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

2 (a (i) P =IV OR 40 = 220 × I OR (I =) P / V OR 40 / 220
           0.18 A   A1

       (ii) [3 × 0.18(2)] = 0.54 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 <u>increases</u>   B1

         (ii) Power (of lamp) decreases   B1
               P = IV <u>and</u> current in lamp decreases. OR P = V^2 / R   B1

[Total: 8]

3 (a rheostat/<u>variable</u> resistor AND
       control/vary/change/ limit the current /resistance/power/ voltage <u>across heater</u>   [1]

    (b) (I =) P/V any form, words or numbers   [1]
         (I =) 1.25 (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]
         1.92 Ω (2 or 3 sig. figs.)   [1]
         note: credit will also be given for alternative approaches

    (c) battery running down/going flat/energy <u>of battery</u> 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 — C1
$(R =)\ 500\,\Omega$ — A1

(ii) $I = (12 \div 1000) = 0.012\,A$ ecf **(i)** — B1

(iii) $(V =)\ IR$ OR 0.012×500 OR $12 \times 500 \div 1000$ — C1
$= 6.0\,V$ ecf **(i)(ii)** — A1

(b) (more current in circuit so) current (in $500\,\Omega$ 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
$75\,000\,W$ OR $75\,kW$

(ii) power loss reduced — C1
resistance reduced — C1
power lost decreases to a quarter OR $(P =)\ 19\,kW\,/\,18.75\,kW$

[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.** 0.7 V   B1
   2. $I = V \div R$ in any form OR ($I =$) $V \div R$ OR 11.3÷4   C1
   2.8 A   A1

   (b) **(i)** **1.** (12÷8 =) 1.5 A   B
   2. (1.5 + 2.825 =) 4.3 A ecf **(a)(ii)2.** and **(b)(i)1.**   B1

   (ii) 1.5 A ecf **(b)(i)1.**   B1

                                                                                                                [Total: 7]