

Problem 1:

$$\rho = \frac{m}{V}$$

$$\begin{aligned} m_T &= m_A + m_B = m_A + \rho_B \cdot V_B \\ &= 1,5 + 0,8 \cdot 0,75 = 2,1 \text{ kg} \end{aligned}$$

$$V_T = V_A + V_B = 0,5 + 0,75 = 1,25 \text{ m}^3$$

$$\rho = \frac{m_T}{V_T} = \frac{2,1}{1,25} = 1,68 \text{ kg/m}^3$$

Problem 2:

Pressure in the fluid should rise with depth,

$$p = p_{\text{atm}} + \Delta p = p_{\text{atm}} + \rho g h$$

$$p = p_{\text{atm}} + [(\rho h)_{\text{gasoline}} + (\rho h)_{\text{water}}] g$$

$$\rho_{\text{gasoline}} = 750 \text{ kg/m}^3 \quad \rho_{\text{water}} = 997 \text{ kg/m}^3$$

$$p = 101 \text{ kPa} + [750 \times 1 + 997 \times 0,5] \frac{\text{kg}}{\text{m}^3} \times 9,807 \text{ m/s}^2 \times \frac{1 \text{ kPa}}{1000 \text{ Pa}}$$

$$= 113,2 \text{ kPa}$$

### Quiz Problem 1:

$$m_{\text{gr2}} = 900 \text{ kg}$$

$$\rho = \frac{m}{V}$$

$$2400 = \frac{900}{V_{\text{gr2}}}$$

$$V_{\text{gr2}} = 0,375 \text{ m}^3$$

$$V_{\text{air}} = 5 - 0,375 = 4,625 \text{ m}^3$$

$$m_{\text{air}} = \rho_{\text{air}} \cdot V_{\text{air}} = 1,15 \frac{\text{kg}}{\text{m}^3} \cdot 4,625 \text{ m}^3$$

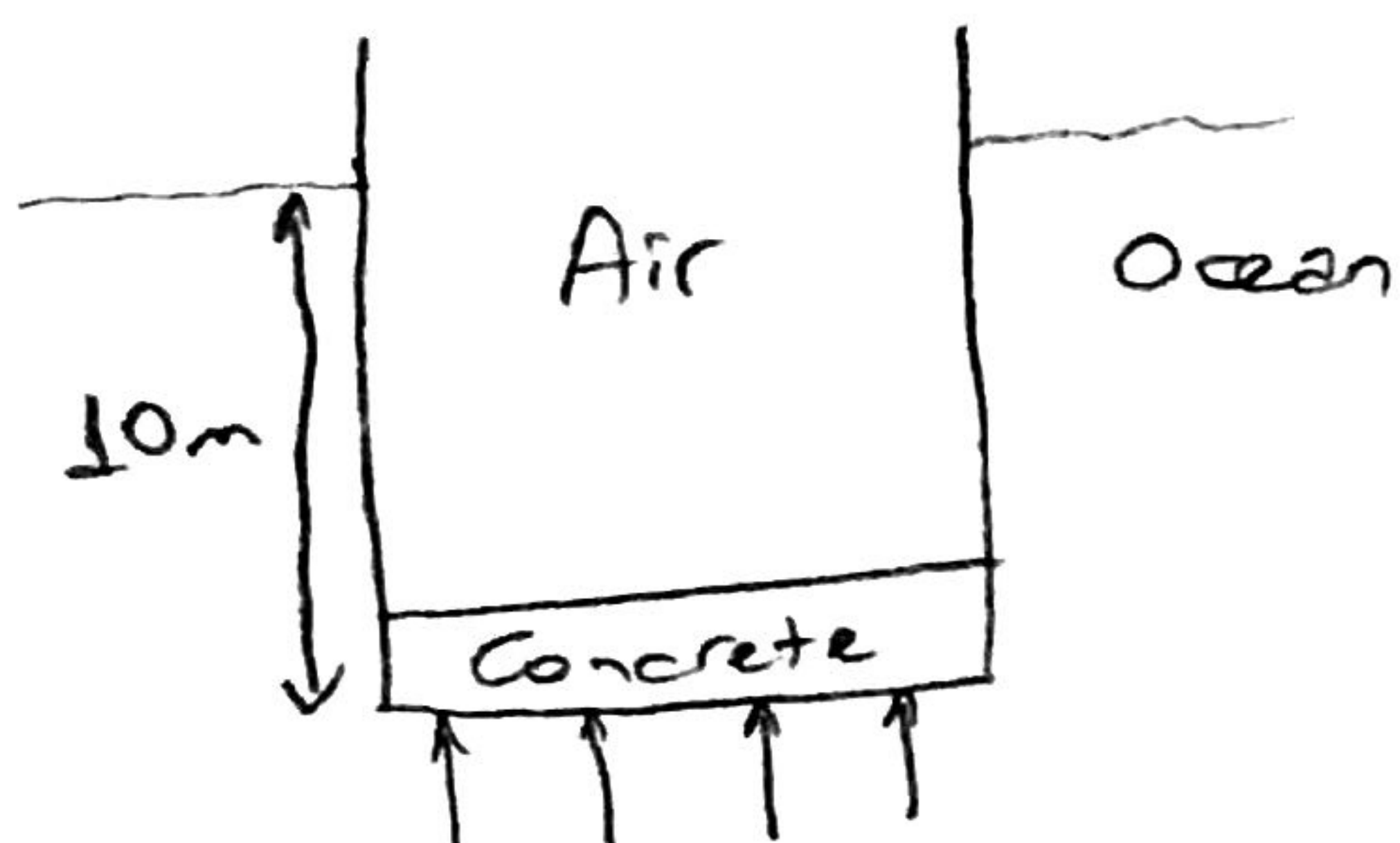
$$m_{\text{air}} = 5,32 \text{ kg}$$

$$v = \frac{1}{\rho} \quad v_{\text{average}} = \frac{V_{\text{tot}}}{m_{\text{tot}}} = \frac{5}{900 + 5,32} = 0,00552 \text{ m}^3/\text{kg}$$

$$\gamma_w = \gamma = \rho_{\text{granite}} \cdot g = 2400 \frac{\text{kg}}{\text{m}^3} \cdot 9,807 \frac{\text{m}}{\text{s}^2} = 23,53 \frac{\text{kN}}{\text{m}^3}$$

$$\gamma_c = \rho_{\text{granite}} / \rho_{\text{water}} = 2400 / 997 = 2,407$$

### Quiz Problem 2:



A force balance requires for this case.

$$F_{\uparrow} = p \cdot A = (\rho_{\text{water}} \cdot g \cdot h + p_{\text{atm}}) A$$

$$F_{\downarrow} = (m_{\text{tank}} + m_{\text{concrete}}) g + p_{\text{atm}} A$$

$$F_{\uparrow} = F_{\downarrow} = (\rho_{\text{water}} \cdot g \cdot h + p_{\text{atm}}) \cdot A = (m_{\text{tank}} + m_{\text{concrete}}) \cdot g + p_{\text{atm}} \cdot A$$

$$m_{\text{concrete}} = (\rho_{\text{water}} \cdot h \cdot A - m_{\text{tank}}) = 997 \times 10 \times 3 - 10000 = 19910 \text{ kg}$$