Determining the density of a liquid - Determining mass and volume

Object of the experiment

1. Determining the densities of different liquids from their mass and volume

Setup

- Fill the beakers with 100 ml of water, salt water, and methylated spirit, respectively.
- Make the salt water by mixing 100 ml of water and approx. 40 g of sodium chloride.

Remark:

It is possible to carry out the experiment using only one graduated cylinder. However, this cylinder has to be rinsed and dried well before every new measurement.

Apparatus

1 Sodium chloride, 1 kg	673 5720
1 Methylated spirits, 1 l	670 9990
3 Beakers, Boro 3.3, 250 ml, squat	664 130
3 Measuring cylinders, 100 ml, with plastic base	665 754
1 Single-pan suspension balance 610 Tara	315 23
1 Polyamide spatula, 150 mm	604 570

Carrying out the experiment

- Put an empty cylinder on the pan.
- Use the taring weight to equilibrate the balance.
- Pour 100 ml of water from the first beaker into the graduated cylinder.
- Equilibrate the balance by shifting the sliding weights of the balance.
- Read the positions of the sliding weights and determine the mass of the water from them.
- Calculate the density of the water from the volume and mass.
- Do the same with the other two liquids.
- Compare the calculated densities of water and methylated spirit with the table values.

Measuring example

Liquid	Volume V in cm³	Mass m in g	Density ρ in g/cm³
water	100	98.9	0.99
salt water	100	113.1	1.13
meth. spirit	100	82.6	0.83

Evaluation

Like the density of a solid body, the density of a liquid can be calculated from the mass and volume according to the formula

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

By comparing the values obtained in the experiment with table values, unknown liquids can be identified.

Table values:

water: $\rho = 0.99$ g/cm³ at 20 °C

meth. spirit: $\rho = 0.83$ g/cm³ at 20 °C

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