

43. Let the mass of the steam be m_s and that of the ice be m_i . Then $L_F m_c + c_w m_c (T_f - 0.0^\circ\text{C}) = L_s m_s + c_w m_s (100^\circ\text{C} - T_f)$, where $T_f = 50^\circ\text{C}$ is the final temperature. We solve for m_s :

$$\begin{aligned} m_s &= \frac{L_F m_c + c_w m_c (T_f - 0.0^\circ\text{C})}{L_s + c_w (100^\circ\text{C} - T_f)} \\ &= \frac{(79.7 \text{ cal/g})(150 \text{ g}) + (1 \text{ cal/g}\cdot^\circ\text{C})(150 \text{ g})(50^\circ\text{C} - 0.0^\circ\text{C})}{539 \text{ cal/g} + (1 \text{ cal/g}\cdot^\circ\text{C})(100^\circ\text{C} - 50^\circ\text{C})} \\ &= 33 \text{ g} . \end{aligned}$$