

Q1.

Question number	Answer	Additional guidance	Mark
(i)	Rearrangement (and substitution) (1) (c) $= \frac{1050}{0.058 \times 78}$ evaluation (1) 230 (J/kg °C)	$c = \frac{\Delta Q}{m \times \Delta \theta}$ award 1 mark if 78 seen accept 232(J/kg °C) award full marks for correct answer without working.	(2)

Q2.

Question number	Answer	Additional guidance	Mark
i	<p>rearrangement and substitution (1)</p> $(\Delta\theta =) \frac{210 (x10^3)}{5.8 \times 860}$ <p>evaluation (1)</p> <p>42 (°C)</p>	$(\Delta\theta =) \frac{210 (x10^3)}{4988}$ <p>accept any value which rounds to 42 e.g. 42.10</p> <p>award full marks for the correct answer without working</p> <p>4.2 to any other power of 10 scores 1 mark</p>	(2) AO2.1

<p>energy transferred to the surroundings (1)</p> <p>argument linking $\Delta\theta$ to ΔQ using</p> $\Delta\theta = \frac{\Delta Q}{m \times c} (1)$	<p>energy dissipated</p> <p>from the equation, if energy supplied to the block is smaller the change of temperature will be smaller</p> <p>'brick transfers (thermal) energy to the surroundings' scores 2 marks</p>
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Q3.

Question number	Answer	Additional guidance	Mark
(ii)	(Use $\Delta Q = m \times c \times \Delta\theta$) substitution thermal energy gained = $0.028 \times 510 \times 80$ (1) evaluation = 1100 (J) (1)	ignore any pot error here 1142 (J)	(2)

Q4.

Question	Answer	Additional guidance	Mark
(i)	30 (°C) (1)		(1) AO3.1

Question	Answer	Additional guidance	Mark
(ii)	substitution (1) (c =) $\frac{96000}{0.82 \times 30}$ evaluation (1) (c =) 3900 (J/kg °C)	allow ECF from (a)(i) throughout allow values that round to 3900 e.g. 3902.4 (J/kg °C) award full marks for the correct answer without working	(2) AO3.1

Q5.

Question Number	Answer	Additional guidance	Mark
(i)	<p>substitution (1) $(\Delta Q) = 1.5 \times 4200 \times 50$</p> <p>evaluation (1) 320 000 (J)</p>	<p>accept 315 000 (J) 310 000 (J)</p> <p>award full marks for the correct answer without working</p> <p>320 000 000 315 000 000 310 000 000 score 1 mark (mass in grams)</p>	(2)
Question Number	Answer	Additional guidance	Mark
(ii)	<p>substitution (1) $3500 = \frac{670\,000}{t}$</p> <p>rearrangement (1) $(t =) \frac{670\,000}{3500}$</p> <p>evaluation (1) 190(s)</p>	<p>accept substitution and rearrangement in either order</p> <p>accept any answer that round to 190(s)</p> <p>power of ten error award 2 marks maximum</p> <p>award full marks for the correct answer without working</p>	(3)

Q6.

Question Number	Answer	Additional guidance	Mark
(i)	substitution into $\Delta Q = m \times c \times \Delta\theta$ (1) $84\,000 = 0.25 \times 4200 \times \Delta\theta$ rearrangement $\frac{\Delta Q}{m \times c}$ (1) $(\Delta\theta =) \frac{84\,000}{0.25 \times 4200}$ (= 80) evaluation (1) (temperature before heating =) 20 (°C)	accept substitution and rearrangement in either order answer of 80 (°C) scores 2 marks award full marks for the correct answer without working	(3)

Q7.

Question number	Answer	Additional guidance	Mark
(ii)	temperature rise = 34 (°C) (1) substitution (1) $\frac{50 \times 300}{0.92 \times 34}$ evaluation (1) 480 (J/kg°C)	ecf temperature rise award full marks for correct answer without working	(3)



Q8.

Question number	Answer	Additional guidance	Mark
i	substitution into $\Delta Q = m \times s \times \Delta T \quad (1)$ $(\Delta Q) = 1.41 \times 4200 \times (100-25)$		(3) AO2
	evaluation (1) (energy =) 444,150 (J) answer to 2 sf (1) 440,000 (J)	ignore POT error for this mark independent mark allow 3 sf 444,000 award full marks for the correct answer without working award 1 mark for answers with values 148,050 or 592,200 (incorrect temp and sf) award 2 marks for answers with values 150,000 or 148,000 or 590,000 or 592,000 (incorrect temp but allowed sf)	

Q9.

Question number	Answer	Additional guidance	Mark
(ii)	<p>Equating the same variable in both equations (1)</p> $\Delta Q = m \times c \times \Delta\theta = P \times t$ <p>Rearrangement (1)</p> $t = \frac{(m \times c \times \Delta\theta)}{P}$ <p>Substitution and evaluation (1)</p> $t = \frac{(1 \times 4200 \times 77)}{3500}$ $= 92 \text{ s}$	<p>allow $\Delta\theta$ seen as 95 – 18</p> <p>92.4 evaluation must be seen to at least 2 s.f. at some point in the working</p>	(3)