States of Matter

Matter – Any Substance or anything which have some mass and it take some place. [DEPTH OF BIOLOGY]

Three Types Of Matters :-

Solid – A substances which has definite , shape, size of volume. [DEPTH OF BIOLOGY]

Liquid – A substance which have definite volume , but shape and size not fixed.

Gas – A substance which have shape, size and volume not fixed.

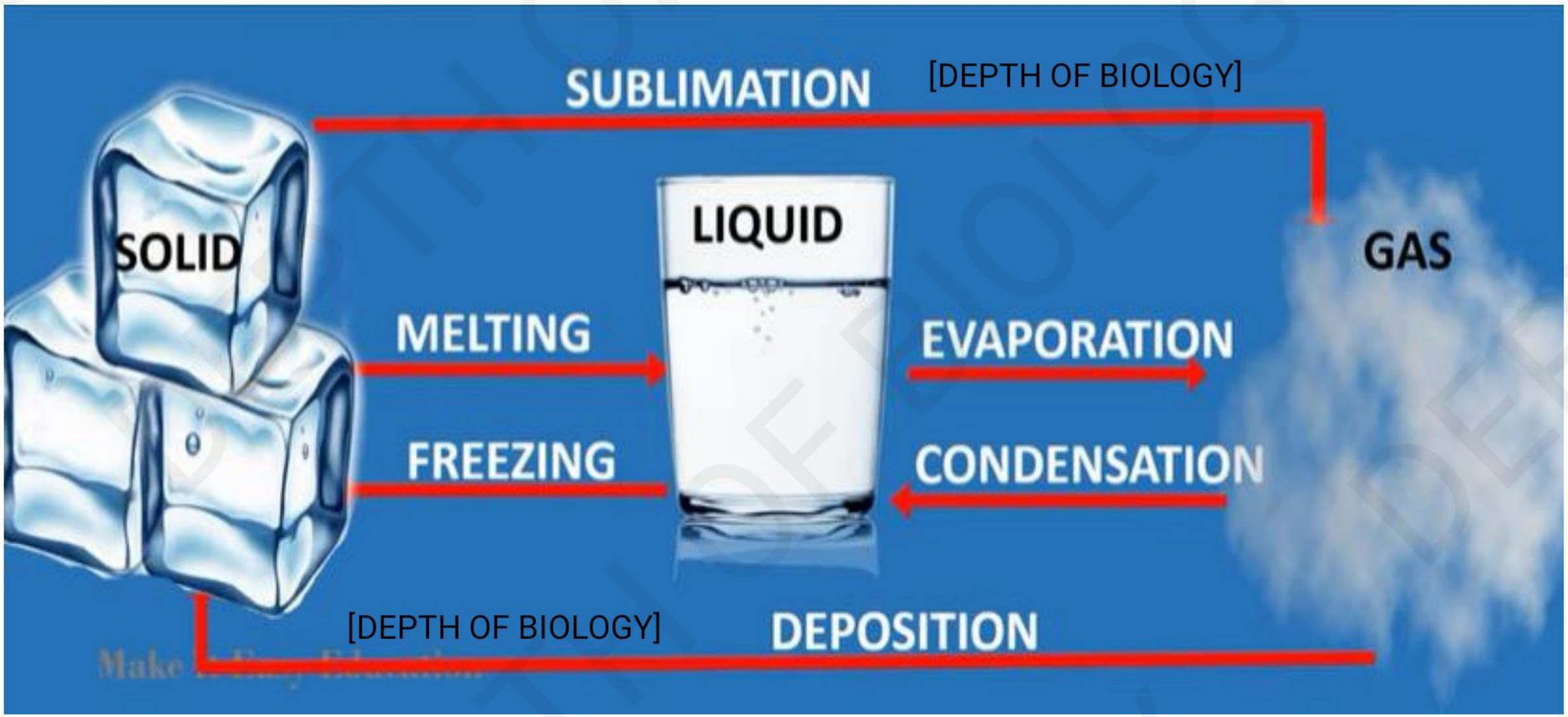
Comparison	Solids	Liquids	Gases
Particles	Tightly packed	Loosely packed	Independent
Shape	Fixed	Not fixed	Not fixed
Volume	Fixed	Fixed	Not fixed
Rigidity	High	Less	Negligible
Forces	Strongest	Intermediate	Weakest
Fluidity	Not a chance	Yes	Yes
Compressibility	No	Slight	High
Density	High	Low	Very low
Diffusibility	No	Less	High
Kinetic energy	Low	Intermediate	High
Examples [DEPTH OF BIOLOGY]	Crystalline and Amorphous solids	All fluids [DEPTH OF BIOLOGY]	O_2, CO_2, SO_2, NO_2, etc

