RHS of ellipse (by eye) e.g.  	1			1		
		(ii)	K2- Reference to sweeping out equal areas in equal intervals of time. e.g. time to traverse A = time to traverse B (1) Therefore speed to traverse A > speed to traverse B (1)	2			2		
	(b)	(i)	Methodology: e.g. attempt at $\frac{T^2}{r^3} = k$ for both moons, or k found for one moon and attempted substitution for T or r for other moon (1) $k = 3.1 \times 10^{-16}$ **for both** moons or correct appropriate substitution and answer for T or r seen (1) **OR** $\frac{r^3}{T^2}$ used (1) look for 3.2×10^{15} (1)			2	2	2	

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
		(ii)	$T^2 = \frac{4\pi^2 r^3}{GM}$ or equivalent seen or by implication (1) Substitution and rearrangement for one Moon: e.g. for Io $M = \frac{(4\pi^2 \text{ x } (4.22 \text{ x } 10^8)^3)}{(6.67 \text{ x } 10^{-11} \text{ x } (1.53 \text{ x } 10^5)^2)}$ **or** $\frac{r^3}{T^2} \text{x} \left(\frac{4\pi^2}{G}\right)$ where $\frac{r^3}{T^2}$ = 3.2×10^{15} (1) $M = 1.9 \times 10^{27}$ [kg] (1)	1	1 1		3	2	
	(c)	(i)	Use of $v = \left(\frac{GM}{r}\right)^{\frac{1}{2}}$ (1) Substitution and answer: $v = 4 \times 10^5$ [m s^{-1}] (1)	1	1		2	1	
		(ii)	[Greater observed velocity] implies greater mass **or** unaccounted mass (1) Which implies existence of dark matter **or** reference to mass that can't be observed or detected (1) Higgs Boson possible source [of dark matter / mass] (1)		3		3		
	(d)		**Any two × (1) from:** • Carry out further independent measurements of different galaxies • Another team to carry out measurements of the same galaxy • Review theory (put forward explanations) • Data or results is peer reviewed Don't accept more research / tests / observations			2	2		
			Question 7 total	**5**	**6**	**4**	**15**	**3**	**0**

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
8	(a)		**Either:** $M_1r_1 = M_2r_2$ and substitution: $9.03 \times 10^{29} \times r_1 = 3.26 \times 10^{26}$ $(1.06 \times 10^9 - r_1)$ (1) $r_1 = 3.83 \times 10^5$ [m] (1) or 383 km **Or:** $r_1 = \frac{M_2 d}{(M_1 + M_2)}$ and substitution: $r_1 = \frac{3.26 \times 10^{26} \times 1.06 \times 10^9}{9.033 \times 10^{29}}$ (1) $r_1 = 3.83 \times 10^5$ [m] (1) or 383 k[m]		2		2	2	
	(b)		$v = \frac{0.2 \times 10^{-12} \times 3 \times 10^8}{656 \times 10^{-9}}$ (1) $v = 91.5$ [m s^{-1}] (1) $T = \frac{2\pi \times 4 \times 10^5}{91.5}$ (**ecf** on v) (1) $T = 2.75 \times 10^4$ (= 7.6 hrs) (1) or 2.63×10^4 **(= 7.23 hrs) if 383 km used** **Alternative for final 2 marks:** $v = \frac{2 \times \pi \times 4 \times 10^5}{7 \times 60^2}$ (1) = 95.5 [m s^{-1}] **and** comment that period must be > 7 hours (1) **Alternative working backwards** to show $\Delta\lambda \approx 0.2$ pm e.g. $v = \frac{2 \times \pi \times 4 \times 10^5}{7 \times 60^2}$ (1) = 95.5 [m s^{-1}] (1) $\Delta\lambda = \frac{95.5}{3 \times 10^8} \times 656 \times 10^{-9}$ (1) $\Delta\lambda = 0.2$ p[m] (1)			4	4	4	

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Question			Marking details	Marks available					
				AO1	AO2	AO3	Total	Maths	Prac
			OR Use of $T = 2\pi\sqrt{\frac{d^3}{G(M_1+M_2)}}$ so T = 27 935 [s] (≈ 7.8 hours) Then $T = \frac{2 \text{ x } \pi \text{x } 400 \text{ x } 10^3}{27\,935}$ (1) ≈ 90 [m s^{-1}] (1) Then $\Delta\lambda = \frac{90}{3 \text{ x } 10^8}$ x 656 x 10^{-9} (1) $\Delta\lambda$ = 0.2 p[m] (1)						
	(c)	(i)	Substitution in Stefan's law (1) P = 1.1 × 10^{25} [W] (1)	1	1		2	1	
		(ii)	Recall equation $I = \frac{P}{4\pi r^2}$ (1) r = 9.5 × 10^{15} × 28.5 (= 2.7 × 10^{17} m) (1) I = 1.2 × 10^{-11} [W m^{-2}] (1) **ecf from (i)**	1	1 1		3	2	
		(iii)	Use Wien's law to determine temperature at peak wavelength (of emitted radiation) or $\lambda_{peak} = \frac{W}{T}$ seen (1) $\lambda_{peak} = \frac{2.9 \text{ x } 10^{-3}}{3\,522}$ = 823 n[m] (1) which corresponds to (near) infra-red so star appears red (1)	1	1 1		3	1	
			Question 8 total	**3**	**7**	**4**	**14**	**10**	**0**

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A level component 2: Electricity and the Universe

SUMMARY OF MARKS ALLOCATED TO ASSESSMENT OBJECTIVES

Question	AO1	AO2	AO3	TOTAL MARK	MATHS	PRAC
1	10	4	2	16	4	0
2	0	6	2	8	6	0
3	0	0	10	10	7	10
4	3	9	0	12	9	0
5	6	8	1	15	6	0
6	3	5	2	10	5	0
7	5	6	4	15	3	0
8	3	7	4	14	10	0
TOTAL	**30**	**45**	**25**	**100**	**50**	**10**

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