CAPILLARY ACTION – CAPILLARY TUBES

MED 18.03

Material:

Item-no.	Qty.	Description
DM875-1K	1	Capillary tubes in holder
C1010-1D	1	Beaker glass, 250 ml, tall form, Boro
P7050-1A	1	Powder dye, red

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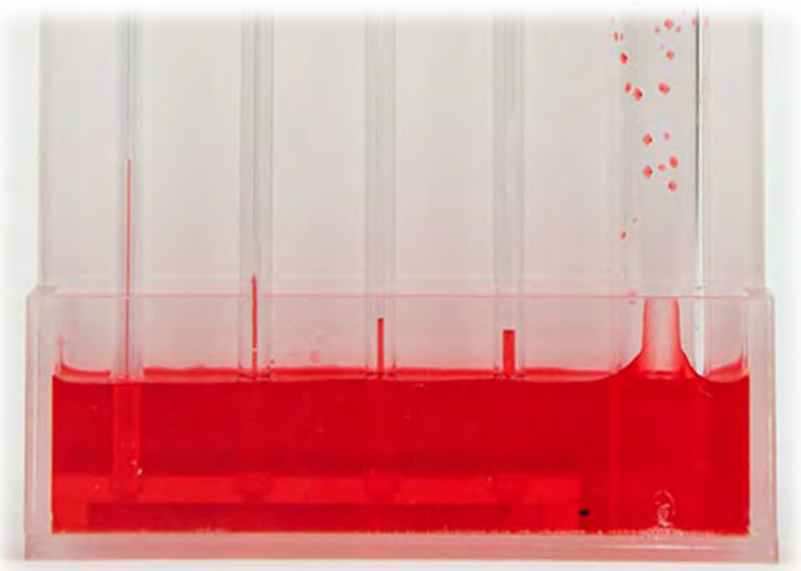
Purpose
Demonstrating the capillary effect

Preparation
We stir about 150 ml of colored water in the beaker. In this experiment, the water can be strongly colored. Due to the thin water columns, this gives better visibility.

Experiment 1
The tank is almost completely filled via the filling pipe. We observe the water level of the capillaries.

Result
The water level rises to different heights in the capillaries.
The smaller the inside diameter of the capillary, the higher is the water level in the tube.

This is a consequence of the molecular forces - between the liquid particles on the one hand and between the liquid particles and the particles of the wall of the tube on the other.



Note
Once the experiment is finished the capillaries and the holder should be cleaned immediately. Ensure cleanliness so that the tube walls do not exert different forces due to contamination (e.g. calcification or residues of food coloring) which would leads incorrect results.

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Additional task
If other liquids are being used different increases can be determined.
Below are the values of the surface tension and the specific weight of different liquids:

Liquid	ρ (kg/m³)	б (mN/m)
Water	998	73,0
Scented petroleum	810	27,0
Castor oil	960	36,4
Turpentine oil	855	27,0

Experiment 2
The height of rise in the tubes can also be calculated:

$$H = \frac{2 * б}{\rho * g * R}$$

H	Height of rise
б	Surface tension of the liquid
ρ	Specific weight of the liquid
g	9,81 m/s²
R	Radius of the capillary tube

The inner diameter of the capillary tubes are:
0,4 (0,36 – 0,37) mm
0,6 (0,55 – 0,60) mm
0,8 (0,76 – 0,78) mm
1,0 (0,97 – 0,98) mm

If you calculate the theoretical heights of rise you will see a clear difference to the actual heights of rise from experiment 1. Why is this?

It should be noted that these heights can only be reached with wetted inner walls.

In order to get as "accurate" heights of rise in the various tubes as possible, we stick a small syringe with a hose on the upper end of a capillary tube. We gently pull up the water pillar. As soon as the pillar is about 3 cm below the upper end, we detach the hose from the capillary. The water pillar should now drop approximately "to the correct height".