Homework 3

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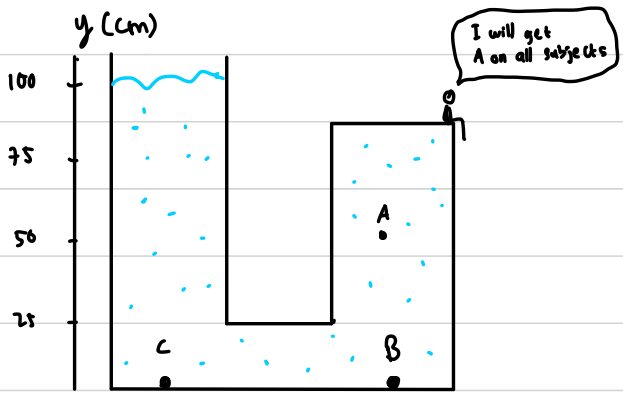
The container shown is filled with oil. It is open to the atmosphere on the left.

a. What is the pressure at point A?

b. What is the pressure difference between points A and B? Between points A and C?



a. The pressure at point A.

The pressure formula is derived from this expression!

$$P = \frac{F}{A} = \frac{m \cdot g}{A} = \frac{\rho V \cdot g}{A} = \rho g h$$

First we know that :

$\rho_{oil} \approx 900 \ kg/m^3$

$gravity \approx 10 \ m/s^2$

The depth of the water at point A = 50 cm = 0,5 m

The atmosphere pressure = $1,013 \times 10^5$ Pa

The total pressure is = $P_{total} = P + P_0$

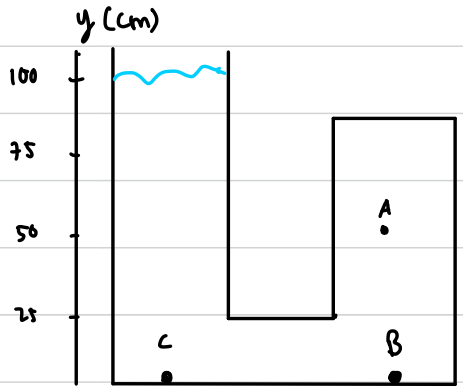
We will calculate P first!

$$P = \rho g h = 900 \cdot 10 \cdot 0,5 = 4500 \ \frac{N}{m^2} = 4500 \ P_0$$

Thus, the total pressure at point A = $1,013 \times 10^5 + 4500$

$= 1,058 \times 10^5$ Pa

b. What is the pressure difference between points A and B and points B and C.



As we know from the lecturer, the pressure is measure by its depth. If the depth of the points is the same, the pressure is also the same between point let us just called it point x and point y.

So, the pressure differences between points A and B is calculated with following methods.

$$\Delta P = |P_B - P_A|$$

We know point A pressure is $1{,}058 \times 10^5$ Pa. Now we'll calculate the pressure at point B!

$P_B = \rho g h_B$

$h_B = 100\text{ cm} = 1\text{ m}$; $\rho_{oil} = 900\text{ kg/m}^3$, $g = 10\text{ m/s}^2$

$P_B = 900 \cdot 10 \cdot 1 = 9000$ Pa

$P_{total\ at\ B} = P_0 + P_B$

$1{,}013 \times 10^5 + 9000 = 1{,}103 \times 10^5$ Pa

Thus, $\Delta P = |P_B - P_A| = 1{,}103 \times 10^5 - 1{,}058 \times 10^5$

$= 4500$ Pa

Thus, the pressure different between point A and B is arround 4500 Pa.

Now, due to the same depht between points B and C, there is no difference in pressure. Hence, the pressure difference between points B and C is = 0 Pa.