GIANCOLI HOMEWORK SOLUTIONS
Section 10-3 to 10-6, #7 - 17

7. GIVEN

a. $m = \frac{60kg}{4} = 15kg$

$$A = \frac{0.0200cm^2}{1} x \frac{1m^2}{100^2 cm^2} = 2x10^{-6} m^2$$

b. $m = 1500kg$

$$A = \frac{800cm^2}{1} x \frac{1m^2}{100^2 cm^2} = 8x10^{-2} m^2$$

SOLUTION

a. $P = \frac{F}{A}$

$$F = mg = (15kg)(9.81) = 147N$$

$$P = \frac{F}{A} = \frac{147}{2x10^{-6}} = 7.36x10^7 \, N/m^2$$

b. $P = \frac{F}{A}$

$$F = mg = (1500kg)(9.81) = 14{,}715N$$

$$P = \frac{F}{A} = \frac{14{,}715}{8x10^{-2}} = 1.84x10^5 \, N/m^2$$

8. GIVEN

$h = 1.6m$

KNOWN

$\rho_{blood} = 1.05x10^3 \, kg/m^3$, page 256

$1mm \cdot Hg = 133 \, N/m^2$, page 261

$\Delta P = \rho g \Delta h$

SOLUTION

$$\Delta P = \rho g \Delta h = (1.05x10^3)(9.81)(1.6m) = 1.65x10^4 \, N/m^2$$

$$1.65x10^4 \, N/m^2 \, x \frac{1mm \cdot Hg}{133 \, N/m^2} = 124mm \cdot Hg$$

9. GIVEN

$A = LxW = 1.6mx2.9m = 4.64m^2$

KNOWN

$P_{atm} = 1atm = 1.013x10^5\ N/m^2$, page 256

$P = \frac{F}{A}$

$PA = F$

SOLUTION

a. $PA = F = (1.013x10^5)(4.64) = 4.70x10^5 N$

b. The same because fluid pressure is the same everywhere (assumed height change from top to bottom of table is negligible).

10. GIVEN

$\Delta P_{max} = -85mm \cdot Hg$

KNOWN

$\rho_{water} = 1.00x10^3\ kg/m^3$, page 256

$1mm \cdot Hg = 133\ N/m^2$, page 261

$$\Delta P_{max} = -85mm \cdot Hg x \frac{133\ N/m^2}{1mm \cdot Hg} = 1.13x10^4\ N/m^2$$

$\Delta P = \rho g \Delta h$

SOLUTION

$\Delta P = \rho g \Delta h$

$$\frac{\Delta P}{\rho g} = \Delta h = \frac{(1.13x10^4)}{(1.00x10^3)(9.81)} = 1.15m$$

