



الجمهورية الجزائرية الديمقراطية الشعبية
Democratic Republic of Algeria People's
وزارة التعليم العالي والبحث العلمي
Ministry of Higher Education and Research



M'sila University

Faculty of Technology

Semester 03 – LMD – Civil Engineering

Practical work in fluid mechanics

PW N° 1 : Mesurment of volumetric mass and density of liquids

1. Learning Objectives

1. Understand the difference between volumetric mass and density.
2. Know how to measure the volumetric mass of a liquid using two experimental methods.
3. Use laboratory equipment (balance, graduated cylinder).
4. Compare experimental results with theoretical values.

2. Theoretical reminders

The volumetric mass (ρ) of liquid is defined as: $\rho = m / V$

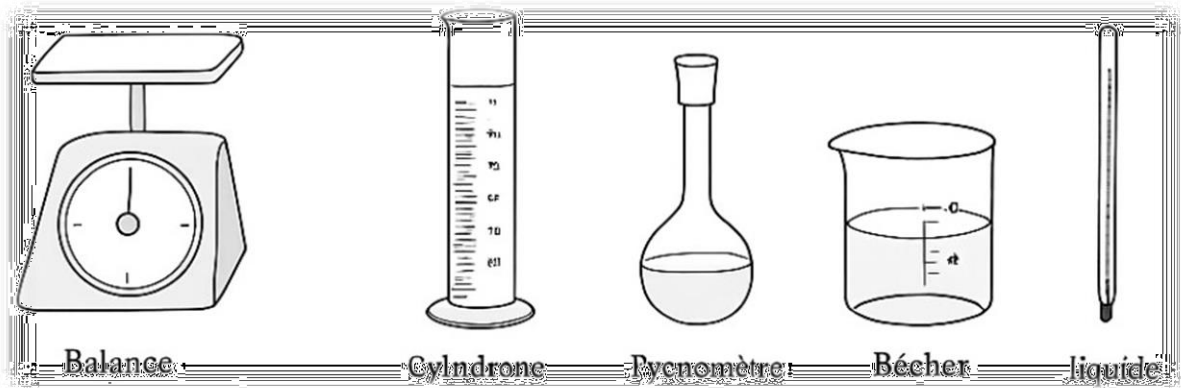
Where m is the mass (in kg) and V is the volume (in m^3).

The density $d = \rho_{\text{liquid}} / \rho_{\text{water}}$ (dimensionless)

For pure water at 4°C: $\rho = 1000 \text{ kg/m}^3$ and $d = 1$.

3. Equipment Used

1. Electronic balance
2. Graduated cylinder
3. Beaker
4. Liquid to be tested (oil, alcohol)



4. Experimental procedure

Method: Using the graduated cylinder (test tube)

1. Measure the mass of empty graduated cylinder (m_0).
2. Pour a known volume V of liquid into graduated cylinder.
3. Weigh the full graduated cylinder and record the total mass (m_1).
4. Determine the mass of the liquid: $m = m_1 - m_0$.
5. Calculate the volumetric mass: $\rho = m / V$.
6. Deduce the density: $d = \rho / 1000$ (if $\rho_{\text{water}} = 1000 \text{ kg/m}^3$).
7. Carry out several tests with different volumes.

$m_0(\text{test tube})$	m_1	m	v	ρ	d
constant mass					
constant mass					
constant mass					
constant mass					
constant mass					

5. Work requested

1. Construct a summary table of each method.
2. Identify deviations and sources of errors (temperature, scale precision, volume reading).
3. What is the difference between volumetric mass and density?
4. In what civil engineering applications is the density of liquids used?

7. Instructions for the report

- Purpose and principle of the experiment.
- Diagram of the assembly used.
- Measurement and calculation tables.
- Comparison with theoretical values.
- Discussion of discrepancies.
- Conclusion.