

Internal Energy

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.3 Particle Model of Matter
Sub-Topic	Internal Energy
Difficulty Level	Bronze Level
Booklet	Mark Scheme 1

Time Allowed: 54 minutes

Score: /54

Percentage: /100

Grade Boundaries:

M1.(a)	solid	1
(b)	decreased <i>correct order only</i>	1
	decreased	1
	increased	1
(c) (i)	A <i>reason only scores if A chosen</i>	1
	uses least / less energy (in 1 year) <i>a comparison is required</i> <i>accept uses least power</i> <i>accept uses least kWh</i>	1
(ii)	greater the volume the greater the energy it uses (in 1 year)	1
(iii)	a very small number sampled <i>accept only tested 3</i> <i>accept insufficient evidence / data</i> <i>allow not all fridges have the same efficiency or a correct description implying different efficiencies</i> <i>only tested each fridge once is insufficient</i>	

there are lots of different makes is insufficient

1

[8]

M2.(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]

- M3.(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]

M4.(a) (i) Z

1

(ii) X

1

(b) (i) moving randomly

1

(ii) stronger than

1

(c) (i) evaporation

1

(ii) any **one** from:

- becomes windy
- temperature increases
accept (becomes) sunny "the sun" alone is insufficient
- less humid

1

[6]

M5. (a) (i) random distribution of circles in the box with at least 50 % of circles touching

1

random distribution of circles occupies more than 50 % of the space
judged by eye

1

(ii) (large) gaps between particles
accept particles do not touch
accept particles are spread out

1

(so) easy to push particles closer (together)
or
forces between particles are negligible / none
an answer in terms of number of particles is insufficient

1

(b) (i) (both are) random
accept a correct description of random eg unpredictable or

move around freely or in all directions
they take up all the space is insufficient
they are spread out is insufficient
they move in straight lines is insufficient

1

(ii) (speed also) increases

1

[6]

M6. (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]

M7. (i) conduction, convection
answer can be in either order

1

(ii) traps (lots of) air
*do **not** accept heat is trapped in the fibre*

1

air is a (good) insulator **or** poor conductor

1

[3]