Capillarity

Apparatus

capillary tubes with different diameters, container of water with dye, two small glass sheets or a pair of glass petrie dishes, perspex sheets or petrie dishes

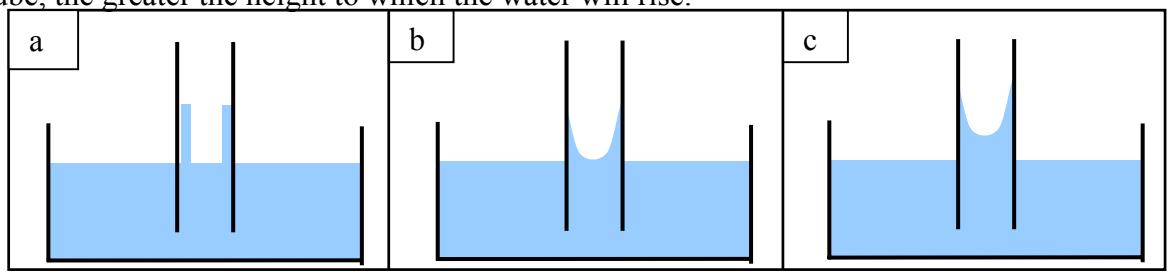
Action.

The students hold the tubes with one end in the container of coloured water and observe how high it rises in the different tubes. They should also note the shape of the meniscus. Different fluids can also be used.

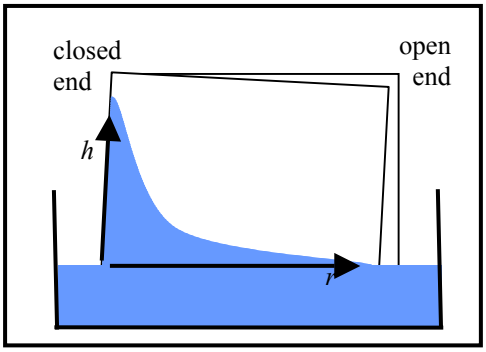
The pairs of plates are held close together and dipped into the water. The petrie dishes can be held so that the bottoms of the two dishes are together and the dipped into the water. The students should observe how the water rises between the different materials. As an interesting extension a paperclip or lump of blu-tack can be used to slightly separate one side of a pair of plates. When the bottom is dipped into the water it will rise to a height depending on the separation and form a curve.

The Physics

Water molecules are attracted to glass more than to each other. When the glass tubes are dipped in water the adhesion between the glass and water causes a thin film of water to be drawn up over the glass (a). Surface tension causes this film to contract (b). The film on the inner surface continues to contract, raising water with it until the weight of the water is balanced by the adhesive force (c). The smaller the tube, the greater the height to which the water will rise.



Water does not adhere to perspex, hence it will not rise between perspex plates, but water will rise between glass plates. If you hold a pair of plates together at one end and slightly apart at the other then the distance, r, between them increases as you move from the closed side to the open side. If you dip this into water it will rise between the plates to a height, h, proportional to $\frac{1}{r}$, giving a neat hyperbola ($\frac{1}{r}$ curve).



Accompanying sheet

Capillarity

Allow the liquid to rise in the different tubes.
Explain why water rises to different heights
in different diameter capillary tubes.

Water rises up between two glass plates but not between perspex plates.
Explain why.