

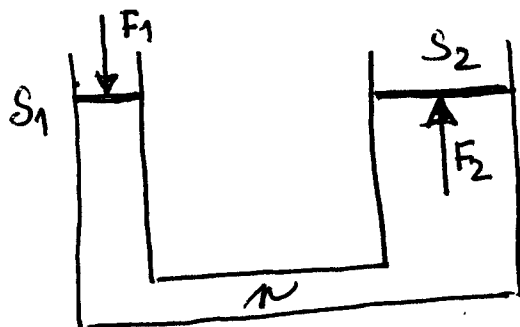
87/2

$$S_1 = 12 \text{ cm}^2$$

$$S_2 = 108 \text{ cm}^2$$

$$F_1 = 60 \text{ N}$$

$$F_2 = ?$$



PODLE PASCALOVA ZÁKONA A PODLE $p = \frac{F}{S}$

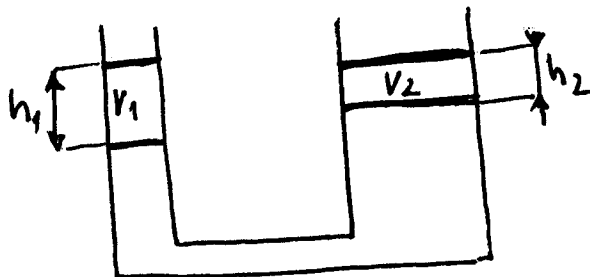
$$\text{JE } \frac{F_1}{S_1} = p = \frac{F_2}{S_2} \Rightarrow F_2 = \frac{F_1 S_2}{S_1} = \frac{60 \cdot 108}{12}$$

$$F_2 = \underline{\underline{540 \text{ N}}}$$

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$$h_1 = 18 \text{ cm}$$

$$h_2 = ?$$



VÝPOČET LZE PROVEŠT TAKTO (2 MOŽNOSTI)

1. OBJEM STLAČENEJ KAPALINY V_1 A VYTLAČENEJ

KAPALINY V_2 MUSÍ SI BÝT ROVNÝ; $V_1 = V_2$

$$S_1 h_1 = S_2 h_2 \Rightarrow h_2 = \frac{S_1 h_1}{S_2} = \frac{12 \cdot 18}{108} = \frac{216}{108} = \underline{\underline{2 \text{ cm}}}$$

2. PRÁCE VYKONANÁ SILOU F_1 NA POSUNUTÍ PÍSTU O

18 cm MUSÍ BÝT STEJNÁ JAKO NA POSUNUTÍ SILOU F_2

O h_2 .

$$W = F \cdot s; F_1 \cdot h_1 = F_2 h_2 \Rightarrow h_2 = \frac{F_1 h_1}{F_2} = \frac{60 \cdot 18}{540}$$

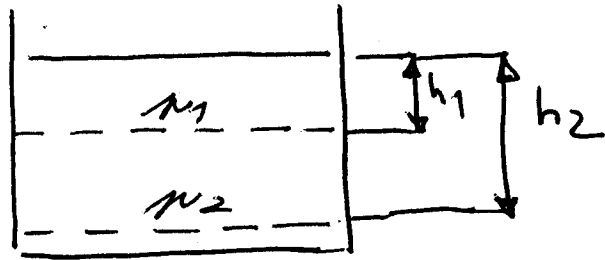
$$h_2 = \frac{1080}{540} = \underline{\underline{2 \text{ cm}}}$$

$$\underline{W_1} = 60 \cdot 0,18 = \underline{\underline{10,8 \text{ J}}} \quad ; \quad \underline{W_2} = 540 \cdot 0,02 = \underline{\underline{10,8 \text{ J}}} \quad ; \quad \underline{W_1 = W_2}$$

90/1

$$h_1 = 2 \text{ m}$$

$$h_2 = 5 \text{ m}$$



$$\rho_1, \rho_2 = ?$$

$$F_H = h \rho g S \Rightarrow \rho = \frac{F_H}{S} \equiv \frac{h \rho g S}{S} = \underline{h \rho g}$$

$$\rho_1 = \frac{h_1 \rho g}{g} = 2 \cdot 1000 \cdot \cancel{9.8} = \underline{19600 \text{ Pa}}$$

