Name of the Student:_____
Max. Marks : 24 Marks **Time : 24 Minutes**

Mark Schemes

Q1.

(a) **Level 3:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

5-6

Level 2: The method would not necessarily lead to a valid outcome. Most steps are identified, but the method is not fully logically sequenced.

3-4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1-2

No relevant content

0

Indicative content

- ammeter in series with filament lamp
- current measured with an ammeter
- voltmeter in parallel with filament lamp
- p.d. measured with a voltmeter
- variable resistor (or variable power pack or variable number of cells) used to vary current in and p.d. across filament lamp
- range of p.d. of 0 to 6 V
- interval of p.d. of 1 V
- reverse connections to power supply to obtain negative values
- take repeat readings and calculate a mean
- discard anomalies

Indicative content may be seen in a circuit diagram.

Level 3 answer: needs to include a circuit which would work (if included) and a method to obtain negative values.

(b) $3.0 = 0.16 \times R$

allow a correct substitution of an incorrect value of I in the range 0.15 (A) to 0.17 (A)

1

$$R = \frac{3.0}{0.16}$$

allow a correct rearrangement of an incorrect value of I in the range 0.15 (A) to 0.17 (A)

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1

R = 18.75 (Ω)

allow 19 (Ω)

allow 18.8

1

(c) t = 1800 (s)

1

Q = 0.21 × 1800

all subsequent marks can score if an incorrectly / not converted value of t is used

1

Q = 378 (C)

1

E = 378 × 6.0

1

E = 2268 (J)

allow an answer to 2 or 3 s.f.

OR

P = 0.21 × 6.0 (1)

P = 1.26 (W) (1)

t = 1800 (s) (1)

all subsequent marks can score if an incorrectly / not converted value of t is used

E = 1.26 × 1800 (1)

E = 2268 (J) (1)

allow an answer to 2 or 3 s.f.

1

(d) (for the power to quadruple) the current and the p.d. would both need to double

1

(but the current doesn't double) because the resistance of the filament lamp increases
or
(but the current doesn't double because the graph shows that) current is not proportional to p.d.

allow the graph does not show direct proportionality

ignore the graph is not a straight line

ignore the graph is not linear

1

[16]

Q2.

(a) spring may become permanently extended

ignore reference to limit of proportionality

allow the harness / spring / chain may break

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or

extension of the spring may be too great (so the baby's feet are always on the floor)

ignore baby may be injured / harmed / may hit doorframe

1

(b) (in position **A**) the baby has gravitational potential energy

allow E_p for gravitational potential energy

1

(as the baby moves down this) is transferred to kinetic energy

allow E_k for kinetic energy

(of the baby) and / then elastic potential energy (of the spring)

allow E_e for elastic potential energy

1

(in position **B**) all the energy is elastic potential energy

ignore energy dissipated to the surroundings

1

(c) $e = 0.080$ (m)

1

$4.0 = ½ \times k \times 0.080^2$

allow a correct substitution using an incorrectly / not converted value of e

1

$$k = \frac{4.0}{(0.5 \times 0.080^2)}$$

allow a correct rearrangement using an incorrectly / not converted value of e

1

$k = 1250$ (N/m)

allow an answer consistent with their value of e

1

[8]

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