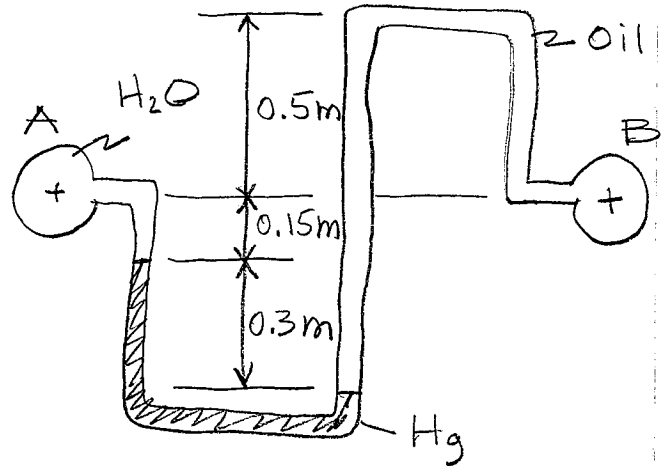


EXAMPLEGIVEN:

$$P_A = 30\text{-mm Hg vacuum}$$

$$\gamma_{oil} = 8.95 \text{ kN/m}^3$$

FIND: P_B SOLUTION:

FLUID PROPERTIES: $\gamma_w = 9.80 \text{ kN/m}^3$ T1.5, 15.6°C

$$\gamma_{oil} = 8.95 \text{ kN/m}^3 \text{ GIVEN}$$

$$S_{oil} = \frac{\gamma_{oil}}{\gamma_w} = \frac{8.95 \text{ kN/m}^3}{9.80 \text{ kN/m}^3} = 0.91$$

$$\gamma_{Hg} = 133 \text{ kN/m}^3 \text{ T1.5, } 20^\circ\text{C}$$

$$S_{Hg} = \frac{133 \text{ kN/m}^3}{9.80 \text{ kN/m}^3} = 13.57$$

$$\begin{aligned} P_B &= P_A + 0.15\text{m } \gamma_w + 0.3\text{m } \gamma_{Hg} - 0.45\text{m } \gamma_{oil} \\ &= P_A + 0.15\text{m } \gamma_w + 0.3\text{m } S_{Hg} \gamma_w - 0.45\text{m } S_{oil} \gamma_w \\ P_B &= P_A + \gamma_w (0.15\text{m} + 0.3\text{m } S_{Hg} - 0.45\text{m } S_{oil}) \end{aligned}$$

but $\frac{P_A}{\gamma_{Hg}} = -30\text{mm} = -0.03\text{m}$; $P_A = -0.03\text{m } \gamma_{Hg}$
 $= -0.03\text{m } S_{Hg} \gamma_w$

so

$$\begin{aligned} P_B &= \gamma_w (0.15\text{m} + 0.27\text{m } S_{Hg} - 0.45\text{m } S_{oil}) \\ &= \frac{9.80 \text{ kN}}{\text{m}^3} (0.15\text{m} + 0.27\text{m} (13.57) - 0.45\text{m} (0.91)) \\ &= 33.4 \text{ kPa} \end{aligned}$$