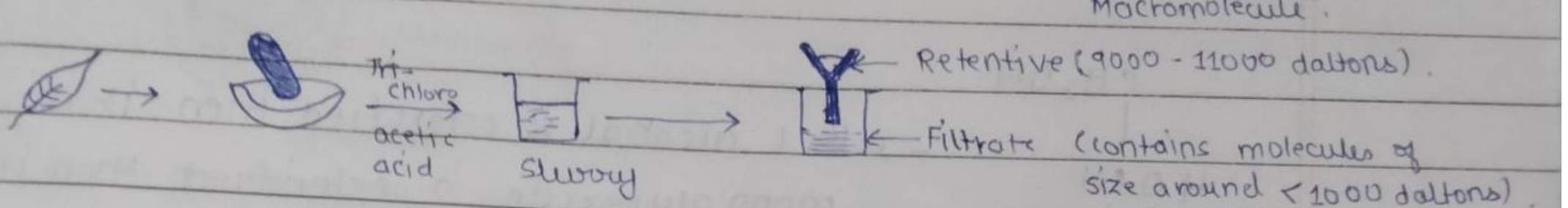
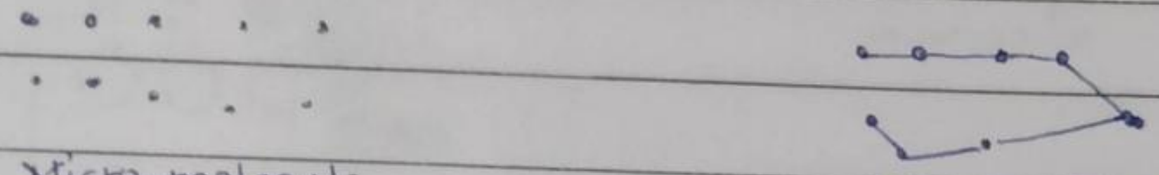
Biomolecules

1) Take a piece of tissue (either plant / animal).
2) Take a mortar & pestle grind the tissue.
3) Take a solvent tri-chloro acetic acid to dissolve the tissue. A thick solution is formed
4) Filter the solution.

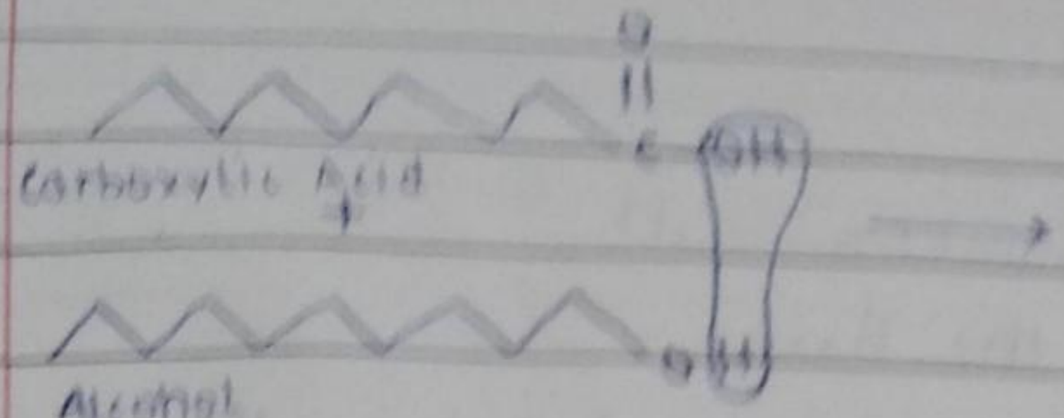


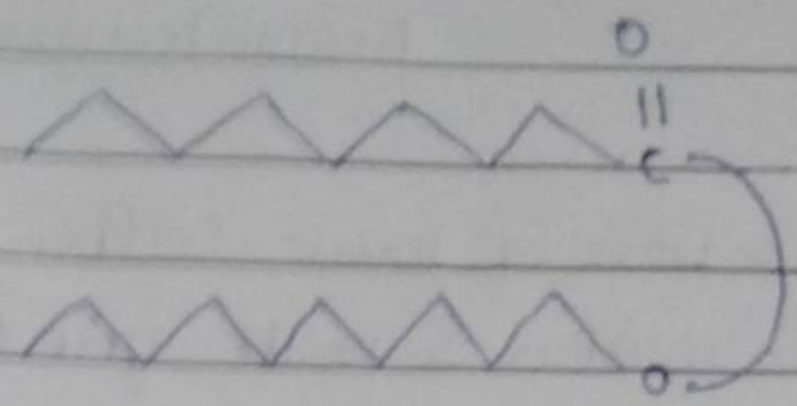
Macromolecules are polymers of micromolecules.



