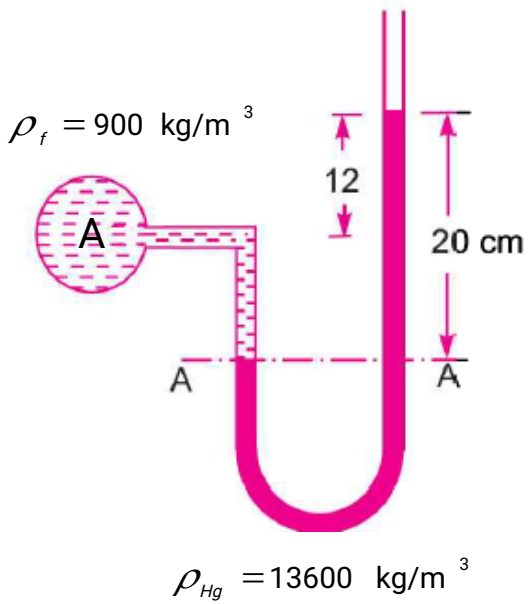
Numericals on Manometers

Problem : *The right limb of a simple U-tube manometer containing mercury is open to the atmosphere while the left limb is connected to a pipe in which a fluid of sp. gr. 0.9 is flowing. The centre of the pipe is 12 cm below the level of mercury in the right limb. Find the pressure of fluid in the pipe if the difference of mercury level in the two limbs is 20 cm.*



$$p_A + \rho_f g(0.2 - 0.12) - \rho_{Hg} g(0.2) = p_{atm}$$

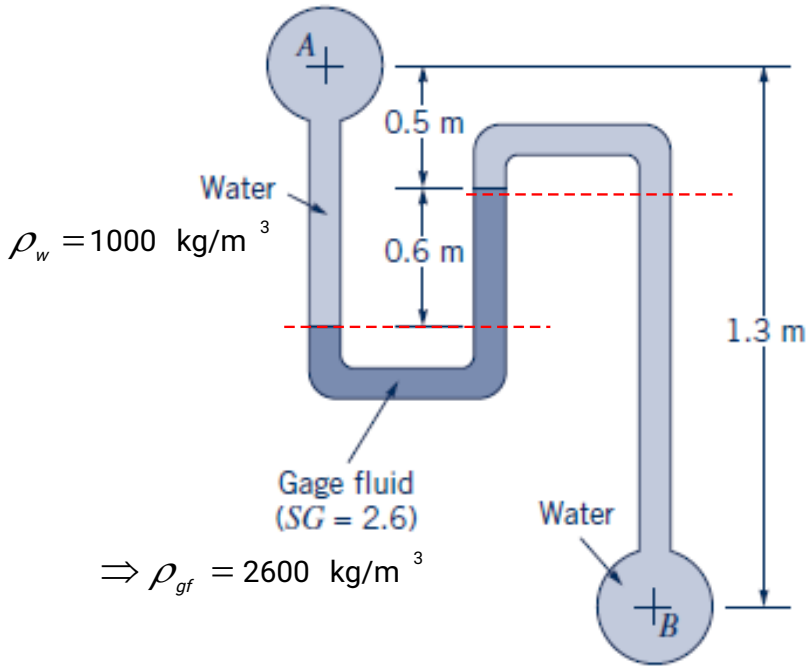
$$\Rightarrow p_A - p_{atm} = \rho_{Hg} g(0.2) - \rho_f g(0.08)$$

$$p_A = 127301.9 \quad \text{Pa} \quad \text{(absolute)}$$

$$\text{(or)} \quad p_A = 25976 .9 \text{ Pa} \quad \text{(gage)}$$

PROBLEM:

Two pipes A and B are connected by a manometer as shown in figure. Determine the pressure difference $p_A - p_B$, between the pipes



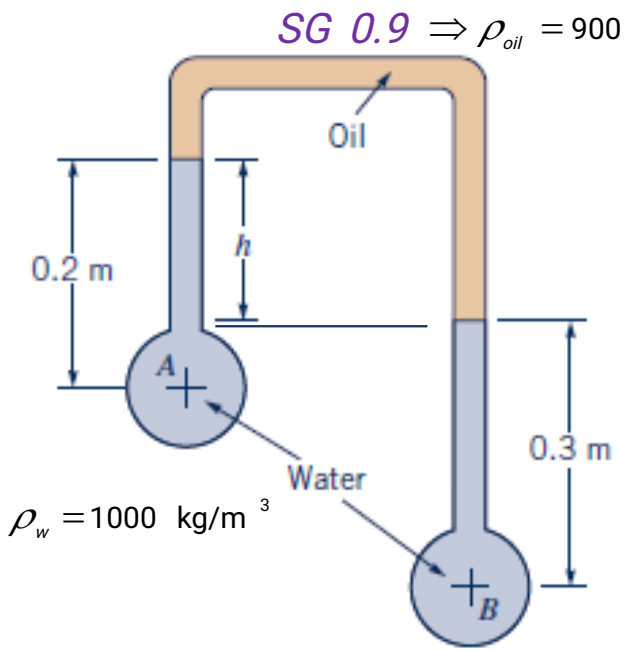
$$p_A + \rho_w g(0.5+0.6) - \rho_{gf} g(0.6) + \rho_w g(1.3-0.5) = p_B$$

$$\Rightarrow \quad p_A - p_B = \rho_{gf} g(0.6) - \rho_w g(1.9)$$

$$\Rightarrow \quad p_A - p_B = -3335.4 \text{ Pa}$$

PROBLEM:

The inverted U-tube manometer contains oil (*SG 0.9) and water as shown. The pressure differential between pipes A and B, p_A-p_B, is -5 kPa.* Determine the differential reading h



$$p_A - \rho_w g(0.2) + \rho_{oil} g(h) + \rho_w g(0.3) = p_B$$

$$\Rightarrow \quad p_A - p_B = -\rho_w g(0.1) - \rho_{oil} g(h)$$

$$\Rightarrow \quad -5000 = -1000 \times 9.81 \times 0.1 - 900 \times 9.81 \times h$$

h =0.46 m