Maritime University of Szczecin

Faculty of Marine Engineering

Department of Physics and Chemistry

Physics Laboratory

Laboratory Manual

Determination of solids density using Nicholson's aerometer

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Equipment:
1. Nicholson's aerometer
2. Set of solids: *1. Acacia wood, 2.Bakelite, 3.Plex, 4.Ebonite, 5.Glass, 6.Steel,7.Brass, 8.Lead, 9.Zinc, 10-12.Aluminium.*
3. A dish with distilled water
4. Set of weights

Exercise:
1. Determine the mass m_b, width a, length b and height c of the solid indicated by the tutor. Calculate its volume $V = abc$ and the material density of the solid:

$$\rho_b = \frac{m_b}{V_b}.$$

2. Load the pan B of the aerometer with weights of mass m_1 so that the position of the marker K is at the level of water surface. The float and the connecting rod of the aerometer shouldn't touch sides of the vessel and the base of the instrument. Air bubbles cannot gather on immersed parts of the instrument.
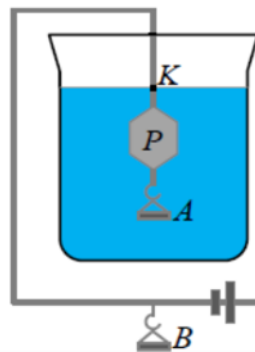
3. Take off weights from the pan B and place examined solid on it. Load the pan B of the aerometer by weights of mass m_2 so that the position of the marker K is at the water surface.
4. Take off the examined solid and weights from the pan B. Place the body on the hook A. Load the pan B of the aerometer by weights of mass m_3 so that the position of the marker K is at the water surface.
5. Using the formula:

$$\rho_b' = \frac{m_1 - m_2}{m_3 - m_2} \rho_w$$

calculate the density ρ_b' of the examined body (ρ_w is the density of distilled water).
6. Compare calculated density values with the tabulated value .
7. The activities listed in items 1-6 are performed for several different solids.

Table:

examined body	m_b [g]	a [cm]	b [cm]	c [cm]	V_b [cm^3]	m_1 [g]	m_2 [g]	m_3 [g]	ρ_b $\left[\dfrac{\text{kg}}{\text{m}^3}\right]$	$\rho_b{}'$ $\left[\dfrac{\text{kg}}{\text{m}^3}\right]$	$\rho_{b\ tabl}$ $\left[\dfrac{\text{kg}}{\text{m}^3}\right]$