

Question	Answer	Mark
1(a)(i)	12Ω	B1
(a) (ii)	$1/R = 1/R_1 + 1/R_2$ OR $1/R = 1/12 + 1/6$ OR $(R =) R_1R_2/(R_1 + R_2)$ OR $(12 \times 6)/(12 + 6)$ 4Ω	C1 A1
(a)(iii)	$4 + 6 = 10\Omega$	B1
(b)(i)	$(I = 12/10 =) 1.2A$	B1
(b)(ii)	$(E =) IVt$ OR $1.2 \times 12 \times 50$ OR I^2Rt OR $1.2^2 \times 10 \times 50$ OR V^2t/R OR $12^2 \times 50/10$ $720J$	C1 A1
		Total: 7

- 2 (a) (i) $P = IV$ OR $40 = 220 \times I$ OR $(I =) P/V$ OR $40/220$
0.18 A A1
- (ii) $[3 \times 0.18(2)] = 0.54 \text{ A}$ OR 0.55 A B
- (iii) $2/0.182 = 10.99$ OR $2/0.18 = 11.1$ C1
10 lamps OR 11 lamps A1
- (b) (i) Resistance increases B1
- (ii) Power (of lamp) decreases B1
 $P = IV$ and current in lamp decreases. OR $P = V^2/R$ B1

[Total: 8]

- 3 (a) rheostat/variable resistor AND control/vary/change/ limit the current /resistance/power/ voltage across heater [1]
- (b) $(I =) P/V$ any form, words or numbers [1]
 $(I =) 1.25 \text{ (A)}$ seen anywhere [1]
 $(V =) 6.0 - 3.6$ OR 2.4 seen anywhere [1]
 $(R =) V/I$ in any form words or numbers [1]
 1.92Ω (2 or 3 sig. figs.) [1]
note: credit will also be given for alternative approaches
- (c) battery running down/going flat/energy of battery used up OR V or e.m.f. less OR more/increasing resistance (of heater) NOT resistance of X increases [1]
use of relationship between I and V or R OR the current decreases [1]

- 4 (a) (i) $1/R = 1/R_1 + 1/R_2$ OR $R = R_1R_2/(R_1 + R_2)$ OR with numbers
($R =$) 500Ω C1
A1
- (ii) $I = (12 \div 1000) = 0.012\text{A}$ ecf (i) B1
- (iii) ($V =$) IR OR 0.012×500 OR $12 \times 500 \div 1000$
 $= 6.0\text{V}$ ecf (i)(ii) C1
A1
- (b) (more current in circuit so) current (in 500Ω resistor) increases B1
- resistance of parallel combination decreases
OR total resistance (of circuit) decreases B1

[Total: 7]

- 5 (a) (i) ammeter symbol in series with wire B1
- (ii) different results OR graph can be plotted OR to ensure wire does not overheat B1
- (b) (i) ($P =$) VI OR $V = IR$ OR 250×1.2 OR $300 (V)$
($P =$) I^2R OR $250^2 \times 1.2$ OR 300×250 C1
 $75\,000\text{W}$ OR 75kW
- (ii) power loss reduced C1
resistance reduced C1
power lost decreases to a quarter OR ($P =$) $19\text{kW} / 18.75\text{kW}$

[Total: 8]

- 6 (a) tick for thermistor under: heat detector B1
 tick for transistor under: switch B1
- (b) increase light intensity/brightness/illuminate B B1
 resistance (of B) decreases cao B1
 voltage at mid-point increases OR greater (share of) voltage M1
 (more) current flows (through lamp) A1

[Total: 6]

- 7 (a) (i) diode B1
- (ii) 1. 0.7V B1
 2. $I = V \div R$ in any form OR $(I =) V \div R$ OR $11.3 \div 4$ C1
 2.8A A1
- (b) (i) 1. $(12 \div 8 =) 1.5$ A B
 2. $(1.5 + 2.825 =) 4.3$ A ecf (a)(ii)2. and (b)(i)1. B1
- (ii) 1.5A ecf (b)(i)1. B1

[Total: 7]