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1.0 EXPERIMENT NO: BNS/103a/02
2.0 NAME OF EXPERIMENT: SURFACE TENSION
3.0 0BJECTIVE: DETERMINATION OF SURFACE TENSION BY CAPILLARY RISE METHOD

4.0 PRINCIPLE:

Surface tension is a property of the surface of a liquid that allows it to resist an external force. It is revealed, for example, in floating of some objects on the surface of water, even though they are denser than water, and in the ability of some insects (e.g. water striders) and even animals (basilisk) to run on the water surface. This property is caused by cohesion of like molecules, and is responsible for many of the behaviors of liquids.

Surface tension has the dimension of force per unit length, or of energy per unit area. The two are equivalent—but when referring to energy per unit of area, people use the term surface energy—which is a more general term in the sense that it applies also to solids and not just liquids.

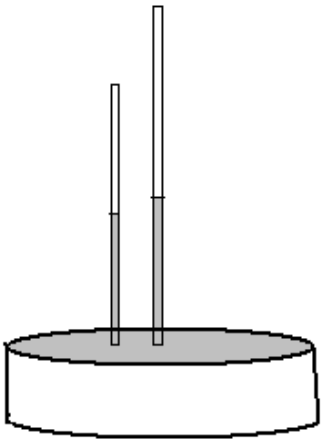
If a glass capillary tube of uniform circular bore be dipped vertically into water, it is found that water rises into the tube to a certain height .if 'h' be the height of the level of water in the tube measured from the level outside and 'r' the internal radius of the tube then the surface tension of water is given by

$$T = \frac{1}{2} rg\left(h + \frac{r}{3}\right)$$

Where g is the acceleration due to gravity.

5.0 TOOLS/APPARATUS REQUIRED:
5.1 capillary tube holders
5.2 Traveling microscope
5.3 water stand
5.4 magnifying glass.

6.0 <u>PROCEDURE:</u> (don't write the procedure in your Lab. Copy)
Pore the water container with water fully. The capillary tubes will be attached to it. Water level will rise up according to the radius of the capillary tube. Measure the water level in the container and in the capillary tube. The differences of water heights will the water level in the capillary. Then measure the radius the radius of the capillary tube with the help of traveling microscope. Calculate the surface tension of water.



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7.0 Tabulation:

TABLE-1
Vernier constant (V.C.) of the microscope
50 divisions (say m) of the vernier scale=49 divisions (say n) of the main scale

Value of 1 smallest main scale division (l_1) (cm)	Value of 1 division of the vernier scale $\frac{n}{m}$ (cm)	Vernier constant $(1-\frac{n}{m}) \times l_1$ (cm)

TABLE-2
Determination of water height of the capillary tube

No of obs	Upper Water meniscus of capillary tube(x) (cm)			Upper Water meniscus of the water container (y) (cm)			Height of the water level in the capillary tube(h) (x~y) (cm)
	Main scale (cm) m_s	Vernier no. v_s	Total reading (cm) $m_s + v_s \times$ v.c.	Main scale (cm) m_s	Vernier no. v_s	Total reading (cm) $m_s + v_s \times$ v.c.	

TABLE-3
Determination of radius of capillary tube

Tube no	Position of the telescope at	Microscope reading				Diameter of the tube (cm)	Mean diameter of the tube (cm)	Radius of the tube (r) (cm)
		Main scale (cm) m_s	Vernier no. v_s	Total reading (cm) $m_s + v_s \times$ v.c.	Mean reading (cm)			
	Left				D_1			
	Right				D_2	$(D_1 \sim D_2)$	D	D/2
	Top				D_3			
	Bottom				D_4	$(D_3 \sim D_4)$		

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TABLE-4
Repeat table 3 for another capillary

TABLE-5

Tube no	Height(h) of the water column (cm)	Radius of the tube(bore) (cm)	Surface Tension of water (T) $T=\frac{1}{2}rg(h+\frac{r}{3})$ Dyne/cm	Average Surface Tension of water (T) (Dyne/cm)

8.0 Discussion:

You have to write all the difficulties you faced during the experiment and their remedies. Also you have to mention some way out that one should adopt during the practical to have a better result.