

- 1 (a) (i)  $I_1 = I_2 + I_3$  B1
- (ii)  $I_1 = I_4$  OR same B1
- (b) (i)  $(V = IR = 0.80 \times 3.0 =) 2.4\text{V}$  A1
- (ii)  $I = V/R$  in any algebraic form OR  $2.4 / 2$  OR **(b)(i) / 2**  
 OR any voltage divided by 2 C1  
 $(I_3 = V/R = 2.4 / 2 =) 1.2\text{A}$  A  
 OR  
 $I_3/I_2 = 3/2$  (C1)  
 $I_3 = 3/2 \times 0.8\text{A} = 1.2\text{A}$  (A1)
- (iii)  $(I_2 + I_3$  OR Current through  $R = 0.8 + 1.2) = 2.0\text{(A)}$   
 OR  $6\text{V} / 2\text{A}$  used C1  
 Parallel combination formula:  $1/r = 1/r_1 + 1/r_2$   
 OR  $(r =) r_1 r_2 / (r_1 + r_2)$  C  
 Use of formula: combined resistance =  $1.2\text{(}\Omega\text{)}$  C  
 $(R + 1.2 = 6/2 = 3.0\Omega \quad R =) 1.8\Omega$  A1  
 OR  
 Current through  $R = 0.8 + 1.2 = 2.0\text{(A)}$  (  
 P.D. across  $R = 6.0 - 2.4$  (C1)  
 $= 3.6\text{(V)}$  (C1)  
 $R = 3.6 / 2.0 = 1.8\Omega$  (A1)

**[Total: 9]**

- 2 (a) Transistor B1
- (b) Resistor / variable resistor / rheostat identified B1  
 Light-dependent resistor / LDR identified B1  
 Resistor or alternative in gap A; LDR in gap B B1
- (c) Thermistor / thermal resistor / heat or temperature dependent resistor identified B1  
 Thermistor (or alternative name) in gap A and resistor in gap B B1

**[Total: 6]**

- 3 (a) (i) total  $R = 320 \text{ } (\Omega)$  or  $V$  per lamp = 6 (V)  
 $I = (240/320 \text{ or } 6/8 =) 0.75 \text{ A}$  ecf from previous line A1 [2]
- (ii) use of  $P = VI$  OR  $I^2R$  OR  $V^2/R$  C1  
 4.5W ecf from (a)(i) A1 [2]
- (b) resistance of each lamp =  $8 \times 1.05 = 8.4 \text{ } (\Omega)$   
 total  $R = 240/0.9 = 266.7 \text{ } (\Omega)$  OR  $V$  per lamp =  $8.4 \times 0.9 = 7.56 \text{ } (V)$  B1  
 no. of lamps (=  $266.7/8.4$ ) = 31.7 OR (=  $240/7.56$ ) = 31.7 B1  
 max. no. of failed lamps = 8 B1  
 accept reverse logic [4]
- [Total: 8]
- 4 (a)  $1/R = 1/R_1 + 1/R_2$  or  $R = R_1 R_2 / (R_1 + R_2)$  or  $R_1 R_2 / (R_1 + R_2)$  or use of C1  
 $1/8 = 1/24 + 1/X$  OR  $8 = 24R/(24 + R)$  or calculations/clear logic to eliminate  
 wrong values C1  
 $12 \text{ } \Omega$  A1 [3]
- (b) battery and resistors correct, condone twin small circles, cell, zig-zag  
 resistors B1  
 ammeter correct position  
 ignore switches, condone breaks in circuit  $\leq 1 \text{ mm}$  condone wrong symbols  
 if clear  
 two resistors in series scores 0/2 as ammeter cannot be in right place [2]
- (ii) use of  $I = V/R$  in any form or  $V/R$  B1  
 $24 \text{ } \Omega$  resistor:  $I = (6/24 =) 0.25 \text{ A}$  B1  
 other resistor:  $I = 6/\text{his (a) correctly evaluated } (6/12 = 0.5\text{A})$  accept 1 s.f. if  
 exact  
 if contradiction between answer of (a) in working and answer in answer line,  
 base marking on answer line B1 [3]

- 5 (a) (i)  $(I =) V/R$  or  $230/46$  C1  
5.0A \*Unit penalty applies A1
- (ii)  $(P =) IV$  or  $V^2/R$  or  $I^2R$  or  $230 \times 5$  or  $230^2/46$  or  $5^2 \times 46$  C1  
ecf from **8(a)(i)** A1  
1100/1150/1200W \*Unit penalty applies ecf from **8(a)(i)**
- (b) same as **8(a)(i)** (c.a.o.) \*Unit penalty applies B1 **[5]**
- \*Apply unit penalty once onl
- 6 (a) (i) light-dependent resistor/LDR B1
- (ii) (in bright light) resistance of Z/LDR/circuit falls/is low B1  
current rises/is large/(starts to) flow/more p.d. across R B1  
relay (coil) magnetises/attracts/is magnet B1  
switch closes/completes second circuit B1
- (b) thermistor replaces LDR or LDR removed **and** thermistor added B1 **[6]**