Opgaven

Opgave: Aquarium

$Q_{opwarmen} = Q_{toevoer}$

- $Q_{opwarmen} = Q_{water} = m \cdot \Delta T \cdot c$
  - $m = \rho \cdot V$
    - $\rho = 0{,}9982 \frac{g}{cm^3}$
    - $V = 200\ L = 200\ dm^3 = 200 \cdot 10^3\ cm^3$
    - $\Rightarrow\ m = 0{,}9982 \cdot 200 \cdot 10^3 = 199640\ g = 199{,}64\ kg$
  - $\Delta T = 25{,}0 - 20{,}0 = 5{,}0\ °C$
  - $c = 4{,}18 \cdot 10^3\ J/kg°C$

$\Rightarrow\ Q_{opwarmen} = 4{,}172 \cdot 10^6\ J$

- $Q_{toevoer} = E_{verwarming} = P \cdot t$
  - $P = 200\ W$

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

Invullen

$\Rightarrow\ 4{,}172 \cdot 10^6 = 200 \cdot t$

$\Rightarrow\ t = 2{,}09 \cdot 10^4\ s = 5{,}8\ h$

Opgave: Warmtecapaciteit

$Q_{opwarmen} = Q_{toevoer}$

- $Q_{opwarmen} = Q_{water} + Q_{joulemeter}$
  - $Q_{water} = m \cdot \Delta T \cdot c$
    - $m = 250\ g = 0{,}250\ kg$
    - $c = 4{,}18 \cdot 10^3\ J/kg°C$
    - $\Delta T = 21{,}5 - 18{,}5 = 3{,}0\ °C$

    $\Rightarrow\ Q_{water} = 3135\ J$
  - $Q_{joulemeter} = \Delta T \cdot C$
    - $\Delta T = 21{,}5 - 18{,}5 = 3{,}0\ °C$

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

  $\Rightarrow\ Q_{opwarmen} = 3135 + 3{,}0 \cdot C$
- $Q_{toevoer} = Q_{koper} = m \cdot \Delta T \cdot c$
  - $m = 120\ g = 0{,}120\ kg$
  - $c = 387\ J/kg°C$
  - $\Delta T = 100 - 21{,}5 = 78{,}5\ °C$

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

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

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

Opgave: Mengen

$Q_{opwarmen} = Q_{toevoer}$

- $Q_{opwarmen} = Q_{alcohol} = m \cdot \Delta T \cdot c$
  - $m = \rho \cdot V$
    - $\rho = 0{,}80\ g/cm^3$
    - $V = 1{,}0\ L = 1{,}0\ dm^3 = 1{,}0 \cdot 10^3\ cm^3$
  - $\Rightarrow\ m = 800\ g = 0{,}800\ kg$
  - $c = 2{,}43 \cdot 10^3 J/kg°C$
  - $\Delta T = T_{eind} - 50$

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

- $Q_{toevoer} = Q_{water} = m \cdot \Delta T \cdot c$
  - $m = \rho \cdot V$
    - $\rho = 0{,}9982\ g/cm^3$
    - $V = 2{,}0\ L = 2{,}0\ dm^3 = 2{,}0 \cdot 10^3\ cm^3$
  - $\Rightarrow\ m = 1996{,}4\ g = 1{,}9964\ kg$
  - $c = 4{,}18 \cdot 10^3\ J/kg°C$
  - $\Delta T = 100 - T_{eind}$

$\Rightarrow\ Q_{toevoer} = 1{,}9964 \cdot 4{,}18 \cdot 10^3 \cdot\ (100 - T_{eind})$

Invullen

$\Rightarrow\ 0{,}800 \cdot 2{,}43 \cdot 10^3 \cdot (T_{eind} - 50) = 1{,}9964 \cdot 4{,}18 \cdot 10^3 \cdot\ (100 - T_{eind})$

$\Rightarrow\ T = 90{,}6 = 91\ °C$