

Temp Changes, Specific Heat Capacity

Mark Scheme

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.3 Particle Model of Matter
Sub-Topic	Temp Changes, Specific Heat Capacity
Difficulty Level	Bronze Level
Booklet	Mark Scheme

Time Allowed: 56 minutes

Score: /56

Percentage: /100

Grade Boundaries:

M1.(a) (i) any **two** from:

- mass (of block)
accept weight for mass
- starting temperature
- final / increase in temperature
temperature is insufficient
- voltage / p.d.
same power supply insufficient
- power (supplied to each block)
- type / thickness of insulation
same insulation insufficient

2

(ii) one of variables is categoric

or

(type of) material is categoric

accept the data is categoric

accept a description of categoric

*do **not** accept temp rise is categoric*

1

(iii) concrete

reason only scores if concrete chosen

1

(heater on for) longest / longer time

a long time or quoting a time is insufficient

*do **not** accept it is the highest bar*

1

(iv) 4500 (J)

*allow **1** mark for correct substitution ie*

$2 \times 450 \times 5$ provided no subsequent step shown

2

(b) (i) point at 10 minutes identified 1

(ii) line through all points except anomalous
line must go from at least first to last point 1

(iii) 20 (°C)
if 20°C is given, award the mark.
If an answer other than 20°C is given, look at the graph. If the graph shows a correct extrapolation of the candidate's best-fit line and the intercept value has been correctly stated, allow 1 mark. 1

(iv) 2 (minutes) 1 [11]

M2.(a) (i) temperature (increase) and time switched on are directly proportional
accept the idea of equal increases in time giving equal increases in temperature
answers such as:

- *as time increases, temperature increases*
- *positive correlation*
- *linear relationship*
- *temperature and time are proportional*

score 1 mark

2

(ii) any **one** from:
"it" refers to the metal block

- energy transfer (from the block) to the surroundings
accept lost for transfer
accept air for surroundings
- (some) energy used to warm the heater / thermometer (itself)

accept takes time for heater to warm up

- (metal) block is not insulated

1

(iii) 15 000

allow 1 mark for correct substitution, ie 50×300 provided no subsequent step shown

2

(b) lead

reason only scores if lead is chosen

1

needs least energy to raise temperature by 1°C

*accept needs less energy to heat it (by the same amount)
lowest specific heat capacity is insufficient*

1

[7]

M3. (a) (i) 2(.0)

accept 2000 W or 2000 watt(s)

accept answer given in table

*do **not** accept 2000*

1

(ii) 4.5

allow 1 mark for correct substitution

ie 1.5×3

allow 1 mark for the answers 1.5 or 6(.0)

2

(iii) 54**or**

their (a)(ii) $\times 12$ correctly calculated

allow 1 mark for correct substitution

*ie 4.5×12 **or***

their (a)(ii) $\times 12$

allow 1 mark if correct answer is given in pounds eg £54

2

(b) (i) 6 pm

1

temperature starts to rise faster

only scores if 6 pm given

or graph (line) is steeper / steepest

it refers to graph gradient or temperature

accept answers in terms of relative temperature rise

eg 5 to 6 pm 2 °C rise, 6 to 7 pm 6 °C rise

accept temperature rises sharply / rapidly / quickly

*do **not** accept temperature starts to rise*

1

(ii) middle box ticked

1

[8]

M4. (a) (i) walls

accept sides (of house)

1

(ii) fit double glazing

or

close / fit curtains / fit shutters

accept close windows

accept keep house at a lower temperature

*accept fit (foam) draft excluders around the windows / in the
jams*

accept put plastic (film) across the windows

*do **not** accept fit thicker glass*

1

(b) (i) cavity (wall insulation)
accept the middle one 1

(ii) fit hot water jacket **and** draught-proofing
both required 1

(together) saves most money
only scores if first mark scores
accept saves more than fitting (energy efficient) light bulbs
accept saves £40
accept gives the shortest payback time
an answer fit energy efficient light bulbs (on its own) gains 1
mark only 1

[5]

M5. (a) (i) 7pm
accept 19.00 / 1900 1

(ii) 8pm
accept 20.00 / 2000 1

temperature drops more slowly
accept heat for temperature accept line is less steep 1

(b) insulator 1

conduction * 1

convection *

* answers can be either way around

1

(c) (i) 4 (years)

1

(ii) it is the cheapest / cheaper / cheap

do **not** accept answers in terms of heat rising or DIY

1

has the shortest / shorter payback time

do **not** accept short payback time

1

[9]

M6. (a) (i) any **one** from:

water to the mug

water to the air

mug to the air

mug to the table

both required

direction of transfer must be correct

1

(ii) when temperatures are the same

accept a specific example eg when the temperature of the water and mug are the same

accept radiant heat transfer will never stop

1

(b) wood

1

- (c) (i) conduction
accept convection if not given as 3rd answer
1
- insulator
1
- convection
1
- (ii) any **one** from:
do **not** accept any rebuilding of house
- double glazing
- loft insulation
accept roof for loft
1
- carpets
- (cavity) wall insulation
do **not** accept closing doors and windows
- draft excluders
- foil behind radiators
accept blocking chimney
- paint inside walls white
[7]

- M7.** (a) (i) (insulate it) with **fibre** glass **or** foam
or felt **or** polystyrene beads **or**
rockwool **or** (aluminium) foil
an example must be included
do not credit loft insulation

1

- (ii) *fill the cavity with fibre glass **or** foam
or mineral wool **or** polystyrene **or**
named liner inside wall **or** making
walls thicker*

an example must be included

do not credit cavity wall insulation

1

- (iii) *double glaze **or** draw the curtains **or**
blinds **or** thicker glass **or** secondary
glazing described*

do not credit fit smaller windows

1

- (iv) *put in draught excluder (or described)
or strip **or** description of filling gaps
or seal gaps **or** double glazed doors
or build porch **or** curtains inside door
or mat under door*

do not credit just carpet

accept buy new doors

*accept premise that gap is between frame and wall as well
as between frame and door*

1

- (b) *windy **or** stormy **or** wet **or** snow **or**
rain **or** sleet **or** hail **or** fog **or** mist*

do not credit frosty

1

[5]