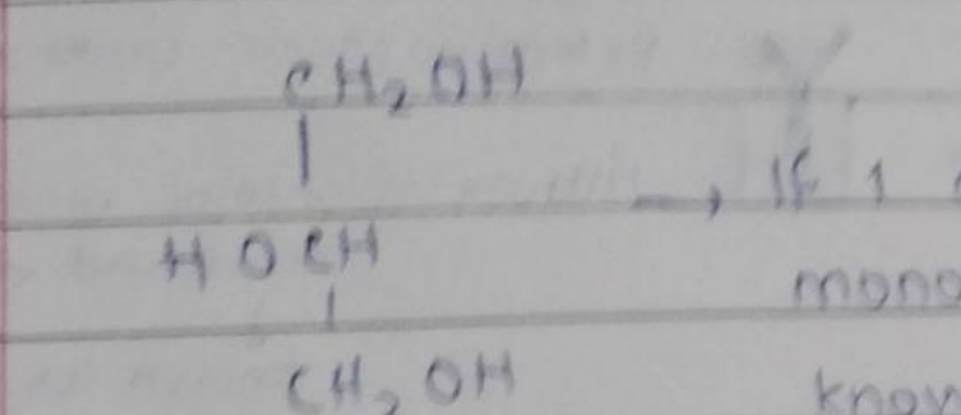
Macromolecular Fraction	Micromolecular Fractions
1) Proteins	1) Amino Acids (Joined by peptide linkage to form protein)
2) Nucleic Acid.	2) Nucleotide (Phospho-di-ester)
3) Polysaccharides	3) Monosaccharides (Joined by glycosydic linkage).
4) lipids	4) Glycerol (Fatty Acids).

Lipids - • Size in the order of 700 - 800 daltons
• Lipids are not true biomolecules because they are not polymers.



