

M1.	(a) 30(%)	1	[6]
	50(%)	1	
	(b) combined heat and power station <u>as waste less energy</u>	1	
	correct reference to 20 % or 70 % <i>accept some energy (50%) is used for heating</i>	1	
	(c) infra red ticked	1	
	(d) dark surfaces <i>accept matt / dull / black surfaces</i>	1	

M2.	absorber	1	[3]
	reflector	1	
	emitter	1	

M3.	(a) (i) 25 (%)	1
	<i>do not accept ¼</i>	
	(ii) increases	1
	(b) tick (✓) in top and bottom box <i>both required</i>	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]

-

- 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) (i) convection

1

- (ii) conduction

1

- (b) (i) 2

1

black is the best absorber (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]

M6. (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]

M7. (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]

