Answer on Question #72826 - Physics - Molecular Physics - Thermodynamics

Question:

A 2.5kg of water at 65 degree celsius is added to a 45kg of water at 8 degree celsius. What is the final temperature of the mixture?

Solution:

Let's assign the index 1 and 2 for the water with different temperature.

During the equilibration, the change in temperature occurs and it has to be included to the heat equation:

$$Q_1 = m_1 c(T_1 - T_x)$$

$$Q_2 = m_2 c(T_x - T_2)$$

At the end point of equilibration, the heat of both systems becomes the same:

$$Q_1 = Q_2$$

$$m_1 c(T_1 - T_x) = m_2 c(T_x - T_2)$$

From this equation we can deviate the final temperature of the mixture:

$$T_x = \frac{m_1 T_1 + m_2 T_2}{m_1 + m_2}$$

$$T_x = \frac{2.5 \cdot 65 + 45 \cdot 8}{2.5 + 45} = 11℃$$

Answer: The final temperature of water mixture is 11°C.