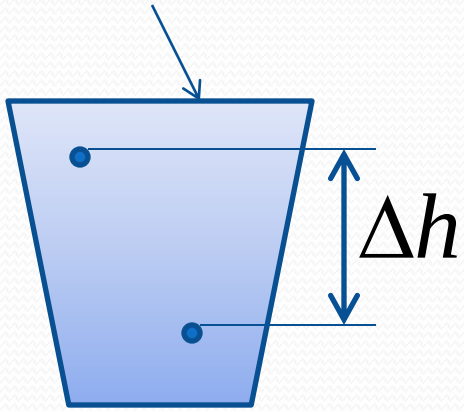
Chapter 14

Fluid Mechanics

Pressure

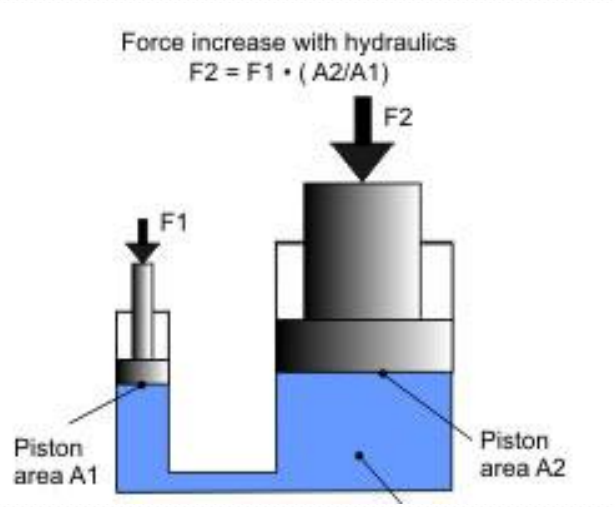
- Pressure = force per unit area $P = \frac{F}{A}$ 1 Pa = 1 N/m²
- Pressure is transmitted equally in all directions through the fluid ("Pascal's law")

atmospheric pressure



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

$$\frac{F_1}{A_1} = \frac{F_2}{A_2}$$

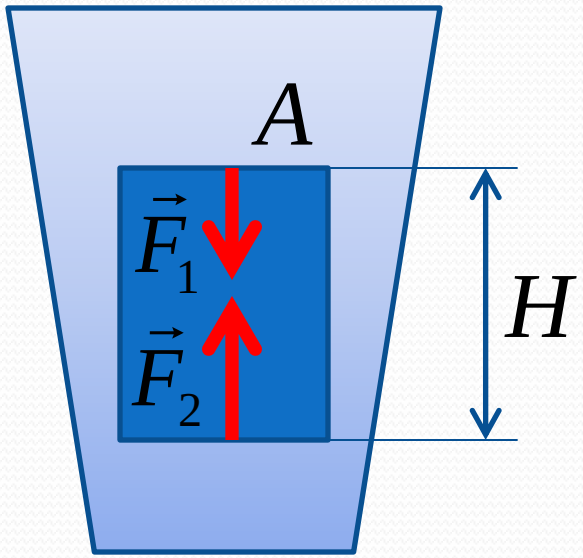


Buoyant Force

- Buoyant force is exerted by a fluid on immersed object

$$F = F_2 - F_1 = (P_2 - P_1)A = \rho g H A = \rho V g = mg$$

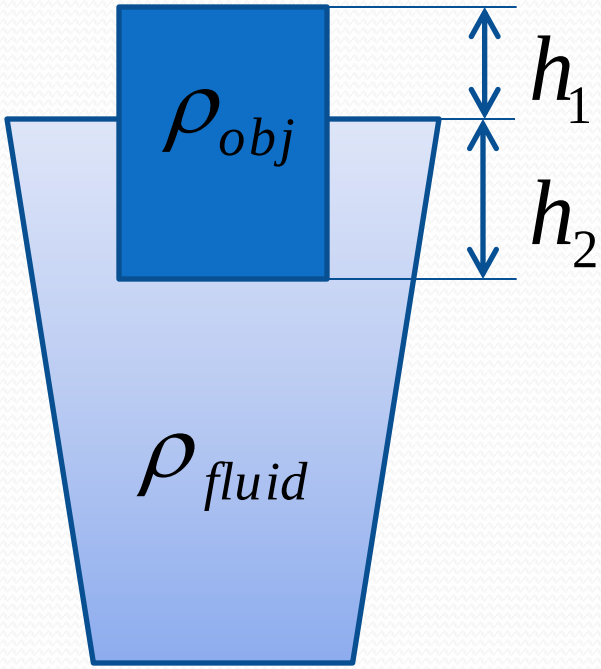
density of the fluid, not the object!



Buoyant force is equal to the weight of the fluid displaced by the object ("Archimedes' principle")

Floating Objects

- Need to have (average) density less than that of fluid



$$\rho_{obj}(h_1 + h_2) = \rho_{fluid} h_2$$