

Viscosity - Viscosity is the resistance that one part of a liquid flowing with one velocity offers to another part of liquid flowing with different velocity.

Units of viscosity - poise, Pascal second (Pa-s), ~~dyne cm<sup>-2</sup>s~~  
dyne cm<sup>-2</sup>s, g cm<sup>-1</sup>s<sup>-1</sup>

Factors affecting viscosity

1. Temperature - The viscosity of a liquid decreases with increase of temperature.
2. Pressure - The viscosity of the liquid increases with increase in pressure.

Poiseuille's equation

coefficient of viscosity,  $\eta = \frac{\pi r^4 \Delta P}{8 V l}$

where  $V$  = volume of the liquid of viscosity  $\eta$  flowing in time ( $t$ ) through a capillary tube of radius ( $r$ ) and length ( $l$ )

$P$  = Hydrostatic pressure of the liquid.

Surface Tension - The surface tension  $\gamma$  is the magnitude  $F$  of the force exerted parallel to the surface of a liquid divided by the length  $L$  of the line over which the force acts.

$$\gamma = \frac{F}{L}$$

Unit - N-m<sup>-1</sup>, joule per square metre (J-m<sup>-2</sup>),  
dyne cm<sup>-1</sup>, erg cm<sup>-2</sup>

## Factors affecting Surface Tension

1. Temperature - As temperature increases, the kinetic energy of the molecules increases. Thus, the intermolecular forces decrease and hence surface tension of the liquid decreases.
2. Effect of surfactants - Surfactants are surface active materials and consist of molecules having polar and nonpolar parts. Presence of surfactants in aqueous solution lowers the surface tension.

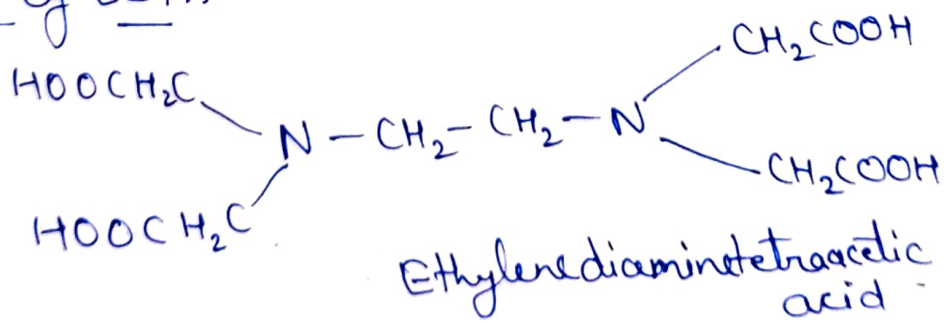
Alkalinity of water - The ability of water to neutralize the acid is k/a alkalinity of water.  
The alkalinity of water is normally due to the presence of bicarbonates, carbonates and hydroxides of sodium, potassium, calcium and magnesium.

Reason for using 2 indicators in alkali mixture titration - Due to wide range of pH in alkali mixture titration 2 indicators were used.

pH range of phenolphthalein  $\Rightarrow$  8 - 9.6

pH range of methyl orange  $\Rightarrow$  3 - 5

## Structure of EDTA



Indicator used in complexometric titration -

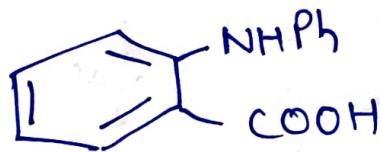
Eriochrome Black-T

Buffer solution -  $\text{NH}_4\text{Cl} + \text{NH}_4\text{OH}$  (pH = 10)

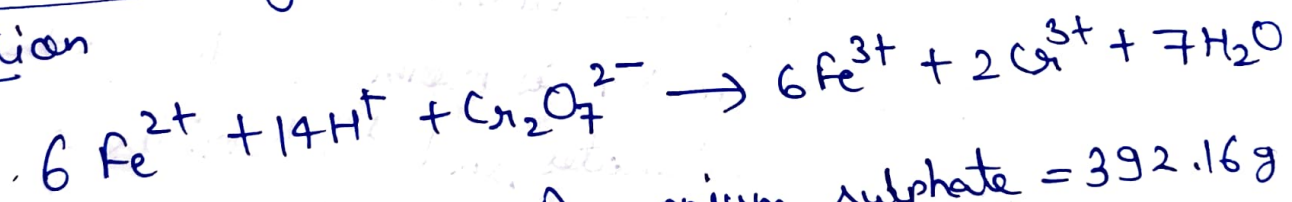
Ferrous Ammonium Sulphate .  $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$

Potassium dichromate -  $\text{K}_2\text{Cr}_2\text{O}_7$

Indicator - N-phenylanthranilic acid (internal indicator)



Reaction involved in ~~redox~~ estimation of iron  
content in a given Ferrous ammonium sulphate  
solution



Equivalent weight of Ferrous Ammonium sulphate = 392.16g