

Experiments with scales

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Introducion

All experiments were performed with Ohaus OHSK-2202 [1] scales that were connected to a computer via the program Logger Pro [2]. We are utilizing the option to record an evolution of mass in real time and plot it into a graph and thereby visualize the progress and results of our measurement.

Experiment 1: Changing mass of a lit candle and steel wool

If a candle is lit, carbon dioxide, soot, and water vapor will be produced as a result of a reaction between wax and oxygen. Those products are released into the surroundings and the mass of a candle starts to decrease. On the other hand, during the combustion of steel wool, the aerial oxygen is bonded into ferric oxide, and as a result, the measured mass will be greater.

A more thorough description of this experiment is available on the web [3].

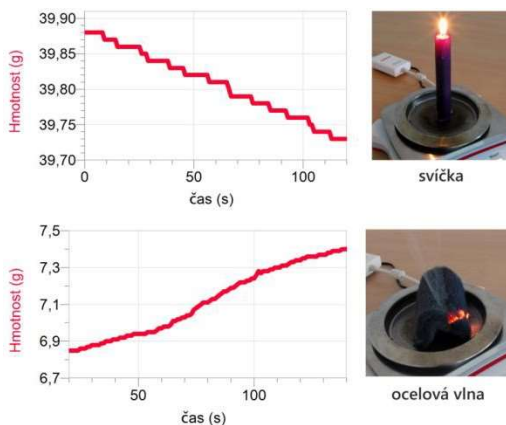


Fig. 1 An illustration of plotted graphs

Experiment 2: Object immersed in a fluid (buoyant force, action and reaction)

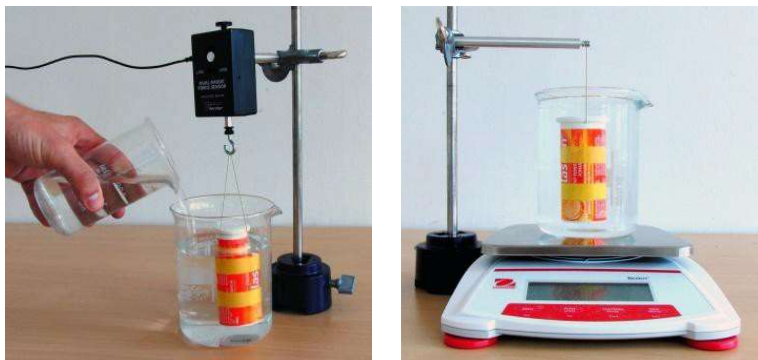
As the famous Archimedes' principle states: any object immersed in a fluid, is buoyed up by a force equal to the weight of the fluid displaced by the object. The goal of this experiment is to demonstrate that the intensity of a buoyant force is in fact independent of the mass of a submerged object and that it depends solely on the immersed volume.



Fig. 2 Used objects

We used weights in the form of two identical vitamin tubes. We filled them with varying amounts of metal nuts (fig. 2). Then we hanged them to a dynamometer and began to immerse them in beaker of water (fig. 3 left). The measurement showed that the force straining the dynamometer had decreased by the same margin for both the lighter and heavier objects (in our case 0.62 N). It is the manifestation of the buoyant force, that upthrusts both objects with the same intensity because their volume is the same.

The experiment can be connected to the action and reaction principle. It states that when two bodies interact, they apply forces to one another that are equal in magnitude and opposite in direction. So, if water buoyes the object up, the object should affect the water by the same amount to the opposite direction – down. That was demonstrated by measuring an increase of the measured mass of the beaker after submersing the tubes (fig. 3 right). Of course let us just remark, that the tubes cannot touch the bottom of the beaker.



Obr. 3 Illustration of the measurement

A thorough description including the instructions is available on the web [4].

Literature

- [1] <http://www.vernier.cz/OHSK-2202>
- [2] <http://www.vernier.cz/LP>
- [3] <http://www.vernier.cz/stahnout/kucharka/kod/zmeny-hmotnosti-pri-horeni>
- [4] <http://www.vernier.cz/stahnout/kucharka/kod/vztlakova-sila>