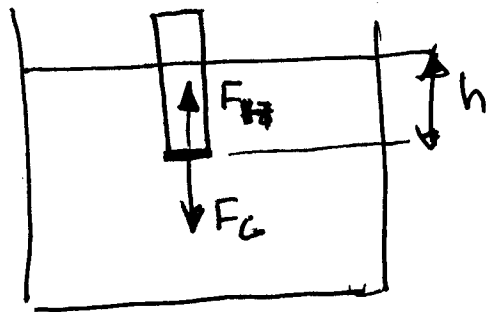
$$\rho_2 = h_2 \rho g = 5 \cdot 1000 \cdot 9.8 = \underline{490000 \text{ Pa}}$$

90/2

$$r = 2 \text{ cm}$$

$$h = 3 \text{ mm}$$

$$h = ?$$



$$F_H = F_G \quad F_H = h \rho g S \quad ; \quad F_G = m \cdot g$$

$$h \rho g S = m g \Rightarrow h = \frac{m}{\rho S}$$

$$m = \rho_H \cdot V = \rho_H \cdot (\pi \cdot 0.02)^2 \cdot 0.003 \quad \rho_{\text{KOSAZY}} = 8400 \frac{\text{kg}}{\text{m}^3}$$

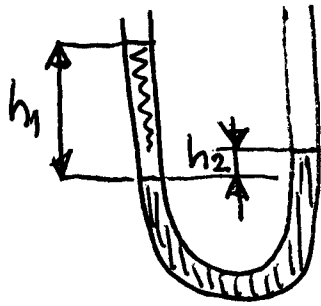
$$m = 8400 \cdot (\pi \cdot 0.02)^2 \cdot 0.003$$

$$h = \frac{8400 \cdot \pi^2 \cdot 0.0004 \cdot 0.003}{1000 \cdot \pi} = \frac{8400 \cdot 0.0003}{1000} = \underline{0.0252 \text{ m}}$$

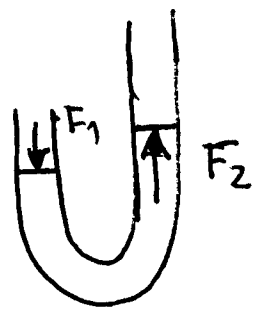
90/3

$$h_2 = 1,5 \text{ cm}$$

$$h_1 = ?$$



DETAIL



→ VÝSLEDKEM LZE DOJÍT PODLE NÁSLEDUJÍCÍHO:

1. NA HLADINU ŽUTÍ MUSÍM PŮSOBIT SILOU F_1 ,
KTEŘA PŮSOBÍ POSUNUTÍ O h_2 VE DRUHÉM
RAMENI.

PODLE PASCALOVA ZÁKONA $\frac{F_1}{S_1} = \frac{F_2}{S_2}$ $S_1 = S_2$

$$F_1 = F_2$$

$$F_1 = m_v \cdot g - \text{TÍHA VODY}$$

$$F_2 = m_r \cdot g - \text{TÍHA ŽUTÍ}$$

$$m_v g = m_r g$$

$$m = \rho V ; V = S \cdot h$$

$$\rho_v S h_1 = \rho_r S h_2 \Rightarrow h_1 = \frac{\rho_r h_2}{\rho_v}$$

HUSTOTA ŽUTÍ $\rho_r = 13500 \text{ kg m}^{-3}$

$$h_1 = \frac{13500 \cdot 1,5}{1000} = \underline{\underline{20,25 \text{ cm}}}$$

2. NA ROZHRANÍ ŽUTÍ A VODY JSOU HYDROSTATICKÉ
TLAKOVÉ SÍLY STEJNÉ

$$F_{H1} = F_{H2} \quad h_1 \rho_v g S = h_2 \rho_r g S \Rightarrow h_1 = \frac{h_2 \rho_r}{\rho_v}$$

