Komal likes to have a tepid bath. She has 5 kg of water at 25 (degree Celcius). How many kg of water should she boil to have a comfortable bath of 45 (degree Celcius)?

Solution:

Let:

$m_1 = 5\ kg$

$T_1 = 25°C$

$T_2 = 100°C$ the temperature of boiling water

$T_3 = 45°C$

$m_2 - ?$

According to the laws of thermodynamics:

$Q_1 + Q_2 = Q_3$

$m_1 c T_1 + m_2 c T_2 = (m_1 + m_2) c T_3$

$m_1 T_1 + m_2 T_2 = m_1 T_3 + m_2 T_3$

$m_2 (T_2 - T_3) = m_1 T_3 - m_1 T_1$

$\boldsymbol{m_2 = \dfrac{m_1 T_3 - m_1 T_1}{T_2 - T_3}}$

$\boldsymbol{m_2 = \dfrac{5*45 - 5*25}{100 - 45} = 1.82\ kg}$

Answer: 1.82 kg