Surface tension:

If a straight line is considered on the surface of a liquid, then on **both sides** of that line the **tangential force** per unit length that act on the surface of the liquid is called surface tension.

$T = \frac{F}{L}$.

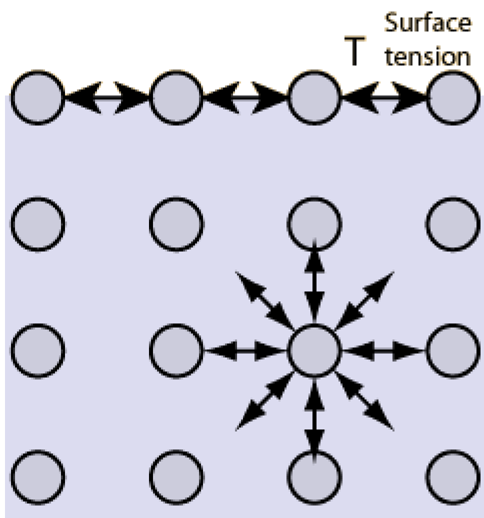
Or,

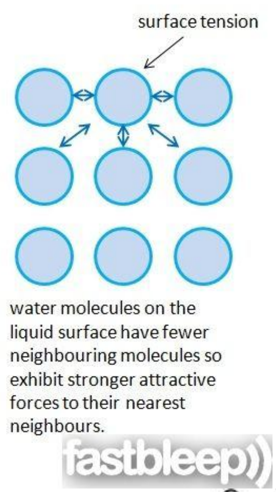
Amount of work needed to be done in order to **increase** the area of a liquid by unity is called the surface tension of that liquid.

$T = \frac{w}{A}$. Here A is the area of the liquid surface, w is the

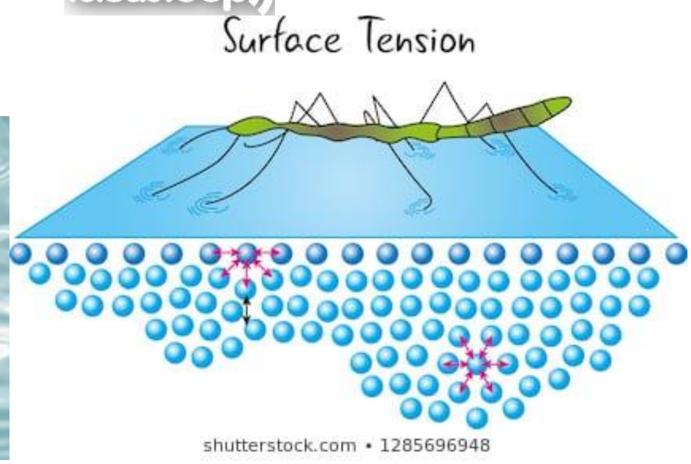
Unit of surface tension:

Dimension of surface tension:





LAPLACE'S THEORY



Characteristics of surface tension:

Surface tension tends to decrease the surface of a liquid.
#Surface tension resists the increase of area of the surface of a liquid.

Factors influencing the surface tension of a liquid:

(i) **Contamination:** If the liquid surface gets contaminated by oily or greasy substances its surface tension in general decreases.

(ii) **Presence of dissolved substances**: If a substance is dissolved in a liquid surface tension of that liquid is changed.

inorganic substances	organic substances
If inorganic substances are dissolved in liquid surface tension of the liquid increases	if organic substances is dissolved the surface tension decreases.

(iii) **Temperature:** Surface tension of liquid is largely dependent on temperature

Generally the surface tension decreases with the increase of temperature and increased with the decrease of temperature.

Within a small range of temperature, relation between surface tension and temperature is

$$T_t = T_0(1 - \alpha t)$$

Here $T_t =$ $T_O =$

$\alpha =$

In surface tension a critical temperature disappears is absent or zero.

When surface tension of a liquid is zero in a temperature, that temperature critical temperature.
Exceptions are noticed only in case of melted copper and cadmium.

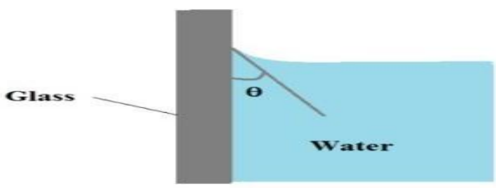
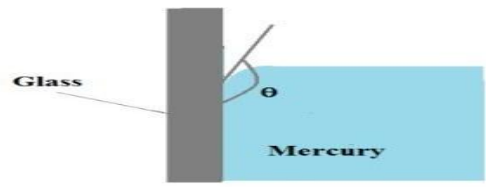
Angle of contact: The angle which the tangent to the liquid surface at the point of contact makes with the solid surface inside the liquid is called the angle of contact. The angle of contact is always measured through the liquid. It is denoted as $\theta \; or \; \alpha$.

Factors affecting angle of contact: The angle of contact depends on the following factors :

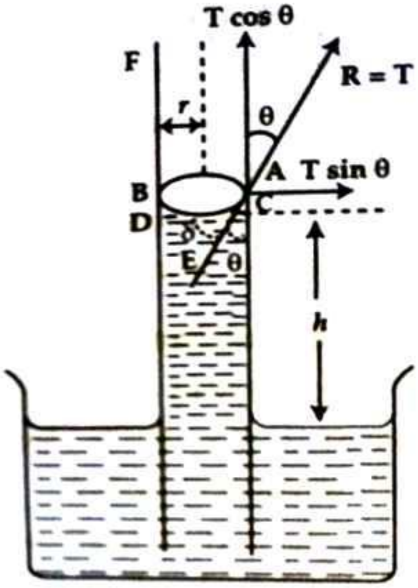
(a) The nature of liquid and solid.

(b) The medium above the surface of the liquid. For example, angle of contact between mercury and glass when there is air above mercury surface is different than the angle of contact between them when water is there above mercury surface.

(c) Purity of liquids and solids. If the liquid is not pure and the surface of solid is not clean, then angle of contact will change. The angle of contact between pure water and clean glass is nearly zero. But for a slightly oily glass plate the angle of contact increases, may even become more than 90°.

	
(a) The surface of liquid in the capillary tube will be concave. (b) The liquid will rise in the capillary tube. (c) The liquid will wet the wall of the tube. (d) The adhesive force is greater than the cohesive force.	(a) The surface of liquid will be convex, (b) The liquid will fall in the capillary tube, (c) The liquid will not wet the wall of the tube, (d) Cohesive force is greater than the adhesive force.

Ascending on angle of water in a capillary tube depending on angle of contact:



$$T = \frac{r\rho g(h + \frac{1}{2})}{2\cos\theta}$$

$$T = \frac{r\rho gh}{2\cos\theta}$$

Where r =

h=

Surface energy: $E = \frac{W}{\Delta A}$

$$Work\ done, W = E = \Delta A \times T = 4\pi(r^2 - R^2)T$$