Changes in the State of Matter :-

- **Melting –** When Solid is converted into liquid by increasing heat. Eg:- Ice cube to water.

- **Vapourisation –** When liquid is converted into gas by increasing temperature. Eg :- water convert into vapours.

- **Sublimation –** when solid particles directly convert into gas by increasing temperature on in high temperature. Eg:- Ice directly converted into vapours.


SUBLIMATION
[DEPTH OF BIOLOGY]
SOLID
LIQUID
GAS
MELTING
EVAPORATION
FREEZING
CONDENSATION
[DEPTH OF BIOLOGY]
DEPOSITION

- **Condensation -** When gas is converted into liquid bt decreasing temperature. Eg:- water vapour in the air turn into liquid on colder surface.

- **Freezing –** when liquid is converted into solid state by decreasing temperature. Eg:- water convert into ice cube in refrigerator.

- **Deposition –** When gas state particles (or vapours) directly convert into solid state without first becoming a liquid . Eg:- at very cold place, water vapour directly converted into ice.

Physical Pharmaceutics

- Latent Heat
- Vapour Pressure
- Sublimation Critical Point
- Eutectic Mixture

[DEPTH OF BIOLOGY]

- **Latent Heat -** That heat which changes liquid into a vapour , (phase change) without change of temperature.

After 100^oC temperature will not increase it remains some and the heat used to convert phase by liquid.

- **Vapour Pressure –** The pressure of a vapour in contact with its solid or on liquid term.

When both is equal or gas is in equilibium that time the pressure Exerted by vapour on any surface is called vapour pressure.

Factors That Affect Vapour Pressure

- **Temperature –** As the temperature of a liquid or solid increase its vapour pressure also increase. [DEPTH OF BIOLOGY]

