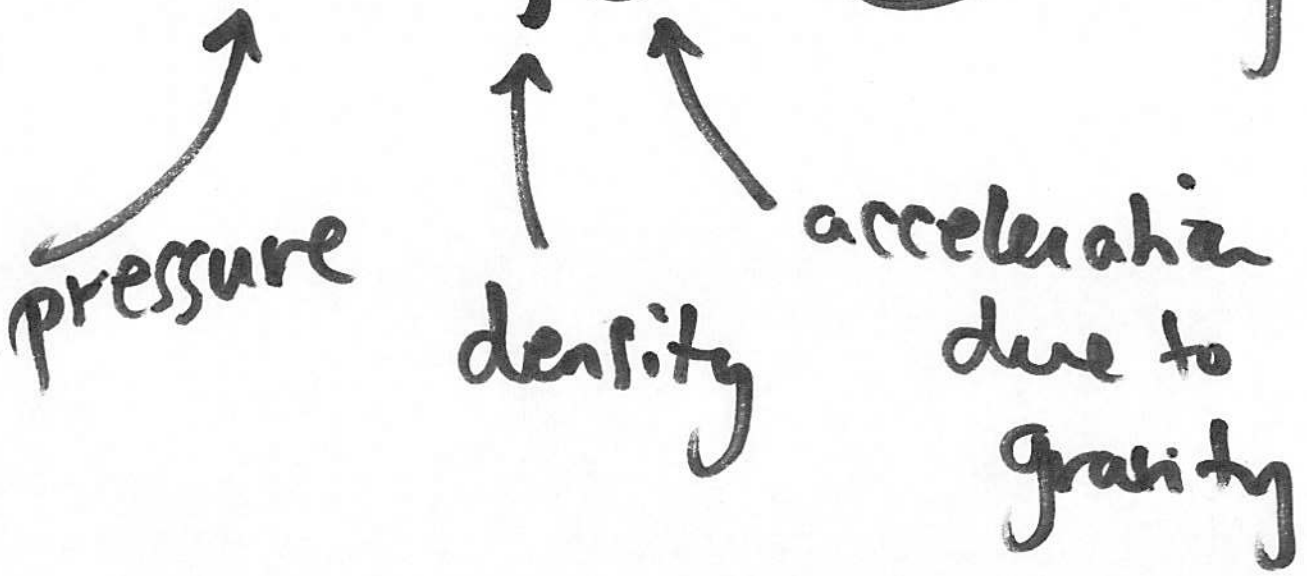
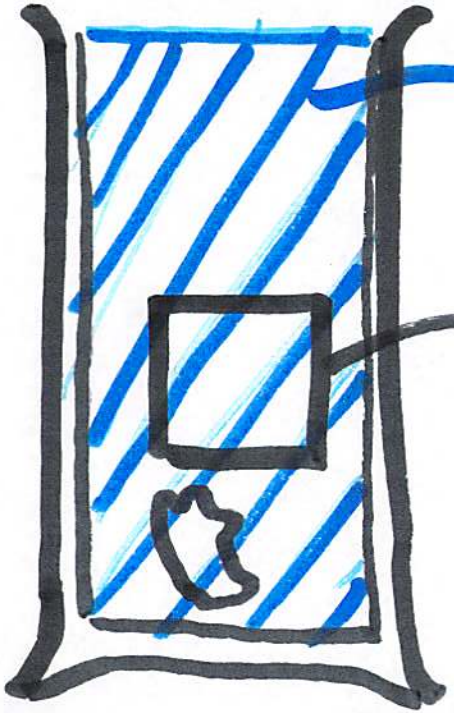
2013-11-19

- hydrostatics

- fluid pressure
- buoyancy
- $P = \rho g h$ ← height.





