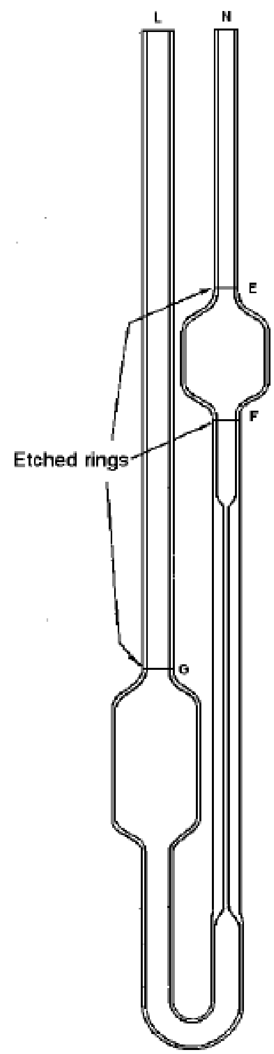
CAPILLARY VISCOMETER EXPERIMENT

VISCOSITY MEASUREMENT WITH CAPILLARY VISCOMETER

The purpose of the experiment: Measuring the kinematic viscosity of liquids.

Description: Kinematic viscosity is calculated using the flow time of a fluid in a capillary tube of known length. The temperature change affects the precise calculation of viscosity. Therefore, the capillary viscometer should be kept in a water bath for some time before the experiment.



Experimental Procedure:

- This viscometer can measure viscosity values in the range of 1-10 mm^2/s (centistoke).
- Mount the head supplied with the viscometer. This will keep the viscometer in a vertical position in the cup.
- Slowly pour the liquid whose viscosity will be measured into the viscometer.
- Pour the liquid into the viscometer so that it contacts the G line at the bottom of the meniscus.
- If you think that the temperature is equalized, measure the temperature of the water outside the viscometer using a suitable thermometer and start the measurement.
- Apply suction or compression to the tubes until the liquid in the right tube rises a few cm above the E line.
- Stop suction/pressure, the liquid will move down in the right tube.
- When the bottom of the fluid meniscus reaches the E line, start the time measurement. When the fluid reaches the F line, stop the timer.
- Consider temperature changes, if any, during flow.
- After doing the experiment once, repeat without interruption, by applying suction/pressure again, until the margin of error between the experiments is 0.2%.
- The viscosity of the fluid can be calculated by the following equation:
    - $\nu = Ct \ (mm^2/s)$

$$C = 0.009587 \ cSt/s$$

Here, t; is the time in seconds and C is the coefficient of the viscometer.

- Compare the calculated kinematic viscosity value with the value in the literature.
- You can find the dynamic viscosity value of fluids by multiplying the kinematic viscosity with the density value at the same temperature.

$$\mu = \nu\rho$$

- If necessary, you can calibrate the viscometer by changing the C coefficient.
- You can repeat this experiment with other fluids.

Table 9.3
Values of kinematic viscosity for fresh water, v, in metric units of $(m^2s^{-1}) \times 10^6$.
Temp. in degrees Celsius

Deg. C	0.0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
0	1.78667	1.78056	1.77450	1.76846	1.76246	1.75648	1.75054	1.74461	1.73871	1.73285
1	1.72701	1.72121	1.71545	1.70972	1.70403	1.69836	1.69272	1.68710	1.68151	1.67594
2	1.67040	1.66489	1.65940	1.65396	1.64855	1.64316	1.63780	1.63247	1.62717	1.62190
3	1.61665	1.61142	1.60622	1.60105	1.59591	1.59079	1.58570	1.58063	1.57558	1.57057
4	1.56557	1.56060	1.55566	1.55074	1.54585	1.54098	1.53613	1.53131	1.52651	1.52173
5	1.51698	1.51225	1.50754	1.50286	1.49820	1.49356	1.48894	1.48435	1.47978	1.47523
6	1.47070	1.46619	1.46172	1.45727	1.45285	1.44844	1.44405	1.43968	1.43533	1.43099
7	1.42667	1.42238	1.41810	1.41386	1.40964	1.40543	1.40125	1.39709	1.39294	1.38882
8	1.38471	1.38063	1.37656	1.37251	1.36848	1.36445	1.36045	1.35646	1.35249	1.34855
9	1.34463	1.34073	1.33684	1.33298	1.32913	1.32530	1.32149	1.31769	1.31391	1.31015
10	1.30641	1.30268	1.29897	1.29528	1.29160	1.28794	1.28430	1.28067	1.27706	1.27346
11	1.26988	1.26632	1.26277	1.25924	1.25573	1.25223	1.24874	1.24527	1.24182	1.23838
12	1.23495	1.23154	1.22815	1.22478	1.22143	1.21809	1.21477	1.21146	1.20816	1.20487
13	1.20159	1.19832	1.19508	1.19184	1.18863	1.18543	1.18225	1.17908	1.17592	1.17278
14	1.16964	1.16651	1.16340	1.16030	1.15721	1.15414	1.15109	1.14806	1.14503	1.14202
15	1.13902	1.13603	1.13304	1.13007	1.12711	1.12417	1.12124	1.11832	1.11542	1.11254
16	1.10966	1.10680	1.10395	1.10110	1.09828	1.09546	1.09265	1.08986	1.08708	1.08431
17	1.08155	1.07880	1.07606	1.07334	1.07062	1.06792	1.06523	1.06254	1.05987	1.05721
18	1.05456	1.05193	1.04930	1.04668	1.04407	1.04148	1.03889	1.03631	1.03375	1.03119
19	1.02865	1.02611	1.02359	1.02107	1.01857	1.01607	1.01359	1.01111	1.00865	1.00619
20	1.00374	1.00131	0.99888	0.99646	0.99405	0.99165	0.98927	0.98690	0.98454	0.98218
21	0.97984	0.97750	0.97517	0.97285	0.97053	0.96822	0.96592	0.96363	0.96135	0.95908
22	0.95682	0.95456	0.95231	0.95008	0.94786	0.94565	0.94345	0.94125	0.93906	0.93688
23	0.93471	0.93255	0.93040	0.92825	0.92611	0.92397	0.92184	0.91971	0.91760	0.91549
24	0.91340	0.91132	0.90924	0.90718	0.90512	0.90306	0.90102	0.89898	0.89695	0.89493
25	0.89292	0.89090	0.88889	0.88689	0.88490	0.88291	0.88094	0.87897	0.87702	0.87507
26	0.87313	0.87119	0.86926	0.86734	0.86543	0.86352	0.86162	0.85973	0.85784	0.85596
27	0.85409	0.85222	0.85036	0.84851	0.84666	0.84482	0.84298	0.84116	0.83934	0.83752
28	0.83572	0.83391	0.83212	0.83033	0.82855	0.82677	0.82500	0.82324	0.82148	0.81973
29	0.81798	0.81625	0.81451	0.81279	0.81106	0.80935	0.80765	0.80596	0.80427	0.80258
30	0.80091	0.79923	0.79755	0.79588	0.79422	0.79256	0.79090	0.78924	0.78757	0.78592