Mark Scheme

Q1.

A

[1]

Q2.

A

[1]

Q3.

(a) (i) for X: ($P = VI$ gives) $24 = 12I$ and $I = 2$ A **(1)**
for Y $18 = 6I$ and $I = 3$ A **(1)**

2

(b) (i) 12 V **(1)**

(ii) voltage across R_2 (= 12 – 6) = 6 (V) **(1)**
$I = 3$ (A) **(1)**
($V = IR$ gives) $6 = 3R_2$ and $R_2 = 2\Omega$ **(1)**
(allow C.E. for I and V from (a) and (b)(i))

[or $V = I(R_y + R_2)$ **(1)** $12 = 3(2 + R_2)$ **(1)** $R_2 = 2\Omega$ **(1)**]

(iii) current = 2 (A) + 3 (A) = 5 A **(1)**
(allow C.E. for values of the currents)

(iv) 27 (V)– 12 (V) = 15 V across R_1 **(1)**

(v) for R_1, $15 = 5\ R_1$ and $R_1 = 3\Omega$ **(1)**
(allow C.E. for values of I and V from (iii) and (iv)

7

[9]

Q4.

(a) (i) 5 V **(1)**

(ii) $R_T = 36\ (\Omega)$
(use of $V = IR$ gives) $15 = I \times 36$ and $I = 0.42$ A **(1)**

3

(b) (i) equivalent resistance of the two lamps $\frac{1}{R} = \frac{1}{12} \times \frac{1}{12} = \frac{1}{6}$ **(1)**

$R_T = 6 + 12 = 18\ (\Omega)$ and $15 = I \times 18$ **(1)** (to give $I = 0.83$ A)

(ii) current divides equally between lamps (to give $I = 0.42$ A)
(or equivalent statement) **(1)**

3

(c) same brightness **(1)**
(because) same current **(1)**

2

[8]

Q5.

(a) (i) 6.0 (Ω) **(1)**

1

(ii) 4.5 (V) **(1)**

1

(iii) (use of $I = V/R$)

$I = 4.5/6.0 = 0.75$ (A) **(1)**

current through cell A = 0.75/2 = 0.375 (A) **(1)**

2

(iv) charge = 0.375 × 300 = 112.5 **(1)** C **(1)**

2

(b) cells C and D will go flat first or A and B last longer **(1)**

current/charge passing through cells C and D (per second) is double/more than that passing through A or B **(1)**

energy given to charge passing through cells **per second** is double or more than in cells C and D **(1)** or in terms of power

3

[9]

Q6.

(b) R = 1.5/0.66 = 2.3(Ω) (2.27) ✓

1

(c) *(use of V = IR)*
I = 1.5/(22 + 1.2) = 0.065✓(A) (0.0647) ✓

1

(d) current in R_1 = 0.66 − 0.0647 = 0.595 (A) ✓

CE from 4.2/4.3

1

resistance of R_1 and probe = 1.5/0.595 = 2.52 (Ω) ✓

alternative method: 1/2.3 = 1/23.2 + 1/(R_{probe} + 2.4) ✓

1

resistance of probe = 2.52 − 2.4 = 0.12 (Ω) ✓

correct rearrangement ✓

range 0.1 – 0.15 ✓

accept 1 sig. fig. for final answer

1

(f) ANY TWO FROM
correct reference to lost volts OR terminal pd OR reduced current ✓
reference to resistors not changing OR resistors constant ratio ✓
reference to voltmeter having high/infinite resistance (so not affecting circuit) ✓
reference to pd between AB being (very) small (due to
closeness of resistance ratios in each arm) ✓
voltmeter (may not be) sensitive enough ✓

1
1

[7]

Q7.

A

[1]