GCSE Physics

Conservation and Transfer of Energy

Mark Scheme

Time available: 55 minutes
Marks available: 49 marks

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 = 15 000 (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 × gravitational field strength × height

allow E_p = m g h

1

(e) E_p = 280 × 9.8 × 14

1

E_p = 38 416 (J)

1

E_p = 38 000 (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 × 4200 × 22 provided no subsequent step

2

(b) Energy is used to heat the kettle.

1

[3]

5. (a) chemical

correct order only **1**

kinetic

1

sound

1

(b) 48% or 0.48

*an answer of 0.48 with a unit gains **1** mark*
*an answer of 0.48% gains **1** mark*
*an answer of 48 with or without a unit gains **1** mark*

2

[5]

6. (a) (i) 150

1

(ii) transferred to the surroundings by heating

reference to sound negates mark

1

(iii) 0.75

*450 / 600 gains **1** mark*
*accept 75% for **2** marks*
*maximum of **1** mark awarded if a unit is given*

2

(iv) 20 (s)

*correct answer with or without working gains **2** marks*
*correct substitution of 600 / 30 gains **1** mark*

2

(b) (i) to avoid bias

1

(ii) use less power and last longer

1

1 LED costs £16, 40 filament bulbs cost £80

or

filament costs (5 times) more in energy consumption

1

(iii) any **one** from:

- availability of bulbs
- colour output
- temperature of bulb surface

1

[10]