Common properties of bodies
Density

Determining the density of air

D 1.1.3.5
Physics experiments
Secondary

Objects of the experiment

1. Determining the mass and volume of air
2. Calculating the density of air

Setup

Apparatus

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1 sphere with 2 stopcocks, glass, 1 l ................... 379 07
1 Support ring for round flask, 250 ml, cork ......... 667 072
1 Hand vacuum pump......................................... 375 58
1 Single-pan suspension balance 610 Tara......... 315 23
1 Measuring beaker, 1000 ml .............................. 604 211
1 Measuring cylinder, 1000 ml, with plastic base . 665 757
1 Silicone tubing, 6 mm/ diam., 1 m..................... 604 432
1 Water, pure, 5 l ................................................ 675 3410
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Measuring example

Mass m_1 in g	290.3
Mass m_2 in g	289.1
Mass m_L in g	1.2
Volume V_L in cm³	1000
Density ρ_L in g/cm³	0.0012

Evaluation

Like the density of solid bodies and liquids, the density of air can be determined from the mass and the volume:

$$\rho = \frac{m}{V} \, .$$

The density of air calculated from the measured values is: $\rho_L = 0.0012 \, \text{g/cm}^3$.

The table value is: $\rho_L = 0.00129 \, \text{g/cm}^3$.

Carrying out the experiment

- Put the sphere with the support ring on the pan.
- Determine the mass m_1 of the sphere with support ring.
- Connect the vacuum pump to a hose nipple of the sphere, and open the stopcock on this side.
- Close the stopcock on the other side of the sphere.
- Evacuate the sphere, close the stopcock, and disconnect the vacuum pump from the sphere.
- Put the evacuated sphere with support ring on the pan, and determine the mass m_2.
- Calculate the mass of the air by forming the difference of m_1 and m_2.
- Determine the volume of the air the same way as in D 1.1.1.6.
- Calculate the density of air.

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