Question Number	Answer	Mark
13	Use of $\rho = \frac{m}{V}$ (1) Use of $\Delta E = mc\Delta\theta$ (1) Use of $\Delta E = L\Delta m$ (1) Use of $P = \frac{\Delta E}{\Delta t}$ [to calculate time to melt completely] **Or** use of $P = \frac{\Delta E}{\Delta t}$ to calculate energy received from the Sun in 1 day (1) $t = 1.21 \times 10^5$ s or **Or** $\Delta E = 7.47 \times 10^{10}$ J (1) t = 33.7 hours, so palace would not melt completely in a day **Or** energy required is 9.09×10^{10} J, so more energy required than would be transferred in 1 day, so palace would not melt completely. (1) (Allow full credit for responses in which 1 day is 12 hours) <u>Example of calculation</u> $m = \rho V = 1325 \text{ kg m}^{-3} \times 1250 \text{ m}^3 = 1.66 \times 10^6 \text{ kg}$ $\Delta E = 1.66 \times 10^6 \times 1.30 \times 10^3 \text{ J kg}^{-1}\text{K}^{-1} \times (36.0\text{-}28.5) \text{ K} = 1.62 \times 10^{10} \text{ J}$ $\Delta E = 4.5 \times 10^4 \text{ J kg}^{-1} \times 1.66 \times 10^6 \text{ kg} = 7.47 \times 10^{10} \text{ J}$ Energy required = $1.62 \times 10^{10} \text{ J} + 7.47 \times 10^{10} \text{ J} = 9.09 \times 10^{10}$ J $t = \frac{(1.62+7.47) \times 10^{10} \text{J}}{7.5 \times 10^5 \text{ W}} = 1.21 \times 10^5 \text{ s}$ $t = \frac{1.21 \times 10^5 \text{ s}}{3600 \text{ s hour}^{-1}} = 33.7 \text{ hour}$ In 1 day, $\Delta E = 7.5 \times 10^5 \text{ W} \times 24 \times 3600 \text{ s} = 6.48 \times 10^{10} J$	**6**
	Total for question 13	**6**