

# Thermal Properties and Temperature

## Mark Scheme 4

<b>Level</b>	IGCSE
<b>Subject</b>	Physics
<b>Exam Board</b>	CIE
<b>Topic</b>	Thermal Physics
<b>Sub-Topic</b>	Thermal Properties and Temperature
<b>Paper Type</b>	Alternative to Practical
<b>Booklet</b>	Mark Scheme 4

**Time Allowed:** 59 minutes

**Score:** /49

**Percentage:** /100

- 1 (a)  $\theta_c = 24$  [1]  
°C [1]
- (b)  $\theta_{av} = 55$  (°C) ecf from (a) [1]
- (c) any two from:  
stirring  
waiting for temperature (to stabilise)  
view thermometer at right angles o.w.t.t.e. [2]
- (d) heat loss (to surroundings) o.w.t.t.e. [1]
- (e) one from:  
lagging beakers o.w.t.t.e.  
use of lid  
swifter transfer of water [1]
- (f) one from:  
amount of stirring o.w.t.t.e.  
hot water temperature  
cold water temperature  
room temperature o.w.t.t.e.  
transfer time [1]

[Total: 8]

- 2 (a)  $\theta_h = 86(^{\circ}\text{C})$  [1]
- (b)  $\text{cm}^3, ^{\circ}\text{C}$  [1]  
 10, 20, 30, 40, 50, 60 [1]
- (c) graph: [1]  
 axes labelled and scales suitable [1]  
 plots to take up half grid [1]  
 all plots correct to nearest  $\frac{1}{2}$  small square [1]  
 well-judged best-fit line [1]  
 thin line and small plots [1]
- (d) any two from: [2]  
 same hot water temperature / initial temperature,  
 constant room/surrounding temperature / other suitable named environmental condition  
 constant cold water temperature  
 same amount/rate of stirring  
 time taken for transfer w.t.t.e. / poured at same time interval
- (e) any one from: [1]  
 avoidance of parallax explained (thermometer or measuring cylinder)  
 wait for temperature to stabilise  
 other suitable suggestion related to measurement

[Total: 10]

- 3 (a)  $83(^{\circ}\text{C})$  [1]
- (b) 5460 [1]  
 7140 and J at least once, not contradicted  
 ecf  $\theta_h$  from (a) [1]
- (c) [1]  
 (i) no, difference too large [1]  
 (ii) any sensible suggestion involving heat loss to surroundings/ heat gained by container [1]
- (d) ticks in boxes 3 and 4 [2]  
 (-1 for any extra ticks in boxes 1, 2, 5 or 6 to minimum of 0  
 if only two boxes ticked, 1 correct and 1 incorrect scores 1 mark)

[Total: 7]

- 4 (a)  $\theta_r$  26 [1]
- (b) (i) s and °C in both tables [1]
- (ii) at least 300s and given to nearest 10s or in mins [1]
- (c) Table 2.2 (heating) justified by two temperature differences compared, must see 14 and 44/56 OR 74 to 60 and 25 to 69/81 [1]
- (d) any two from:  
same starting temperature  
constant room temperature/avoid draughts/same place  
same time intervals  
same thermometer (wtte)  
same mass/amount/volume of water  
same beaker  
lid always used [2]

[Total: 6]

- 5 (a) any three from:  
mass/volume/amount of water  
room temperature  
temperature of water  
amount of stirring  
size/shape of beaker  
temperature of ice cube  
number/mass/size of cubes [3]
- (b) any three from:  
stopclock: time  
balance: mass  
thermometer: temperature  
measuring cylinder: volume (of water) [3]

[Total 6]

- 6 (a)  $t$  in s,  $\theta$  in  $^{\circ}\text{C}$  seen in BOTH  
(symbols or words (sec allowed but NOT degrees/centigrade) [1]
- (b) 19 ( $^{\circ}\text{C}$ ) [1]
- (c) rate of heating greater (wtte) (can be included as part of justification) [1]  
comparison given of changes in temperature with correct numbers [1]
- (d) any two from:  
same (starting) temperature (wtte)  
constant room temperature/draughts (wtte)/environment/place  
carry out in same time intervals/duration/allow 'time' alone  
same thermometer (wtte)
- NOT volume of water/location of thermometer/beaker/'temperature' alone  
if > 2 responses, -1 for each additional incorrect (ignore 'neutrals') [2]

[Total: 6]

- 7 (a) three from:  
mass/amount/volume/level of salt  
implication of salt particle size (e.g. 'same type of salt')  
mass/volume/amount/level of water  
size/shape of beaker  
amount/rate of stirring  
NOT ref to temperature/room temperature/type of thermometer [3]
- (b) three from:  
clock : time  
thermometer : temperature  
balance : mass (NOT weight)  
measuring cylinder : volume  
NOT unit without quantity  
(but ignore incorrect unit with correct quantity) [3]

[Total: 6]