

9. BIOMOLECULES

Biomolecules

Living ← Biomolecules → Group of atom

- All organic Carbon Compound in a living tissue is called Bio-molecules.
- If some of the tissue taken mortar & pestle & mixed with tri-chloro Acetic acid and grind it & then filter it two group of Compound is form —

- Filtrate / Acid - Soluble pool / Micromolecules.
- Retentate / Acid - insoluble pool / Macromolecules.

<u>Bio - macromolecules</u>	<u>Bio - micromolecules</u>
Protein	Amino acid
Poly sacheride / Carbohydrate	Mono sacheride / Oligo Sacheride
Nucleic Acid	Nucleotide
If Value is more than 1000 Daltons than it is called Bio-macro molecules.	If Value is 18 - 800 Daltons that is less than 1000.

atom → molecules → Bio-
molecules → Cell Organelles
/ Organ of Cell

Start physical
Hierarchy

Biological
Hierarchy

↓
Cell

↓
Cell / Tissue

↓
Organ

↓
Organ system

↓
Organism

- "Corti" absorb that Cell Content of living substances (later on we call it as protoplasm).
- Protoplasm term was given by "purkinje" in 1839.
- "Dujardin" given it the term Sarcode for protoplasm.
- "Max Schultze" given protoplasm is the physical basis of life.

• For Bio-molecules exploration most excepted theory for protoplasm is Crystallo-Colloidal theory.

- Crystal — Acid, Base, Salt, Sugar
- Colloidal — Protein & Lipid.

• Crystallo-Colloidal theory given by —

- Willison
- Fisher
- Hardy

• According to this theory protoplasm is poly-phasic Crystallo-Colloidal in nature.

• In a cell average Composition of different Crystal & Colloidal Composition —

Component	% of the Total Cellular mass
Water	70-90
Proteins	10-15
Carbohydrates	3
Lipids	2
Nucleic acids	5-7
Tons	1

- About total 34 types of element are found in protoplasm in which some are essential & some are non-essential.

- 13 elements are essential elements-

Carbon, Hydrogen, Oxygen, Nitrogen, Sulphur, potassium, phosphorus, Calcium, magnesium, Sodium, Iodine, Iron, Chlorine.

- Essential elements are those element which element can't be synthesized by our body system.

- Non-essential elements are 21. In which some are semi-essential also.

- All the element which are found in the sample of earth-crust are also the constituent of living tissue but related to comparison with human body. They are proportion to :-

Element	% Weight of	
	Earth's Crust	Human body
Hydrogen (H)	0.14	0.5
Carbon (C)	0.03	18.5
Oxygen (O)	46.6	65.0
Nitrogen (N)	Very little	3.3
Sulphur (S)	0.03	0.3
Sodium (Na)	2.8	0.2
Calcium (Ca)	3.6	1.5
Magnesium (Mg)	2.1	0.1
Silicon (Si)	27.7	negligible

★ Lipid :

- Molecular weight of lipid that not exists 1000 Dalton.
- During Separation it is isolated along with acid insoluble fraction. So, it is Consider as Bio-macromolecules.
- Hence, lipid is not a true Bio-macromolecules.
- lipid is not a polymeric since, it does not form polymer.
- found in retentate - from aggregates (800 Da)

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★ Metabolites : The Organic Compound which are involved in metabolism is called Metabolites.

➤ Metabolites is of two type :-

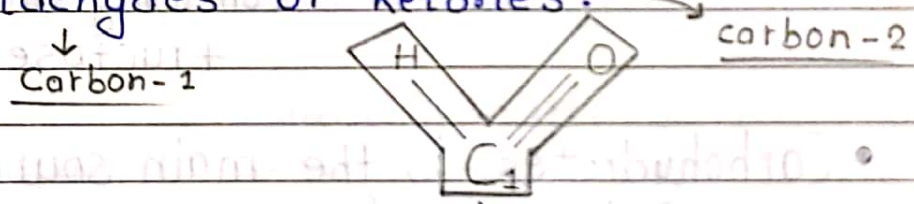
<u>Primary metabolites</u>	<u>Secondary metabolites</u>
• Directly involved in metabolism. • It found in all type of Cell.	• Directly not involved in metabolism. • It only found in some of the plant cell or microbes like fungi.
<u>Ex:-</u> Carbohydrates protein lipid Nucleic Acid	<u>Ex:-</u> Pigments Alkaloids • Terpenoides Essential oils Toxins Lectins Drugs etc.

➤ Some Secondary metabolites :

Pigments	Carotenoids, Anthocynins, etc.
Alkaloids	Morphine, Codeine, etc.
Terpenoides	Monoterpenes, Dilterpenes etc.
Essential oils	Lemon grass oil, etc.
Toxins	Abrin, Ricin.
Lectins	Concanavalin A
Drugs	Vinblastin, Curcumin etc.
Polymeric Substances	Rubber, gums, Cellulose.

* Carbohydrates :- Hydrotates of Carbon (C.H.O)

- It is the Optically active polyhydroxy aldehydes or ketones.



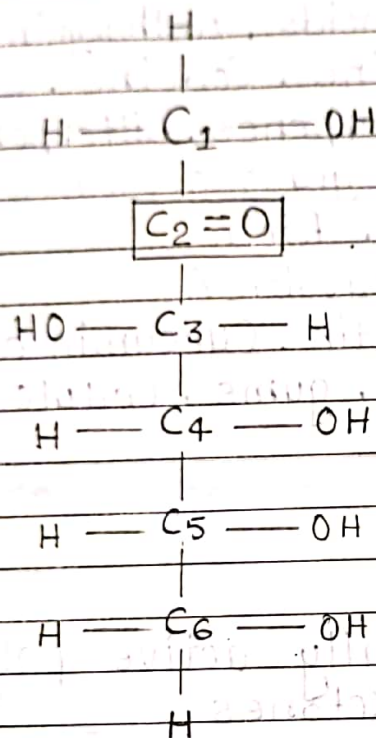
Group use

↓
Aldose

↓ also Called

Aldose
Sugar

Commonly Called -
Glucose



Group use

↓
Ketone

↓ also called
Ketose sugar

Commonly called -
fructose.

- Carbohydrates is the main source of energy in our body.

