Conduction and Convection 1 MS

QUESTION 1

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	as a source of thermal radiation	accept heat for thermal radiation accept to act as the Sun do not accept sunlight alone	1
a)ii)	any one from: volume of water distance between lamp and boiling tube initial / starting temperature of water same room temperature	accept amount for volume do not accept time or same insulation material	1
a)iii)	any one from: greater sensitivity / precision could link to a computer for (automatic) data analysis could take more frequent readings reduces instrument reading error	do not accept more reliable (negates mark) accept more accurate do not accept easier to use on its own	1
b)i)	acts as a control	accept to be able to make a comparison accept to see the difference do not accept 'to make it a fair test' OWTTE on its own	1
b)ii)	(plastic) foam and aluminium foil		1
b)iii)	(aluminium) foil is a poor absorber of thermal radiation or (aluminium) foil is a (good) reflector of thermal radiation	accept heat / infra red for thermal radiation do not accept 'reflects sunlight' on its own accept (plastic) foam is a poor conductor / (good) insulator	1

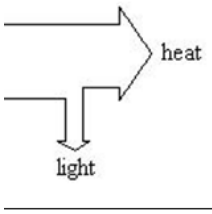
	(plastic) foam traps air which is a (good) insulator	do not accept 'the material' is a good insulator / poor conductor	1
c)	particles vibrate with a bigger / stronger amplitude / faster / with more (kinetic) energy energy transferred by collisions with other particles	accept particles vibrate more do not accept start to vibrate only do not accept answers in terms of free/mobile electrons	1 1
Total marks			9

QUESTION 2

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	silvered surfaces — more than the correct number of ticks in a row negates the mark radiation plastic cap conduction convection } both required		1 1
a)ii)	because there are no particles in a vacuum conduction and convection need particles / medium	any mention of air or any other substance in a vacuum scores zero accept atoms / molecules for particles accept	1 1

	conduction	convection	radiation
vacuum	✓	✓	
silvered surfaces			✓
plastic cap	✓	✓	

		vacuum is empty space accept there is nothing in a vacuum accept there is no air / gas in the vacuum need reference to both conduction and convection accept correct descriptions	
b)i)	less heat lost (to air above the heater) light shiny surfaces are poor emitters (of radiation) or dull, matt surfaces are good emitters (of radiation)	do not accept no heat lost accept radiators for emitters references to reflection are neutral do not credit answers which infer reflection from the underside of the hood ignore correct reference to absorption	1 1

b)ii)	correct diagram drawn with one output arrow narrower than the other arrows correctly labelled with energy form eg 	flow charts score zero ignore input	1
b)iii)	energy cannot be destroyed	accept (principle of) conservation of energy do not accept because energy cannot be lost without clarification	1
Total marks			9

QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	radiation		1
a)ii)	traps (small pockets of) air	do not accept it's an insulator do not accept reduces conduction and / or convection do not allow it doesn't allow heat to escape	1
b)i)	bigger temperature difference (between the water and surroundings) at the start (than at the end)	do not accept water is hotter	1
b)ii)	starting temperature (of the water)	accept thickness of fleece do not accept same amount of fleece do not accept thermometer / can do not accept time is the same	1

b)iii)	18 (°C)	correct answer only	1
b)iv)	M smallest temperature drop (after 20 mins)	cannot score if M is not chosen accept it's the best insulator accept smallest loss in heat accept keeps heat / warmth in for longer	1 1
Total marks			7

QUESTION 4

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	convection		1
a)ii)	Conduction		1
b)i)	2 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 1
b)ii)	the colour of the metal plates		1
b)iii)	any one from: • more precise / accurate /reliable •can measure continuously • take many readings in a small time •removes (human) readingerror • can compare / draw graphs automatically •records data automatically	do not accept better reading do not accept thermometer is unreliable accept easier to read	1
c)i)	radiation	accept radiates accept infra red (IR) waves do not accept heat waves	1
c)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 transfers / absorbs less heat or gives smallest increase in	the mark is for the reason which does not score if M is chosen accept will keep fire fighters cooler	1

	temperature	accept N is cooler (after 15 minutes) an answer N goes up to 52oC and M goes up to 100oC is insufficient	
Total marks			9

QUESTION 5

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	conduction		1
a)ii)	free / mobile electrons gain (kinetic) energy free electrons collide with other (free) electrons / ions / atoms / particles	accept free / mobile electrons move faster an answer in terms of atoms / particles gaining (kinetic) energy (and) colliding with / vibrating and passing energy to other atoms / particles gains 1 mark only answers in terms of heat particles negate	1 1
a)iii)	convection		1
b)i)	A and C or B and D only one (independent) variable or different shapes but the same colour	this mark only scores if a correct pair is chosen and a correct reason given both required and none other both required and none other accept only the shape changes	1
b)ii)	B radiates heat faster or B is a better emitter (of heat) but B has a smaller (surface) area or B has a smaller (surface) area: volume ratio	converse answer in terms of A gains full marks allow 2 marks for both lose the same quantity / amount of heat in the same time or both have same rate of heat loss allow 1 mark for both lose the same quantity / amount of heat	1 1
b)iii)	any one from: • transfer a lot of heat (too rapidly)	accept (significantly) more heat will be lost from the first radiator	1

	water temperature drops too rapidly water too cold for the next radiator	mention of absorption of heat negates mark	
Total marks			8