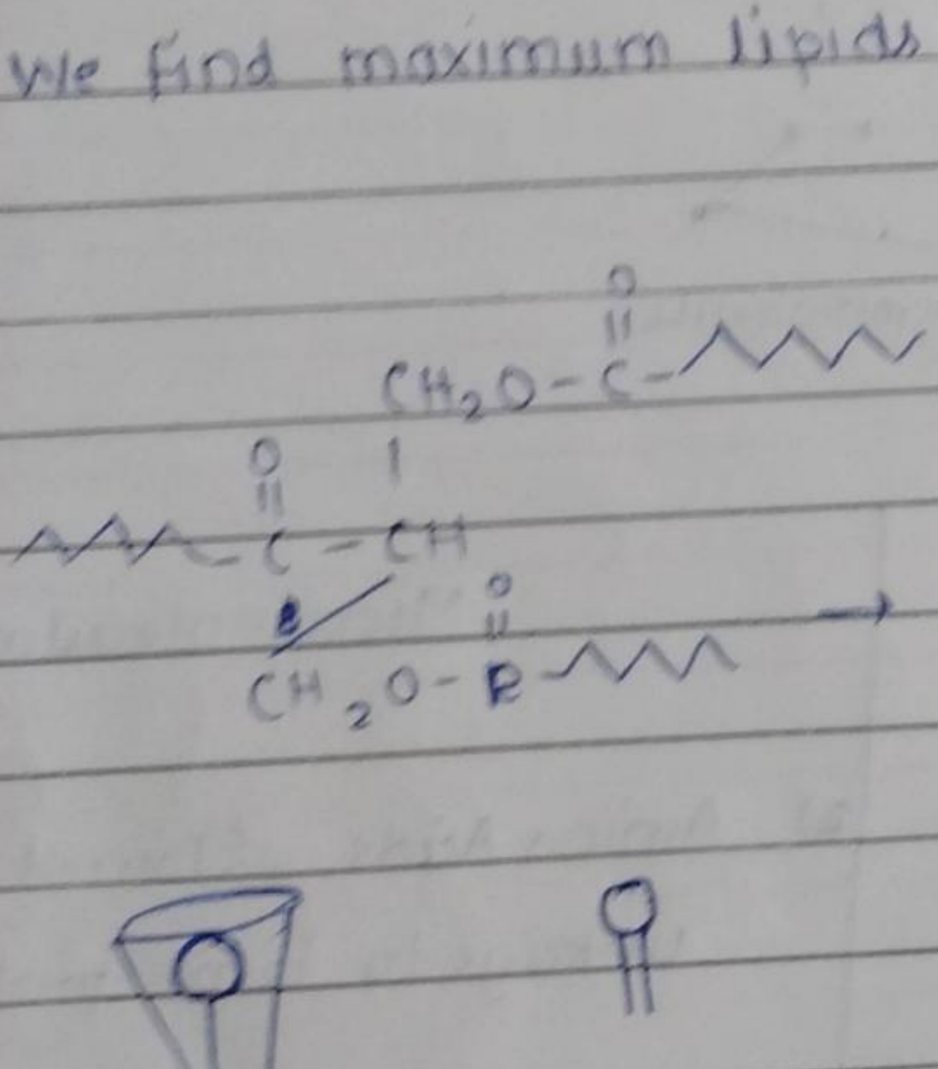


Ester

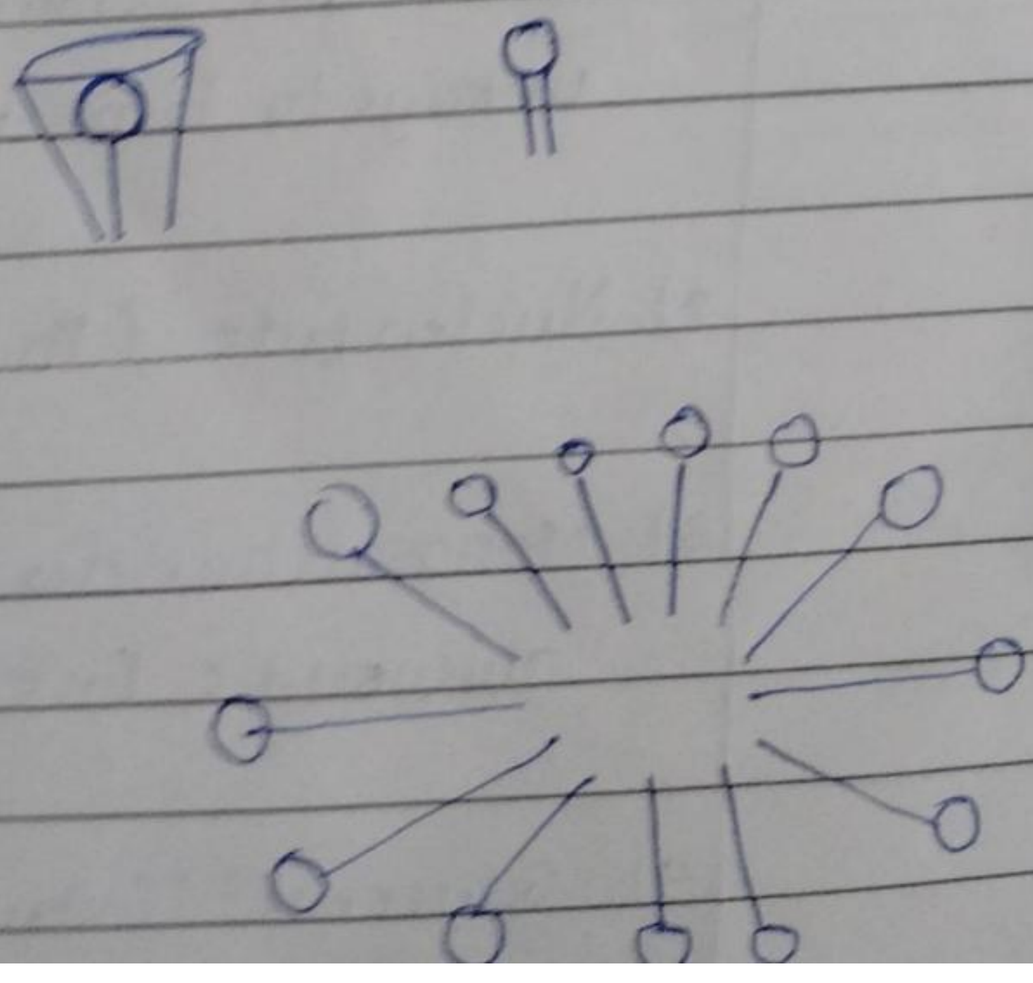


→ If 1 alcohol is esterified then it is known a monoglyceride, 2 esterified then it is knows as diglyceride

