

Faculty of matter Sciences and Computer Science
 Department of Physics – L2_Physics
 Exercise Series of Fluid Mechanics, 2025-2026
 Exercise Series Number 2: Fluid Statics

Exercise O1 :

When diving into the bottom of a swimming pool, you can sometimes have an unpleasant feeling on your ears: this is because of the pressure exerted by the water on our eardrums.

What pressure is exerted on a diver's ears at a depth of 10 m ?

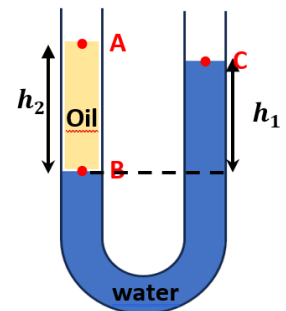
We give: $\rho_{eau} = 1000 \text{ kg.m}^{-3}$ $P_{atm} = 1.013 \times 10^5 \text{ Pas}$ $g = 9.81 \text{ N.kg}^{-1}$

Exercise O2 :

Consider a U-shaped tube filled with two immiscible liquids, water and oil

Heights are measured $h_1 = 9 \text{ cm}$ and $h_2 = 10 \text{ cm}$.

- Determine the density of the oil.



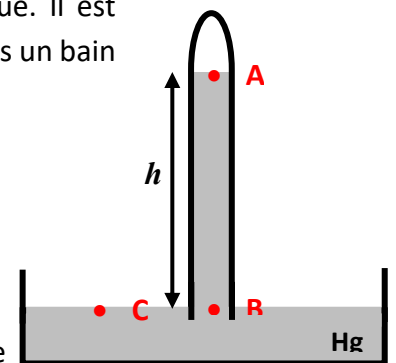
Exercise 3 : Le Baromètre de Torricelli

Le baromètre de Torricelli sert à mesurer la pression atmosphérique. Il est constitué d'un tube d'un mètre fermé à une extrémité qui plonge dans un bain de Mercure.

La zone supérieure du tube ne contient plus d'air, la pression en A est alors nulle.

- 1- Quelle est la pression aux points B et C ?
- 2- Calculer la hauteur de la colonne de mercure h ?
- 3- En cas de baisse de la pression atmosphérique, comment varie la hauteur de mercure dans le baromètre de Torricelli ?

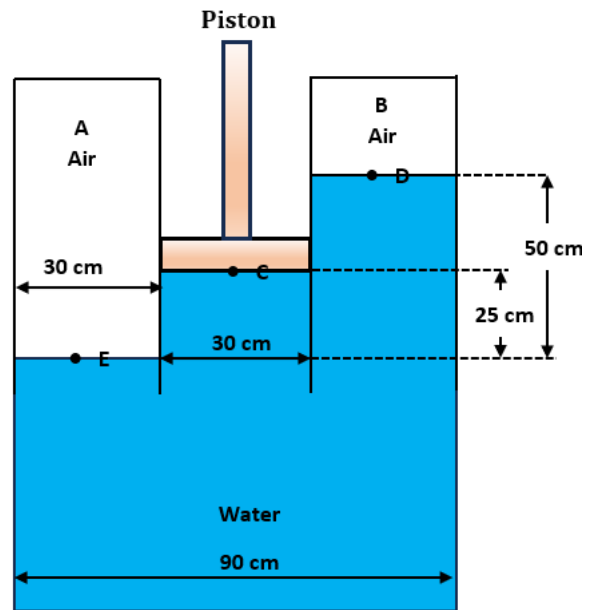
Donnée : $\rho_{Hg} = 1.35 \times 10^4 \text{ kg.m}^{-3}$ $P_{atm} = 1.013 \times 10^5 \text{ Pas}$ $g = 9.81 \text{ N.kg}^{-1}$



Exercise O4 :

Two chambers with the same fluid at their base are separated by a piston with a diameter of 30 cm with a weight of 25 N, as shown in the figure 1. It is assumed that the pressure change with elevation in each air chamber is negligible due to the low air density.

- Calculate the pressures in chambers A and B.



Exercise 05 : (Archimede's pr

A cork is held at the bottom of a container filled with water. It is then released.

- 1) What will the cork do?
- 2) We study the cork system. The latter is subject to two forces. Which? You will give their name and characteristics.
- 3) The cork has a volume of 0.250 dm^3 , the density of cork is $0,2 \text{ kg/L}$ and that of water is 1 kg/L . Remember that $1 \text{ L} = 1 \text{ dm}^3$.
 - a) Calculate the mass of the cork.
 - b) Deduct its weight. We remind that $g = 9,81 \text{ N} \cdot \text{kg}^{-1}$.
 - c) Calculate the magnitude of Archimedes' thrust(force).
 - d) Represents, on a diagram, a plug in the water and the two forces experienced by the plug.

We will take 1 cm for 0.5 N as a scale.

- 4) Are the values found for the intensity of each force in agreement with the answer to question 1?

Exercise 06 : (Law of Mariotte)

A balloon is inflated by blowing 1.2 L of air measured at atmospheric pressure inside. The balloon is shaped like a sphere with a radius of 6 cm .

What is the pressure inside the balloon?