

M1. (a) any **two** from:

- black is a good emitter of (infrared radiation)
accept heat for radiation
ignore reference to absorbing radiation
- large surface (area)
- matt surfaces are better emitters (than shiny surfaces)
accept matt surfaces are good emitters
ignore reference to good conductor

2

(b) 90% or 0.9(0)

$$\text{efficiency} = \frac{\text{useful energy out} (\times 100\%)}{\text{total energy in}}$$

allow 1 mark for correct substitution, ie $\frac{13.5}{15}$
provided no subsequent step shown
an answer of 90 scores 1 mark
an answer of 90 / 0.90 with a unit scores 1 mark

2

(c) (producing) light

allow (producing) sound

1

(d) any **two** from:

- wood is renewable
accept wood grows again / quickly
accept wood can be replanted
- (using wood) conserves fossil fuels
accept doesn't use fossil fuels
- wood is carbon neutral
accept a description

cheaper / saves money is insufficient

2

(e) $E = m \times c \times \theta$

2 550 000

*allow 1 mark for correct substitution
ie $100 \times 510 \times 50$
provided no subsequent step shown
answers of 1 020 000, 3 570 000 gain 1 mark*

2

joules /J

*accept kJ / MJ
do **not** accept j
for full credit the unit and numerical answer must be
consistent*

1

[10]

- M2. (a) (i) radiation
ignore thermal / infrared 1
- (ii) black is a better / good absorber (of heat / radiation)
ignore reference to black being a good emitter
black absorbs heat is insufficient
*do **not** accept black attracts / absorbs the Sun*
*do **not** accept black attracts heat* 1
- (so) temperature rises faster
must be an indication of heating up quicker
or white is a worse / poor absorber (of heat / radiation) (1)
accept white is a better / good reflector (of heat / radiation)
- (so if white faces) temperature would rise slower (1)
ignore any reference to light 1
- (b) (i) 1.2 (hours) **or** 1 hour 12 minutes
no tolerance 1
- (ii) increases (rapidly at first then increases at a slower rate)
*do **not** accept increases at a steady rate* 1
- (c) (i) any **two** from:
- (fill with) same mass / volume / amount of water
 - same level of (sun)light / sunshine
accept same heat / light source
accept same place
 - outside for the same (length of) time
 - outside at same time (of day / year)

- initial water temperature
- the side of the bag facing the Sun
*do **not** accept any factors to do with the construction of plastic bags eg thickness*

2

- (ii) curved line drawn above given line
both lines must start from the same point
ignore if continues beyond one hour or levels off after 1 hour
*do **not** accept a straight line*

1

[8]

M3. (a)	dark matt	1
	light shiny	1
(b)	B A C	1
	biggest temperature difference (80 °C) <i>dependent on first mark</i>	1
(c) (i)	(the can that is) dark matt	1
	best absorber (of infrared radiation)	1
(ii)	any three from:	
	<ul style="list-style-type: none"> • same area / shape of can • surrounding temperature is the same for all cans • same surface underneath cans • same position in the room 	3
(d)	fox A	
	smaller ears	1
	thicker fur	1

these minimise energy transfer
dependent on first 2 marks

1
[12]

- M4. (a) (black) is a good absorber of (infrared) radiation 1
- (b) (i) amount of energy required to change (the state of a substance) from solid to liquid (with no change in temperature) 1
melt is insufficient
- unit mass / 1kg 1
- (ii) 5.1×10^6 (J) 2
accept 5×10^6
allow 1 mark for correct substitution ie $E = 15 \times 3.4 \times 10^5$
- (c) (i) mass of ice 1
allow volume / weight / amount / quantity of ice
- (ii) to distribute the salt throughout the ice 1
- to keep all the ice at the same temperature 1
- (iii) melting point decreases as the mass of salt is increased 1
allow concentration for mass
accept negative correlation
*do **not** accept inversely proportional*
- (d) 60 000 (J) 1
accept 60 KJ

allow 2 marks for correct substitution ie $E = 500 \times 2.0 \times 60$

allow 2 marks for an answer of 1000 or 60

allow 1 mark for correct substitution ie

$E = 500 \times 2.0$ or $0.50 \times 2.0 \times 60$

allow 1 mark for an answer of 1

3

- (e) Marks awarded for this answer will be determined by the Quality of Communication (QC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

0 marks

No relevant content

Level 1 (1–2 marks)

There is an attempt at a description of some advantages or disadvantages.

Level 2 (3–4 marks)

*There is a basic description of some advantages **and** / **or** disadvantages for some of the methods*

Level 3 (5–6 marks)

There is a clear description of the advantages and disadvantages of all the methods.

examples of the points made in the response

extra information

energy storage

advantages:

- no fuel costs
- no environmental effects

disadvantages:

- expensive to set up and maintain
- need to dig deep under road
- dependent on (summer) weather
- digging up earth and disrupting habitats

salt spreading

advantages:

- easily available
- cheap

disadvantages:

- can damage trees / plants / drinking water / cars
- needs to be cleaned away

undersoil heating

advantages:

- not dependent on weather
- can be switched on and off

disadvantages:

- costly
- bad for environment

6
[18]

M5.

(a) infrared / IR

correct answer only

1

(b) any **two** from:

- increase the power / watts
allow increase the temperature of the oven or make the oven hotter
- decrease the speed
allow leave the biscuits in for longer
- put biscuits through again
increase radiation is insufficient
ignore changes to the design of the oven

2

(c) (inside) surface is a (good) reflector or poor absorber (of IR)

Ignore bounce for reflect

surface is a (good) reflector of light does not score

surface is a (good) reflector of light and infrared / heat does score

1

(and) outside surface is poor emitter (of IR)

1

(so) increases the energy reaching the biscuits

allow reduces energy loss or makes oven more efficient

*do **not** accept no energy losses*

keeps oven hotter is insufficient

1

[6]