- On the basis of number of Saccharides or sugar is of three type —

(i) Monosaccharides

(ii) Oligosaccharide / Di-saccharide

(iii) Polysaccharides

• Monosaccharide :-

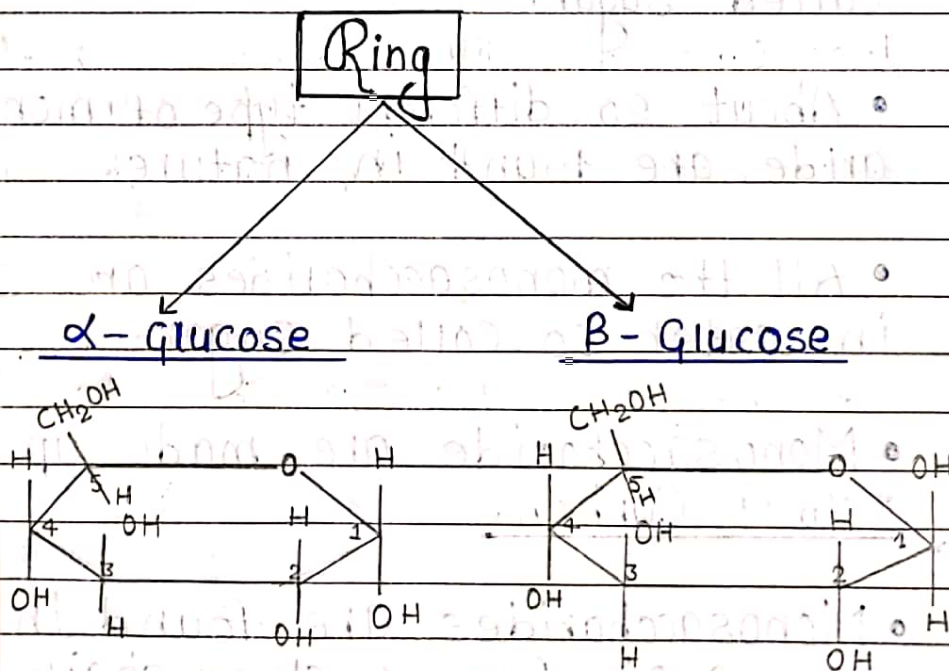
Single

- It is the smallest Carbohydrate i.e. made up of only one unit of sugar.
- Monosaccharide is form of single unit of sugar. So, it can't further hydrolyse.
- All the Carbohydrate which are soluble in water are sweet in test are called sugar.
- About 20 different type of monosaccharide are found in nature.
- All the monosaccharides are soluble in water so, called sugar.
- Monosaccharide are made up of 3 to 7 Carbon.
- Monosaccharides are found in both open chain form & close chain form.
- 5 membered ring is called furanose.
4 Carbon + 1 Oxygen
- 6 membered ring is called Pyranose.
5 Carbon + 1 Oxygen

Imp. $\begin{cases} \text{C-1 - Isomers} \rightarrow \text{ANOMERS} \\ \text{C-2,3,4 - Isomers} \rightarrow \text{EPIMERS} \end{cases}$

> Anomer :-

- In aqueous solution glucose is found in Ring form.
- Different position of H & OH at Carbon No. 1 of ring form of glucose.
- Two different form of isomer is called Anomer.

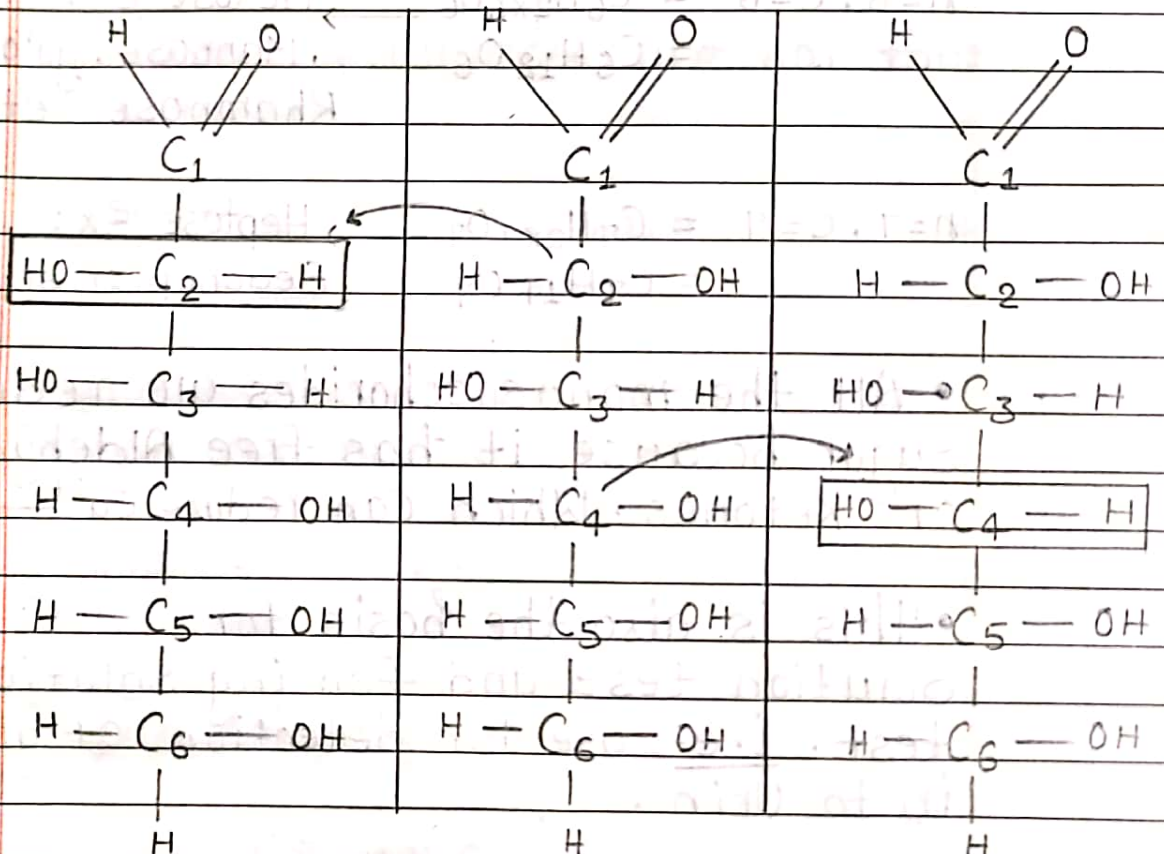


> Epimer :-

- In epimer glucose found in Open form.
- If in glucose 2nd position

Shows epimer than mannose form.

- If in glucose 4th position shows epimer than it form Galactose.

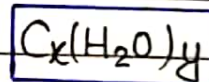
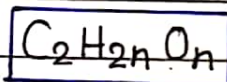


Mannose

Glucose

Galactose

G.F



$$\begin{aligned}
 n=3, C=3 &= \text{C}_3\text{H}_{2 \times 3}\text{O}_3 \\
 &= \text{C}_3\text{H}_6\text{O}_3
 \end{aligned}$$

Triose Ex:- PGAL, DHAP, Glycerol etc.

$$\begin{aligned}
 n=4, C=4 &= \text{C}_4\text{H}_{2 \times 4}\text{O}_4 \\
 &= \text{C}_4\text{H}_8\text{O}_4
 \end{aligned}$$

Tetrose Ex:- Erythrose, Erythrose, Xylose, Xylulose, Arbinose etc.

$n=5, C=5 = C_5H_{2 \times 5}O_5$
 $= C_5H_{10}O_5 \longrightarrow$ Pentose Ex:- Ribose
Sugar, Deoxy
Ribose Sugar etc.

$n=6, C=6 = C_6H_{2 \times 6}O_6$
 $= C_6H_{12}O_6 \longrightarrow$ Hexose Ex:- Glucose
, Mannose, galactose,
Rhamnose etc.

$n=7, C=7 = C_7H_{2 \times 7}O_7$
 $= C_7H_{14}O_7 \longrightarrow$ Heptose Ex:-
Sedoheptulose etc.

- All the monosaccharides are reducing Sugar because it has free Aldehydes or Ketones. Which can reduce $Cu^{2+} \rightarrow Cu^+$.

- This is also the basis for Solution test and fehling solution test. i.e. use for detection of glucose in to Urin.

- Glucose is

- Glucose is abundantly found in grapes. So, also called Grape sugar.

- If glucose is found in blood. So, also called blood sugar.

- Fructose is found in Sweet fruit. So, also called fruit sugar.
- Fructose is the natural sweetest sugar.
- Galactose & Mannose are not found in free form.
- Galactose is associated with glycolipid like.
- Galactose is found in brain. So, also called as Brain Sugar.
- Mannose is associated with hemi-cellulose.

• Oligosaccharides :- few

- It is also called "Disaccharide".
- It is made up of 2 to 10 Saccharide or sugar.

Ex:- Disaccharide, Trisaccharide, Tetra-saccharide, pentasaccharide, Hexa-saccharide, ----- decasaccharide.

- In oligosaccharide glucose are attached to each other through "Glycosidic bond."