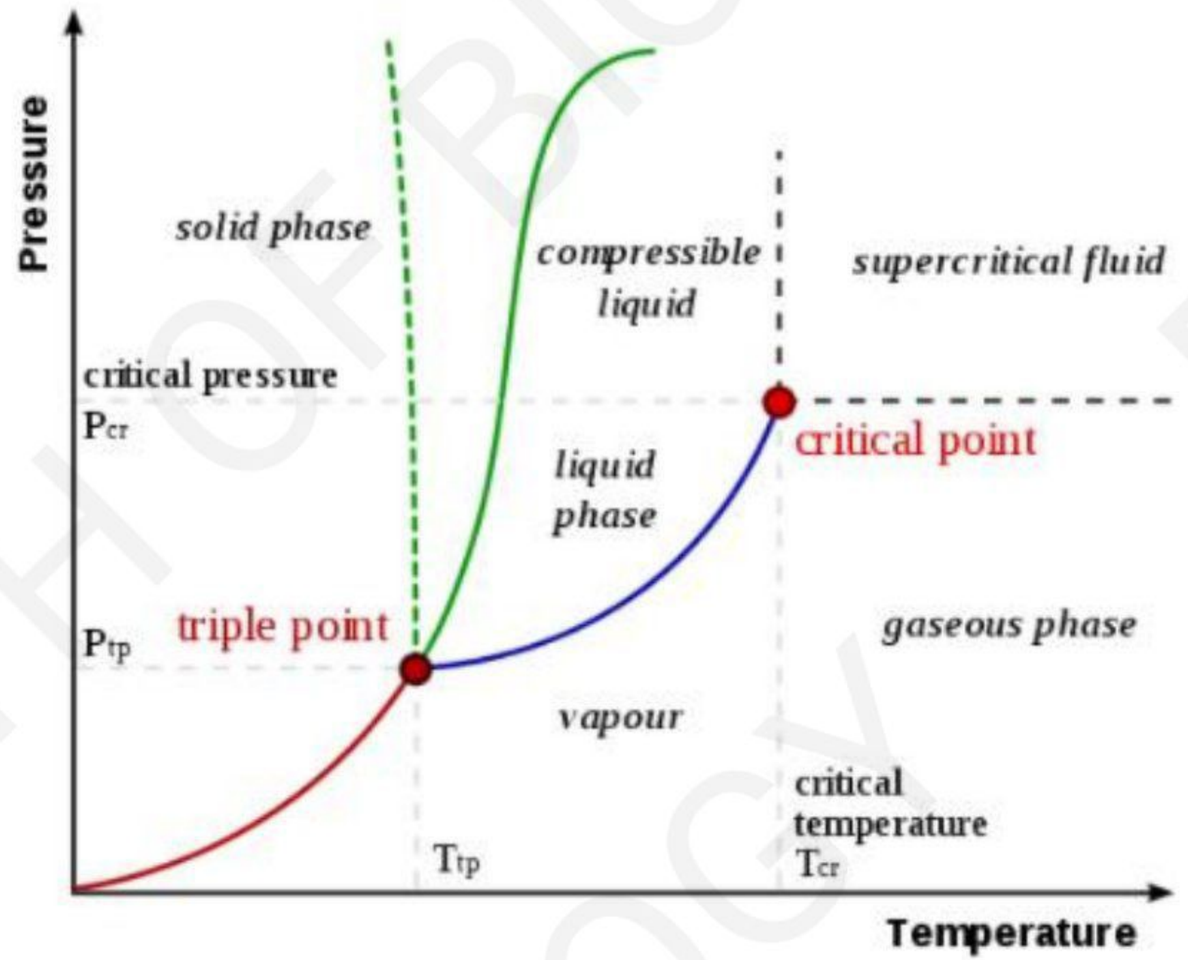
- **Intermolecular forces –** Those liquid in which the intermolecular forces are weak shows high vapour.

- **Surface Area –** Vapour pressure is independent of the surface area

[DEPTH OF BIOLOGY]

- **Sublimation Critical Point :-**

It is an Equilibrium or Constant (maximum or minimum Temperature and pressure) at which the state of matter Cannot be changed.



