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 bad / poor conductor**or**air is a good insulator

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]