

Example 2

Mix 0.17 kg of 12°C milk into 0.75 kg of 95°C coffee. Both are essentially water with a specific heat capacity of 4186 J/(kg °C). What is the equilibrium temperature?

milk		coffee
m	kg	kg
c	J kg ⁻¹ °C ⁻¹	J kg ⁻¹ °C ⁻¹
θ	°C	°C

$$Q_{\text{loss}} = Q_{\text{gained}}$$

$$Q_{\text{coffee}} = Q_{\text{milk}}$$

$$m c \Delta \theta = m c \Delta \theta$$

$$() () (- \theta_f) = () () (\theta_f -)$$

$$(- \theta_f) = (\theta_f -)$$

$$- \theta_f = \theta_f -$$

$$\theta_f =$$

$$\theta_f = \underline{\hspace{2cm}}$$

$$= \text{ } ^\circ\text{C} \#$$

Example 3

What is the final temperature of 0.47kg of ice at 0°C added to an insulated container filled with 3.75 kg of water at 22°C? ($c_{\text{ice}} = 2090 \text{ J/kg}^\circ\text{C}$)

	ice	water
m	kg	kg
c	$\text{J kg}^{-1}^\circ\text{C}^{-1}$	$\text{J kg}^{-1}^\circ\text{C}^{-1}$
θ	$^\circ\text{C}$	$^\circ\text{C}$

$$Q_{\text{loss}} = Q_{\text{gained}}$$

$$Q_{\text{water}} = Q_{\text{ice}}$$

$$m c \Delta\theta = m c \Delta\theta$$

$$(\quad) (\quad) (-\theta_f) = (\quad) (\quad) (\theta_f -)$$

$$- \theta_f = \theta_f$$

$$\theta_f =$$

$$\theta_f = \underline{\hspace{2cm}}$$

$$= \quad ^\circ\text{C}$$

Example 4

A, B and C are the type of liquid which mass A is 8 kg and mass B is 22 kg. The initial temperature of liquid A is 65°C , liquid B is 45°C and liquid C is 15°C . The final temperature when all the liquid mixed is 40°C . If the specific heat of A, B and C are $2.1 \times 10^3 \text{ J/kg}^{\circ}\text{C}$, $3.3 \times 10^3 \text{ J/kg}^{\circ}\text{C}$ and $4.2 \times 10^3 \text{ J/kg}^{\circ}\text{C}$, calculate the mass of the liquid C.

	A	B	C
m	kg	kg	
c	$\text{J kg}^{-1}^{\circ}\text{C}^{-1}$	$\text{J kg}^{-1}^{\circ}\text{C}^{-1}$	$\text{J kg}^{-1}^{\circ}\text{C}^{-1}$
θ	$^{\circ}\text{C}$	$^{\circ}\text{C}$	$^{\circ}\text{C}$

$$\theta_{\text{final}} = 40^{\circ}\text{C}$$

$$Q_{\text{loss}} = Q_{\text{gained}}$$

$$Q_A + Q_B = Q_C$$

$$m_A c_A \Delta\theta_A + m_B c_B \Delta\theta_B = m_C c_C \Delta\theta_C$$

$$(8)(2.1 \times 10^3)(65 - 40) + (22)(3.3 \times 10^3)(45 - 40) = m(4.2 \times 10^3)(40 - 15)$$

$$+ = m()$$

$$\therefore m = \underline{\hspace{2cm}}$$

$$= \underline{\hspace{2cm}} \text{ kg}$$