

Question Number	Answer	Mark
11	<p>Use of <math>\Delta E = mc\Delta\theta</math> (1)</p> <p>Use of volume flow rate to calculate <math>V</math> (1)</p> <p>Use of <math>\rho = \frac{m}{V}</math> to calculate mass of shower water (1)</p> <p>Use of <math>\frac{\text{Energy used to heat bathwater}}{\text{Energy used to heat shower water}}</math>  <b>Or</b> calculates <math>10 \times (\text{energy used to heat shower water})</math> (1)</p> <p>Taking a bath uses 12 times as much energy  <b>Or</b> <math>1.14 \times 10^7 \text{ J} &gt; 9.34 \times 10^6 \text{ J}</math> so bath uses more than <math>10 \times</math> shower energy (1)</p> <p><u>Example of calculation</u></p> <p><math>\Delta E = 160 \text{ kg} \times 4180 \text{ J kg}^{-1} \text{ K}^{-1} \times (32 - 15) \text{ K} = 1.14 \times 10^7 \text{ J}</math></p> <p>In 1 second, <math>m = 1.00 \times 10^3 \text{ kg m}^{-3} \times 1.8 \times 10^{-5} \text{ m}^3 = 0.018 \text{ kg}</math></p> <p><math>m = 0.018 \text{ kg s}^{-1} \times 9 \times 60 \text{ s} = 9.72 \text{ kg}</math></p> <p><math>\Delta E = 9.72 \text{ kg} \times 4180 \text{ J kg}^{-1} \text{ K}^{-1} \times (38 - 15) \text{ K} = 9.34 \times 10^5 \text{ J}</math></p> <p>Energy ratio = <math>\frac{1.14 \times 10^7 \text{ J}}{9.34 \times 10^5 \text{ J}} = 12.2</math></p>	5
	<b>Total for question 11</b>	<b>5</b>