

3(a)	(thermal) energy per unit mass (to cause state change)
	(thermal) energy to change state at constant temperature
3(b)	(for vaporisation): involves greater change in volume (of substance) or involves greater increase in separation of molecules
	more work has to be done by molecules (to separate) or greater increase in potential energy of molecules
	kinetic energy of molecules unchanged, so more thermal energy needed
3(c)	$Q = mc\Delta\theta$ and $Q = mL$
	$\Delta\theta$ for the water = 26.4 – 10.3
	$(37.0 \times L) + (37.0 \times 4.18 \times 10.3) = (208 \times 4.18 \times 16.1)$
	$L = 335 \text{ J g}^{-1}$

3(a)	(thermal) energy per unit mass (to cause temperature change)
	(thermal) energy per unit change in temperature
3(b)(i)	density = mass / volume
	mass = $2.700 \times 10^3 \times 3.612 \times 10^{-3}$ = 9.752 kg
3(b)(ii)	volume = $3.612 \times 10^{-3} \times (2.700 / 2.620) = 3.722 \times 10^{-3} \text{ m}^3$ or volume = $9.752 / (2.620 \times 10^3) = 3.722 \times 10^{-3} \text{ m}^3$
3(b)(iii)	$W = p\Delta V$
	= $1.01 \times 10^5 \times (3.722 - 3.612) \times 10^{-3}$
	= 11.1 J
3(b)(iv)	volume (of block) increases
	work is done against the atmosphere so work done (on block) is negative
3(b)(v)	thermal energy = $(4.38 \times 10^6) + 11.1$
	specific heat capacity = $(4.38 \times 10^6) / (9.75 \times 500)$
	= $898 \text{ J kg}^{-1} \text{ }^\circ\text{C}^{-1}$
3(c)	work done is negligible compared with (change in) internal energy so (answer in (b)(v) would be) unchanged

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2(a)	same temperature (as each other)
	no net transfer of thermal energy (between them)
2(b)(i)	$E_1 = XL$
2(b)(ii)	$E_2 = Mc(t - \theta)$
2(b)(iii)	$E_3 = Xc\theta$
2(c)	$E_2 = E_1 + E_3$
	$Mc(t - \theta) = XL + Xc\theta$ and completion of algebra to reach $\theta = (Mct - XL) / c(M + X)$