11. GIVEN

$P_{guage} = 240kPa = 2.4x10^5\ N/m^2$

$$A = \frac{220cm^2}{1} x \frac{1m^2}{100^2 cm^2} = 2.2x10^{-2} m^2$$

KNOWN

$P = \frac{F}{A}$

$F = mg$

SOLUTION

$PA = F = mg$

$\frac{PA}{g} = m$

$\frac{(2.4x10^5)(2.2x10^{-2})}{(9.81)} = m = 538kg$ per tire

$538\,kg/tire\ x\ 4\ tires = 2153kg$

12. GIVEN

$$P_{max} = 17.0atm\ x\ \frac{1.013x10^5\ N/m^2}{1atm} = 1.72x10^6\ N/m^2$$

$d_{out} = 28cm = 0.28m$

$r_{out} = 0.14m$

KNOWN

$F = mg$

$$P = \frac{F}{A}$$

$A = \pi r^2$

SOLUTION

$$P = \frac{F}{A}$$

$mg = P\pi r^2$

$$m = \frac{P\pi r^2}{g} = \frac{(1.72x10^6)\pi(0.14)^2}{9.81} = 1.08x10^4 kg$$

13. GIVEN

$\rho_{alcohol} = 0.79x10^3\ kg/m^3$, page 256

$P_{atm} = 1.013x10^5\ N/m^2$

KNOWN

$P = \rho gh$

SOLUTION

$$\frac{P}{\rho g} = h = \frac{(1.013x10^5)}{(0.79x10^3)(9.81)} = 13.1m$$

14. GIVEN

$A = LxW = 22.0m\ x\ 8.5m = 187m^2$

$h = 2.0m$

$P_0 = P_{atm} = 1.013x10^5\ N/m^2$

$\rho_{water} = 1.00x10^3\ kg/m^3$, page 256

KNOWN

$P_{abs} = P_0 + \rho gh$

$P = \frac{F}{A}$

SOLUTION

a. $P_{abs} = P_0 + \rho gh = (1.013x10^5) + (1.00x10^3)(9.81)(2.0) = 1.21x10^5\ N/m^2$

$F = PA = (1.21x10^5)(187) = 2.26x10^7 N$

b. The pressure on the sides near the bottom will be the same as the pressure on the bottom.

15. GIVEN

$\rho_{air} = 1.29\ kg/m^3$, page 256

$P_{atm} = 1.013x10^5\ N/m^2$

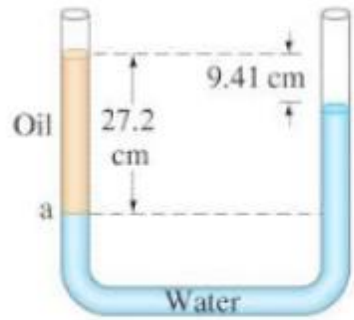
KNOWN

$P = \rho gh$

SOLUTION

$$\frac{P}{\rho g} = h = \frac{(1.013x10^5)}{\frac{1}{2}(1.29)(9.81)} = 1.60x10^4 m$$

16. GIVEN



$P_a = P_b$

$\rho_{water} = 1.00x10^3\ kg/m^3$, page 256

$h_{water} = 27.2cm - 9.41cm = 17.79cm = 0.1779m$

$h_{oil} = 27.2cm = 0.272m$

SOLUTION

$P_a = P_b$

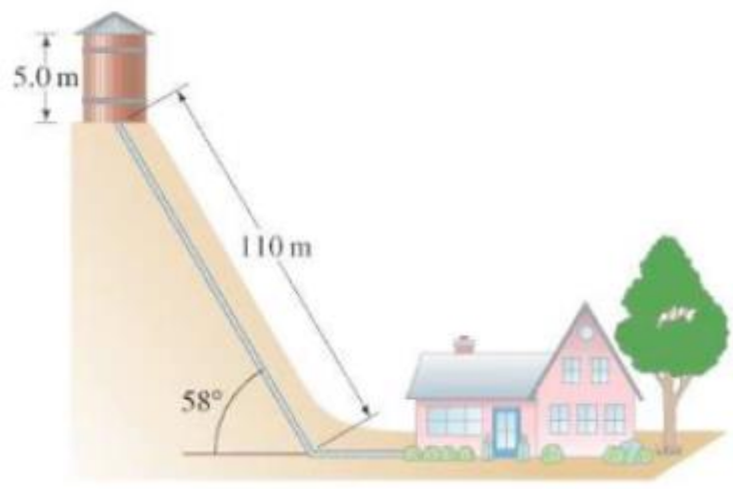
$P = \rho gh$

$\rho_{oil} g h_{oil} = \rho_{water} g h_{water}$

$\rho_{oil} h_{oil} = \rho_{water} h_{water}$

$$\rho_{oil} = \frac{\rho_{water} h_{water}}{h_{oil}} = \frac{(1.00x10^3)(0.1779)}{(0.272)} = 6.54x10^2\ kg/m^3$$

17. GIVEN



$h_{water} = 5.0m$

$h_{tank} = 110m$ @ 58°

$\rho_{water} = 1.00x10^3\ kg/m^3$, page 256

KNOWN

$P = \rho gh$

SOLUTION

a. $P = \rho g(h_{water} + h_{tank})$

$$\sin\theta = \frac{h_{tank}}{110}$$

$h_{tank} = 110\sin(58°) = 93.3m$

$P = (1.00x10^3)(9.81)(5 + 93.3) = 9.64x10^5\ N/m^2$

b. Assuming energy is conserved, the water should shoot up to the height of the water in the tank above the house, $(5 + 93.3) = 98.3m$.