SURFACE TENSION

A molecule I in the interior of a liquid is under attractive forces in all directions and the vector sum of these forces is zero.

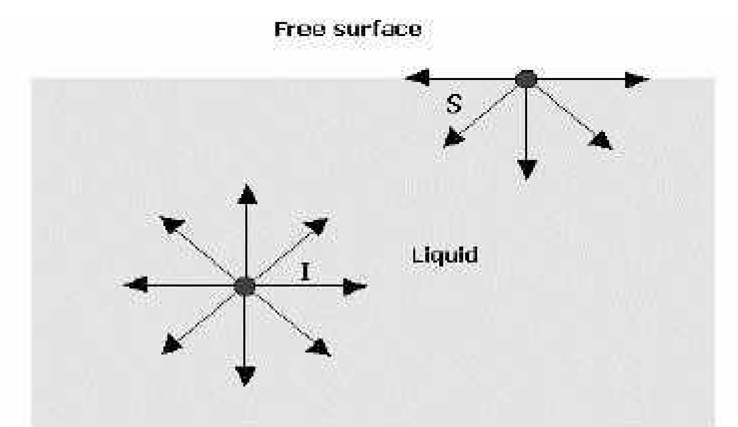
But a molecule S at the surface of a liquid is acted by a net inward cohesive force that is perpendicular to the surface.

Hence it requires work to move molecules to the surface against this opposing force, and surface molecules have more energy than interior ones.

The surface tension (sigma) of a liquid is the work that must be done to bring enough molecules from inside the liquid to the surface to form one new unit area of that surface.

It is also defined as " the tensile force acting on the surface of a liquid in contact with a gasor on the surface between two immiscible liquids such that the contact surface behaves like a membrane under tension. It is denoted by

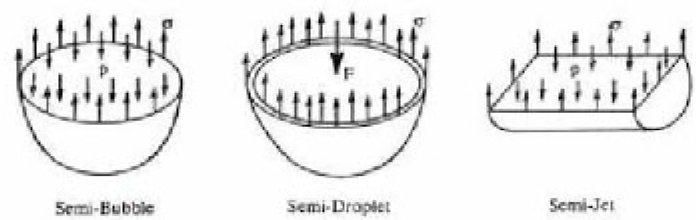
(J/m2 = N/m). (1 dyne/cm = 0.001 N/m).



Surface tension is the tendency of the surface of a liquid to behave like a stretched elastic membrane.

Surface Tension on Liquid Droplet

There is a natural tendency for liquids to minimize their surface area. For this reason, drops of liquid tend to take a spherical shape in order to minimize surface area.



Surface Tension in Bubbles, Droplets and Jets

For such a small droplet, surface tension will cause an increase of internal pressure p in order to balance the surface force.

We will find the amount (dp = p - poutside) by which the pressure inside a liquid droplet of radius r, exceeds the pressure of the surrounding vapor/air by making force balances on a hemispherical drop. Observe that the internal pressure p is trying to blow apart the two hemispheres, whereas the surface tension is trying to pull them together. Therefore, dp Λr2 = 2Λr ı

i.e. dp = 2ı/r (for liquid droplet)

Similar force balances can be made for cylindrical liquid jet.

dp 2r= 2ı

i.e. dp = ı/r (for cylindrical liquid jet)

Similar treatment can be made for a soap bubble that is having two free surfaces.

dp Λr2 = 2X2Λr ı i..e p = 4ı/r (for a soap bubble)

Surface tension generally appears only in situations involving either free surfaces (liquid/gas or liquid/solid boundaries) or interfaces (liquid/liquid boundaries); in the latter case, it is usually called the interfacial tension.

Source : http://mediatoget.blogspot.in/2011/11/surface-tension.html