

Opgaven

Opgave: Aquarium

$$Q_{\text{opwarmen}} = Q_{\text{toevoer}}$$

$$* Q_{\text{opwarmen}} = Q_{\text{water}} = m \cdot \Delta T \cdot c$$

$$* m = \rho \cdot V$$

$$* \rho = 0,998 \frac{\text{g}}{\text{cm}^3}$$

$$* V = 200 \text{ L} = 200 \text{ dm}^3 = 200 \cdot 10^3 \text{ cm}^3$$

$$\Rightarrow m = 0,998 \cdot 200 \cdot 10^3 = 199600 \text{ g} = 199,6 \text{ kg}$$

$$* \Delta T = 25,0 - 20,0 = 5,0 \text{ }^\circ\text{C}$$

$$* c = 4,18 \cdot 10^3 \text{ J/kg}^\circ\text{C}$$

$$\Rightarrow Q_{\text{opwarmen}} = 4,17 \cdot 10^6 \text{ J}$$

$$* Q_{\text{toevoer}} = E_{\text{verwarming}} = P \cdot t$$

$$* P = 200 \text{ W}$$

$$\Rightarrow Q_{\text{toevoer}} = 200 \cdot t$$

Invullen

$$\Rightarrow 4,17 \cdot 10^6 = 200 \cdot t$$

$$\Rightarrow t = 2,1 \cdot 10^4 \text{ s} = 5,8 \text{ h}$$

Opgave: Warmtecapaciteit

$$Q_{\text{opwarmen}} = Q_{\text{toevoer}}$$

$$* Q_{\text{opwarmen}} = Q_{\text{water}} + Q_{\text{joulemeter}}$$

$$* Q_{\text{water}} = m \cdot \Delta T \cdot c$$

$$* m = 250 \text{ g} = 0,250 \text{ kg}$$

$$* c = 4,18 \cdot 10^3 \text{ J/kg}^\circ\text{C}$$

$$* \Delta T = 21,5 - 18,5 = 3,0 \text{ }^\circ\text{C}$$

$$\Rightarrow Q_{\text{water}} = 3135 \text{ J}$$

$$* Q_{\text{joulemeter}} = \Delta T \cdot C$$

$$* \Delta T = 21,5 - 18,5 = 3,0 \text{ }^\circ\text{C}$$

$$\Rightarrow Q_{\text{joulemeter}} = 3,0 \cdot C$$

$$\Rightarrow Q_{\text{opwarmen}} = 3135 + 3,0 \cdot C$$

$$* Q_{\text{toevoer}} = Q_{\text{koper}} = m \cdot \Delta T \cdot c$$

$$* m = 120 \text{ g} = 0,120 \text{ kg}$$

$$* c = 387 \text{ J/kg}^\circ\text{C}$$

$$* \Delta T = 100 - 21,5 = 78,5 \text{ }^\circ\text{C}$$

$$\Rightarrow Q_{\text{toevoer}} = 3645,54 \text{ J}$$

Invullen

$$\Rightarrow 3135 + 3,0 \cdot C = 3645,54$$

$$\Rightarrow C = 170,18 = 1,7 \cdot 10^2 \text{ J/}^\circ\text{C}$$

Opgave: Mengen

$$Q_{\text{opwarmen}} = Q_{\text{toevoer}}$$

$$* Q_{\text{opwarmen}} = Q_{\text{alcohol}} = m \cdot \Delta T \cdot c$$

$$* m = \rho \cdot V$$

$$* \rho = 0,80 \text{ g/cm}^3$$

$$* V = 1,0 \text{ L} = 1,0 \text{ dm}^3 = 1,0 \cdot 10^3 \text{ cm}^3$$

$$\Rightarrow m = 800 \text{ g} = 0,800 \text{ kg}$$

$$* c = 2,43 \cdot 10^3 \text{ J/kg}^\circ\text{C}$$

$$* \Delta T = T_{\text{eind}} - 50$$

$$\Rightarrow Q_{\text{opwarmen}} = 0,800 \cdot 2,43 \cdot 10^3 \cdot (T_{\text{eind}} - 50)$$

$$* Q_{\text{toevoer}} = Q_{\text{water}} = m \cdot \Delta T \cdot c$$

$$* m = \rho \cdot V$$

$$* \rho = 0,998 \text{ g/cm}^3$$

$$* V = 2,0 \text{ L} = 2,0 \text{ dm}^3 = 2,0 \cdot 10^3 \text{ cm}^3$$

$$\Rightarrow m = 1996 \text{ g} = 1,996 \text{ kg}$$

$$* c = 4,18 \cdot 10^3 \text{ J/kg}^\circ\text{C}$$

$$* \Delta T = 100 - T_{\text{eind}}$$

$$\Rightarrow Q_{\text{toevoer}} = 1,996 \cdot 4,18 \cdot 10^3 \cdot (100 - T_{\text{eind}})$$

Invullen

$$\Rightarrow 0,800 \cdot 2,43 \cdot 10^3 \cdot (T_{\text{eind}} - 50) = 1,996 \cdot 4,18 \cdot 10^3 \cdot (100 - T_{\text{eind}})$$

$$\Rightarrow T = 90,7 = 91 \text{ }^\circ\text{C}$$