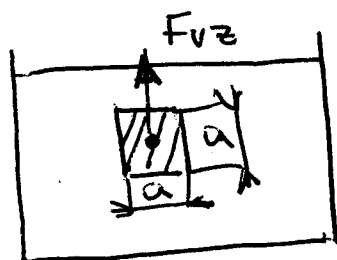
$$h_1 = \frac{1,5 \cdot 13500}{1000} = \underline{\underline{20,25 \text{ cm}}}$$

92/1

$a = 2 \text{ cm}$

$g = 10 \text{ m/s}^2$

$F_{vz} = ?$



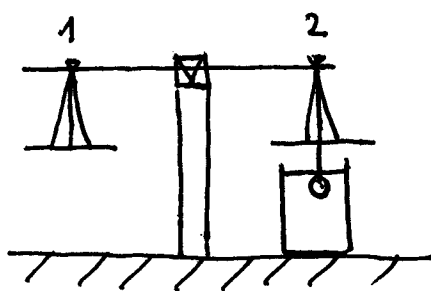
PODLE ARCHIMÉDOVA ZÁKONA

$F_{vz} = V \rho g = 0,02^3 \cdot 1000 \cdot 10 = \underline{0,08 \text{ N}}$

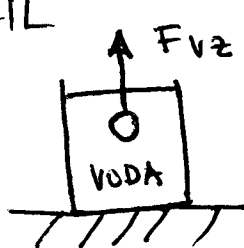
92/1

$m = 25 \text{ g}$

$M = ?$



DETAIL



OBJEM KULIČKY $V = \frac{m}{\rho} = \frac{0,025}{8400} = 2,98 \cdot 10^{-6} \text{ m}^3$

$\rho_{\text{KOSAČKY}} = 8400 \text{ kg/m}^3$

$F_{vzT} = \rho_v \cdot V \cdot g = 2,98 \cdot 10^{-6} \cdot 1000 \cdot 10 = \underline{0,0298 \text{ N}}$

$F_{vzT} = m \cdot g \Rightarrow m = \frac{F_{vzT}}{g} = 0,00298 \text{ kg} \doteq \underline{0,003 \text{ kg}}$

ZÁVAŽÍ PŘILOŽÍME NA MISKU 2. ZÁVAŽÍ BUDE MÍT HMOTNOST 3g.

(BYLO BY I MOŽNÉ Z MISKY 1 ODEBRAT 3g.)

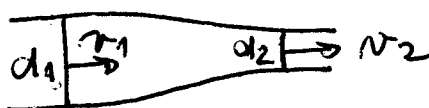
95/1

$$d_1 = 4 \text{ cm}$$

$$v_1 = 1,25 \text{ m s}^{-1}$$

$$v_2 = 20 \text{ m s}^{-1}$$

$$d_2 = ?$$



PODLE ROVNICE KONTINUITY

$$S_1 v_1 = S_2 v_2$$

$$S_2 = \frac{S_1 v_1}{v_2} = \frac{\pi d_1^2 v_1}{4 v_2}$$

$$S_2 = \frac{\pi d^2}{4}$$

$$\frac{\pi d_2^2}{4} = \frac{\pi d_1^2}{4} \frac{v_1}{v_2}$$

$$d_2^2 = \frac{d_1^2 v_1}{v_2}$$

$$d_2 = \sqrt{\frac{d_1^2 v_1}{v_2}}$$

$$d_2 = \sqrt{\frac{4^2 \cdot 1,25}{20}} = \underline{\underline{1 \text{ cm}}}$$

95/2

VÍZ. OBRAŽEK 2-51 (STR. 94)

$$v_1 = 1 \text{ m s}^{-1}$$

$$p_1 = 800 \text{ Pa}$$

$$p_2 = 300 \text{ Pa}$$

$$v_2 = ?$$

DLE BERNOULLIHO ROVNICE

$$p_1 + \frac{1}{2} \rho v_1^2 = p_2 + \frac{1}{2} \rho v_2^2$$

$$v_2 = \sqrt{\frac{2}{\rho} (p_1 - p_2 + \frac{1}{2} \rho v_1^2)}$$

$$v_2 = \sqrt{\frac{2}{1000} (800 - 300 + \frac{1}{2} \cdot 1000 \cdot 1)}$$

$$v_2 = \sqrt{\frac{2000}{1000}} = \sqrt{2} \doteq \underline{\underline{1,4 \text{ m s}^{-1}}}$$

