

7th Laboratory exercise

Law of Hydrostatic Pressure

Theoretical part

When a power F It acts on a surface A then the ratio:

$$P = \frac{F}{A}$$

it is called pressure on the surface A . Pressure's unit (SI) is 1 N/m^2 and is called Pascal ($1 \text{ pascal} = 1 \text{ Pa} = 1 \text{ N/m}^2$). Other pressure units are $1 \text{ Bar} = 10^5 \text{ Pa} = 1 \text{ atm}$.

The pressure due to the weight of a liquid is called **Hydrostatic**. The hydrostatic pressure P at a certain point in the liquid (if you ignore the atmospheric) is proportional to: the depth from the surface of the liquid h , the liquid density p and the acceleration of gravity g . The above conclusions are expressed in the language of mathematics by the relationship:

$$P = p \cdot g \cdot h$$

(Law of Hydrostatic pressure)

Where: p Hydrostatic pressure in N/m^2 , p the density of liquid in Kg/m , g the acceleration of gravity in m/s^2 and h the depth from the surface of the liquid to m . It is worth noting that hydrostatic pressure, depends **Not** on the shape of the container or the volume of the liquid. We feel the same pressure when we take a dip and our head is sunk by one meter either in a small seawater pool or in the middle of the sea.

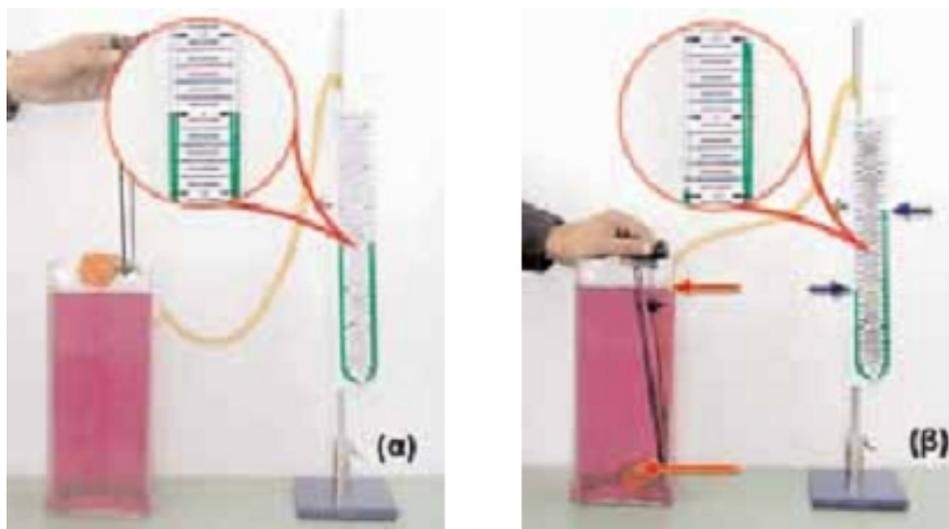


Fig. 1: Measurement of Hydrostatic pressure
(a) the membrane is located outside the liquid (b) The membrane is in the liquid

Experimental part

Instruments, apparatus and materials:

1. Manometric capsule with Manometer
2. Volumetric Cylinder
3. Ruler
4. Water
5. Concentrate Saline solution

Experimental procedure:

1. Fill the glass basin with water until the $\frac{3}{4}$. Plunge the Manometric capsule into the water and adjust the height of the device so that the center of the membrane of the manometric capsule is 2 cm under the surface of the water.
2. Observe the indication of gauge and fill it in Table 1.
3. Continue, repeating procedures 5 and 6 for depths 4 cm, 6 cm, 8 cm, 10 cm etc. Fill in Table 1. What do you notice from these measures? How does hydrostatic pressure change in relation to the depth from the surface of the liquid?
4. Fill with a saline solution the plastic basin. Plunged into the saltwater the manometric capsule in 8 cm depth. Observe the indication of gauge. Fill in the respective table 2 field Comparing the values of hydrostatic pressure in water and saltwater, for the same depth. What do you see?

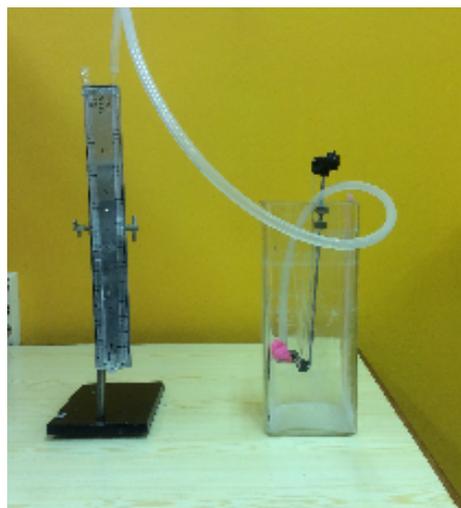


Fig. 2: Experimental apparatus

Table 1

Depth h (cm)	2	4	6	8	10
Pressure P (cm H_2O)					
Depth h (cm)	12	14	16	18	20
Pressure P (cm H_2O)					

Table 2

1	2	3
Liquid	Depth h (cm)	Pressure p (cmH_2O)
Water	8	
Saltwater	8	

5. Fill the communicating containers with water. What do you notice? Give an explanation.