# **Chapter Thirteen**

# Liquid surface in contact with solids, capillarity, acids and bases:

- When a liquid is put into a container, two types of force of attraction act and these are the cohesion and the adhesion forces.
  - 1. <u>Cohesion (cohesive) force</u>: This is the type of attractive forces which acts between the molecules of the same type, or a particular type of substance. For example these types of forces act between the molecules of water, so as to bind or bring them together.
  - 2. <u>Adhesion (adhesive) force</u>: This is the type of attractive force which acts between the molecules of two different substances. For example if water is put into a drinking glass, adhesive forces will act between the water molecules and the glass molecules

## The wetting of glass:

- When a substance such as water is put on the surface of glass, the water will spread on the surface of the glass.
- Because water is able to spread on the surface of the glass, the water is said to wet glass.
- The water is capable of wetting the glass because the adhesion forces acting between the water and the glass molecules, is greater than the cohesion forces acting between the water molecules.

# Liquids which do not wet glass:

- When a liquid such as mercury is placed on the surface of a glass, the mercury will not spread on the surface of the glass.
- Because the mercury is unable to spread on the surface of the glass, we say that mercury does not wet glass.
- The mercury was unable to wet the glass because the cohesion forces acting between the mercury molecules, is greater than adhesive forces acting between the mercury molecules and the glass molecules.

# Surface tension:

- This is the ability of the surface of water to act as an elastic material.

- Items such as a small sewing needle, blade or a mosquito larva can float on the surface of water, since the water's surface acts as an elastic material, or as a result of surface tension.
- If a few drops of alcohol, soap solution, detergent or camphor is added to the water, the surface tension will be reduced and for this reason, any floating item on the surface of the water such as the needle, blade or insect will sink.

#### The effects of surface tension:

(1) It enables items such as needle and blade to float on the surface of water.

(2) It enables the mosquito larva to stay on the surface of water.

#### **Uses of surface tension:**

- Umbrellas, raincoats and tents made of canvas do not leak, because the surface tension of water prevents water from passing through the hole.

#### Meniscus:

- When water is put into a glass tube and its surface is looked at the top, the water appears to be curved upward.
- This curved surface of the water is called meniscus.

## **Capillarity:**

- This is the ability of a liquid to rise or fall within a capillary tube.
- A capillary tube is a narrow tube with a narrow bore or hole in its middle.

#### **Capillary rise or elevation:**

- This refers to the rise of a liquid in a capillary tube, when the tube is placed in the liquid.
- Capillary rise can only occur in a liquid which wets glass, such as water.



## Factors which affects or determines capillary rise:

- There are two of such factors and these are:

#### (1) The width or size of the bore:

- It is a well-known fact that the thinner or smaller the size of the bore of the capillary tube, the higher will be the rise of the liquid within the capillary tube.



# (2) The density of the liquid:

- The less dense or the lower the density of a liquid, the greater the level to which it will rise within a capillary tube.
- For example, if a liquid is less dense than water, then it will rise to a higher level than water within a capillary tube.



# Application of capillary rise:

- Application can be seen in the following cases:
- (a) The rise of oil such as kerosene in a wick.
- (b) The absorbing of ink into items such as a blotting paper.

## **Capillary depression:**

- If a capillary tube is placed in a liquid which does not wet glass such as mercury within a container, the level of mercury within the tube will fall below the surface of mercury within the container.
- The fall of a liquid such as mercury within a capillary tube, is referred to as capillary depression.
- The greater or the bigger the bore of the capillary tube, the greater will be the fall.



# Acids:

- An acid is a substance which can dissolve in water to produce  $H^+$  ions.

# **Types of acids:**

- There are two types and these are:
- (i) Mineral acid.
- (ii) Organic acid.

# Mineral acids:

- These acids are prepared from minerals which are dug from the earth.
- Examples are sulpheric acid (H<sub>2</sub>SO<sub>4</sub>), and nitric acid (HNO<sub>3</sub>).