

Question	Answer	Mark
1(a)	Gas molecules (very) far apart OR empty space between gas molecules Molecules of liquid (very) <u>close together</u> / compact OR are touching (each other)	<b>B1</b> <b>B1</b>
(b)(i)	Faster / more energetic water molecules evaporate / escape / leave Slower / less energetic molecules remain (so temperature is lower)	<b>B1</b> <b>B1</b>
(b)(ii)	Water in wide container AND has water with larger surface (area) Rate of evaporation higher / faster / quicker OR higher chance of evaporation	<b>B1</b> <b>B1</b>
		<b>Total: 6</b>

2 (a) Coal, hydroelectric and wind boxes ticked B2

(b) (i) Copper is a good conductor of thermal energy / heat  
Black surface is a good / the best absorber of radiation / infra red B1

(ii) (Temp rise = )  $72 - 20 = 52 (^{\circ}\text{C})$   
(Q =)  $mc\Delta\theta$  OR  $0.019 \times 4200 \times 52$  C1  
4100 J A1

(iii) Efficiency = (power) output / (power) input ( $\times 100$ )  
OR  $70 \frac{(4100 / 5) \times 100}{\text{power input}}$  OR  $\frac{(4100 \times 100)}{\text{power input}}$  OR rearranged C1  
Power input = 1200 W A1

**[Total: 9]**

- 3 (a) energy/heat required to increase temperature
- of 1 kg / 1 g / unit mass (of the substance) B1
  - by 1 °C / 1 K / unit temperature B1
- (b)  $E = mc\Delta\theta$  in any form OR ( $c =$ )  $E \div m\Delta\theta$  C1  
 $E = Pt$  in any form OR  $420 \times 95 (= 39900)$  C1  
 $\Delta\theta = [40.5 - 19.5]$  OR 21 C1  
( $c = 39900 \div 42 =$ )  $950 \text{ J}/(\text{kg } ^\circ\text{C})$  A1
- (c) any two separate points from: max. B2
- lagging / insulation (around block) OR insulate (the block)
  - raise temperature of block by a smaller amount OR heat for a shorter time OR use lower power heater for same time OR higher power for same temperature rise / shorter time
  - polish the surface of the block OR wrap the block in shiny material OR paint (shiny) white
  - reduce initial temperature of block (to below room temperature) OR raise temperature of room
  - reduce draughts

[Total: 8]

- 4 (a) same distance moved (by thread) for same temperature change B1
- (b)  $-10^\circ\text{C}$  B1
- (c) any two from: max. B2
- longer stem
  - bigger bulb OR more liquid
  - narrower bore OR thinner thread
  - liquid with greater expansivity
- (d) (i) falls from  $100^\circ\text{C}$  with a decreasing gradient AND at a faster rate B1  
finishes horizontal along  $20^\circ\text{C}$  line B1
- (ii) **only** bottom box ticked B1

[Total: 7]

5	<b>(a)</b> energy/heat needed to change state of substance/melt (from solid to liquid at constant temperature / melting point) per kg / per unit mass	B1 B1
	<b>(b) (i)</b> ( $l_f =$ ) $Q \div m$ in any form: words, symbols, numbers 340 J/kg OR 336 J/g OR equivalent in J/kg	C1 A1
	<b>(ii)</b> ( $c =$ ) $Q \div [m \Delta T]$ in any form: words, symbols, numbers 4.1 J / (g °C) OR 4100 J / (kg °C)	C1
	<b>(iii)</b> <u>cold</u> water denser AND sinks convection (current) OR circulation OR warmer water rises	B1 B1
		<b>[Total: 8]</b>

6	<b>(a) (i)</b> reduces (rate of evaporation) NOT zero (rate of evaporation) no / fewer evaporated molecules removed by wind OR greater humidity / vapour pressure NOT fewer molecules in liquid / puddle blown away	M1  A1
	<b>(ii)</b> increases (rate of evaporation) molecules move faster / have more energy OR more molecules have energy to escape	M1 A1
	<b>(b)</b> greater (rate of evaporation) OR rate is less in <u>small</u> puddle ignore rate of disappearance of puddle surface areas correctly compared	B1 B1
	<b>(c)</b> description of viable experiment NOT absorption expt statement of measurements to be made good detail e.g. thermometers in comparable positions OR pyrometer same position relative to different surfaces	M1 A1 A1
		<b>[Total: 9]</b>

- 7 (a)  $(m =) Pt/l$  **OR**  $460 \times 180 / 2.3 \times 10^6$  **OR**  $82\,800 / 2.3 \times 10^6$  C1  
 0.036 kg **OR** 36 g A1
- (b) (i) any two from:  
 (surface) area  
 draught  
 temperature (of water / room)  
 humidity of air B2
- (ii) any two from:  
 evaporation at any temperature / below boiling point  
 evaporation (only) at the surface  
 evaporation influenced by surface area / draught / temperature / humidity (not if given in (b)(i)) B2
- [Total: 6]**

- 8 (a) (nuclear) fusion B1 [1]
- (b) (i) smaller (surface) area  
 (accept thinner, narrower(at top), ignore reference to lid) B1 [1]
- (ii) apparatus: black object, white object, thermometer(s)/ball-bearing with wax/level of water in vessel B1
- source of heat e.g. Sun/radiant heater (condone light bulb/Bunsen burner) B1
- action: (fill cans with water and) measure temperature rise **or** wax melts **or** compare volumes of water B1
- observation: water in black can (better absorber) has greater temperature increase / wax melts first / less water  
 note: emission experiment gains max. 2 B1 [4]
- [Total: 6]**

- 9 (a) T-shirt in wind/on L dries quicker OR T-shirt out of wind/on R dries slower M1  
 wind removes more evaporated molecules accept quicker A1 [2]  
 NOT wind gives water molecules more KE
- (b) T-shirt folded double/on R dries slower OR T-shirt unfolded/on L dries quicker M1  
 correct reference to smaller/larger surface area for molecules to evaporate A1 [2]  
 OR water trapped (in fold) OR more humid in fold
- (c) water evaporates from her hair B1  
 heat required for evaporation OR heat flows (from body/hair) to warm up cold water  
 OR faster molecules escape leaving water cooler/lowering KE  
 ignore: there is a cooling effect B1 [2]
- [Total: 6]**

10	(a)	turn on heater and wait until water starts dripping in beaker empty beaker & replace, start watch stop watch & remove beaker at same time record time find and record mass of water in beaker	B1 B1 B1 B1 B1	[M4]
	(b)	$60 \times t = 120 \times 340$ $t = 680 \text{ s}$	C1 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]