

# Conduction and Convection 2 MS

## QUESTION 1

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	Conduction convection	correct order only	1 1
a)ii)	to keep the ceramic bricks hot for a longer time		1
b)i)	18.2	$E = P t$ allow 1 mark for correct substitution ie 2.6 7 provided that no subsequent step is shown	2
c)	2 250 000	$E = m c \theta$ allow 1 mark for correct substitution ie 120 750 25 provided that no subsequent step is shown answers 2250 kJ or 2.25 MJ gain both marks	2
Total marks			6

## QUESTION 2

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	conduction		1
a)ii)	atoms gain (kinetic) energy or atoms vibrate with a bigger amplitude or atoms collide with neighbouring atoms transferring energy to (neighbouring / other) atoms or making these other atoms vibrate	accept particles / molecules for atoms do not accept electrons for atoms accept vibrate faster / more do not accept start to vibrate  do not accept heat for energy	1  1

	with a bigger amplitude	accept faster / more for bigger  amplitude mention of (free) electrons moving and passing on energy negates this mark	
b)i)	5 (oC) to 25 (oC)	either order	1
b)ii)	a correct example of doubling temperature difference doubling heat transfer  eg going from 5 to 10 (oC) difference doubles heat transfer from 30 to 60 (J/s)	accept for heat transfer number of joules / it  allow 1 mark for correctly reading 1 set of data eg at 5 oC the heat transfer is 30 or for every 5oC increase in temperature difference heat transfer increases by 30 (J/s)  no credit for stating they are directly proportional	2
b)iii)	1800	allow 1 mark for obtaining heat  transfer value = 120	2
Total marks			8

### QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	to reflect (the infrared)	accept (shiny surfaces) are good reflectors ignore reference to incorrect type of wave	1
b)	Black 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 1

c)	to reduce energy loss or so temperature of water increases faster or reduces loss of water (by evaporation)	accept to stop energy loss accept heat for energy accept to stop / reduce convection  accept to heat water faster accept cooks food faster	1
d)	672000	allow 1 mark for correct  substitution, ie $2 \times 4200 \times 80$ provided no subsequent step shown	2
Total marks			6

#### QUESTION 4

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	(matt) black is a good emitter of infrared / radiation to give maximum (rate of) energy transfer (to surroundings)	accept heat for infrared / radiation ignore reference to good absorber attracts heat negates this marking point accept temperature (of coolant) falls fast(er) accept black emits more radiation for 1 mark black emits most radiation / black is the best emitter of radiation for 2 marks	1  1
b)	the fins increase the surface area so increasing the (rate of) energy transfer or so more fins greater (rate of) energy transfer	accept heat for energy	1 1
c)	114000	allow 1 mark for correct  temperature change, ie 15 (°C)	3

		or allow 2 marks for correct substitution, ie $2 \times 3800 \times 15$ answers of 851 200 or 737 200 gain 2 marks or substitution $2 \times 3800 \times 112$ or $2 \times 3800 \times 97$ gains 1 mark an answer of 114 kJ gains 3 marks	
d)	increases the efficiency less (input) energy is wasted or more (input) energy is usefully used	accept some of the energy that would have been wasted is (usefully) used accept heat for energy	1 1
Total marks			9

#### QUESTION 5

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	conduction		1
b)i)	any one from: •starting temperature (of cold water) •pipe length •pipe diameter •pipe (wall) thickness •volume of cold water • temperature of hot water (in) time	temperature is insufficient  accept size of pipe  accept amount for volume	1
b)ii)	copper greatest temperature change	only scores if copper chosen accept heat for temperature accept heated water the fastest accept it was hottest (after 10 minutes) accept it is the best / a good conductor	1 1
c)	the pipe has a larger (surface) area (so) hot / dirty water (inside pipe) is in contact with cold / clean water (outside pipe) for longer	accept pipe is longer	1 1

Total marks			6
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