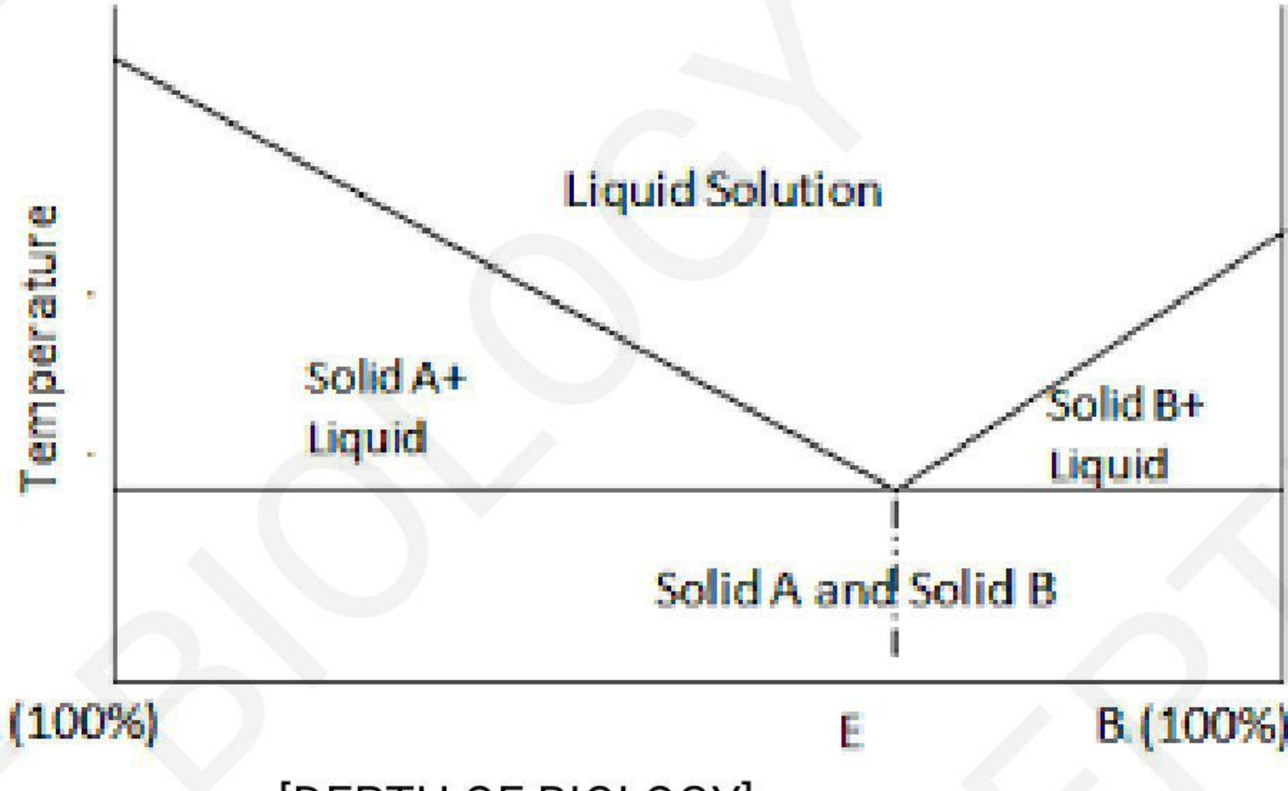
Eutectic Mixture :-

It is a mixture in which two solid particles mix together and reduced their melting point and converted into liquid at normal temperature. [DEPTH OF BIOLOGY]

Eg :- Menthol-thymol powder, when these powder mixed it convert into in liquid by reducing their melting point.

- Gases - shape and size and volume are not fixed.
- Aerosol - An aerosol is a suspension of fine solid particles or liquid droplet in air or another gas. [DEPTH OF BIOLOGY]

Eg:- Natural aerosol are fog,mist,geyser,steam.



- Inhaler – An inhaler is a device that gets medicine directly into a person's lungs.

Peoples inhaled medicine in mouth through

inhaler. Eg:- Asthma Pump .[DEPTH OF BIOLOGY]

- Relative Humidity – It is the ratio of water vapour present in the air drop to the saturated air.

[DEPTH OF BIOLOGY]

- Liquid Crystal – These are matter in a states that has properties between those are conventional liquid and those of solid crystal. A solid crystal may flow like a liquid.

Eg:- Cholestrol Benzoat

- Liquid Complexes – these are binary mixtures that have a existences between two phases :-

Solid-liquid (suspension etc.)

Solid-gas (granular [DEPTH OF BIOLOGY]

etc.) Liquid-gas

(foams) Liquid-liquid

(emulsion).

- Glassy state – Glass is non equilibrium , non-crystalline state of matter that appears solid on a short time scale but continuosly relaxes towards the liquid state.

Solid – A substance that has definite , shape , size and volume. [DEPTH OF BIOLOGY]

Crystalline Solid

- Which have shape of size fixed and pattern of intermolecular are fixed.
- Eg:- Metal,rocks,ice etc.
- On cutting edge is plane/ smooth.
- Melting point of boiling point is sharp .

Non Crystalline Solid

- They non-crystalline solid, in which the atom and molecules are not arranged in a definite pattern.
- Eg:- glass, plastic etc .
- On cutting edge is rough.
- Melting point and boiling point in wide range.

- Polymorphism – These are those solid which has ability to change their form according to situaton.
  Eg:- carbon : diamond in a cubic.

