Physics
Ch8 Pretest

① As the ballon rises, the Helium expands, causing the Ballon to stretch. It will continue to rise until the Balloon Brusts.

② Archimede's principle:

The upward Buoyant force is equal in magnitude to the weight of the fluid displaced By the object.

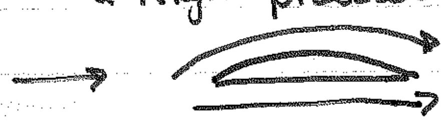
FB = weight of fluid displaced

③ Pressure change in fluid: Horizontal - Same
Vertical - ↑ as you go deeper/lower

④ Bernoulli's principle/ In Class:

Base ball or wing

* high pressure moves to low pressure!!



Fast Air = low Pressure

Slow Air = high pressure

⑤ Viscosity: flow Rate of fluid

lava - high Viscosity
water - Low Viscosity

⑥ An Ideal fluid is a fluid that has: ① No Internal friction
② NON Viscous
Nonturbulent ① (same)
③ Incompressible

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(3) Given:

Wide Tunnel	Narrow Tunnel
$dia_w = 8.25\,m$	$dia_N = 3.50\,m$
$V_w = 3.5\,m/s$	$V_n = ?$
$P_w = ?$	$P_N = 92\,KPa$

Flow Rate:

$$A_w V_w = A_n V_n$$

Area $= \pi r^2$

$r = D/2$

Area $= \pi \left(\frac{D}{2}\right)^2$

$$\pi \left(\frac{D_w}{2}\right)^2 V_w = \pi \left(\frac{D_n}{2}\right)^2 V_n$$

$$V_n = \left(\frac{D_w}{2}\right)^2 V_w \left(\frac{2}{D_n}\right)^2$$

$$= \left(\frac{8.25\,m}{2}\right)^2 (3.5\,m/s)\left(\frac{2}{3.50\,m}\right)^2$$

$$\boxed{V_n = 19\,m/s}$$

$$P_w + \frac{1}{2}\rho V_w^2 + \rho g h_w = P_n + \frac{1}{2}\rho V_n^2 + \rho g h_N$$

$h_w = h_n = 0$ level

$$P_w = P_n + \frac{1}{2}\rho V_n^2 - \frac{1}{2}\rho V_w^2$$

$$= P_n + \frac{1}{2}\rho\left(V_n^2 - V_w^2\right)$$

$$= 9.2\times10^4\,Pa + \frac{1}{2}\left(1.00\times10^3\,\frac{kg}{m^3}\right)\left((19\,m/s)^2 - (3.5\,m/s)^2\right)$$

$$= 9.2\times10^4\,Pa + \frac{1}{2}\left(1.00\times10^3\,\frac{kg}{m^3}\right)\left(349\,m^2/s^2\right)$$

$= ~~174384.2~~$ 266500

$\boxed{P_w = ~~17000~~\,Pa}$

270000 PA

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Part III

① $V_H = 4.91 \times 10^{-1}\ m^3$ App Weight $= 3.14 \times 10^{2}\ N$

$m_H = ?$ $\rho_w = 1.00 \times 10^{3}\ Kg/m^3$

Soln:

$$\text{AppWeight} = F_g - F_B \quad \text{if submerged}$$

$$F_g = m_H g$$

$$F_B = V_H \rho_w g$$

$$\text{App Weight} = \overset{?}{m_H} g - V_H \rho_w g$$

$$m_H = \frac{\text{AppWeight}}{g} + V_H \rho_w$$

$$= \frac{(3.14 \times 10^{2}\ N)}{9.81\ m/s^2} + (4.91 \times 10^{-1}\ m^3)(1.00 \times 10^{3}\ Kg/m^3)$$

$$= 32.0\ Kg + 491\ Kg$$

$$\boxed{m_H = 523\ Kg}$$

② Large Piston

$m_L = 3.50 \times 10^{5}\ Kg$

$A_L = ?$

Small Piston

$m_S =$ don't care $F_S = 3.30 \times 10^{3}\ N$

$A_S = .55\ m^2$

Soln:

$$\frac{F_L}{\underset{?}{A_L}} = \frac{F_S}{A_S}$$

$$A_L = \frac{A_S}{F_S} F_L \qquad F_L = m_L g$$

$$= \frac{A_S}{F_S} m_L g$$

$$= \left(\frac{.55\ m^2}{3.30 \times 10^{3}\ N}\right)\left(\frac{3.50 \times 10^{5}\ Kg}{1}\right)\left(9.81\ m/s^2\right)$$

$$\boxed{A_L = 572\ m^2}$$