Question Number	Answer	Acceptable answers	Mark
1(a)(i)	<table><tr><th>component</th><th>~</th></tr><tr><td>ammeter</td><td></td></tr><tr><td>coil of wire</td><td></td></tr><tr><td>battery</td><td></td></tr><tr><td>magnet</td><td></td></tr><tr><td>voltmeter</td><td></td></tr></table>	one mark for each correct tick deduct 1 mark for each extra tick	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(a)(ii)	Explanation linking any two of • wind (speed) is not constant (1) • voltage depends on wind speed (1)	need idea of varying wind {electrical energy / electricity} depends on wind speed higher wind speed gives {higher voltage/more electrical energy/more electricity} = 2 marks voltage is alternating = 2 marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(a)(iii)	(saving) = 2 × 3 × 15 (1) 90 (p) (1)	award full marks for correct answer with no working 2 × 3 × 0.15 (£) 0.90	**(2)**

Question Number	Answer	Acceptable answers	Mark
1(b)	power = 2500 (W) (1) (current) = $\frac{2500}{230}$ (1) **ecf** 11 (A) (1)	award full marks for correct answer with no working [2.5/230 is 1 mark for these 2] 10.9 / 10.8... **accept** {0.01… / 0.11… / 1.1…} for 2 marks	**(3)**

Question Number	Answer	Acceptable answers	Mark
1(c)	EITHER sometimes no / very little wind (1) OR some appliances rated above 2 kW (1)	need wind vague references to weather are insufficient may use more than one appliance at once **or** house needs more (than 2kW) power not enough power for kettle **ignore** references to electrical energy / electricity	**(1)**

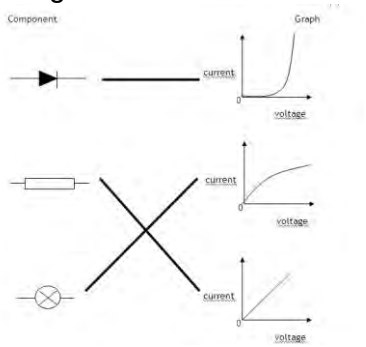
Total for Question 3 = 10 marks

Question Number	Answer	Acceptable answers	Mark
2(a)(i)	(correct) voltmeter symbol seen anywhere (1) voltmeter symbol connected in parallel / across heater (1)	accept symbols that are attempts at circles. accept line through symbol accept for second mark: any symbol or diagram of meter or box provided it is just from one side of the heater to the other	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(ii)	Substitution (into V = I x R) V = 0.56 x 15 (1) Evaluation = 8.4 (V) (1)	Allow full marks for correct answer with no working shown accept any power of 10 error for 1 mark e.g. 84 (V) or 0.84 (V) scores 1 mark accept rounding to 8 (V) for both marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iii)	Substitution Energy = 6.0 x 0.40 x 30 (1) Evaluation 72(J) (1)	accept any power of 10 error for 1 mark e.g. 720 or 7200 (J) scores 1 mark Allow full marks for correct answer with no working shown	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(a)(iv)	An explanation linking any two from: (there is the same) current in the (variable) resistor/ wires (1) (so) <u>energy</u> is {transferred/used/goes to/ lost/ wasted} in the <u>{(variable) resistor/wires}</u> (1) (so) <u>{(variable) resistor / wires}</u> gains/loses thermal energy (1)	 accept there is a p.d. across the (variable) resistor or {p.d./voltage} across heater is different to battery {p.d./voltage} ignore references to voltmeter and heater ignore 'energy wasted as heat' without qualification accept {resistor/wires} {heats/warms} (up) gains 1 mark energy lost in (variable) {resistor/ wires} as heat gains both marks	**(2)**

Question Number	Answer	Acceptable answers	Mark
2(b)	Connecting lines as shown  (2)	all 3 for 2 marks allow one mark if one or two lines correct more than one line from any component or to any graph is incorrect, so a maximum of 1 mark is possible	**(2)**

Total for Question 4 = 10 marks

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

Question Number	Answer	Acceptable answers	Mark
3 (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
3 (a)(iii)	**C** (same as)		**(1)**

Question Number	Answer	Acceptable answers	Mark
3(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	***3(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	

Total for Question 6 = 12 marks

Question Number	Answer	Acceptable answers	Mark
4(a)(i)	**C** electrons (1)		**(1)**

Question Number	Answer	Acceptable answers	Mark
4(a)(ii)	current (1) potential difference/voltage (1) Note: award one mark if these answers are in the wrong order	amps / A /mA/ amperage/ampage accept rate of flow of charge but, charge flowing is insufficient ignore electricity ie rate of flow of electricity does not score pd / p.d./ volts / V/ mV / kV etc can accept e.m.f / emf just potential is insufficient accept numerical responses with correct unit award one mark for: meter 1 = ammeter NOT ampmeter AND meter 2 = voltmeter NOT voltameter	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(b)	substitution 0.4 x 6 x 20 (1) evaluation 48 (J) (1) Ignore any unit given by the candidate	 Ignore power of 10 until evaluation e.g. 1 mark for 4.8 Give full marks for correct answer, no working	**(2)**

Question Number	Answer	Acceptable answers	Mark
4(c)	p.d. for current of 0.3 A = 3.0 (V) (1) substitution 3.0 ÷ 0.3 (1) evaluation 10 (Ω) (1) Ignore any unit given by the candidate	3 (V) seen in any calculation is enough for a mark check graph if no other mark 3 ÷ 0.3 gains two marks 0.3 ÷ 3 (= 0.1) gains 1 mark (for 3 V) or bald 0.1 scores 1 mark (for 3V) Allow clear ecf from incorrect reading from graph for maximum 2 marks ie their reading ÷ 0.3 but 0.3 ÷ 0.3 does NOT score unless 0.3 written on graph Give full marks for correct answer, no working DO NOT award any marks for POT error where there is no working.	**(3)**

(Total for Question 1 =8 marks)

Question Number	Answer	Acceptable answers	Mark
5(a)	- 1 joule per coulomb		**(1)**

Question Number	Answer	Acceptable answers	Mark
5(b)(i)	Substitution (1) 1800 = 230 x I Transformation (1) I = 1800 / 230 Evaluation (1) 7.8 (A) substitution and transposition can be in either order	 current = power / pd Any value which rounds to 7.8 such as 7.8261 Allow full marks for correct answer with no working shown	**(3)**

Question Number	Answer	Acceptable answers	Mark
5(b)(ii)	Using E = I x V x T: Substitution (1) 7.8 x 230 x 2 (x 60) Evaluation(1) 220 000 (J) (note: incorrect conversion of time loses the evaluation mark)	Allow ecf from 2(b)(i) Using energy = power x time 1800 x 2 (x 60) (1) Values which round to 220 000 such as 216 000 (J) 215 280 (J) Allow correct conversion to MJ or kJ Allow full marks for correct answer with no working shown	**(2)**

Question Number	Answer	Acceptable answers	Mark
5(b)(iii)	An explanation linking two from Energy is transferred (1) (as a result of) collisions of electrons (1) with ions/atoms / lattice (1)	electrons collide with each other for 2 marks	**(2)**

(Total for Question 2 = 8 marks)