

11. cvičení

1. HRW, kapitola 15, 41Ú

Dáno:

vnitřní poloměr $r_1 = 8 \text{ cm} = 8 \cdot 10^{-2} \text{ m}$ vnější poloměr $r_2 = 9 \text{ cm} = 9 \cdot 10^{-2} \text{ m}$

$$\frac{V_p}{V_c} = \frac{1}{2}$$

hustota kapaliny $\rho_k = 800 \text{ kg m}^{-3}$

a)

$$\text{Celkový objem } V_c = \frac{4}{3}\pi r_2^3$$

$$\frac{V_p}{V_c} = \frac{\rho_c}{\rho_k} = \frac{1}{2} \Rightarrow \rho_c = \frac{1}{2}\rho_k$$

$$m = V_c \rho_c = \frac{4}{3}\pi r_2^3 \frac{1}{2}\rho_k = \frac{2}{3}\pi r_2^3 \rho_k = \frac{2}{3}\pi \cdot (9 \cdot 10^{-2})^3 \cdot 800 \text{ kg} = 1,2 \text{ kg}$$

b)

$$\text{Objem } V = \frac{4}{3}\pi(r_2^3 - r_1^3)$$

$$\rho = \frac{m}{V} = \frac{\frac{2}{3}\pi r_2^3 \rho_k}{\frac{4}{3}\pi(r_2^3 - r_1^3)} = \frac{1}{2}\rho_k \frac{r_2^3}{r_2^3 - r_1^3} = \frac{1}{2} \cdot 800 \cdot \frac{(9 \cdot 10^{-2})^3}{(9 \cdot 10^{-2})^3 - (8 \cdot 10^{-2})^3} \text{ kg m}^{-3} = 1344 \text{ kg m}^{-3}$$

2. HRW, kapitola 15, 43Ú

Dáno:

ve vzduchu $F_G = 6000 \text{ N}$ ve vodě $F_1 = 4000 \text{ N}$ hustota železa $\rho = 7,87 \text{ g cm}^{-3} = 7870 \text{ kg m}^{-3}$ hustota kapaliny $\rho_k = 1000 \text{ kg m}^{-3}$ objem dutinek V'

$$F_G = mg = V\rho g \Rightarrow V = \frac{F_G}{\rho g}$$

$$F_1 = F_G - (V + V')\rho_k g = F_G - \left(\frac{F_G}{\rho g} + V'\right)\rho_k g = F_G - F_G \frac{\rho_k}{\rho} - V'\rho_k g$$

$$V'\rho_k g = F_G - F_G \frac{\rho_k}{\rho} - F_1$$

$$V' = \frac{F_G}{\rho_k g} - \frac{F_G}{\rho g} - \frac{F_1}{\rho_k g} = \frac{F_G \rho - F_G \rho_k - F_1 \rho}{\rho \rho_k g} = \frac{F_G(\rho - \rho_k) - F_1 \rho}{\rho \rho_k g}$$

$$V' = \frac{6000 \cdot (7870 - 1000) - 4000 \cdot 7870}{7870 \cdot 1000 \cdot 9,81} \text{ m}^3 = 0,13 \text{ m}^3$$