EXPERIMENT NO. 6

Aim : To determine the coefficient of viscosity of a given viscous liquid by measuring the terminal velocity of a spherical body.

Apparatus : Glass tube containing the viscous liquid, spherical body, screw gauge, stop watch.

Theory : Terminal velocity is the constant velocity with which the body moves in a liquid after acceleration. The relation for coefficient of viscosity of the liquid is given by :

$$\eta = \frac{2\, r^2 (\rho - \sigma)\, g}{9\, v_t} \quad \text{----------(1)}$$

Where: r – radius of the spherical body
ρ - density of the spherical body (Iron : 7.8 gcm^{-3} lead : 11.3 gcm^{-3}, steel : 7.77 gcm^{-3})
σ - density of the liquid (Castor oil : 0.96 gcm^{-3}, vegetable oil : 0.91 gcm^{-3} glycerine : 1.26 gcm^{-3}
v_t - terminal velocity of the body

Procedure :

1. **Measure the radius of the sphere using a screw gauge.**
2. **Drop the object in the liquid and observe the time it takes to cover a definite length. Measure the time using a stop watch.**
3. **Calculate the coefficient of viscosity of the liquid using equation (1)**

Result : The coefficient of viscosity of the given liquid is _____ poise

Precautions :

1. **The body should be perfectly spherical**
2. **Velocity should be measured only when it becomes a constant**

Sources of error :

1. **The liquid may not have uniform density**
2. **The measured velocity may not be a constant.**

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Observations :

Zero error :

LC = **Zero correction:**

To find the diameter

Sr. No.	LSR (mm)	CSD (n)		CSR = n x L.C	d = PSR + CSR (mm)
		Observed	Corrected		
1					
2					

Mean diameter(d) = mm ; radius of the sphere = mm

= cm

To find the terminal velocity

Sr. No	Distance (cm)	Time (s)	Velocity (cm/s)
1			
2			
3			

Calculations :

Terminal velocity , v_t = _____ cm/s

Viscosity $\eta = \frac{2\, r^2 (\rho - \sigma)\, g}{9\, v_t}$

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