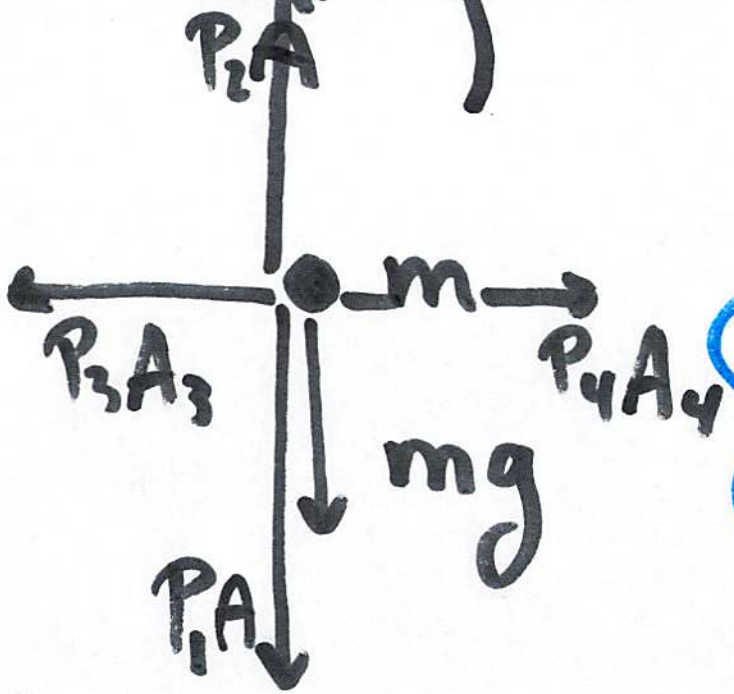
water $\rho = 1000 \frac{kg}{m^3}$

block of water

mass

$$m = \rho h A$$

f.b.d.



pressure is locally "isotropic." (normal forces)

include... what is 1 atm?

$$\Delta P = \rho g \Delta h = 10^5 \frac{kg}{m^3}\frac{m}{s^2}m$$

$\Delta h = 10\,m$

$\rho = 1000\frac{kg}{m^3}$

$g = 10\frac{m}{s^2} = 10^5 \frac{kg}{m\,s^2}$

$$= 10^5 \left(\frac{kg\,m}{s^2}\right)\left(\frac{1}{m^2}\right)$$

$$= 10^5 \frac{N}{m^2} = 10^5\,Pa$$

100 kPa

Vertical direction:

