

Mark schemes

1.

(a) higher

1

(b) low(er)

1

hot(ter)

allow warm(er)

1

(c) advantage:

- water heated continuously (by the Sun)

1

one disadvantage from:

- temperature of water is lower (for most of the time than water heated by immersion heater)
- water may not be hot enough

allow less control over water temperature

- it takes longer to heat the water

1

(d) $\frac{4\,030\,000}{4\,070\,000}$

1

0.99

an answer of 99% scores 2 marks

an answer of 99 or 0.99% scores 1 mark

1

an answer of 0.99 scores 2 marks

allow an answer that rounds to 0.99 for 2 marks

(e) power = energy transferred / time

allow $P = E / t$

1

(f) $5000 = \frac{4070000}{t}$

1

$$t = \frac{4070000}{5000}$$

1

$$t = 814$$

1

seconds

other units of time must be consistent with numerical value

1

an answer of 814 seconds scores 4 marks

an answer of 13.57 minutes scores 4 marks

[12]

2.

(a) $P = \frac{120000}{8.0}$

1

$$P = 15000 \text{ (W)}$$

1

an answer of 15 000 (W) scores 2 marks

(b) energy is transferred in heating the surroundings

1

friction causes energy to be transferred in non-useful ways

1

(c) the switches are in parallel

1

(so) closing either switch completes the circuit

1

(d) gravitational potential energy = mass \times gravitational field strength \times height

allow $E_p = m g h$

1

(e) $E_p = 280 \times 9.8 \times 14$

1

$$E_p = 38416 \text{ (J)}$$

1

$$E_p = 38000 \text{ (J)}$$

an answer that rounds to 38 000 scores 2 marks

1

an answer of 38 000 scores 3 marks

[10]

3.

(a) 80 (°C)

1

(b) **C**

1

temperature after 10 minutes was lowest

or

final temperature was lowest

*reason only scores if material **C** is chosen*

allow temperature after 10 minutes was lower

1

(c) lower total temperature rise (for all materials)

allow lower final temperature (for all materials)

1

(because) the rate of temperature increase would be lower

allow lower gradient lines

1

(d) higher resolution

1

reduced risk of misreading instrument

1

(e) polyurethane foam

no marks if polyurethane foam not chosen

1

(because it has the) lowest rate of energy transfer

1

[9]

4.

(a) 46 200

accept 46 000

allow 1 mark for correct substitution

ie $0.5 \times 4200 \times 22$ provided no subsequent step

2

(b) Energy is used to heat the kettle.

1

[3]

5.	<p>(a) chemical <i>correct order only</i></p> <p>kinetic</p> <p>sound</p> <p>(b) 48% or 0.48 <i>an answer of 0.48 with a unit gains 1 mark</i> <i>an answer of 0.48% gains 1 mark</i> <i>an answer of 48 with or without a unit gains 1 mark</i></p>	<p>1</p> <p>1</p> <p>1</p> <p>2</p> <p>[5]</p>
6.	<p>(a) (i) 150</p> <p>(ii) transferred to the surroundings by heating <i>reference to sound negates mark</i></p> <p>(iii) 0.75 <i>450 / 600 gains 1 mark</i> <i>accept 75% for 2 marks</i> <i>maximum of 1 mark awarded if a unit is given</i></p> <p>(iv) 20 (s) <i>correct answer with or without working gains 2 marks</i> <i>correct substitution of 600 / 30 gains 1 mark</i></p> <p>(b) (i) to avoid bias</p> <p>(ii) use less power and last longer 1 LED costs £16, 40 filament bulbs cost £80 or filament costs (5 times) more in energy consumption</p> <p>(iii) any one from:</p> <ul style="list-style-type: none"> • availability of bulbs • colour output • temperature of bulb surface 	<p>1</p> <p>1</p> <p>2</p> <p>2</p> <p>1</p> <p>1</p> <p>1</p> <p>1</p>