



# Experiment of Viscosity Coefficient

## Purpose

Calculate the viscosity coefficient based on the fluid flowing in the capillary.

## Instrument

No.	Accessory	Qty	No.	Accessory	Qty
1	Aluminum support stand (include piezometers x1 and capillary tube clamp x1)	1	2	Movable sink	3
3.	Dropper	1	4	Movable graduate clip and graduate	1
5	Silicone tube	4	6	Capillary glass	1
7	Binder clip	2	8	Stopwatch (optional)	1

## Theory

The viscosity coefficient of the fluid in the capillary is  $\eta = \frac{\pi R^4 (P_1 - P_2)}{8QL}$ .  $P_1$  and  $P_2$  are water pressures at two ends of the capillary. ( $P_1 - P_2$  is the pressure difference at two ends of the capillary).  $R$  is the radius of the capillary.  $L$  is the length of the capillary and  $Q$  is the amount of fluid that flows through the capillary per unit time.

This experiment will use the height difference of two cups to create pressures at two ends of the capillary. Use communicating vessels principles and scales on the support stand to calculate the pressure difference by the height difference of water level.

Reference data :

Capillary	A	B	C
Radius $R$	0.075cm	0.1cm	0.125cm
Length $L$	12cm	12cm	12cm

## Procedure

1. Measure the length and the radius of the capillary or use the reference data.
  2. Use the latex tube to connect the cup to the capillary. Use the latex tube to connect the open piezometric and the cup.
  3. Keep the height difference between two cups in 5~15cm.
  4. Put graduated cylinders under cups to catch water.
  5. Add water into the cup in lower position until the water flows out off the tube. Empty the water in the graduated cylinder.
  6. Use binder clips to clip tubes and stop the water from flowing.
  7. Add water to the cup in higher position until the water flow out off the tube. Empty the water in the graduated cylinder.
  8. Put the funnel cup on the cup in higher position. Tighten the clip to fill the funnel cup with water.
  9. Record the height difference of water.
  10. Switch on the knob clip so the water in the funnel cup starts flowing into the cup in higher position.
  11. Take off binder clips and start timing.
  12. The water flows from the cup in higher position to the graduated cylinder via the cup in lower position.
  13. Stop timing when the water amount in the graduated cylinder at the lower position reaches 25ml.
  14. Finish the experiment recording sheet.
- ※ Note: Maintain the water level on the cup in higher position during the experiment. If the water level is lower than the beginning level, the experiment must be re-conducted. The flowing rate in the funnel cup should be slightly larger.