- Physiochemical properties of drug molecules :-

- Refractive Index
- Optical rotation
- Dielectric Constant
- Dipole Moment
- Dissociation Constant

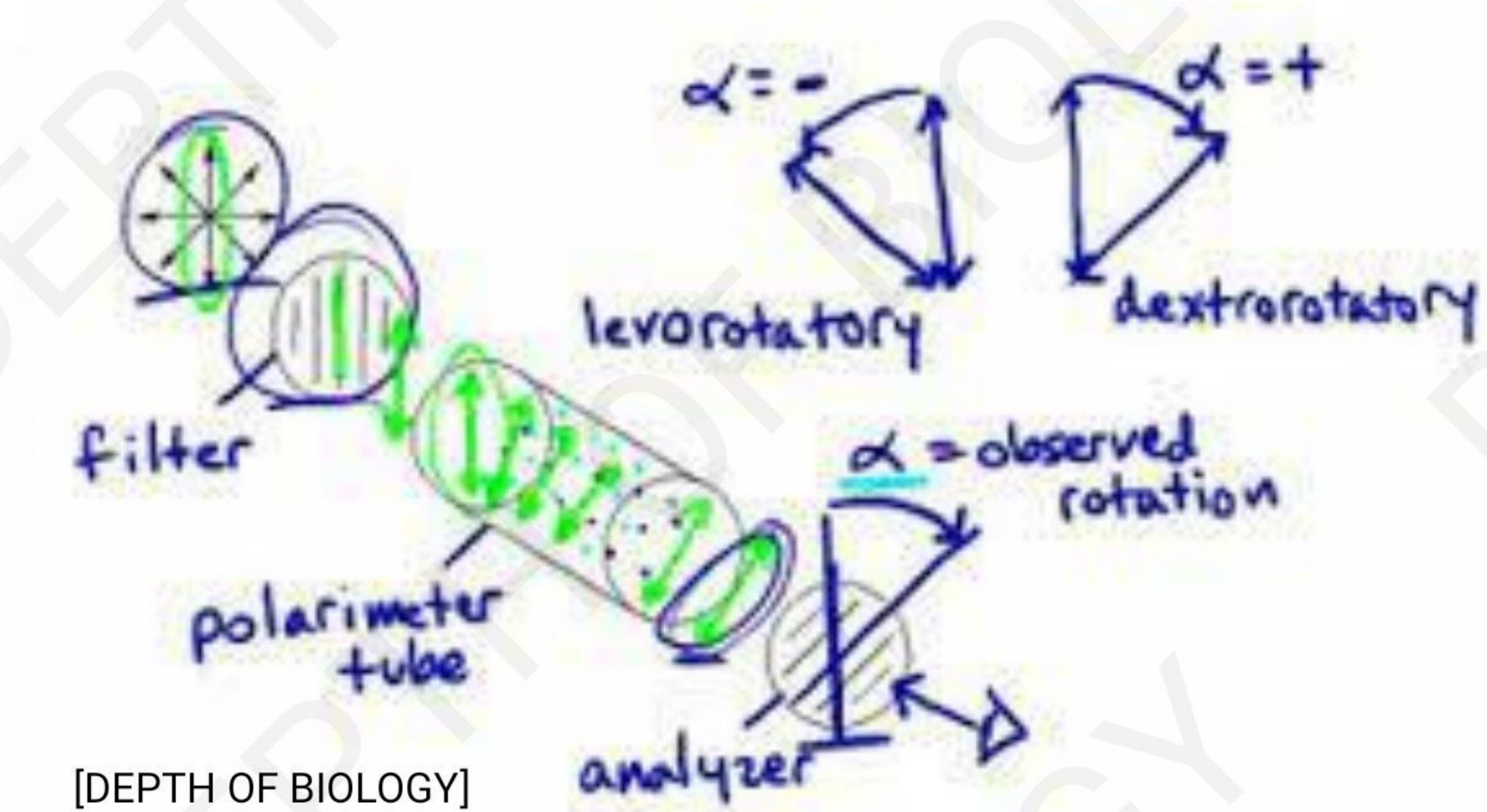
- Refractive Index – It is the ratio of speed of light between any two medium.

$$RI = \frac{\text{Speed of light in air}}{\text{Speed of light in water}}$$

Speed of light is differente in different medium. So we take ratio of any two medium.

