

Thermal Properties and Temperature

Mark Scheme 7

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Thermal Physics
Sub-Topic	Thermal Properties and Temperature
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 7

Time Allowed: 44 minutes

Score: /37

Percentage: /100

- 1 (a) SOLID higher temperature means higher energy/greater speed of mols/particles/atoms NOT more vibration NOT vibrate more B1
- vibrations get bigger or movement greater/take up more space or separation larger B1
- GAS (ave) speed/energy of mols/particles/atoms greater B1
- (ave) separation of mols/particles/atoms greater or mols/particles/atoms take up more space or increased pressure causes container to get bigger B1
- (b) liquids: slightly more B1
- gases: much more B1
- (c) regular/uniform expansion or appropriate range (be generous if numbers quoted) or expands a lot/large expansivity or (relatively) non-toxic or low freezing point/melting point or measures low temperatures any 1 B1
- IGNORE reacts to small temp change IGNORE high boiling point [7]
- 2 (a) (i) funnel no longer giving heat to ice OR ice at M.P./constant temp OR heater reached max temp B1
- (ii) inside of large pieces could be well below freezing point)
 OR smaller air gaps if pieces smaller) any 1 B1
 OR better contact between heater and ice)
 OR to ensure heat from heater only goes to the ice)
 OR larger surface area)
 Ignore ice melts faster
- (b) mass of beaker NOT mass of ice NOT mass of water B1
 mass of beaker + water B1
 (apply $\checkmark + \times = 0$ for extras other than power & time)
- (c) (mass of ice melted by heater = $16.3 - 2.1$) = 14.2 g C
 ml in any form, words, symbols or numbers C1
 Wt or Pt in any form, words, symbols or numbers accept VI t C
 338 J/g OR 338 000 J/kg c.a.o A1 [8]

- 3 (a) total mass before ice added B1
 total mass after all ice melted B1 [2]
- (b) (i) mass \times sp ht cap \times change in temp or 20 OR $mc\theta$ B1 [1]
 (ii) mass (of melted ice) \times sp latent ht OR ml B1 [1]
 OR (heat gained by ice) = heat lost by water
- (c) heat/mass or 12 800/30 C1
 427 J/g OR 426667 J/kg any no s.f. ≥ 2 A1 [2]
- (d) heat gained from surroundings OR no lagging B1
 heat needed to cool beaker/stirrer and thermometer) any 2 +
 too much ice added or similar point) B1 [2]
 allow stirring gives energy, allow evaporation/condensation
 (ignore "mistakes when taking readings" or similar)

[Total: 8]

- 4 (a) on surface/throughout; no bubbles/bubbles; all temps./b.p.;
 s.v.p. < at. pressure; svp = at. pressu any two B2 2
- (b) energy/work to separate molecules B1
 (against) forces of attraction between water molecules B1 2
 (to break bonds C1)
 The k.e./speed of the molecules does not increase B1 1
- (c) $Wt = mL$ or $120 \times 1 = 0.05 \times L$ C1
 $L = 120/0.05$ C1
 $L = 2400 \text{ J/g}$ A1 3

[8]

- 5 (a) increase surface area of tank
blow air over surface/put in windy place B1
B1 2
- (b) (i) capillary tube longer or liquid with lower expansivity B1
- (ii) capillary tube thinner/finer or liquid with higher expansivity
or bigger bulb B1 2
- (c) $p_1v_1 = p_2v_2$ or $1 \times 10^5 \times 150 = p_2 \times 50$ C1
 $p_2 = 3 \times 10^5$ (Pa) A1 2
[6]