1 **(a)** SOLID higher temperature means higher energy/greater speed of mols/particles/atoms B1
NOT more vibration NOT vibrate more

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 ✓ + × = 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 VIt 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 × sp ht cap × change in temp or 20 OR mcθ B1 [1]

(ii) mass (of melted ice) × sp latent ht OR ml
OR (heat gained by ice) = heat lost by water B1 [1]

(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 x 1 = 0.05 x L C1
L = 120/0.05 C1
L = 2400 J/g A1 **3**

[8]

5	**(a**	increase surface area of tank		B1	
		blow air over surface/put in windy place		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]