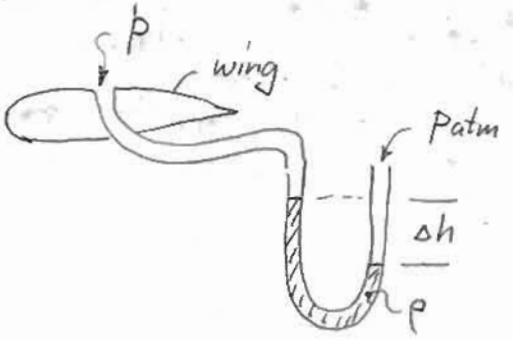
Problem F1 | Solution | Fall '03

Part A. – Anderson Problem 1.11



U-tube manometer.

Given: $p_{atm} = 1.01 \times 10^5 \ N/m^2$

$\rho = 1.36 \times 10^4 \ kg/m^3$

$g = 9.81 \ m/s^2$

$\Delta h = 20 \ cm = 0.2 \ m$

$\rightarrow p = p_{atm} - \rho g \Delta h = 7.43 \times 10^{-4} \ N/m^2$

Part B.

Measured weight = gravity force − buoyancy force

$$F = mg - \rho_{fluid} \cdot \forall$$

($\forall$ → volume of Al)

Given: $m = 1 \ kg$, so $mg = 9.81 \ N$ same for all cases.

Also, $m = \rho_{Al} \cdot \forall$, so $\forall = m/\rho_{Al} = 1 \ kg / 2700 \ kg/m^3$

$\rightarrow \forall = 3.70 \times 10^{-4} \ m^3$

Vacuum: $\rho_{fluid} = 0 \rightarrow F = 9.81 \ N$

Air: $\rho_{fluid} = 1.226 \ kg/m^3 \rightarrow F = 9.8096 \ N$

Water: $\rho_{fluid} = 1000 \ kg/m^3 \rightarrow F = 9.44 \ N$