

- M1.** (a) solid 1
- (b) decreased 1
correct order only
- decreased 1
- increased 1
- (c) (i) A 1
reason only scores if A chosen
- uses least / less energy (in 1 year) 1
a comparison is required
accept uses least power
accept uses least kWh
- (ii) greater the volume the greater the energy it uses (in 1 year) 1
- (iii) a very small number sampled 1
accept only tested 3
accept insufficient evidence / data
allow not all fridges have the same efficiency or a correct
description implying different efficiencies
only tested each fridge once is insufficient
there are lots of different makes is insufficient

[8]

- M2.** (a) (i) random distribution of circles in the box with at least 50 % of circles touching 1
- random distribution of circles occupies more than 50 % of the space
judged by eye 1
- (ii) (large) gaps between particles
accept particles do not touch
accept particles are spread out 1
- (so) easy to push particles closer (together)
or
forces between particles are negligible / none
an answer in terms of number of particles is insufficient 1
- (b) (i) (both are) random
accept a correct description of random eg unpredictable or
move around freely or in all directions
they take up all the space is insufficient
they are spread out is insufficient
they move in straight lines is insufficient 1
- (ii) (speed also) increases 1

[6]

- M3.** (a) (i) 7pm
accept 19.00 / 1900 1
- (ii) 8pm
accept 20.00 / 2000 1
- temperature drops more slowly
accept heat for temperature accept line is less steep 1
- (b) insulator 1
- conduction * 1
- convection *
** answers can be either way around* 1
- (c) (i) 4 (years) 1
- (ii) it is the cheapest / cheaper / cheap
do not accept answers in terms of heat rising or DIY 1
- has the shortest / shorter payback time
do not accept short payback time 1

[9]

M4. (a) the bigger the surface area, the faster the water cools down / temperature falls
answers must imply rate
accept heat for temperature provided rate is implied
*do **not** accept cools down more unless qualified*

1

(b) any **two** from:

the ears:

- have large surface / area
not just has large ears
- radiate heat
accept loses heat, but does not score
if the reason given for heat loss is wrong
- keep blood cooler

2

(c) (i) radiation

1

(ii) conduction

1

[5]

M5. (a) to reflect (the infrared)
accept (shiny surfaces) are good reflectors
ignore reference to incorrect type of wave 1

(b) black 1

best absorber (of infrared)
answer should be comparative black absorbs (infrared) is insufficient
accept good absorber (of infrared)
ignore reference to emitter
ignore attracts heat ignore reference to conduction 1

(c) to reduce energy loss
accept to stop energy loss
accept heat for energy
accept to stop / reduce convection

or so temperature of water increases faster
accept to heat water faster
accept cooks food faster

or reduces loss of water (by evaporation) 1

(d) 672 000
allow 1 mark for correct substitution, ie $2 \times 4200 \times 80$
provided no subsequent step shown 2

[6]

M6.(a) (i) Z 1

(ii) X 1

(b) (i) moving randomly 1

(ii) stronger than 1

(c) (i) evaporation 1

(ii) any **one** from:
• becomes windy
• temperature increases
accept (becomes) sunny "the sun" alone is insufficient
• less humid 1

[6]

M7. (a) (i) any **two** from:

- mass (of block)
accept weight for mass
- starting temperature
- final / increase in temperature
temperature is insufficient
- voltage / p.d.
same power supply insufficient
- power (supplied to each block)
- type / thickness of insulation
same insulation insufficient

2

(ii) one of variables is categoric

or

(type of) material is categoric

accept the data is categoric

accept a description of categoric

do not accept temp rise is categoric

1

(iii) concrete

reason only scores if concrete chosen

1

(heater on for) longest / longer time

a long time or quoting a time is insufficient

do not accept it is the highest bar

1

(iv) 4500 (J)

allow 1 mark for correct substitution ie

$2 \times 450 \times 5$ provided no subsequent step shown

2

(b) (i) point at 10 minutes identified

1

(ii) line through all points except anomalous
line must go from at least first to last point

1

(iii) 20 (°C)
if 20°C is given, award the mark.
If an answer other than 20°C is given, look at the graph. If the graph shows a correct extrapolation of the candidate's best-fit line and the intercept value has been correctly stated, allow 1 mark.

1

(iv) 2 (minutes)

1

[11]

M8.(a) (i) temperature (increase) and time switched on are directly proportional
accept the idea of equal increases in time giving equal increases in temperature

answers such as:

- *as time increases, temperature increases*
- *positive correlation*
- *linear relationship*
- *temperature and time are proportional*

score 1 mark

2

(ii) any **one** from:

“it” refers to the metal block

- *energy transfer (from the block) to the surroundings*
accept lost for transfer
accept air for surroundings
- *(some) energy used to warm the heater / thermometer (itself)*
accept takes time for heater to warm up
- *(metal) block is not insulated*

1

(iii) 15 000

allow 1 mark for correct substitution, ie 50×300 provided no subsequent step shown

2

(b) lead

reason only scores if lead is chosen

1

needs least energy to raise temperature by 1°C

accept needs less energy to heat it (by the same amount)
lowest specific heat capacity is insufficient

1

[7]