Thermal Properties and Temperature

Mark Scheme 8

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Thermal Physics
Sub-Topic	Thermal Properties and Temperature
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 8

Time Allowed: **63 minutes**

Score: **/52**

Percentage: **/100**

1 **(a)** **(i)** 1 is 20°C
2 is 15 ± 1°C, need both correct for a mark   A1

   (ii) more heat lost at higher temperature   B1   [2]

 (b) heat in = 60 x 210 or *Wt* or 12 600 (J)   C1
heat in water = *m* x *s* x $\Delta\theta$ or 75 x *s* x 40   C1
s = 12600/75 x 40   C1
= 4.2 J/g °C   A1   [4]

 (c) outline correct, two wires with <u>clear</u> junction and a meter/datalogger/computer   M1
labels, hot and cold junctions or clear, two different metals   A1   [2]

                                                                       [Total: 8]

2	**(a)**	start temp. and final temp. or change in temperature	B1	
		mass of iron	B1	
		time heater on	B1	**3**
	(b)	P x t, VIt or in words	B1	
		= m x shc x cit or words	B1	**2**
	(c)	heat lost to surroundings/air	B1	
	(ii)	add lagging/insulate	B1	**2**
				[7]

3	**(a)**	turn on heater and wait until water starts dripping in beaker	**B1**	
		empty beaker & replace, start watch	**B1**	
		stop watch & remove beaker at same time	**B1**	
		record time	**B1**	
		find and record mass of water in beaker	**B1**	**[M4]**
	(b)	60 x t = 120 x 340	**C1**	
		t = 680 s	**A1**	**[2]**
	(c)	ice gains heat from surroundings/ice falls through funnel	**B1**	
	(ii)	lag or fit lid to funnel/place gauze in funnel bottom	**B1**	**[2]**
				Total [8]

4 (a) (i) put hot junction in beaker (of hot water)　　　　　　　**1**
　　　　　read temperature from galvo. in some way (calibration)　**1**　　**2**

(ii) high/low temperatures stated or high/low values quoted or
temperature varying rapidly or small site/at point or remote
place (from meter) or in control systems　　　any 2　　**2**　　**2**

(b) (i) raises the water temperature　　　　　　　　　　　**1**

(ii) provides latent heat or boils/evaporates water　　　**1**　　**2**
　　　　　　　　　　　　　　　　　　　　　　　　　　　(6)

5 (a) Y is a wire of different metal/not copper　　　　　　**B1**
　　　Z is a galvanometer/millivoltmeter/milliammeter　　**B1**　　**2**

(b) 2 junctions at different temperatures, accept one hot,　**B1**
one cold
temperature difference causes e.m.f./voltage/current　**B1**
reading of meter changes (with temperature)　　　　**B1**
1 junction at known temperature/need for calibration　**B1**　　**max 3**

(c) dull or black surface　　　　　　　　　　　　　　**B1**　　**1**
　　　　　　　　　　　　　　　　　　　　　　　　　　　[6]

6 (a) (i) nitrogen　　　　　　　　　　　　　　　　　　　　　　　　**M1**

(ii) copper-solid-molecules very tightly bonded together so separate little　**B1**

water – liquid – molecules less tightly bonded/still small separation　**B1**

nitrogen – gas – molecules "free" and not bonded so separate most　**B1**　**M3**

(N.B. accept 2 bonding statements for 2 marks. 1 separation statement for 1 mark)

(b) (i) size of movement/change in length of liquid column per degree　**B1**

(ii) change in length (of liquid column) same for all degrees　　　**B1**

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　[5]

7

a   junction of two metals, other ends to meter/alternative arrangements   C1

two metals named, meter labelled   **2** A1   **2**

b(i) meter calibrated in degrees or read value and use calibration chart   B1

(ii) change in temp. causes change in voltage/current   **2** B1   **2**

c   high $_{low}$ temperatures   B1

rapidly changing temperatures (or low thermal capacity)   B1

any valid physical reason e.g. distance reading needed, small site etc   **2** B1 M2 *

QT   6

4 a(i) $L = VIt/(m_1 - m_2)$ correct for 2 eg. $VIt = (m_1 - m_2)L$ only 1 or $m_2 - m_1$ **2** C1, A1

(ii) $= 12 \times 2 \times 3750 / 40$ C1

$= 2250$ J/g *   or 2.25×10^6 J/Kg   **2** A1   4

b   large (intermolecular) forces in liquid / bonds   B1

(great) energy needed to separate molecules of liquid   **2** B1   **2**

QT   6