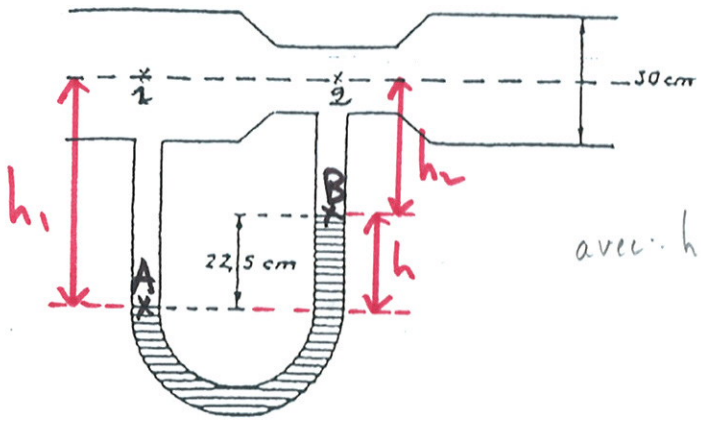
(5)



avec : $h_1 = h + h_2$

× **B. entre 1 et 2 :**

En altitude : $P_1 + \frac{1}{2}\rho_e u_1^2 = P_2 + \frac{1}{2}\rho_e u_2^2$

$$\boxed{P_1 - P_2 = \frac{1}{2}\rho_e \left(u_2^2 - u_1^2\right)} \quad (1)$$

× $\begin{cases} P_A = \rho_e g h_1 + P_1 \\ P_B = \rho_e g h_2 + P_2 \end{cases} \Leftrightarrow P_A - P_B = \rho_e g h + \cancel{\rho_e g h_2} + P_1 - \cancel{\rho_e g h_2} - P_2$

Soit $\boxed{P_A - P_B = \rho_e g h + P_1 - P_2}$ (2)

Lecture du manomètre diff :

$$\boxed{P_A - P_B = \rho_{Hg} g h} \quad (3)$$

(3) dans (2) $\Rightarrow$ $\boxed{P_1 - P_2 = gh\left(\rho_{Hg} - \rho_e\right)}$ (4)

(4) dans (1) $\Rightarrow 2gh\left(\rho_{Hg} - \rho_e\right) = \rho_e\left(u_2^2 - u_1^2\right)$ (4')

Equation de continuité :

$u_2^2 = u_1^2 \cdot \left(\frac{d_1}{d_2}\right)^4$ or $d_1 = 2 d_2$ $\Rightarrow$ $\boxed{u_2^2 = u_1^2 \times 16}$ (5)

(5) dans (4) : $2gh(\rho_{Hg}-\rho_e) = \rho_e \times 15 v_1^2$

$$\Leftrightarrow \boxed{v_1 = \left(\frac{2}{15} gh \cdot \frac{(\rho_{Hg}-\rho_e)}{\rho_e}\right)^{1/2}}$$

A.N :

$$\begin{cases} \rho_{Hg} = 13,6\,10^3 \text{ kg m}^{-3} \\ \rho_e = 10^3 \text{ kg m}^{-3} \\ h = 22,5\,10^{-2} \text{ m} \\ g = 9,81 \text{ m s}^{-2} \end{cases}$$

$$v_1 = \left(\frac{2 \times 9,81 \times 22,5 \times 12,6 \cdot 10^{-2}}{15}\right)^{1/2}$$

$$\boxed{v_1 = 1,93 \text{ m s}^{-1}}$$

$$Q_v = v_1 \times \frac{\pi d_1^2}{4}$$

A.N : $Q_v = \frac{1,93 \times \pi \times 3\,10^{-2}}{4}$ $\Leftrightarrow$ $\boxed{Q_v = 0,136 \text{ m}^3 \text{ s}^{-1}}$

$$\begin{cases} d_1 = 3\,10^{-1} \text{ m} \end{cases}$$