$\theta_i = 18°C$ $\quad \theta_f = ?$ $\quad \Delta h = 10\ m$

$x = 5 \cdot 10^{-3} \frac{kg}{kg_{air\ sec}}$ $\quad P_{cost} \Rightarrow x\ cost$ *

(* Diagram. i-x)

Transf adiabatique $\Rightarrow \Delta Q = 0$

Solution:

$E_{tot}\ h_1 = E_{tot}\ h_2$

$$E_{pot\,1} + i_1 \cdot m_{air\ sec} = E_{pot\,2} + \overbrace{i_2\ m_{air\ sec}}^{Q}$$

$$m_1 g h_1 + i_1 m_{air\ sec} = m_2 g h_2 + i_2\ m_{air\ sec}$$

1) $\underbrace{m_1 g h_1 - m_2 g h_2}_{= \ (m_1 = m_2)} = \underbrace{i_2 m_{as} - i_1 m_{as}}_{=}$

$m \cdot g\,(\underline{h_1 - h_2})$ $\qquad \underbrace{i_2 - i_1}_{=}(m_{as})$

$\Delta h = h_2 - h_1 \rightarrow -\Delta h$ $\qquad \Delta i\,(m_{as})$

2) $m \cdot g\,(-\Delta h) = \Delta i \cdot m_{air\ sec}$

Formule entalpie

$$i = (1 + 1{,}8x) \cdot \theta + 2{,}5 \cdot 10^3 \left[\frac{kJ}{kg_{air\ sec}}\right]$$

$$\Delta i = i_2 - i_1 = (1 + 1{,}8x) \cdot \Delta\theta \left[\frac{kJ}{kg}\right]$$

3) $m \cdot g \left(-\Delta h\right) = \left(1 + 1{,}8x\right) \cdot 10^3 \cdot \Delta\theta \cdot m_{air\ sec}$

$10^3$ : Transf. en J (Unité internat.)

$m_{air} = m_{air\ sec} + m_{vap\ eau}$

$$\frac{\overbrace{m_{air\ sec}}^{=1} + \overbrace{m_{vap\ eau}}^{=x}}{m_{air\ sec}} \cdot g\left(-\Delta h\right) = \left(1 + 1{,}8x\right) \cdot 10^3 \cdot \Delta\theta$$

(Formule enthalpie)

$$(1 + x) \cdot g \cdot \left(-\Delta h\right) = (1 + 1{,}8x) \cdot 10^3 \cdot \Delta\theta$$

$$\Delta\theta = \frac{(1+x)\cdot g}{(1+1{,}8)\cdot 10^3}\left(-\Delta h\right)$$

$x = 5 \cdot 10^{-3}$

$\Delta h = 10\ m$

$\Delta\theta = -0{.}0977\ °C = K$

a) $\uparrow 10\ m$ $\quad \theta = 17{,}9\ °C$ $\quad (\Delta h = 10 - 0)$

b) $\downarrow 10\ m$ $\quad \theta = 18{,}1\ °C$ $\quad (\Delta h = -10 - 0)$

c) Gradient Adiabatique

$$\frac{\Delta\theta}{\Delta h} = -10\ \frac{K}{km}$$

$$\frac{\Delta\Theta}{\Delta h}(\text{env}) = 0 \qquad \rho = \frac{PM}{RT}$$

$$T \downarrow \Rightarrow \rho \uparrow \Rightarrow \text{bulle monte}$$