- Optical Rotation – when we pass light through any medium , if light turn on rotate then if is optical activate or if light not rotate then medium is optically inactive.

[DEPTH OF BIOLOGY]



[DEPTH OF BIOLOGY]

- Dielectric Constant – It is the ratio of permitivity of medium upon permitivity of free space

$$\text{Dielectric constant} = \frac{E}{Eo}$$

Measurement -

i. Co-arial proble method
ii. Free space method
iii. Resonant cavity method
iv. Parallel – plats capacetor method

Applications :-

i. Dielectrics are used to manufacture capacitor

[DEPTH OF BIOLOGY]

ii. Used to manufacture transformer

iii. They are used to measuring and heating processes.

[DEPTH OF BIOLOGY]

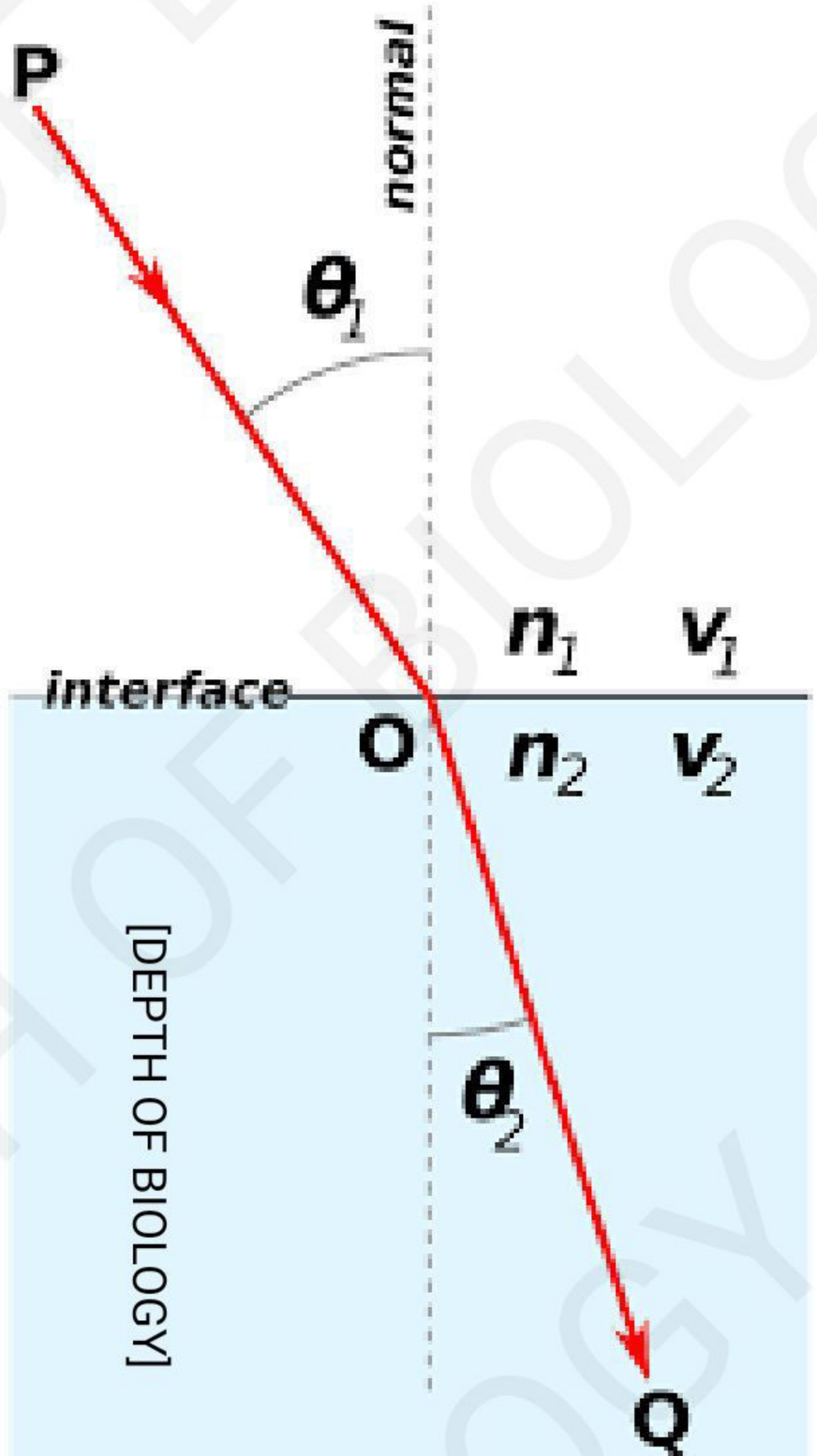
- Snell's Law :-

