Phys10-2Rec
Quiz#3-Sect.22
Chapter 18

Name: Key Id:

What mass of steam initially at 100 °C should be mixed with 300 g of ice at 0 °C in a thermally insulated container to produce liquid water at 20 °C?
Given:
Specific heat of water is 1 cal/g K.
Specific heat of ice is 0.53 cal/gK.
Latent heat of fusion of ice is 80 cal/g.
Latent heat of vaporization of steam is 540 cal/g.

$$Q_{steam} + Q_{ice} = 0$$

$$Q_{steam} = -m_s L_v + m_s c \Delta T = -m_s \times 540 + m_s \times 1 \times (20-100)$$

$$Q_{ice} = m_{ice} L_v + m_{ice} c \Delta T = 300 \times 80 + 300 \times 1 \times (20-0)$$

$$m_s [540 + 80] = 24000 + 6000 = 30000$$

$$m_s = \frac{30000}{620} = \boxed{48.3\ g}$$