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Homework

2.2 $P = P_0 + h.\rho.g$

$= (101,33 kPa) + (11000 m)(1025 kg/m^3)(9,8 m/s^2)$

$= 11 \times 10^7 kPa$

2.3 $P_{air} = 6 lb/in^2 = 864 lb/ft^2$

$\gamma_{glycerin} = 78,6 lb/ft^3$

$P = P_0 + \gamma h$

$= (864 lb/ft^2) + (78,6 lb/ft^3)(10 ft)$

$= 1650 lb/ft^2$

2.20 $\rho_{1500} = 1,496 \times 10^{-3} slugs/ft^3$

$\rho_0 = 2,37 \times 10^{-3} slugs/ft^3$

$m_{mountain\ level} = \rho_{1500} \times V_{1500}$

$= 1,496 \times 10^{-3} \times V_{1500}$

$m_{sea\ level} = \rho_0 \times V_0 = 2,37 \times 10^{-3} \times V_0$

the person takes in the same volume of air at high mountain level as at sea level → $V_{1500} = V_0$

→ $\frac{m_{mountain}}{m_{sea}} = \frac{1,496 \times 10^{-3}}{2,37 \times 10^{-3}} = 0,631 = 63,1\%$

2.31 $P = \gamma_{H_2O}.h + P_0$

gage pressure $= P - P_0 = \gamma_{H_2O}.h = (0,0361 lb/in^3) \times (3 in)$

$= 0,1083 lb/in^2$

P_{gas} in in. $H_2O = 3 in$

P_{gas} in lb/in^2 gage $= 0,183 lb/in^2$

2.35 $\rho_{water}.g.(h_w + h_m) = \rho_{Hg}.g.(h_m + h_m)$

→ $\rho_{water}.g.h_w + \rho_{water}.g.h_m = 2\rho_{Hg}.g.h_m$

→ $\rho_{water}.g.\frac{h_w}{h_m} + \rho_{water}.g = 2\rho_{Hg}.g$

→ $\frac{h_w}{h_m} = \frac{2\rho_{Hg} - \rho_{H_2O}}{\rho_{H_2O}} = \frac{2 \times 13600 - 1000}{1000} = 26,2$

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2.43 $\gamma_{gage} = 2,6 \times 62,4 lb/ft^3 = 162,24 lb/ft^3$ / $l = 8in = 0,7ft$

$P_A = 0,6 psi = 86,4 lb/ft^2$ / $h = 3in = 0,25ft$

$P_A + \gamma_{H_2O}.h = P_B + \gamma_{gage}.l.\sin\theta + \gamma_{H_2O}.h$

$\rightarrow P_B = P_A + \gamma_{H_2O}.h - \gamma_{gage}.l.\sin\theta - \gamma_{H_2O}.h$

$= 86,4 + 62,4 \times 0,25 - 162,24 \times 0,7 \times \sin 30° - 62,4 \times 0,25$

$= 29,616 lb/ft^2$

3.4. $dp.dA = -\rho.dA.ds.a$

$\rightarrow \frac{dp}{ds} = -\rho.a = -(1000 kg/m^3) \times (30 m/s^2)$

$= -3 \times 10^4 Pa/m = -30 kPa/m$

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