Archimedes' principle - Measurement with a hydrostatic balance

Object of the experiment

1. Investigating the relation between the buoyancy force acting on a body and the gravitational force of the liquid displaced by the body

Setup

Preparing the balance:

- Adjust the balance before starting the measurement.
- To do this, slide the balance beam with the holder to the upper end of the stand rod, and adjust the balance by means of the balancing nuts on the left and on the right.
- If the balancing range does not suffice, exchange the scales with each other.

Preparing the Archimedes' cylinder:

- Connect the hooks of the solid and the hollow cylinder by means of a 3 cm long piece of thread.

Apparatus

1 Archimedes' cylinder	362 02
1 Hydrostatic balance	315 011
1 Set of weights, 10 mg to 200 g	315 31
1 Sodium chloride, 1 kg	673 5720
1 Methylated spirits, 1 l	670 9990
1 Beaker, Boro 3.3, 100 ml, tall	664 137
1 Beaker, Boro 3.3, 250 ml, tall	664 138
1 Fishing line, set of 2	309 48ET2
1 Glass stirring rod, 300 mm x 8 mm diam.	665 213

Carrying out the experiment

- Suspend the solid and the hollow cylinder from a scale, and counterbalance by putting weights on the other scale.
- Fill approx. 200 ml of water into the large beaker, and place it under the cylinders.
- By loosening the screw at the holder, slowly slide the balance beam downwards until the solid cylinder is completely immersed in the liquid.
- Observe the deflection of the balance.
- Step by step pour water into the hollow cylinder up to the brim, and observe the deflection of the balance again.
- Repeat the experiment with salt water and with methylated spirit.

Measuring example

Mass m of the solid and the hollow cylinder: $m = 206\,\mathrm{g}$.

After immersion in the liquid, the pointer is deflected to the left.

When the same liquid is poured into the hollow cylinder, the deflection decreases.

It becomes zero when the hollow cylinder is brimful.

Evaluation

A buoyancy force acts on a body which is immersed in an arbitrary liquid.

The magnitude of the buoyancy force equals the gravitational force of the liquid displaced by the body.

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