

YEAR 2 | MODULE 5 | PACK 02

Heat capacity and latent heat

Official past-paper mark scheme

2017-2023 | OCR A H556 | 5.1.3; links to 5.1.2(g)

28 marks | 7 question entries

One practice session

Match each extract using its question number and stable TP identifier. Original OCR answers, examiner guidance, alternatives, diagrams and level descriptors are preserved.

The heading gives the maximum marks for the assigned subparts. Alternative methods and "any n from" lists offer routes to those marks; do not add every printed point together.

Click a source reference to open OCR's full official mark scheme. Keep this file closed while attempting the questions.

Reserved: all 2024 and 2025 papers are excluded. These files contain official examination questions only; no sample, specimen or practice papers.

Question index

TP identifiers are stable across the question packs and mark schemes; Q numbers refer to this pack.

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Q01 | TP09

1 mark

June 2022 | H556/01 | Q7

Question	Answer	Marks	Guidance
7	D	1	

Q02 | TP03

1 mark

June 2018 | H556/01 | Q6

Question	Answer	Marks	Guidance
6	B	1	

Q03 | TP19

6 marks

June 2017 | H556/01 | Q20

Question			Answer	Marks	Guidance
20	(a)		power $\times$ time = $2200 \times 4.0 \times 60$	C1	Note: Answer to 3 s.f. is 5.28×10^5 (J)
			energy = 5.3×10^5 (J)	A1	
	(b)		Energy used to heat water to $100\text{ }^{\circ}\text{C}$ = $0.60 \times 4200 \times 80$ (= 201.6 kJ)	C1	Possible ecf from (a)
			Energy remaining to vaporise water = $528\text{ (kJ)} - 201.6\text{ (kJ)}$ (= 326.4 (kJ))	C1	
			mass vaporised = $326.4 \times 10^3 / 2.3 \times 10^6 = 0.1419$ (kg)	C1	
			mass of water left = $0.60 - 0.1419$		
			mass of water left = 0.46 (kg)	A1	

Q04 | TP30A

7 marks

November 2021 | H556/01 | Q18(a)

Question			Answer	Marks	Guidance
18	(a)	(i)	(energy =) 150×7 or 1050 (J) $1050 = 0.025 \times c \times 20$ ($c =$) $2100 \text{ (J kg}^{-1} \text{ K}^{-1}\text{)}$	C1 C1 A1	Allow any correct re-arrangement
		(ii)	(energy=) $150 \times (63 - 7)$ or 8400 (J) $8400 = L_{\text{f}} \times 0.025$ ($L_{\text{f}} =$) $3.4 \times 10^5 \text{ (J kg}^{-1}\text{)}$	C1 A1	
		(iii)	Longer time to heat water (through the same temperature) / shorter time to heat (ice) through same temperature / gradient of graph is greater for ice / gradient of graph is smaller for water/AW Water has greater specific heat capacity	M1 A1	

Q05 | TP24B

2 marks

June 2019 | H556/01 | Q21(b)

Question			Answer	Marks	Guidance
	(b)		$E = mc\Delta\theta$ (any subject) <u>and</u> gradient is larger for CD The specific heat capacity of the liquid is less than that of the solid.	M1 A1	ORA Allow: $\Delta\theta$ is larger for liquid in the same time interval or same energy supplied for “gradient” Allow $c \propto \text{gradient}^{-1}$ Not: $c = 1 / \text{gradient}$

Q06 | TP37

8 marks

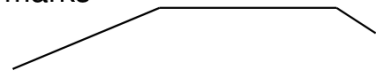
June 2023 | H556/03 | Q6(b)

Question			Answer	Mark	Guidance
	(b)	(i)	Either (thermal/heat) energy required per unit mass to change solid to liquid <u>at constant temperature</u> or (thermal/heat) energy released per unit mass when liquid changes to solid <u>at constant temperature</u>	B1 (B1)	Ignore $L = E/m$ unless letters are defined Allow energy per kg /energy of 1kg for energy per unit mass Allow energy required to melt unit mass at constant temperature Allow energy released when unit mass solidifies at constant temperature
		(ii)	(Energy =) $Pt = mL$ $m = \frac{40 \times 60}{9.4 \times 10^4} =$ 2.6×10^{-2} (kg)	C1 A1	Allow $E = Pt$ and $E = mL$ seen separately Formulae may be implied from subsequent calculation Correct to at least 2sf 2.553×10^{-2} to 4sf so annotate 2.5×10^{-2} as AE

Q06 | TP37 - continued

8 marks

June 2023 | H556/03 | Q6(b)

Question			Answer	Mark	Guidance
6	(b)	(iii)	Any two from - not all the heat / energy is used to melt the PLA or some heat / energy is 'lost' (to environment / surroundings) - some heat / energy / time is used to raise temperature of PLA up to or above its melting point / 160°C (PLA not all applied to same spot so) PLA needs (time) to move from one place to another - PLA needs (time) to solidify	B1 × 2	For environment, allow printer or any named part of printer (e.g. nozzle, print head, print bed, build plate, hot-end, cables) Allow energy transfer is not 100% efficient Not energy is lost through sound or light Not PLA needs time to melt
		(iv)	a single line (or curve) starting at A which gradually and continuously rises to 160°C followed by an initial flat section at 160°C after a flat section at 160°, the line (or curve) rises and then falls back to 160°C a second flat section at 160°C followed by a single line (or curve) which gradually and continuously falls, ending at B	B1 B1 B1	Note: this flat-topped shape gains the first and third marks 

Q07 | TP34

3 marks

June 2022 | H556/03 | Q4(b)(iv)

Question			Answer	Marks	Guidance
		(iv)	$E = Pt = IAt$ and $V = Ah$ where A is CSA of cylindrical tank and h is height of tank $\Delta\theta = \frac{E}{mc} = \frac{I A t}{\rho A h c} = \frac{I t}{\rho h c} \text{ and so } \frac{\Delta\theta}{t} = \frac{I}{\rho h c}$ $E = mc\Delta\theta$ and $m = \rho V$ $\text{max temp rise s}^{-1} \left(= \frac{\Delta\theta}{t} \right) = \frac{3 \times 10^{-6}}{1000 \times 5 \times 4200}$ max temp rise $\text{s}^{-1} = 1 \times 10^{-13} \text{ (}^{\circ}\text{C s}^{-1}\text{)}$	C1 C1 A1	Allow nonstandard letters as long as meaning is clear Allow 1000 (kg m^{-3}) for ρ Allow $\pi r^2 h$ or $5\pi r^2$ for V Allow answer to more than 1s.f. ($1.43 \times 10^{-13} \text{ (}^{\circ}\text{C s}^{-1}\text{)}$)