★ Disaccharide:

- It is made up of two saccharide or sugar.
- Disaccharide are interlinked through Glycosidic bond.
- It is also soluble in water. So, sweet in test i.e. also called sugar.

➤ Type of Disaccharide:-

① Maltose — Glucose + Glucose
(α -D-Glucose + α -D-Glucose)

- It is reducing sugar.

② Lactose — Glucose + Galactose
(β -D-Glucose + β -D-Galactose)

- It is also a reducing sugar.
- It is also called milk sugar.
- Lactose is list sweet sugar.

- Maximum Lactose is found in human.
i.e. 7%.

③ Sucrose — (α -D-Glucose + β -D-fructose)

- It is non-reducing Sugar.
- It is also called Cane sugar.
- It is also called Commercial sugar or Table sugar or Invert sugar.
- It is also found in insects Hemolymph.
- Hemolymph is found in "Trehalose" of insects.

★ Polysaccharide:

many

- It is made up of more than 10 Saccharide or Sugar.
- In polysaccharide all sugar are attached to each other through glycosidic bond.
- All the polysaccharides are non-reducing Sugar.
- Polysaccharides are water insoluble. so,

It is not sweet in test.

> Polysaccharide is of two type:-

- i) Homopolysaccharide
- ii) Heteropolysaccharide.

• Homopolysaccharide :

• It is made up of same type of sugar.

• It is of five different type:-

- (i) Cellulose
- (ii) Starch
- (iii) Glycogen
- (iv) Insulin/Anulin
- (v) Chitine

* Cellulose

• It is a linear polymer of β -D-Glucose.

• It is interlinked to each other through β -1,4 Glycosidic bond.

• Cellulose is most abundant organic compound on this earth.

- Partial digestion of Cellulose gives a disaccharide . i.e. Called Cellobiose.

- 50 % part of wood is Cellulose.

- 99 % part of Cotton is Cellulose.

* Starch

→ Amyloplast

- It is a branch polymer of α -D-Glucose.

- Starch is the main store food in plant

- Starch Consists of two type of chain:-

i) Amylose ii) Amylo pectin

- Amylose : 15 to 20 %.

- It is linear polymer of α -D-Glucose.

- It is interlinked through each other through α -1,4 Glycosidic bond.

- It gives blue colour with iodine.

- Amylo pectin : 80 to 85 %.

- It is branch polymer of α -D-Glucose.

- It is interlinked through each other through $\alpha-1,4$ & $\alpha-1,6$ Glycosidic bond.

- It gives red colour with iodine.

- Potato Contains 20 % of Amylose & 80 % Amylo pectin.

* Glycogen

- It is highly branched polymer of $\alpha-D$ -Glucose.

- It is interlinked through each other $\alpha-1,4$ & $\alpha-1,6$ glycosidic bond.
 Linear branched

- It is main store food in animal and fungi.

- In animal, it store in liver & Muscles.

- It gives red colour with iodine.

* Chitine

- It is linear polymer of N-Acetyl

Glucosamine.

- It is interlinked through β -1,4 glycosidic bond.

PYQ

- N-Acetyl Glucosamine is the derivatives of β -D-Glucose.

- It forms the exo skeleton of Arthropods & Cell Wall of fungi.

- It is also called "fungal Cellulose".

- It is the second most abundant organic compound on this earth.

* Inulin

- It is formed by fructose.

- Inulin is the polymer of fructose.

- In Inulin right terminal is called reducing end while left terminal is also called non-reducing end.

* Insulin

- It is the polymer of β -D-fructose.

• Insulin is made up of 51-different amino acid.

• In insulin 21 amino acid are attached with each other through α -chain or A-chain, while another 30 amino acid attached with each other through B-chain or B-chain.

• It is the smallest stored poly-saccharide.

• It is Soluble in Water.

• It is found in root of Dahlia & Artichoke.

• It is used in detection of GFR (Glomerular filtration Rate).

* Lipid:-

• Term lipid was given by "Boiler".

• It is discovered by "Chevreul".

• Lipid is made up of Carbon, Hydrogen & Oxygen.

• Ester of fatty acid + Alcohol.

- * Lipid formation - 'Lipogenesis'
- * Lipid breakdown - 'Lipolysis'
- * 1 gm of lipid - 9 kcal

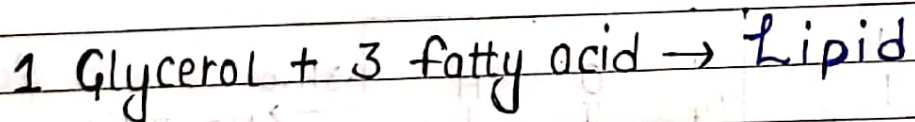
• Lipid is not a true biomolecules. Since it never form polymer.

• Lipid is water insoluble.

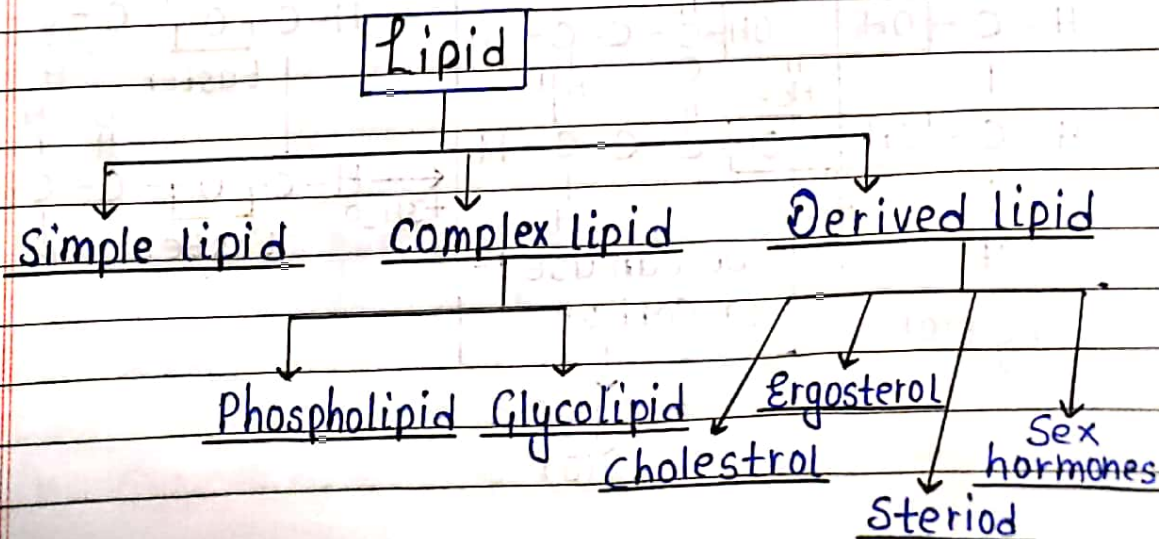
• Animals store maximum amount of food extra in the form of lipid.

• Lipid is formed by 1 molecule of glycerol with 3 fatty acid.

[fatty acid consists of a Carboxylic group attached with alkali group. Alkali group may be methyl, ethyl & long chain of hydrocarbons] (Carbon range may be 1-19 Carbon.)