95/3

$$d_1 = 4 \text{ cm}$$

$$v_1 = 1,2 \text{ m s}^{-1}$$

$$d_2 = 2,4 \text{ cm}$$

$$v_2 - v_1 = ?$$



DLE 2. CONTINUITY

$$S_1 v_1 = S_2 v_2$$

$$\Rightarrow v_2 = \frac{S_1 v_1}{S_2}$$

$$v_2 = \frac{\pi d_1^2 \cdot 1,2 \cdot 4}{4 \pi d_2^2} = \frac{4^2 \cdot 1,2}{(2,4)^2} = \frac{19,2}{5,76} = 3,3 \text{ m s}^{-1}$$

$$p_1 + \frac{1}{2} \rho v_1^2 = p_2 + \frac{1}{2} \rho v_2^2$$

$$p_1 - p_2 = \frac{1}{2} \rho (v_2^2 - v_1^2)$$

$$p_1 - p_2 = \frac{1}{2} \cdot 1000 (3,3^2 - 1,2^2)$$

$$p_1 - p_2 = 500 (10,89 - 1,44)$$

$$p_1 - p_2 = 500 (9,45) = \underline{\underline{4725 \text{ Pa}}}$$

97/1

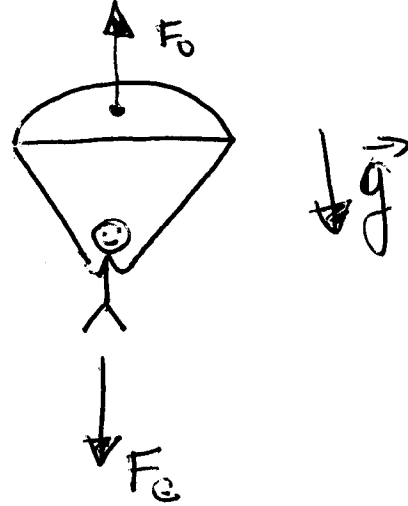
$$m = 90 \text{ kg}$$

$$c = 1,33$$

$$l = 5 \text{ m}$$

$$\rho = 1,3 \text{ kg m}^{-3}$$

$$v = ?$$



PŘI USTÁLENÍ RYCHLOSTI

JE $v = \text{konst}$ a $F_G = F_0$

$$F_G = m \cdot g$$

$$F_0 = \frac{1}{2} c s \rho v^2 \Rightarrow mg = \frac{1}{2} c s \rho v^2$$

$$\Rightarrow v = \sqrt{\frac{2mg}{c s \rho}} = \frac{2 \cdot 90 \cdot 9,8}{1,33 \cdot \pi R^2 \cdot 1,3}$$

$S = \pi R^2$ ← PŘÍČEZ KOLMÝ NA SMĚR RYCHLOSTI

$$v = \sqrt{\frac{180 \cdot 9,8}{1,33 \cdot 1,3 \cdot \pi \cdot 5^2}} = \sqrt{12,99} = \underline{\underline{3,6 \text{ m s}^{-1}}}$$

98/2

$$c = 1,33$$

$$F = 800 \text{ N}$$

$$v = 5 \text{ m s}^{-1}$$

$$\rho = 1,3 \text{ kg m}^{-3}$$

$$D = ?$$

PODOBNE JAKO U

PŘÍKLADU 97/1

$$F_o = F_G$$

$$\frac{1}{2} c s \rho v^2 = m \cdot g$$

$$\frac{1}{2} c + D^2 \rho v^2 = F$$

$$D^2 = \frac{2F}{c + \rho v^2} \Rightarrow D = \sqrt{\frac{2 \cdot 800}{1,33 + 1,3 \cdot 5^2}}$$

$$D = \sqrt{\frac{1600}{1,729 + 25}} = \underline{\underline{3,4 \text{ m}}}$$