Mark schemes

Q1.

(a) energy transferred = 0.000 002 × 300 000

1

energy transferred = 0.6 (J)

1

[2]

Q2.

(a)

$$\mathbf{X} = \frac{0.26 + 0.21 + 0.25}{3}$$

1

X = 0.24 (A)

allow $\mathbf{X} = \frac{0.26 + 0.25}{2} = 0.255$

for 2 marks

1

(b) current = 0.17 (A)

1

power = 3.0 × 0.17

allow a correct substitution using a value of I in the range 0.16 to 0.18 A

1

power = 0.51 (W)

allow an answer consistent using a value of I in the range 0.16 to 0.18 A

*answers of 0.456, 5.1 or 51 score **2** marks*

1

[5]

Q3.

(a) energy = power × time
or
$E = P \times t$

1

(b) P = 500 000 000 (W)

1

E = 500 000 000 × 3600

allow a correct substitution of an incorrectly / not converted value of P

1

E = 1 800 000 000 000 (J)
or
$E = 1.8 \times 10^{12}$ (J)

allow an answer consistent with an incorrectly / not converted value of P

1

[4]

Q4.

(a) energy = power × time
or
$E = P \times t$

1

(b) t = 3600 (s)

1

E = 3000 × 3600

allow a correct substitution using an incorrectly/not converted value for t

1

E = 10 800 000 (J)
or
$E = 1.08 \times 10^{7}$ (J)

allow an answer consistent with their incorrectly/not converted value for t

allow a correct answer given to 2 s.f.

1

[4]

Q5.

(a) increase

must be in this order

1

decrease

1

(b) $P = I^2R$

1

(c) $1.60 \times 10^9 = 2000^2 \times R$

1

$$R = \frac{1.60 \times 10^9}{2000^2}$$

1

$R = 400\ (\Omega)$

1

(d) $$\text{efficiency} = \frac{\text{useful energy output}}{\text{total energy input}}$$

or

$$\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$$

1

(e) $$0.992 = \frac{\text{useful energy output}}{34.2}$$

1

useful energy output = 0.992×34.2

1

useful energy output = 33.9 (GJ)

allow a correct answer given to more than 3 s.f.

1

[10]

Q6.

(a) energy transferred = power × time
or
$E = P \times t$

1

(b) $3600 = 1200 \times t$

1

$t = \frac{3600}{1200}$

1

$t = 3$ (s)

1

[4]

Q7.

(a) $P = V \times I$

1

(b) $4.4 = 40 \times I$

1

$I = \frac{4.4}{40}$

1

$I = 0.11$ (A)

1

(c) $\text{efficiency} = \frac{\text{useful power output}}{\text{total power input}}$

1

(d) $0.85 = \frac{P}{4.0}$

1

$P = 0.85 \times 4.0$

1

$P = 3.4$ (W)

1

[8]