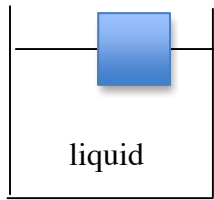


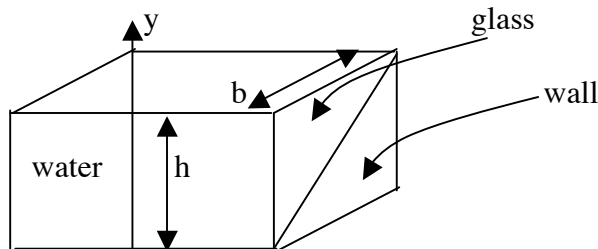
Problem 1 (10 pts+2pts extra credit)



A cubic block of side length 10 cm and mass 100 g floats in a liquid (not water). Half of the block is submerged. Ignore atmospheric pressure.

- Find the pressure on the bottom face of the block, in N/m^2 .
- Find the density of the liquid, in kg/m^3 .
- (for extra credit) How much work (in J) needs to be done to push the block completely into the liquid?

Problem 2 (10 pts)



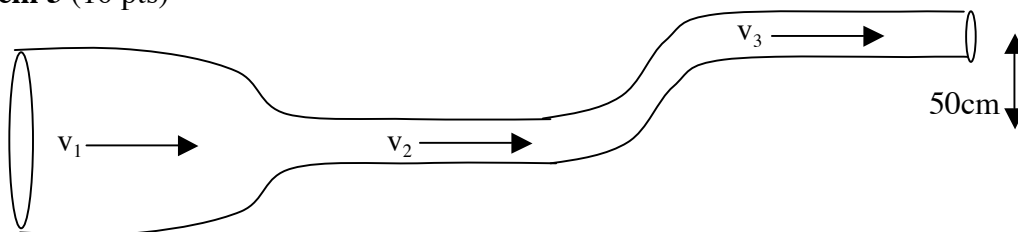
In the aquarium filled with water shown in the picture, half the lateral wall is glass in the triangular shape shown, the other half is wall. The height of the lateral wall/glass is h , the width is b .

- Find an expression for the force on the glass due to water pressure, in terms of ρ (density of water), h and b .

Hint: note that at height y from the bottom. the width of the glass is by/h .

- How much smaller is the force on the glass than the total force on glass plus wall?

Problem 3 (10 pts)



In the pipe shown in the figure, water is flowing ($\rho=1000\text{kg/m}^3$). There are 3 parts to the pipe. The wide part on the left has diameter 8cm, the middle and right parts have diameter 6cm. The right part is raised by 50cm relative to the middle and left parts. The speed of the water in the middle part is $v_2=8\text{m/s}$, and the pressure on the left part is $P_1=50\text{kPa}$.

- Find the speed in the left part, v_1 ,
- Find the pressure in the middle part, P_2 .
- Find the pressure and the speed in the right part, P_3 and v_3 .