proprep™

High School Physics

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Fluids and Pressure

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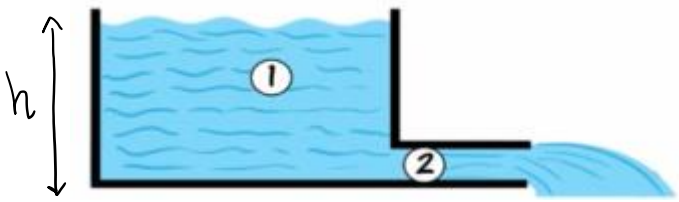
Questions:

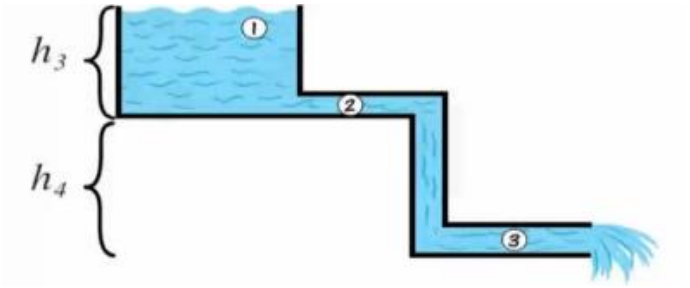
1) Draining Reservoir

What is the velocity of water flowing out of reservoir?



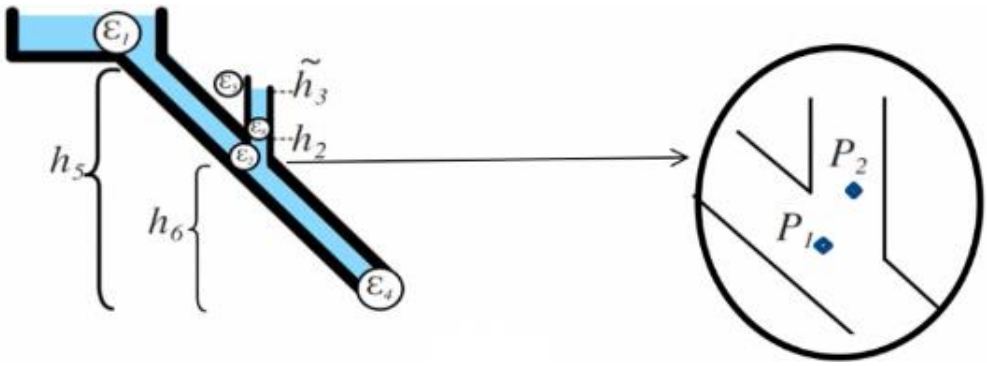
2) Pressure in a Tank

What are the pressures at points 2 and 3?



3) Reservoir and Pipe

In the diagram below there is a reservoir, water pipe and another pipe for measuring the pressure. Find the pressures at the different points of the system.

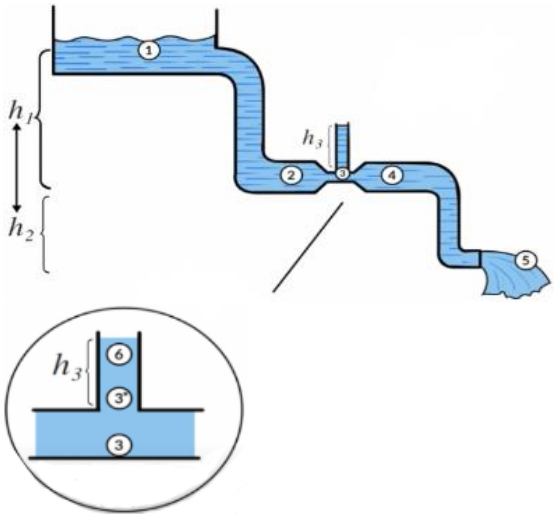


4) Venturi Tube

Water is flowing out from the reservoir.

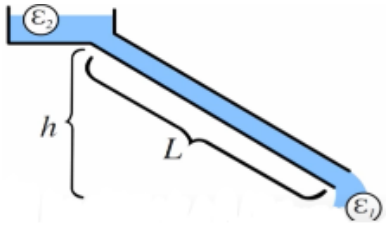
At point 3, the cross-sectional area is $\frac{1}{3}$ the area of the rest of the tube.

Find the pressure at each of the points 1-5 and find the height of the water above point 3.



5) Energy Loss due to Viscosity

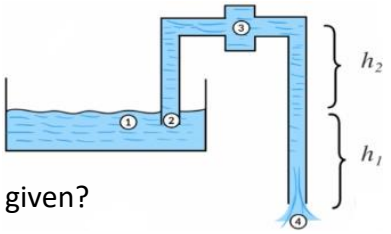
A fluid, of known viscosity, is flowing through the following system. Find the flow rate through the tube, given the following information: the viscosity of the fluid, the length and radius of the tube, and the height of the reservoir.



6) Venturi Tube with Friction

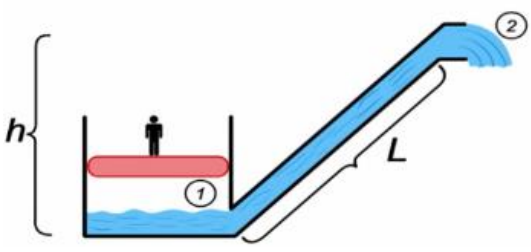
We are given the following system.
The cross-sectional area at point 3 is twice as large as the rest of the tube.

a. What is the velocity of the flow if there is no energy loss?
b. What is the velocity of the flow if a coefficient of viscosity is given?



7) Pressure on a Pool.

A tube of diameter d and length L leads out from the bottom of a shallow pool.
A man of mass m stands on a surface of area S (which perfectly fits the pool's dimensions).
The surface then pushes down on the air underneath it, causing an increase in pressure on the pool water.
How long will it take the pool to become empty, if we are told that the initial volume of the pool is K and that the viscosity of the water is η?



Answer Key:

1) $v = \sqrt{2gh}$

2) $p_2 = pgh_3 - \frac{1}{2}pv^2, \quad p_2 = pg(h_3 + h_4) - \frac{1}{2}pv^2$

3) $p_2 = pg(h_5 - h_6) + p_{atm} - \frac{1}{2}pv^2, \quad h_3 = h_5 - h_6 - \frac{1}{2}\frac{v^2}{g}$

4) $p_1 = p_5 = p_{atm}, \quad p_2 = p_4 = pgh_1 + p_{atm} - \frac{1}{2}pv^2, \quad p_3 = pgh_1 + p_{atm}\frac{-9}{2}pv^2, \quad h_3 = \frac{9v^2}{g}$

5) Refer to the video.

6) a. $v = \sqrt{2gh_1}$ b. Refer to the video.

7) $t = \frac{K}{Q}$