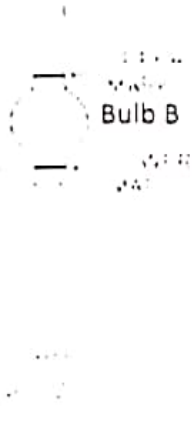
# EXPERIMENT

## Object:

To determine relative viscosity of a given liquid with respect to water at room temperature by Ostwald's viscometer.

## Apparatus and chemicals:




Distilled water. Stop watch, viscometer (Ostwald's). liquid sample, R.D. bottle, pipette etc.

## Theory:

Viscosity is the property of a fluid which offers resistance to the movement of the layer of fluid over another adjacent layer of the fluid.

The measurement of viscosity by viscometer is based on the Poiseulle's equation, which is

$$\eta = \frac{\pi P r^4 t}{8Vl} \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, $V$= volume of liquid of viscosity $\eta$ flowing in time $t$, through the capillary tube of radius $r$ and length $l$.

P= pressure of the liquid.

If $t_1$ and $t_2$ are times required to flow for equal volumes of two liquids through the same length of a capillary tube, then from equation (1) we have

$$\frac{\eta_2}{\eta_1} = \frac{P_2 t_2}{P_1 t_1} \quad \ldots\ldots\ldots\ldots\ldots (2)$$

The pressure of liquid =

Since for two liquids $h$ and $g$ are same, hence

$$\frac{P_2}{P_1} = \frac{d_2}{d_1} \quad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Therefore,

$$\frac{\eta_1}{\eta_2} = \frac{d_1 t_1}{d_2 t_2} \quad \ldots\ldots\ldots\ldots\ldots\ldots (+)$$

Where, $d_1$ and $d_2$ are the densities of two liquids.

If $\eta_1$ = Viscosity of the liquid

and $\eta_2$ = Viscosity of water

Then $\frac{\eta_1}{\eta_2}$ = Relative viscosity of liquid with respect to water.

## Procedure:

(1) Viscometer consists of two tubes: one broader (A) and one narrow (B). (2) Introduce water to bulb A such that bulb is more than half-filled. (3) Now suck water with the help of rubber tube attached to tube B and fill the bulb B upto the mark. (4) Measure the flow time until the water crosses the mark below the bulb. Note the time. (5) Take 4 readings with water and take the mean of them. (6) Now, introduce the same volume of given liquid to the bulb A and repeat the experiment as before 4 times.

## Observation:

Room temperature = °C.

| S.No. | Time of flow for water ($t_2$) | Time of flow for liquid ($t_1$) |
|---|---|---|
| 1. | | |
| 2. | | |
| 3. | | |
| 4. | | |

Density of liquid ($d_1$) and of water ($d_2$)

Wt. of empty R.D. bottle = .....gm.

Wt. of empty R.D. bottle + water = .....gm.

∴ Wt. of water = gm.

Similarly, Wt. of empty R.D. bottle + liquid = .....gm.

∴ Wt. of liquid = gm.