M1.(a) $R = \frac{(15-10)}{110\times10^{-3}}$ **(1)**

= 45(.5) Ω **(1)**

2

(b) (use of $P = I^2R$ gives) P = (110 × 10^{-3})^2 × 45 **(1)**

= 0.54(5) W **(1)**

(allow C.E. for value of R from (a)

2

(c) 43 (Ω) **(1)**

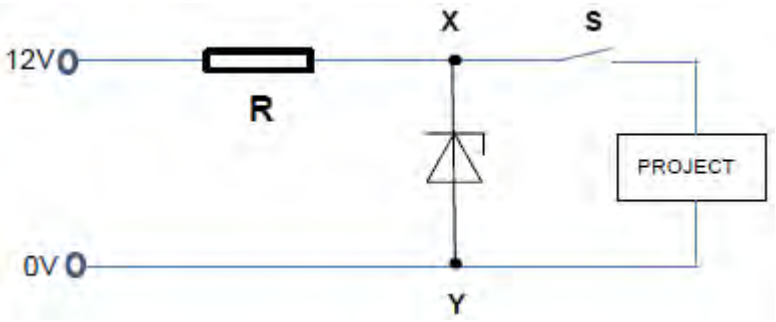
(allow C.E. for value of R from (a)

go to lower resistor to ensure current through zener is > 10 mA **(1)**

2

[6]

M2.(a)



1 mark for Zener symbol

1 mark for orientation

2

(b) (i) 80mA + 5mA = 85mA

Answer − 1

1

(ii) 12V − 5.1 V = 6.9V

Calculation and answer − 1

1

(iii) R = 6.9V / 85mA = 81Ω

Calculation and answer − 2

2

(c) (i) $P = V^2 / RP = (6.9 \times 6.9) / 75P = 0.64W$
Hence P is approx. 0.6W

Calculation and answer − 2

2

(ii) I = V / R I = 6.9 / 75 I = 92mA

Calculation and answer − 2

2

[10]

M3.(a) 10mA + 88mA = 98mA✓; V across resistor = 4.4-2.7 = 1.7V✓; R=1.7 / 0.098 ✓= 17.3Ω✓

4

(b) 98mA✓

1

(c) P = I.V = 0.098 × 2.7✓ = 0.265W✓; use 0.5W✓

3

(d) Voltage across R will increase✓,
so current through R will increase. ✓
current through zener will increase ✓

3

[11]

M4.(a) (i) zener diode✓

1

(ii) 4.7V✓ **1**

(iii) reverse✓ **1**

(b) (i) 5 + 100 = 105mA✓ **1**

(ii) 10 - 4.7 = 5.3V✓ **1**

(iii) 5.3 ÷ 0.105✓ = 50.5Ω✓ **2**

(iv) 47Ω✓ **1**

(c) (i) 14.4- 4.7 = 9.7V✓ 9.7 ÷ 33 = 294mA✓ **2**

(ii) 4.7 × 0.294 = 1.38W✓ **1**

[11]