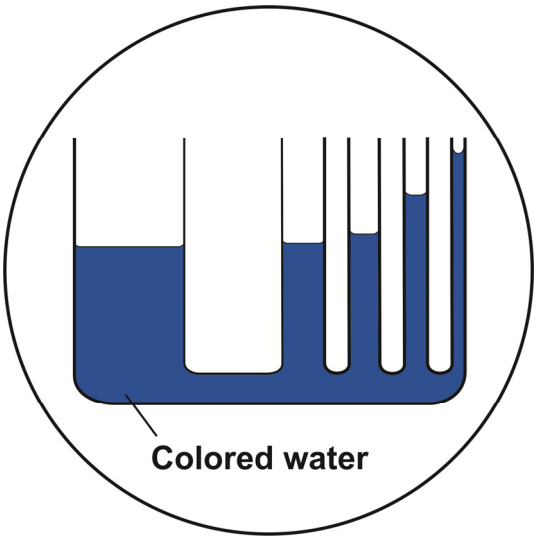
Capillary Tubes in Action



Equipment:

"capillary tubes apparatus" (communicating system of several capillary tubes with different diameters and a main reservoir)
glass beaker
glass rod
glass funnel

Chemicals:

deionized water
food coloring

Procedure:

The water in the glass beaker is dyed with food coloring as dark as possible. Subsequently, the "capillary tubes apparatus" is cautiously filled with the colored water via the main reservoir with the help of the glass funnel until the main reservoir is two-thirds full.

Observation:

The water rises in the capillary tubes higher than in the main reservoir and reaches different levels. The smaller the diameter of the tube, the higher the water rises.

Explanation:

The capillary rise h of a liquid with a surface tension σ and a density ρ depends on the radius r_c of the capillary:

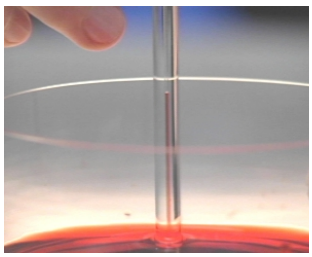
$$h = \frac{2\sigma}{\rho r_c g},$$

meaning the capillary rise is inversely proportional to the capillary radius. This relationship is proven by the experiment.

Disposal:

The dyed water can be disposed of by flushing it down the drain.

Supplement: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In a simplified version of the experiment three capillary tubes with different inner diameters (e.g. 1 mm, 0.6 mm and 0.4 mm) and the same length of about 7 cm are used. The dyed water is filled in a Petri dish. Subsequently, the three capillary tubes are vertically placed into the water beginning with the tube with the largest inner diameter (but they should not touch the bottom of the Petri dish). After waiting for the liquid to stop rising, the respective level reached is indicated with a permanent marker. As expected, the following also applies in this case: The narrower the tube, the higher the water rises.