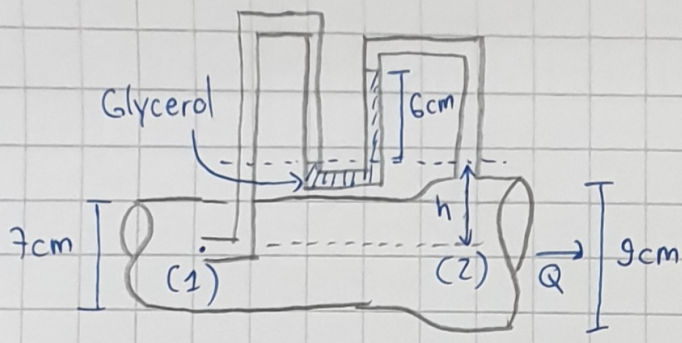
Nguyen Xuan Binh 887799 Exam Question 3



The flow rate of inlet and outlet are the same (continuity equation) $\Rightarrow Q_1 = Q_2$

$\Rightarrow v_1 A_1 = v_2 A_2 = Q$

Difference of pressure between p_1 and p_2

$p_1 - \rho_{air} g(h + 0.06) + \rho_{air} g(0.06) - \rho_{gly} g(0.06) + \rho_{air} g(0.06 + h) = p_2$

$\Rightarrow p_1 + \rho_{air} g(0.06) = p_2 + \rho_{glycerol} g(0.06)$

$\Rightarrow p_1 - p_2 = -1.2 \cdot 9,98 \cdot 0.06 + 1260 \cdot 9.98 \cdot 0.06 = 753.77$ Pa

Bernoulli equation: $p_1 + \frac{1}{2}\rho v_1^2 + \rho g z_1 = p_2 + \frac{1}{2}\rho v_2^2 + \rho g z_2$

We have $v_1 = 0$, $z_1 = z_2 \Rightarrow p_1 = p_2 + \frac{1}{2}\rho v_2^2 \Rightarrow p_1 - p_2 = \frac{1}{2}\rho v_2^2$

$\Rightarrow \frac{1}{2} 1000 v_2^2 = 753.77 \Rightarrow v_2 = 1.22$ m/s

$\Rightarrow Q = v_2 A_2 = 1.22 \cdot \frac{\pi 0.09^2}{4} \approx 7.76 \times 10^{-3}$ m^3/s (answer)