

- M1.** (a) (i) walls
accept sides (of house) 1
- (ii) fit double glazing
or
 close / fit curtains / fit shutters
accept close windows
accept keep house at a lower temperature
accept fit (foam) draft excluders around the windows / in the jams
accept put plastic (film) across the windows
 do **not** accept fit thicker glass 1
- (b) (i) cavity (wall insulation)
accept the middle one 1
- (ii) fit hot water jacket **and** draught-proofing
both required 1
- (together) saves most money
only scores if first mark scores
accept saves more than fitting (energy efficient) light bulbs
accept saves £40
accept gives the shortest payback time
an answer fit energy efficient light bulbs (on its own) gains 1 mark only 1

[5]

- M2.** (a) (i) any **one** from:
- water to the mug
 - water to the air
 - mug to the air
 - mug to the table
- both** required*
- direction of transfer must be correct*
- 1
-
- (ii) when temperatures are the same
- accept a specific example eg when the temperature of the water and mug are the same*
- accept radiant heat transfer will never stop*
- 1
-
- (b) wood
- 1
-
- (c) (i) conduction
- accept convection if not given as 3rd answer*
- 1
- insulator
- 1
- convection
- 1
-
- (ii) any **one** from:
- do **not** accept any rebuilding of house*
- double glazing
- loft insulation
- accept roof for loft*
- 1
- carpets

(cavity) wall insulation

*do **not** accept closing doors and windows*

draft excluders

foil behind radiators

accept blocking chimney

paint inside walls white

[7]

- M3.** (a) (i) (insulate it) with **fibre glass or foam or felt or polystyrene beads or rockwool or (aluminium) foil**
an example must be included
do not credit loft insulation 1
- (ii) fill the cavity with fibre glass **or foam or mineral wool or polystyrene or named liner inside wall or making walls thicker**
an example must be included
do not credit cavity wall insulation 1
- (iii) double glaze **or draw the curtains or blinds or thicker glass or secondary glazing described**
do not credit fit smaller windows 1
- (iv) put in draught excluder (or described) **or strip or description of filling gaps or seal gaps or double glazed doors or build porch or curtains inside door or mat under door**
do not credit just carpet
accept buy new doors
accept premise that gap is between frame and wall as well as between frame and door 1
- (b) windy **or stormy or wet or snow or rain or sleet or hail or fog or mist**
do not credit frosty 1

[5]

M4.(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]

- M5.** (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]

M6. (a) (i) 2(.0)
accept 2000 W or 2000 watt(s)
accept answer given in table
do not accept 2000 1

(ii) 4.5
allow 1 mark for correct substitution
ie 1.5×3
allow 1 mark for the answers 1.5 or 6(.0) 2

(iii) 54or
their (a)(ii) $\times 12$ correctly calculated
allow 1 mark for correct substitution
ie 4.5×12 or
their (a)(ii) $\times 12$
allow 1 mark if correct answer is given in pounds eg £54 2

(b) (i) 6 pm 1

temperature starts to rise faster
only scores if 6 pm given

or graph (line) is steeper / steepest
it refers to graph gradient or temperature
accept answers in terms of relative temperature rise
eg 5 to 6 pm 2 °C rise, 6 to 7 pm 6 °C rise
accept temperature rises sharply / rapidly / quickly
do not accept temperature starts to rise

1

(ii) middle box ticked 1

[8]

M7.(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]

M8.(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]