M1. (a) (i) 25 (%)

*do **not** accept ¼*

1

(ii) increases

1

(b) tick (✔) in top and bottom box

both required

1

(c) SHINY surfaces are good reflectors of infra-red radiation

accept white for shiny

or black surfaces are POOR reflectors of infra-red radiation

accept bad for poor
accept insertion of 'not' before 'good' in statement

or black surfaces are good EMITTERS of infra-red radiation

or black surfaces are good ABSORBERS of infra red radiation

1

[4]

-

M2.   (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 comparativeblack absorbs (infrared) is insufficient*
> *accept good absorber (of infrared)*
> *ignore reference to emitter*
> *ignore attracts heatignore reference to conduction*

1

   (c)   to reduce energy loss

> *accept to stop energy loss*
> *accept heat for energy*
> *accept to stop / reduce convection*

   orso temperature of water increases faster

> *accept to heat water faster*
> *accept cooks food faster*

   orreduces loss of water (by evaporation)

1

   (d)   672 000

> *allow **1** mark for correct substitution, ie 2 × 4200 × 80 provided no subsequent step shown*

2

[6]

M3. absorber

1

reflector

1

emitter

1

[3]

M4. (a) (i) The volume of boiling water.

1

(ii) any **one** from:

- (more) precise
    *do **not** accept better (reading)*

- accurate

- reliable
    *do **not** accept thermometer is unreliable*

- removes human / reading error
    accept easier to read
    accept take temperature more frequently

1

(b) **B**
    marks are for the explanation

temperature falls faster
    *this mark point cannot score if **A** chosen*

1

because black is a better / good emitter
    ignore reference to better absorber
    *accept for both marks an answer in terms of why **A** is the white can*

1

(c) (i) faster than

1

(ii) darker / black surfaces absorb heat faster
    accept black is a better / good absorber
    dark surfaces attract heat negates this mark

1

Page 5

(iii)   air is a <u>bad / poor</u> conductor **or** air is a good <u>insulator</u>

accept air is an insulator

1

[7]

M5. (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]

M6. (a)   (i)   convection

1

(ii)   conduction

1

(b)   (i)   2

1

black is the best <u>absorber</u> (of thermal energy / heat)
accept black is the best emitter (of thermal energy / heat)
note that a comparative is needed (eg better or best)

1

(ii)   the colour of the metal plates

1

(iii)   any **one** from:

- more precise / accurate / reliable
    *do **not** accept better reading*
    *do **not** accept thermometer is unreliable*

- can measure continuously

- take many readings in a small time

- removes (human) reading error
    accept easier to read

- can compare / draw graphs automatically

- records data automatically

1

(c)   (i)   radiation
            accept radiates
            accept infra red (IR) waves

*do **not** accept heat waves*

1

  (ii) to reflect (heat away from the fire fighter)
     accept it reflects
     accept it is a poor absorber (of thermal radiation / heat)
     *do **not** accept deflect / bounce for reflect*

1

 (d) **N**
     *the mark is for the reason which does not score if **M** is chosen*

  transfers / absorbs less heat **or** gives smallest increase in temperature
     accept will keep fire fighters cooler
     *accept **N** is cooler (after 15 minutes)*
     *an answer **N** goes up to 52°C and **M** goes up to 100°C is insufficient*

1

[9]