Date 4/11/17

Expt. No. 01

Page No. 01

EXPERIMENT NO. ~ 01

Name Of the Experiment :-

To find the viscosity of a given liquid at room temperature using Ostwald viscometer.

Apparatus Required :-

Ostwald viscometer, Specific gravity bottle, stopwatch etc.

Theory :-

According to Poiseuille's Equation, for any viscous liquid

$$\eta \propto dth \quad \text{— (1)}$$

$$\Rightarrow \boxed{\eta = gdth} \quad \text{— (2)}$$

Where, η = Coefficient of viscosity
d = density of liquid
t = time taken by liquid to cross unit Cross sectional area per unit time.
h = height or length of the capillary tube
and g = acceleration due to gravity

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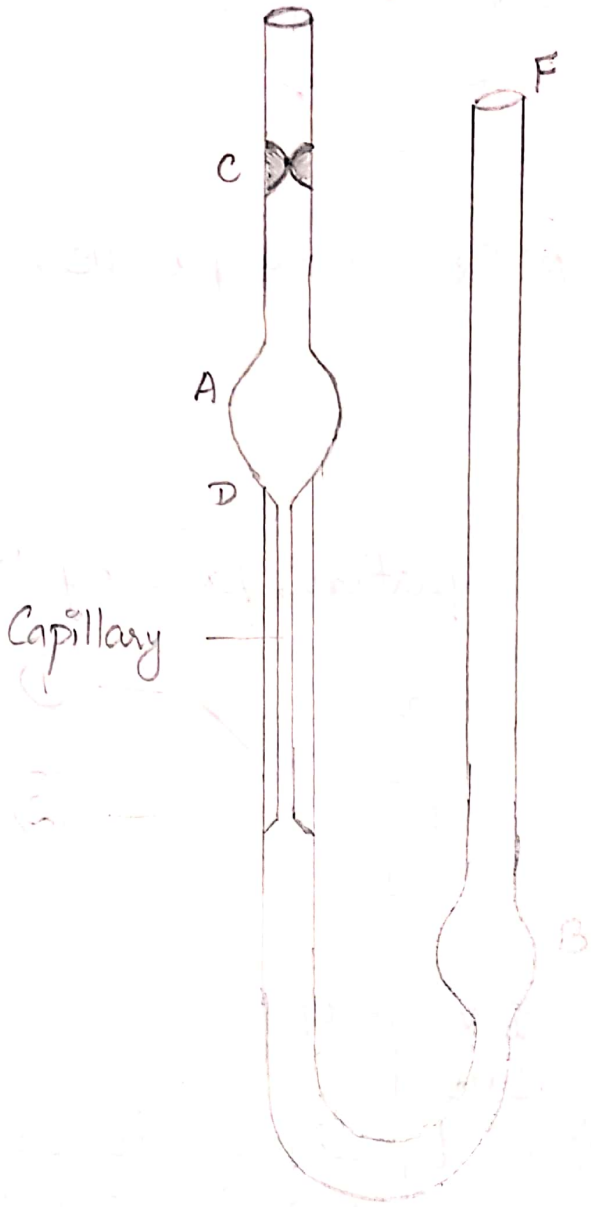

Fig :- Ostwald viscometer

For a tube having height 'h', let

η_1 = Coefficient of viscosity of a liquid.
η_2 = Coefficient of viscosity of another liquid.

then,

$$\frac{\eta_1}{\eta_2} = \frac{d_1 t_1 h}{d_2 t_2 h}$$

$$\Rightarrow \boxed{\frac{\eta_1}{\eta_2} = \frac{d_1 t_1}{d_2 t_2}} \quad \text{---- (III)}$$

Procedure :-

15-20 ml Known Organic Compound (liquid) was taken in the Ostwald viscometer. The Organic liquid was sucked from the narrow end of the tube through capillary into bulb A as shown in the figure. At point 'C' as marked in the Ostwald tube, the stopwatch is started. When the liquid touched the end point 'D' at the bulb 'A', the stopwatch is stopped and the time taken (t_1) was noted down.

This process was repeated 4-5 times to find out the average time (t_1).

Similar procedure was done with water in the

Teacher's Signature : _____

Expt. No. 01 Date 4/11/...

Page No. 03

Ostwald tube having equal volume and the average time for water 't_2' is noted down.

Observation :-

OBSERVATION TABLE

Room temperature = 24°C

S.No.	Time of flow of water in seconds (t_1)	Time of flow of benzene in seconds (t_2)
1.	41	35
2.	41.5	35
3.	41	35.3
4.	41.3	36.5
	Mean time (t_1) = 41.2 sec	Mean time(t_2) = 35.2

Calculation :-

From the Observation Table,

t_1 = 41.2 sec t_2 = 35.2 sec

Teacher's Signature : _____

Expt. No. 01 Date

Page No. 04

* Determination of density of Organic liquid :-

Weight of Specific gravity bottle = 11.345 g

Weight of Specific gravity bottle + water = 42.755 g

Weight of Specific gravity bottle + benzene = 38.795 g

∴ Weight of water = 32.010 g

Weight of benzene = 36.980 g

Then,

$$\eta_{benzene} = \frac{t_2}{t_1} \times \frac{\text{Wt. of benzene}}{\text{Wt. of water}} \times \eta_{water}$$

$$= \frac{35.2}{41.2} \times \frac{32.010}{36.980} \times 0.0081$$

$$= \frac{9.075}{1576 \times 18}$$

$$= 0.00543$$

$$= 5.43 \times 10^{-3} \text{ Poise}$$

Teacher's Signature :

Date 6/11/17

No. 01

Page No. 05

sult :-

iscosity of benzene at 24°c room temperatu
ound to be 5.43×10^{-3} poise.

Theoretical value of benzene between 20°C to
30°C is 6.52×10^{-3} to 5.61×10^{-3} pois