• Classification of Lipid :-



Simple lipid

True fats ← Triglycerol Wax

Glycerol fatty acid

Saturated fatty acid

Unsaturated fatty acid

Palmitic acid (16)

Steric acid (18)

MUFA

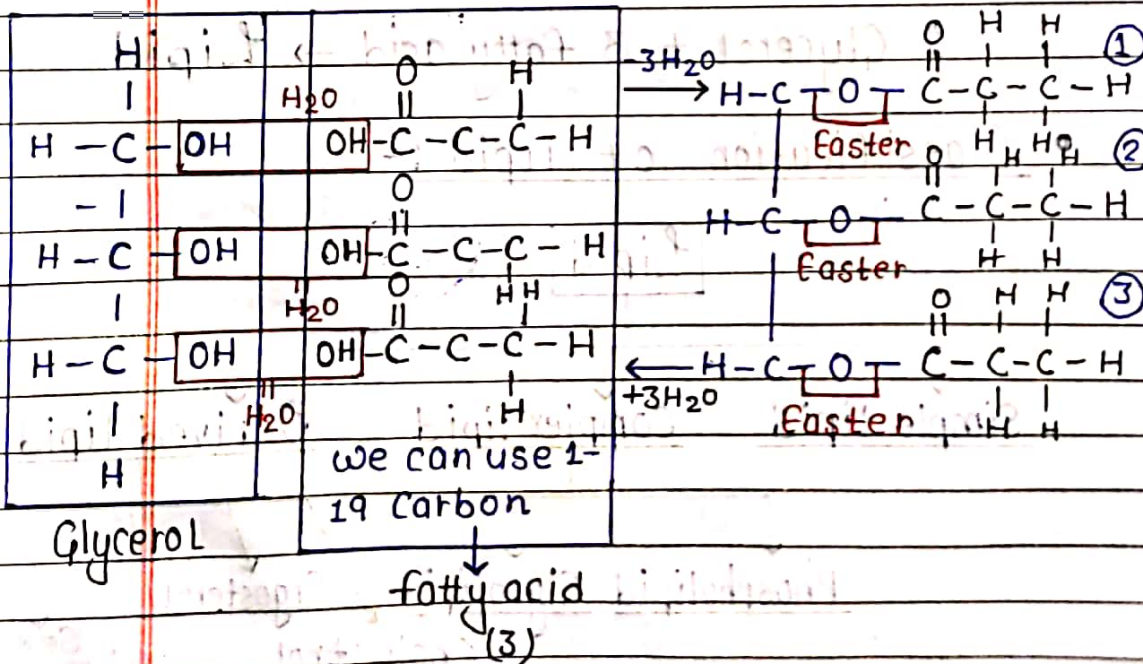
PUFA

Oleic acid

linoleic acid

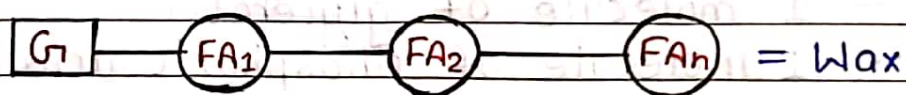
Arachidonic acid

• Triglycerol :-



- Prostaglandin is the derivatives of Arachidonic acid.
- Fatty acid which are non-synthesized by our body is called Unsaturated fatty acid.
- Unsaturated fatty acid are ~~stable~~ that essential fatty acid.
- Lipid having Saturated fatty acid are stable that store in our body & Cause obesity.
- fatty acid having essential & unsaturated fatty acid can easily digested.

• Wax :-



- Wax is a monoglyceride of linear form of fatty acid.
- It is also called monohydroxy alcohol.
Ex:- honey bee wax (Hexacosyle palmitate), ear wax (Serumen), Spermatity (skull of Whale, Dolphine & Shark), Linotin (found in connective tissue & reproductive duct

found from sheep.

* Complex Lipid...

- It is non lipid part associated with lipid then Complex lipid form.

* Phospholipid:

- It is the most abundantly found in protoplasm.
- It is the main Constituent of plasma membrane.
- Its Composition is
 - 2 molecule of fatty acid
 - 1 molecule of glycerol
 - 1 molecule of phosphoric acid (H_3PO_4)
 - Nitrogenous Compound

Ex:- phospho tidy Serive
phospho tidy Choline
phospho ethanol Amine

* Glycolipid: Carbohydrate + lipid

- It is found in brain & Spinal chord.

• Its Composition is

- 2 molecule of fatty acid
- 1 molecule of Sphingosin
- 1 molecule of galactose

ex:- Cerebroside (it is found in grey matter of brain), Ganglioside (it is found in ganglion & in spine).

* Derived Lipid:

• It is derived from Simple & Complex lipid like steroid.

* Steroid

• In steroid tetracyclic Compound is present.

• On the basis of functional group Steroid is of two type :-

- (i) Sterol - Cholesterol, ergosterol
- (ii) Sterone - Sex hormone, Diosgenin

* Cholesterol

• It is found in brain, neural tissue.

adrenal Cortex, Cell membrane (trace amount) etc.

- In skin 7-dehydro cholesterol is present which reacts with that comes from sun & converted it into Cholecalciferol (Vitamin D)

* Ergosterol

- It is found in oil seed & in some fungi like yeast & ergot.
- It also reacts with UV rays & convert it into ergocalciferol (another form of Vitamin - D)

* Sex Hormone

- Testosterone, progesterone, Steroid, prostaglandin,

* Chromolipid: Vitamine A + fat

- It is Special type of lipid.
- It is the most Complex lipid of protoplasm.

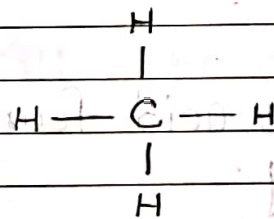
- It is made up of isoprene unit & terpenes.

ex:- Natural Rubber, Carotenoid, Vitamin-A, Vitamin-E & Vitamin-K.

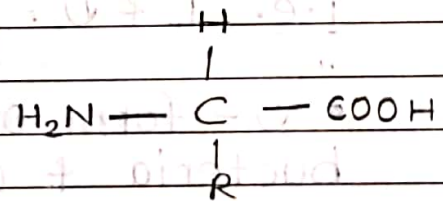
★ AMINO ACID

- It is a Substituted methane.

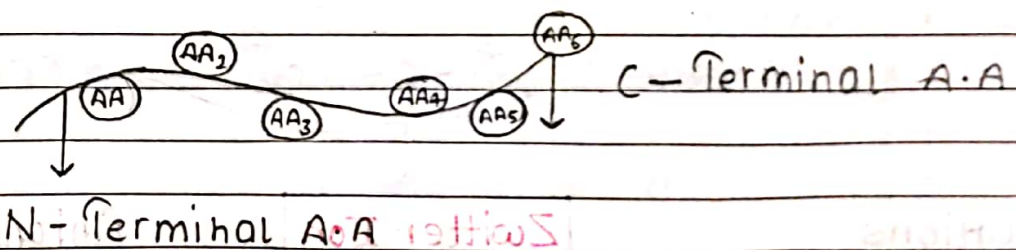
Methane



Amino Acid



- There are four valency and are occupied Carboxylic group, NH_2 (Amines group), Hydrogen atom and a variable R group.
- Imagine protein is a line.



• First Amino Acid is represented by left end and it is called N-terminal & last amino acid is represented by right end & it is called C-terminal amino acid.

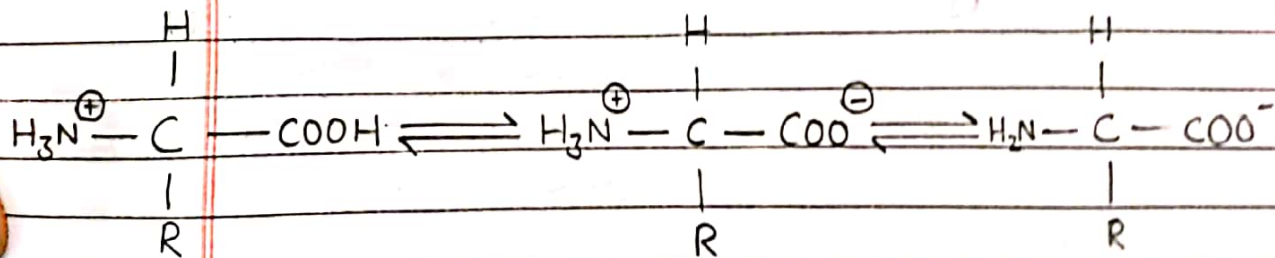
• All the amino acid are optically active except glycine.

