Q1.

Question Number	Answer	Acceptable answers	Mark
(a)(i)	**B**	.	**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(ii)	substitution V = 0.039 x 185 (1) evaluation 7.215 (which is about 7.2) (V) (1)	Substitution 7.2 = I x 185 (1) transposition I = 7.2 ÷ 185 (1)	**(2)**

Question Number	Answer	Acceptable answers	Mark
(a)(iii)	**C** (same as)		**(1)**

Question Number	Answer	Acceptable answers	Mark
(a)(iv)	An explanation to include The resistance (of the LDR) changes Greater resistance when in the dark	 LDR has less resistance in the light	**(2)**

Question Number		Indicative Content	Mark
QWC	***(b)**	An explanation linking some of the following. • less current is used at night-time • Resistance (of LDR or circuit) would increase with less ambient light • Higher resistance will allow less current (in the circuit) (ORA) • Less current in circuit means less energy from the battery • Less power required in the dark ORA for light conditions • Less current means less energy transferred (per second) • Total energy transferred is less during night time (than it would otherwise have been) due to the higher resistance of the LDR	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• A limited explanation linking the light level to EITHER resistance OR current. eg. It increases the resistance in the dark. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• A simple explanation linking the light level to TWO of resistance, current, energy. eg. At night-time its resistance would increase. This would reduce the current from the battery • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed explanation linking the light level to resistance AND current, AND energy. e.g. At night-time the resistance would be more. This would reduce the current and mean that the battery will not have to supply as much energy. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q2.

Question number	Answer	Additional guidance	Mark
(a)(i)	Any one reason from: • the thermistor and the water are at the same temperature (1) • large volume of water gives a steady temperature rise (1)	accept idea that only small part of thermometer would be in contact with a thermistor in air accept difficult to control change in temperature of thermistor when heated in air	(1)

Question number	Answer	Additional guidance	Mark
(a)(ii)	Any one of the following developments to the procedure: • add ice to increase lower limit of temperature range (1) • use liquid with higher boiling point to increase upper limit of temperature range (1)	accept named liquid with higher boiling point, e.g. oil	(1)

Question number	Answer	Additional guidance	Mark
(b)	A comparison and contrast that must include at least **one** similarity and **one** difference from the following points to a maximum of three marks: Similarities • resistance of both changes with temperature (1) • both graphs show a non-linear relationship (1) • data comparison, e.g. both have the same resistance at 80 °C (1) Differences • resistance of A decreases with temperature but resistance of B increases with temperature (1) • for A, (largest slope/rate of change) is at lower temperature but for B, (largest slope/rate of change) is at higher temperature(s) (1) • for B, resistance is constant below 50 °C but for A resistance is roughly constant above 60 °C (1)	accept (smallest slope/rate of change) for A is at higher temperature but (smallest slope/rate of change) for B is at lower temperature	**(3)**

Q3.

		Indicative Content	Mark
		A explanation including some of the following points Light dependent resistors (LDR) • Resistance changes with light intensity • Bright light , low resistance • No light (dark), high resistance • Low resistance gives high current.(RA) Thermistor • Resistance changes with temperature • Negative temperature coefficient • High temperature, low resistance • Low temperature, high resistance • Low resistance gives high current (RA)	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited explanation linking light affecting LDR AND heat affecting thermistor OR a correct relationship for one device, e.g. thermistors change resistance when the temperature changes and LDRs change resistance when it gets dark OR the resistance decreases/ current increases of a LDR when the light gets brighter • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple explanation correctly linking the temperature and light with resistance or current for both devices OR a correct relationship for one device with a link to the way this affects the current	

		and resistance. e.g. the resistance of a LDR increases when the light gets dimmer and when the temperature lowers the resistance of a thermistor increases OR the resistance of a LDR decreases when the light gets brighter and this increases the current • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed explanation including the qualitative relationships for both devices and a link to the way resistance change affects the current in BOTH of them, e.g. the resistance of a LDR is less when the light gets brighter which increases the current. When the temperature lowers the resistance of a thermistor increases. This means that the current will decrease as the thermistor cools down. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors