EXPERIMENT NO 6 **DATE:**

Determination of viscosity coefficient of given liquid using Ostwald's viscometer

PRINCIPLE: Viscosity arises due to friction between moving layers of a liquid. A liquid flowing through a cylindrical tube of uniform diameter is expected to move in the form of layers. Layer close to inner surface of the tube will be almost stationary. Whereas the layer at the axis moves fast than the immediate next layer. A slow moving layer exerts a friction on its adjacent layer backwards. This property of the liquid which opposes the movement between the layers is called viscosity. The coefficient of viscosity is defined as "**tangential force per unit area required to maintain unit velocity gradient between the two successive layers separated unit distance apart".**

The coefficient of viscosity is given by the Poiseuille's formula

$$\eta = \frac{\Pi P r^4 t}{8Vl}$$

Where p is the pressure between the two ends of the tube, v is the volume of the liquid flowing through the tube, r is the radius of the tube, l is the length of the tube and t is time of flow of the liquid. Under similar conditions if two different liquids of same volume are made to flow through the same tube then

$$\frac{\eta_1}{\eta_2} = \frac{t_l d_l}{t_w d_w}$$

For standard liquid of known viscosity and density, time of flow in the tube is determined. Then the time of flow for test liquid of known density is determined in the same tube. Then the viscosity of the test liquid can be calculated.

PROCEDURE: Fix a viscometer fitted with rubber tube on the limb containing small bulb vertically in a water bath such that the big bulb is completely dipped in water. Add about ten cm^3 of the given liquid into the big bulb. Wait for three minutes such that the liquid attains the constant temperature of the water bath. Suck the liquid above the upper mark in the limb containing the small bulb. Allow the liquid to flow down the capillary tube of the viscometer. As soon as the liquid crosses the upper mark start a stopwatch and stop the watch when the liquid crosses the lower mark. Note down the time of flow in seconds. Repast three to four times and find out the average time of flow of liquid in seconds. Remove the liquid from the viscometer and wash it well with acetone and dry the same in hot air oven. Cool the viscometer to room temperature and repeat the experiment by taking same volume of distilled water.By knowing the values for viscosity and density of distilled water viscosity of the liquid can be calculated using the formula

$$\eta_l = \frac{t_l d_l}{t_w d_w} \times \eta_w$$

Experiment No:

Observation and Calculations:

Liquid	Time of flow		
	In minutes and seconds	In seconds	Average in seconds
Given liquid			T_l
water			T_w

Laboratory temperature = ^oC

Density of water at laboratory temperature = gcm^3

Viscosity of water at laboratory temperature= milli poise

Density of given liquid at laboratory temperature = g/cm^3

Viscosity of given liquid at laboratory temperature = $\eta_l = \frac{t_l d_l}{t_w d_w} x\eta_w$

(1 milli poise = 10^{-4} Nsm^{-1})

RESULT: Viscosity of given liquid =…….. Nsm^{-1}

Signature of the teacher

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