• All optically active amino acid found in two enantiomeric form i.e. L & D.

• D-form of amino acid found in bacteria & antibody.

• L-form of amino acid found in our body / Human body.

* Zwitter Ion:



Cations
Low pH

Zwitter Ion

Anions
High pH

- Isoelectric pH is that point of pH at which amino acid does not show movement of electron in electric form.
- Amino Acid which are Not-synthesized by our body are called essential amino acid & it must be obtained from diet or food material.
- Total amino acid present in nature in 20.
- All type of protein are synthesized by only peptidic amino acid.
- Out of peptidic amino acid 8 are essential & 2 are semiessential.
- Essential Amino Acid —

(i) Lysine	(v) Phenylalanine
(ii) Leucine	(vi) Threonine
(iii) Isoleucine	(vii) Tryptophan
(iv) Methionine	(viii) Valine

Semi essential amino acid —

- (i) Histidine
- (ii) Arginine

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> Type of Amino Acid ...

(i) Acidic Amino acid:

- It has negative charged R-group.
- R-group is COOH .

Ex:- Glutamic Acid, Aspartic Acid
/ Glutamate

(ii) Basic Amino acid:

- It has positively charged R-group.
- R-group is NH_2 or Amines.

Ex:- Histidine, Arginine & Lysine.

(iii) Neutral Amino acid:

- R-group is $1-\text{COOH}$ & $1-\text{NH}_2$.
- They have neutral R-group.

Ex:- Rest of amino acid are neutral.

- Glycine is the simplest amino acid.
- Tryptophan is the most complex amino acid.

- Sulphur Containing amino acid Cysteine & Methionine.
- Aromatic amino acid Tyrosine, Tryptophan & phenyl-Alanine.
- Alcoholic amino acid Serine & Threonine.
- Histidine, proline & Hydroxy proline are heterocyclic amino acid.
- proline & Hydroxy proline are amino acid because at the place of NH_2 only NH is present.

★ PROTEIN

- Protein is the polymer of Amino Acid.

➤ Types of proteins :

- Primary protein
- Secondary protein
- Tertiary protein
- Quater protein

• Primary protein :

- It is formed by linear attachment

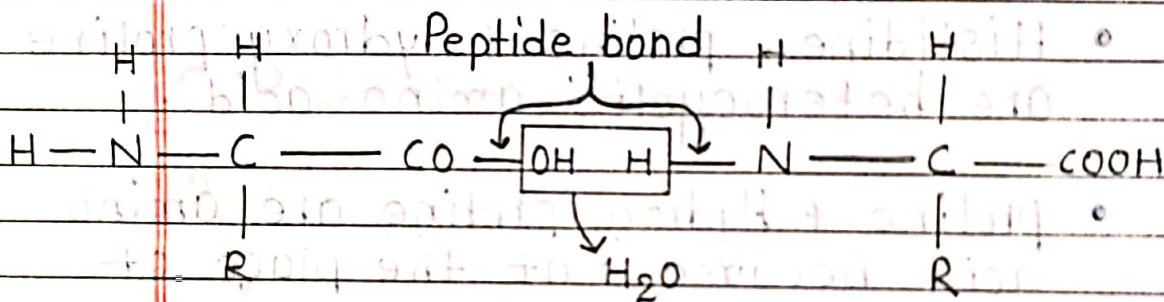


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of Amino acid through peptide bond.

- Primary proteins are One dimensional protein.
- Peptidyl transferase enzyme help in formation of peptide bond.



• Secondary protein:

• When primary protein present either in the form of Helix or β -pleated form then this Configuration is Called Secondary Configuration and Secondary Configured structure is Called Secondary protein.

• It is two dimensional structure.

- Secondary protein is insoluble in water.

> There structure is presented in two form —

- α - Helix
- β - plated or β - sheet structure.

- α - Helix :-

- It is right handed helix.

- In this structure intramolecular hydrogen bond is present.

Ex:- Carotene $\rightarrow$ found in Hair & Nail.

Myosin & Tropomyosin $\rightarrow$ found in muscles.

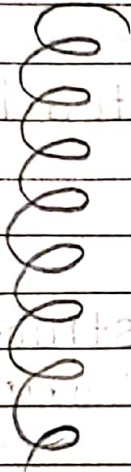
- β - plate :-

- It shows Zig - Zag structure.

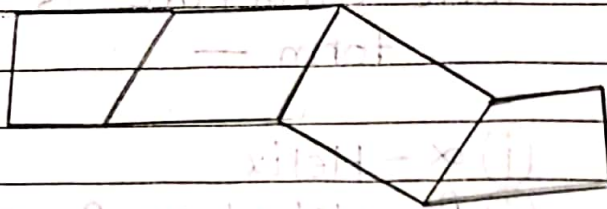
- In this structure - intermolecular hydrogen bond is present.

Ex:- fibroin or Silk protein.

(i) α -Helix



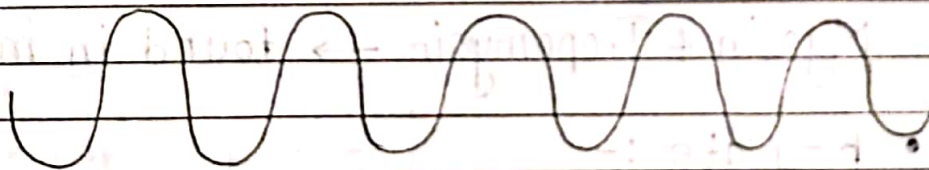
(ii) β -plate



• Tertiary protein:

• It is formed by highly foldings of primary & Secondary protein.

• It is Globular in shape.

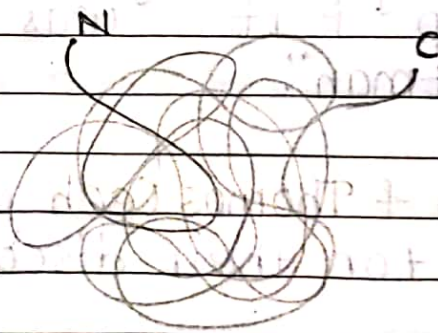


• It is Water Soluble.

• It is three-dimensional structure.

• Most of the enzymes & proteins present in the form of tertiary protein in protoplasm.

- Active Site (enzyme started) of enzyme is made up of tertiary protein.
- Quater protein :
 - When two or more polypeptide chains are attached to each other through different type of bonds like di-Sulphide bond than structure is called quaternary structure and this proteins are called quaternary protein.
 - Lactic dehydrogenase is the three dimensional structure & it is quaternary protein.
 - Hemoglobin Consist of four subunit, i.e. two subunit consist of α -type & two subunit consist of β -type.



★ ENZYME

→ Biocatalyst

- Enzyme was discovered by "Buchner".
- Term enzyme was given by "Kunhe".
- Enzyme is a bio catalyst & it was discovered by "Berzelius".
- "J.B Sumner" first Crystallized the enzyme & study that enzyme are made up of protein.
- Enzyme Convert the Substrate into product without involving in product.
- All enzymes are made up of protein except few RNA enzyme.
- "Thomos Cech" who discover the first RNA enzyme that was Ribozyme.
- Another Ribozyme enzyme was ribonuclease - p & it was discovered by "Sidney Altman".
- Sidney Altman & Thomos Cech got the nobel prize for their discovery.

- RNA is the only enzyme that act as genetic material & catalyst or enzyme
- 23S R-RNA found in ribosome which is larger subunit of 70S ribosome.