It gives the relation between the angle of incidence and angle of refraction.

$$N = \frac{\sin i}{\sin r}$$

Where ,

I = angle of incidence R = angle of refraction


P
normal
θ_1
n_1
v_1
interface
O
n_2
v_2
[DEPTH OF BIOLOGY]
θ_2
Q

DISSOCIATION CONSTANT

$H_2O \rightleftharpoons H^+ + OH^-$ [DEPTH OF BIOLOGY]

According to law of mass action

Rate of reaction $\propto [H^+][OH^-] / [H_2O]$

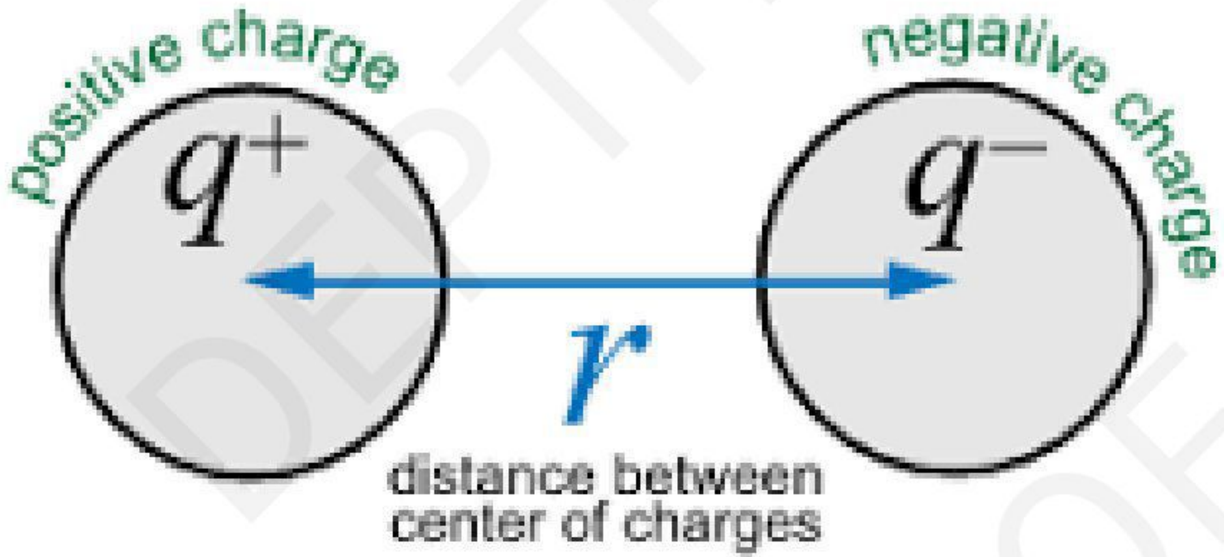
$Dx/dt = Ka [H^+][OH^-]/ [H_2O]$

$Ka = [H_2O]/ [H^+][OH^-]$ dx/dt

Dissociation constant is usually written as quotient of equilibrium constant [DEPTH OF BIOLOGY]

DIPOLE MOMENT

Mathematical product of charge into distance



$$\mu = q \cdot r$$

dipole moment — separated charge — distance between