

82. The heat needed is

$$\begin{aligned} Q &= (10\%)mL_F \\ &= \left(\frac{1}{10}\right)(200,000 \text{ metric tons})(1000 \text{ kg/metric ton})(333 \text{ kJ/kg}) \\ &= 6.7 \times 10^{12} \text{ J} . \end{aligned}$$