★ Classification of enzyme —

> Six type of enzyme :-

- | | |
|--------------------|---------------|
| (i) Oxidoreductase | (iv) Lyase |
| (ii) Transferase | (v) Isomerase |
| (iii) Hydrolase | (vi) Ligase |

- Oxidoreductase :- It helps in Oxidation & reduction.

Ex:- Pyruvate dehydrogenase.

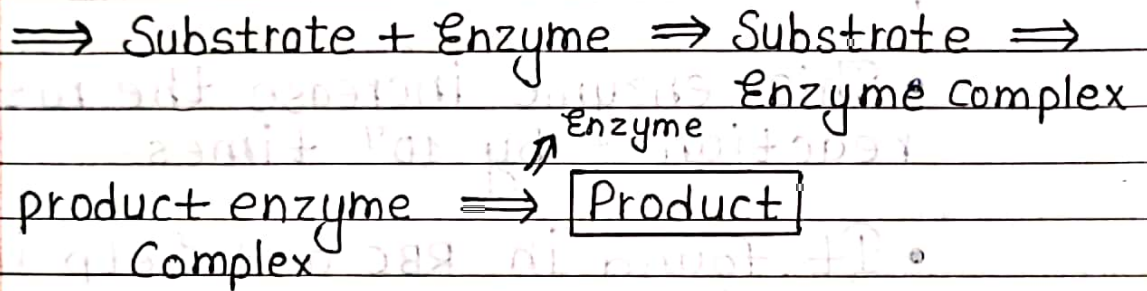
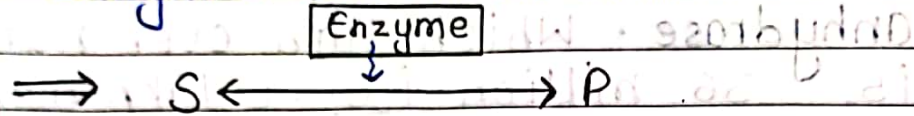
- Transferase :- It help in transfer of One substrate in to another substrate.

Ex:- Glutamic pyruvate dehydrogenase

- Hydrolase :- It helps in hydrolysis reaction i.e. releasing of water due to breaking down.

Ex:- All digestive enzyme.

- Enzymes are heat sensitive.



- During any enzymatic reaction formation of enzyme Substrate Complex is must and during formation of this Complex small amount of energy is release i.e. Called Binding Energy.

- During an enzymatic reaction enzyme never modified or alter.

- Enzyme Catalyse the metabolic reaction by lowering down the requirement of activation energy.

* TON (Turn Over Number):

- The number of Substrate molecule get Converted in to product by enzyme in per minute is Called TON.

- Fastest known enzyme Carbonic anhydrase. Which turn over number is 36 million i.e. 6 lakh molecule per second.

- This enzyme increase the rate of reaction by 10^7 times.

- It found in RBC and help in formation of H_2CO_3 (Carbonic acid) by joining $CO_2 + H_2O$.

* Factor affecting the rate of enzymatic reaction:

- Rate of enzymatic activity increase due to increase in Substrate Concentration.

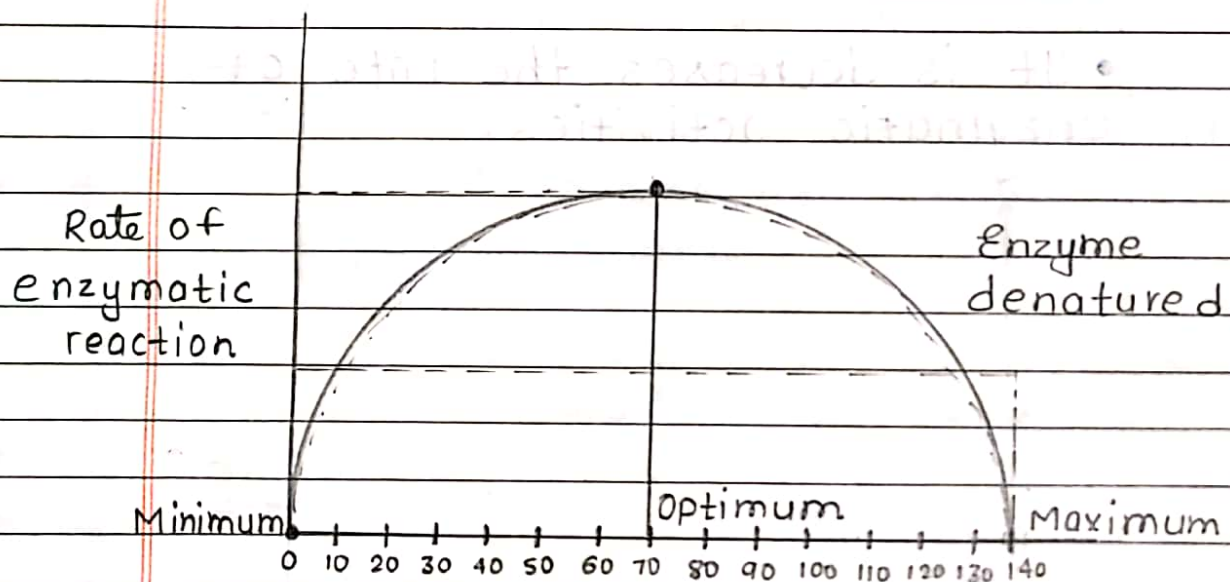
- Rate of enzymatic activities first increases rapidly and then decreases.

- The Concentration at which rate of enzymatic activities become half of the maximum of velocity is called K_m .

(K_m = Michaelis menten Constant)

- Higher the value of K_m lower will be affinity of enzyme with substrate.

★ Temperature :



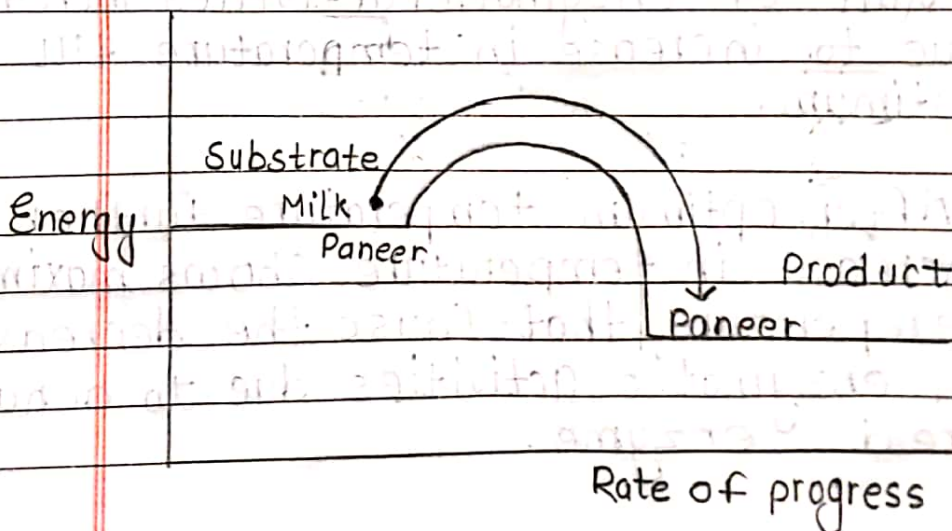
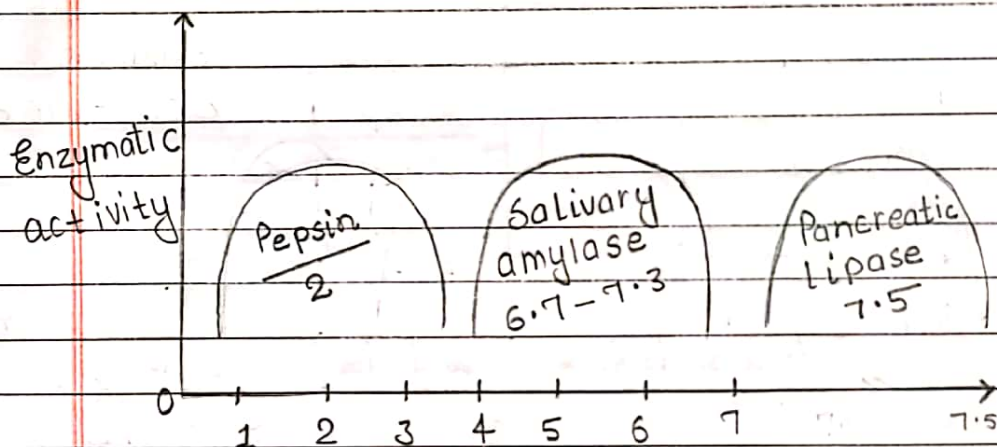
- Rate of enzymatic activities increases due to increase in temperature till optimum.
- After optimum temperature further increase in temperature shows maximum temperature that cause the decrease in enzymatic activities due to denatured enzyme.

