

# Simple Kinetic Molecular Model of Matter

## Mark Scheme 1

<b>Level</b>	IGCSE
<b>Subject</b>	Physics
<b>Exam Board</b>	CIE
<b>Topic</b>	Thermal Physics
<b>Sub-Topic</b>	Simple Kinetic Molecular Model of Matter
<b>Paper Type</b>	Alternative to Practical
<b>Booklet</b>	Mark Scheme 1

**Time Allowed:** 52 minutes

**Score:** /43

**Percentage:** /100

Question	Answer	Marks
1(a)	$\theta_R = 21(^{\circ}\text{C})$	1
1(b)	s, $^{\circ}\text{C}$ , $^{\circ}\text{C}$ time values correct 30, 60, 90, 120, 150, 180	1 1
1(c)(i)	'therm <b>A</b> cools more rapidly' <u>and</u> 'greater overall temperature change' reference to 'in the same time'	1 1
1(c)(ii)	rate increases then decreases OR cooling is less in first 30 s than in subsequent 30 s periods	1
1(d)(i)	makes comparison fair / only one factor changed	1
1(d)(ii)	causes start temperature to be lower	1
1(e)	any two appropriate factors: e.g. start temperatur room temperature, draughts, humidity, amount of insulation, type of thermometer	2
		<b>Total: 10</b>

- 2 (a) 85 (recorded in table) [1]
- (b) s, °C [1]
- (c) Graph:
- axes correctly labelled, right way round and with units [1]
  - suitable scales, plots occupying at least half grid in both directions [1]
  - all plots correct to within  $\frac{1}{2}$  small square [1]
  - good best-fit line judgement [1]
  - single, thin, continuous line [1]
- (d) (i) decreases owtte, no ecf [1]
- (ii) statement justified by reference to the graph [1]

**[Total: 9]**

- 3 (a) 21(°C) [1]
- (b)  $t$  values correct: 30, 60, 90, 120, 150, 180, 210, 240, 270 [1]
- (c)  $x_1 = 0.083$  [1]  
°C/s [1]  
 $x_2 = 0.061$  AND  $x_3 = 0.05(0)$  [1]
- (d) prediction less than  $x_3$  [1]  
justification with specific mention of (average) cooling rate decreasing with time/temperature [1]
- (e) any two precautions relating to temperature measurement e.g: [2]
- stir before reading
  - keep thermometer at same depth
  - read thermometer 90° to scale/with reading at eye level
  - wait until thermometer has stopped rising (at the start)
  - thermometer in middle of water/not touching beaker

[Total: 9]

- 4 (a) 22(.0) AND 88(.0) [1]
- (b) units correct and consistent (symbols or words) [1]
- (c) conclusion which matches the temperature changes [1]
- (d) any two from: [2]
- volume / level of hot water
  - initial temperature of hot water
  - initial temperature of cold water
  - same type of boiling tube
  - room temperature / draughts / appropriate environmental condition
- (e) any two improvements relating to apparatus: [2]
- lid on beaker
  - insulation on beaker
  - lid / cotton wool in boiling tube
  - thinner / metal walls on tube
  - all cold water in boiling tube below hot water level
  - greater contact area of tube
  - use of water bath
- explanation matching first improvement, including: [1]
- reduces loss of thermal energy from beaker
  - reduces loss of thermal energy from boiling tube
  - better thermal conduction
  - not affected by variation in hot water temperature

[Total: 8]

- 5 (a) 78 °C c.a.o. unit needed [1]
- (b)(c) both thermometer readings correct 69, 61 [1]  
correct differences 9, 17 allow e.c.f. [1]
- (d) order matches results (expect D, B, C, A) allow e.c.f. [1]
- (e) any two from:  
room temperature (or other environmental condition)  
initial (hot) water / starting temperature (accept initial temperature)  
volume / mass / amount / level of (hot) water  
same type / thickness / material / size / volume of beaker  
time delays during operations [2]
- (f) same time of cooling for each experiment [1]

**[Total: 7]**