# Thermal Processes

## Mark Scheme 3

| | |
|---|---|
| **Level** | IGCSE |
| **Subject** | Physics |
| **Exam Board** | CIE |
| **Topic** | Thermal Physics |
| **Sub-Topic** | Thermal Processes |
| **Paper Type** | Alternative to Practical |
| **Booklet** | Mark Scheme 3 |

**Time Allowed:** **51 minutes**

**Score:** **/42**

**Percentage:** **/100**

1 **(a** stopwatch / stopclock [1]

**(b)** any three from:
- length of rod
- diameter / thickness / area (of cross-section) of rod
- amount of wax / type of wax
- weight / size/mass of marker
- position for the markers
- (Bunsen) flame / (rate of) heating
- position of Bunsen / flame
- position of rod on tripod [max 3]

**(c)** temperature too high
or thermometer only measures up to about 100 °C
or small range [1]

thermometer / bulb can't make proper contact [1]

**[Total: 6]**

2 **(a)** 24 (°C) [1]

**(b)** units all correct (symbols or words) [1]
times 1, 2, 3, 4, 5, 6 (allow seconds if compatible with heading) [1]

**(c)** thermometer near bottom/no significant difference
and justification matching statement (words or figures) with mention/implication of temperature change [1]
in same time [1]

**(d)** appropriate precaution:
e.g. stir before reading / keep thermometer at same dep [1]
matching explanation:
e.g. ensure temperature is the same throughout / temperature different at different depths [1]

**(e)** appropriate precautions relating to comparison
any two of:
same size/thickness/surface area of beaker
same volume of water
same initial temperature (of water)
same room temperature / appropriate environmental condition [2]

**[Total: 9]**

3 **(a)** 87 ($^{o}$C) [1]

**(b)** s, $^{o}$C, $^{o}$C [1]

**(ii)(iii)** **B** and greater temperature difference
OR numbers quoted, *must see* 21 and 8 or 24 and 5 [1]

**(iv)** **A** 23($^{o}$C) and **B** 40($^{o}$C) [

**(v)** 20 – 26 ($^{o}$C) [1]

**(c)** EITHER viewing thermometer at right angles
OR reference to being ready on time [1]

**(d)** any two from:
room temperature
water / starting temperature
distance of thermometer bulb from water surface
relevant reference to draughts / fans / air conditioning [2]

**[Total: 8]**

4 **(a** **A** = 87(°C) and **B** = 88(°C) [1]

**(b)** units correct (symbols or words) [1]
times correct (0, 30, 60, 90, 120, 150, 180) [1]

**(c)** statement matching temperature changes (accept 'no significant difference' if justified) and justification matching statement (comparison of temperature changes) [1]
including specific mention of temperature change in same time [1]

**(d)** appropriate condition relating to comparison
i.e. any one fro
same size/thickness of beaker
same volume of water
same initial temperature
same room temperature / appropriate environmental condition
same time for cooling [1]

**(e)** any sensible alteration e.g.
put lid on/cover top of **A**
extra experiment without insulation or lid / take lid off **B** [1]
matching explanation e.g.
most thermal energy loss by convection or o.w.t.t.e.
have only changed one factor or o.w.t.t.e. [1]

**[Total: 8]**

5 **(a** 23 (°C) [1]

(b) $t$ in s, $\theta$ in °C [1]

$T_1$= 14 [1]
$T_2$ = 1 [1]

**(c)** Graph:
Axes the right way round, both labelled with quantity, ignore unit [1]
Use of the scale temperature 50 – 80 and time 0 – 200 or 0 – 250, using the whole grid [1]
All seven plots correct to ½ small square [1]
Good line judgement [1]
Thin line [1]

**(d)** Greater rate of cooling in first 30 s (owtte) ecf possible [1]
Decreasing slope of graph (owtte) ecf possible [1]

**[Total: 11]**