PHYSICS NOMEWORK # 3 CHAPTS 12 - 14

12.5 Density

1) MASS Density same on Moon as EARTH?

$D_m = \frac{m}{V}$ $D_w = \frac{F_w}{V}$

mass density - same

weigh density different $w = mg$, g on moon 1/6

pg 317

2) Steel Column $S = F/A$

EXAMPLE 1 pg 317/318

$A = 2500 \text{ cm}^2 \times \left(\frac{1m}{100cm}\right)^2 = \boxed{.250 \text{ m}^2}$

$F = 1.50 \times 10^5 \text{ N}$

$S = F/A = (1.5 \times 10^5 \text{ N})(.250 \text{ m}^2) = 600k \text{ N/m}^2$

$= 600 \text{ kPA}$

Homework # 2

$S = F/A$

$A = 3500 \text{ m}^2 = (3500)\left(\frac{1m}{100cm}\right)\left(\frac{1m}{100cm}\right) = .35 \text{ m}^2$

$F = 2.5 \times 10^5 \text{ N}$

$S = (2.5 \times 10^5 \text{ N})(.35 \text{ m}^2) = 714,285.7 \text{ N/m}^2$

Example pg 320

3) Compressed 3.46×10^{-4} m under weight of 6.42E+5 N

what is compression with weight 5.8×10^6 N

$K = \frac{F}{\Delta l}$ $\frac{F = 6.42E+5 \text{ N}}{3.46 \times 10^{-4} \text{ m}} = 1.855E+9 \text{ N/m}$

IF $F = 5.8 \times 10^6$ N, what is Δl

$\Delta l = F/K = \frac{5.8 \times 10^6 \text{ N}}{\cancel{3.46 \times 10^{-4}} \text{ N/m} \; 1.86E+9} =$

PHYSICS HW # 3 Ch 8/9 12-14

3) $K = F/\Delta l$ $F = 1.3 \times 10^5 N$ $\Delta l = 5.9 \times 10^{-3} cm$

$$\left[5.9 \times 10^{-3} cm\right] \frac{1m}{100 cm} = 5.9e-5\ m$$

$$K = \frac{1.3 \times 10^3 N}{5.9 \times 10^{-5} m} = 2.20 \times 10^9$$

a) if $F = 5.5 \times 10^{+5} N$ what is Δl?

$$\Delta l = F/K = \frac{5.5 \times 10^5}{2.2 \times 10^9} = 2.5e^{-4} m$$

b) $F = (\Delta l)(K) = (0.\cancel{7}10\ cm)\left(\frac{1m}{100 cm}\right) 2.2 \times 10^9 = 15,620,000 N$

$= 1.562 \times 10^6 N$

$$\left(0.0710\ cm \frac{1m}{100 cm}\right)(2.2 \times 10^9) = (.00071)(2.2 \times 10^9)$$

$$= 1,562,000 = 1.562 \times 10^6$$

4) specific gravity - ratio comparison of density of a substance to water

see pg 332

Gasoline has specific gravity of 0.68

Since unknown denser - will sink

(5) $D_m = \frac{m}{V}$ - Since water decreases volume, but mass remains the same, D → increases

(6) on top of mountain g slightly lower therefore $W = mg$ less on mountain top

→ EASIER to SP on mountain top

Harder @ sea level

PHYSICS HW # 3

7) Gas flows from larger diameter pipe to smaller what happens?

see Pg 360 359

a) Speed increases where stream is narrow
b) Bernoulli's Principle - higher speed $\rightarrow$ lower pressure
c) spacing reduced between streamlines

4) Pressure = F/A $\quad r = 250\,cm^2 \frac{1m}{100cm} \frac{1m}{100cm} = .025m$

Pg 348/349

Need $P_1 = P_2 = \frac{F_1}{A_1} = \frac{F_2}{A_2}$ $\quad A_2 = 2.5e-3\ m$

$$\frac{(1500\,kg)(9.8\,m/s^2)}{0.025\,m} = \frac{F_2}{2.5e^{-3}\,m} = \frac{36.75}{.025} = 1470\,N$$

9) $Q = vA$ $\quad r = 6.5\,cm = 6.5\,cm \frac{1m}{100cm} = .065\,m$

Pg 356

$$A = \pi r^2 = 1.32E-2\ m^2$$

$$Q = \left(4.53\ m/s\right)\left(1.32E-2\ m\right) = \left[6.0127\ \frac{m^3}{s}\right]\left(\frac{10^3 L}{m^3}\right)\left(\frac{60s}{min}\right)$$

$$= \left[6.0127\ \frac{\cancel{m^3}}{\cancel{s}}\right]\left[\frac{10^3 L}{\cancel{m^3}}\right]\left[\frac{60\cancel{s}}{min}\right] = 3.607E+3\ L/min$$

$$= 3607\ L/min$$

b) In 25 minutes
(25)(3607) = 90,191.59 liters

PHYSICS HW # 3 CHAPTS 12-14

10) Gap becomes wider as metal expands

Pg 345/346 11) $\Delta l = \alpha l \Delta T$ α = coefficient of Linear Expansion

See Example 1 page 346

steel railroad 40 ft long @ 0° F

Heat to 100° F

$\alpha = 6.5 \times 10^{-6} / F^\circ$

$$\Delta l = \alpha l \Delta T = 6.5 \times 10^{-6} / \cancel{F} \, (40 \text{ ft}) (100^\circ \cancel{F}) = 0.26 \text{ ft}$$

HW Problem

$\Delta T = 70^\circ C - 20^\circ C = 50^\circ C$

$l = 1 \text{ m}$ $\alpha = 2.3 \times 10^{-5} / C^\circ$

$$\Delta l = \alpha l \Delta T = \left(2.3 \times 10^{-5} / \cancel{{}^\circ C}\right) (1 \text{m}) (50^\circ \cancel{C}) = 1.15e\text{-}3 \text{ m}$$

$$L = 1 + 1.15e\text{-}3 = 1.00115 \text{ m}$$

12) Pg 379 $Q = cm\Delta T$ c = specific heat ΔT = temp change

m = mass

Q = heat

$$c = 0.092 \frac{\text{cal}}{\cancel{g^\circ C}} (10 \cancel{g}) (100^\circ \cancel{C}) = 92 \text{ calories}$$

more heat for water - higher capacity

13) $\Delta T = \dfrac{Q}{cm} = \dfrac{1000 \text{ J}}{\frac{4.19 \text{J}}{(4.184 \text{J})(1000 \text{g})}} = 0.23^\circ C$