★ pH Value :

- Potency of H_2 is Condition at which any enzyme start to work i.e. every enzyme has its own pH.

- Product :

- It is decreases the rate of enzymatic activities.



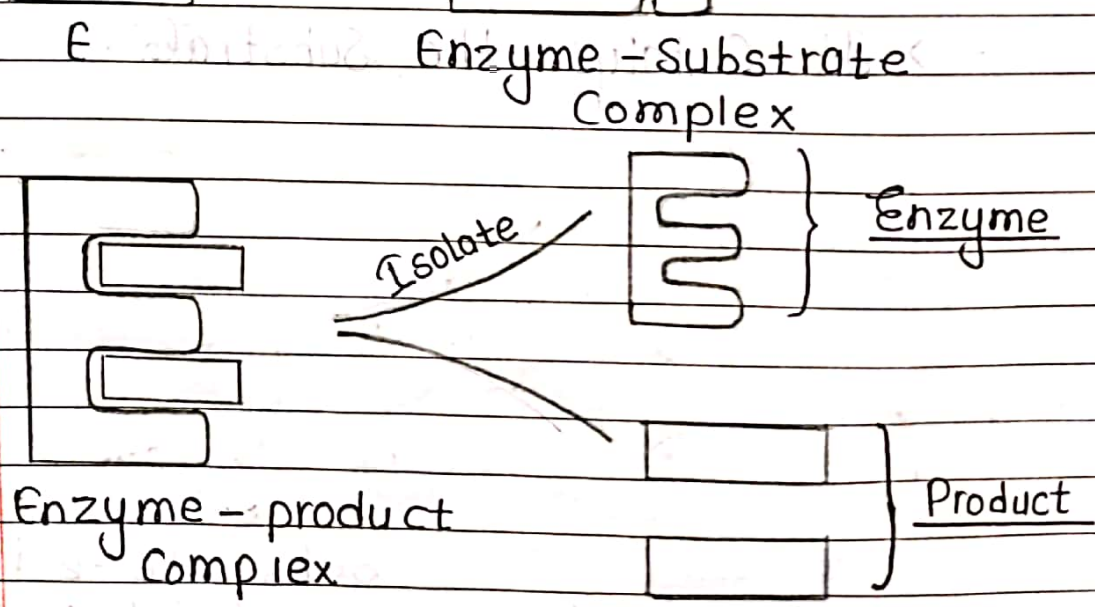
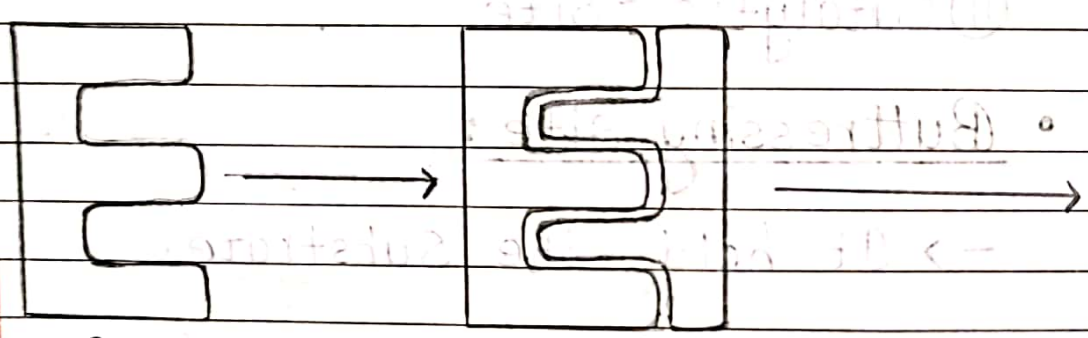
- Hydration increase the rate of enzymatic activity while dehydration decrease the enzymatic activities.

➤ Mechanism of Enzyme action :-

• LOCK AND KEY HYPOTHESIS / MODEL :

→ It is given by Emil and Fisher.

→ According to this model shape of active site is fix of static.



• INDUCED FIT MODEL :

→ According to this model shape of active site is not fix.

→ Substrate induce the active site.
So,

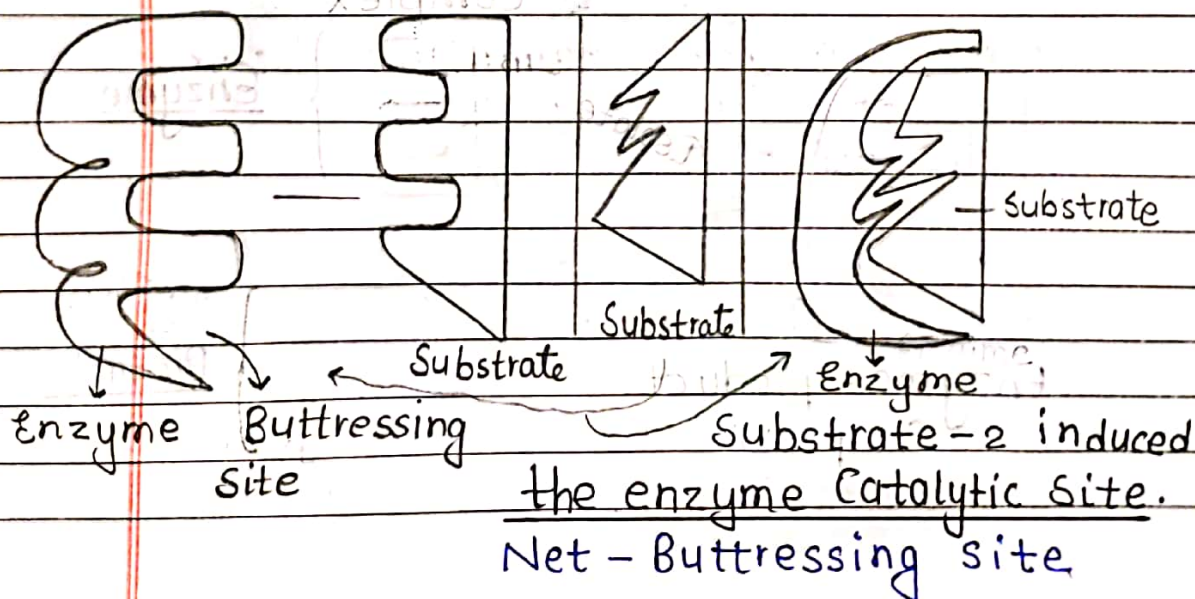
> According to this model two type of sites are found in this enzyme -

- (i) Buttressing site
- (ii) Catalytic site

• Buttressing site :

→ It holds the substrate.

