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

(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]