Thermal Properties and Temperature

Mark Scheme 5

Level	IGCSE
Subject	Physics
Exam Board	CIE
Topic	Thermal Physics
Sub-Topic	Thermal Properties and Temperature
Paper Type	Alternative to Practical
Booklet	Mark Scheme 5

Time Allowed: **68 minutes**

Score: **/56**

Percentage: **/100**

1 **(a** θ_r = 27 [1]

(b) t in s, θ in ^oC in both tables [1]

(ii) statement correct (about the same) [1]
justified – within limits – numbers similar, etc. [1]

(c) any two from:
same starting temperature
constant room temperature/avoid draughts
carry out at same time/place/time interval
same thermometer (wtte)
same mass/volume/amount of water
same type of beaker [2]

[Total: 6]

2 **(a** 87 (^oC) [1]

(b) s, ^oC, ^oC [1]

(c) ecf allowed [1]
justified by reference to readings (up to 90s) with comparison of drops in temperatures (with numbers) given (ecf allowed) [1]

(d) Any two from:
starting temperature
room temperature
carry out at same time
same thermometer (words to that effect)
same position of thermometers
same time intervals [2]

[Total: 6]

3 **(a** 91 (°C) [1]

(b) t in s, both θ in °C [1]

(c) statement B and justified by reference to readings [1]

(d) any two from:
same starting temperature/temperature of hot water
constant room temperature/keep away from draughts/out of direct sunlight
same time intervals [2]

[Total: 5]

4 Table
θ in °C, V in cm^3 [1]
correct V 0, 20, 40, 60, 80, 100 [1]

Graph: axes labelled with symbol and unit [1]
axes suitable (e.g. not '3' scale) and plots occupy more than ½ grid [1]
all plots correct (better than ½ sq) [1]
well judged, thin best fit line [1]

(c) 1. sensible comment about heat loss to the surroundings, e.g. use of insulation/lid [1]
2. sensible comment about adding water in a regulated, timed flow (including small volumes/set time intervals/shorter intervals [1]

[Total: 8]

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

6 **(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]

7 **(a** θ_H = 92 (°C) [1]

(b) (i) table: s, °C, °C [1]

(ii) decreases [1]

justified by reference to results, giving numbers referring to temperature drops [1]

(c) any two from:
- room temperature / air conditioning / draughts / environmental conditions
- starting temperature (of thermometer) / temperature of (hot) water
- density of packing / amount of cotton wool / dryness of cotton wool [max 2]

[Total: 6]

8 **(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]