→ It catalyse the substrate.



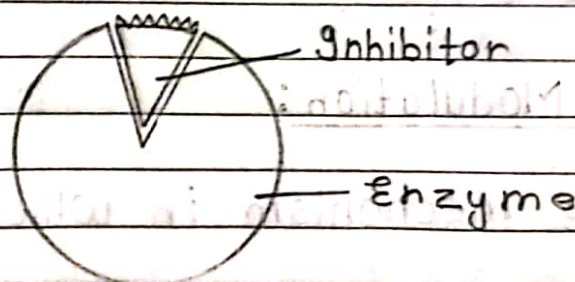
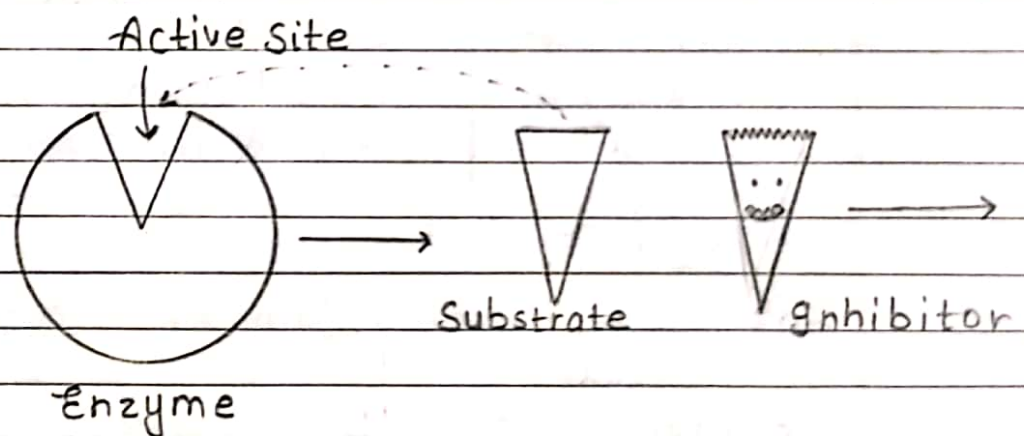
* Inhibition of Enzymatic activities :

➤ Three types of enzymatic activities —

- (i) Competitive Inhibition
- (ii) Non-Competitive Inhibition
- (iii) Allosteric Modulation / Negative feedback mechanism.

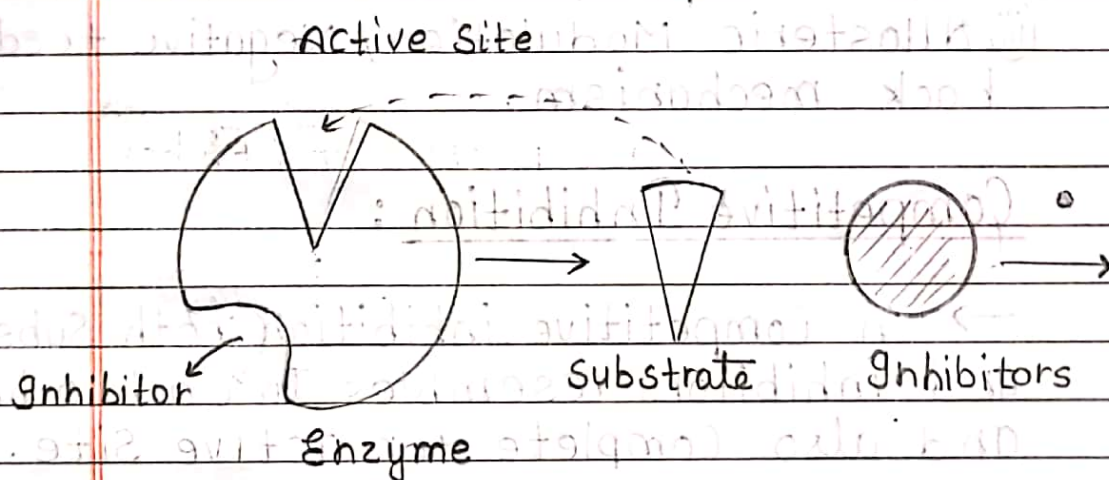
• Competitive Inhibition :

→ In Competitive inhibition both substrate and inhibitors resembles to each other and also compete for active site.



Here, Inhibitor block the Active site.
So, desire produced will not be formed.

- Non-Competitive Inhibition:



Enzyme - Inhibitor Complex

Inhibitor change the Active Site of substrate.

- Allosteric Modulation:

- It is the mechanism in which two site are

- (i) Active site
- (ii) Allosteric site

> Allosteric site is of two type :-

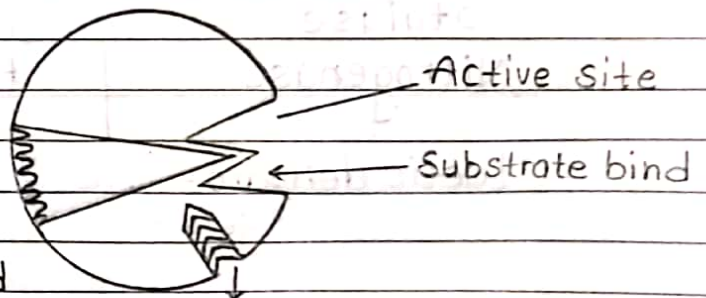
- (i) Inhibitor site
- (ii) Activator site

<u>Inhibitor site</u>	<u>Activator site</u>
• When inhibitor bind with inhibitor site then inhibitor denatured or deform the active site. So, that substrate would not be able to bind with active site.	• When activator bind with active site then it makes able substrate bind with active site. so, substrate would further perform and produced product.

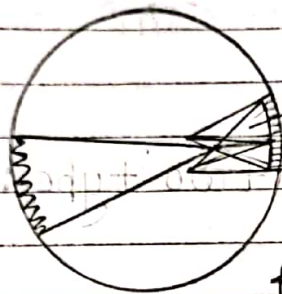
Activator



Activator bind with active site to able substrate bind with active site.

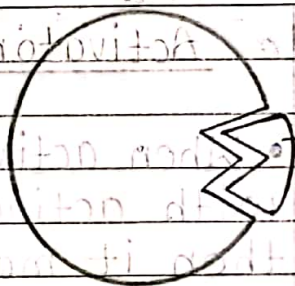


Inhibitor binds with inhibitors site that change the Active Site.



Site become inhibit
by act of inhibitor.

Inhibitor are inactive
& form the active Site.



Substrate bind with
Active site.

<u>Enzyme</u>	<u>Activator</u>
Hexokinase	Mg^{2+}
Rubisco	Mg^{2+}
Pe pcase	Mg^{2+}
Catalase	Fe
Nitrogenase	Fe & Mo
Lactic dehydro- genase	Zn

★ Co-factors :

- Enzyme is of two type :-

(i) If having protein part than it is called P-Apoenzyme.

(ii) If having non-protein part than it is called N-p-Cofactor.

> Co-factor is of three type :-

(i) Prosthetic Group

(ii) Co-Enzyme

(iii) Metal ions.

• Prosthetic group :

• It is Organic in nature.

• It is tightly binds with Apoenzyme.

• Heme is the Seven prosthetic group found in Catalase & peroxidase enzyme.

• Co-Enzyme :

• Co-enzyme also having organic nature.

• It is binds with Apoenzyme temporary.

• It occur during Catabolism.



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- Co-enzyme NAD & NADP has Vitamin Niacin.

• Metal ions :

- It is inorganic in nature.
- It is attached with Apoenzyme through Coordinate bond.

★ Nucleic Acid :

- It is discovered by Frederick Mischer.

↓
"Nuclein"

- Nucleic Acid term given by "Altman".