static
$ma = 0$

$$\Sigma F_{forces} = P_2A - P_1A - mg = 0$$

P_2A: force from bottom

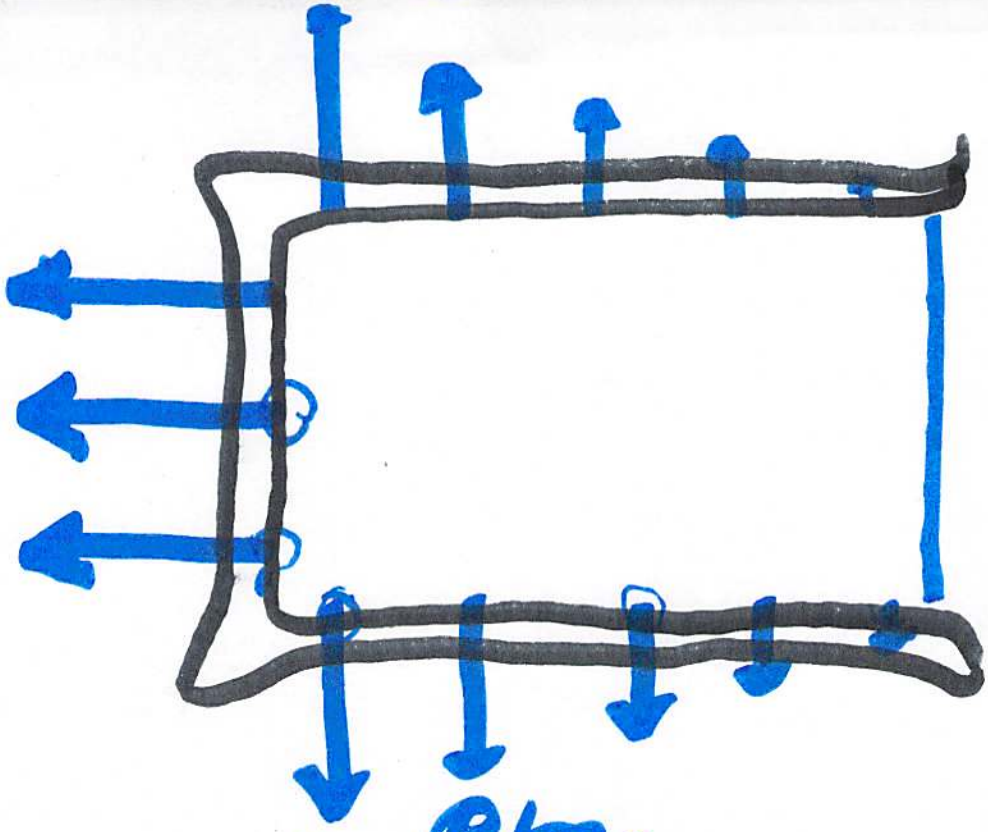
P_1A: force from top

0: doesn't fall

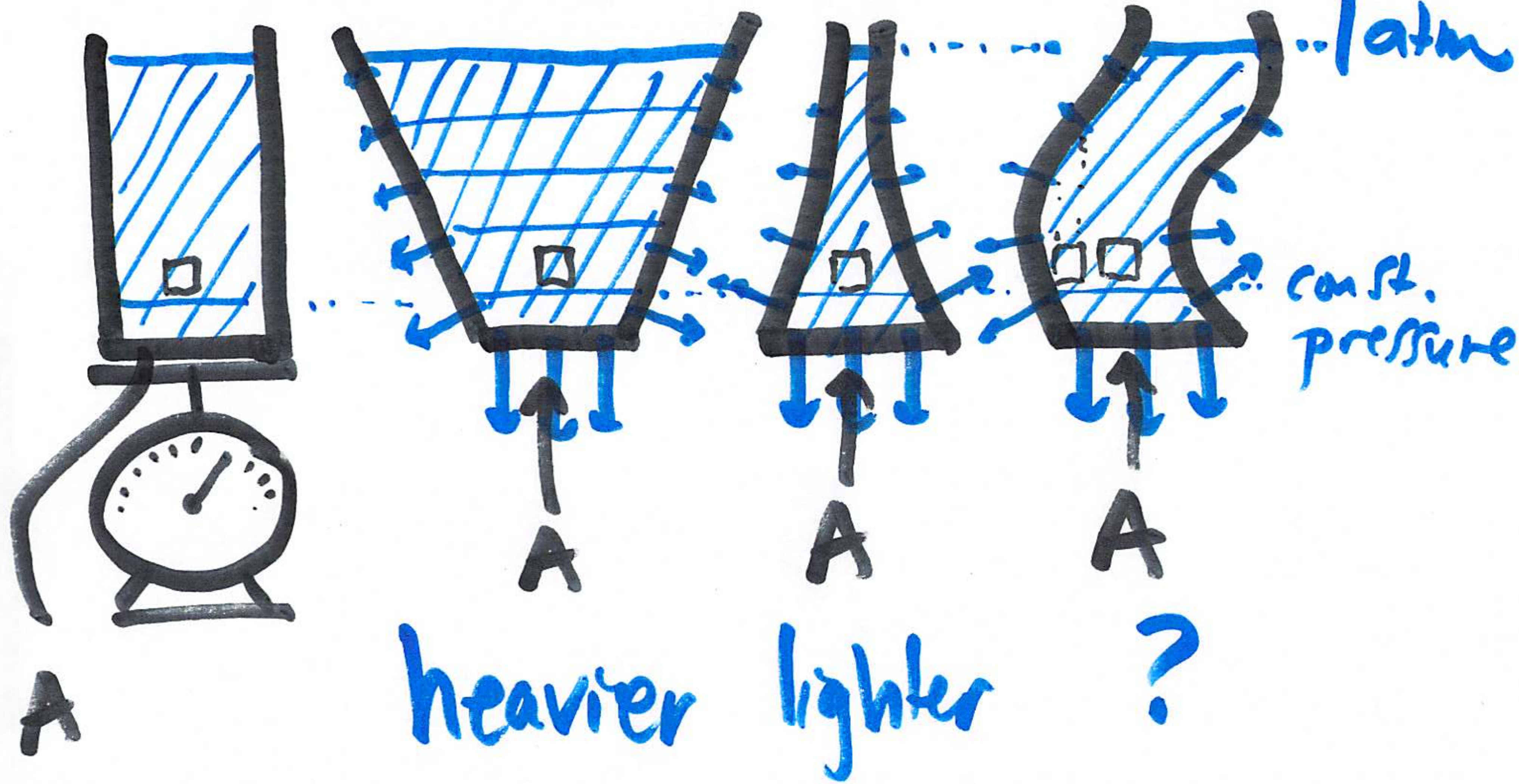
$$P_2A - P_1A = \rho h A g$$

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

The reason the block doesn't fall is: the pressure increases with depth



pressure on the beaker from the water.


1atm
const. pressure
A
A
A
A
heavier
lighter
?

$1\ \text{atm} = 10^5 \frac{N}{m^2}$

$\rho g h$ for water, $h = 10\ m$

mercury, $h = 760\ mm$

$= 0.76\ m$

$\rho \sim 13 \times$ water.

$P \sim e^{-\frac{h}{H_0}}$