* We find maximum lipids in the cell membrane

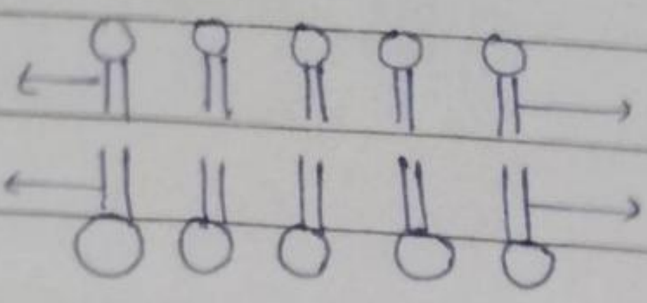


→ If phosphorus is present. It is known a phospholipids

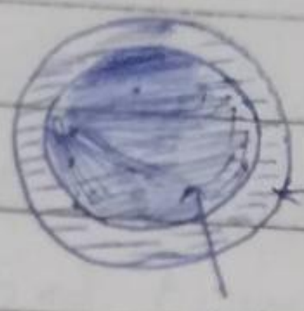


micelli. (present in detergent)

Bi-layer

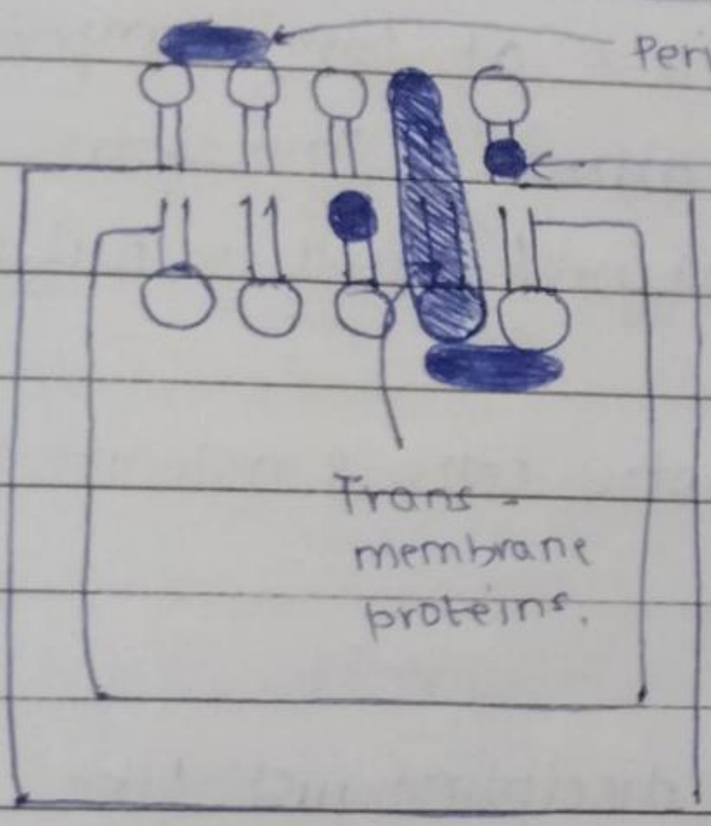


To gain stability lipids form circular structure by starting interaction with the end lipids. They fold up.



Cell structure.

Fluid - Mosaic Model.



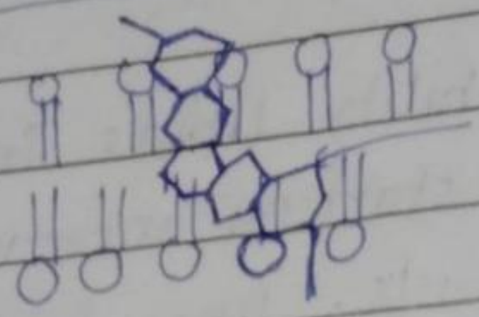
Section of Cell Membrane.

* While forming the slurry (in the first experiment) the lipid present in the cell membrane breaks into multiple pieces as a result we do not get a single lipid in any fraction of filtrate or residue. Even if we find one we may find it in the filtrate part.

* Lipids are long-chain fatty acides esterified to alcohols.

* only diglycerides form lipids, neither monoglycerides nor triglycerides

Cholestrol



If we increase the temperature, the membrane becomes fluid and collapses some occurs when we reduce the temperature. The cells come close to each other and freeze.

Function of cholestrol - Cholestrol increase fluidity of the cell membrane at low temperature and reduces fluidity at high temperatures. Therefore cholestrol acts as a temperature buffer / fluidity buffer.

* Cholestrol is only present in eukaryotic cells & not in prokaryotic cells.

Class Activity

Q1 "Biology is an important scientific discipline just like Physics, Chemistry and Mathematics". Bring out the fundamental similarities and differences between Biology & Engineering by comparing the working of human eye and camera.

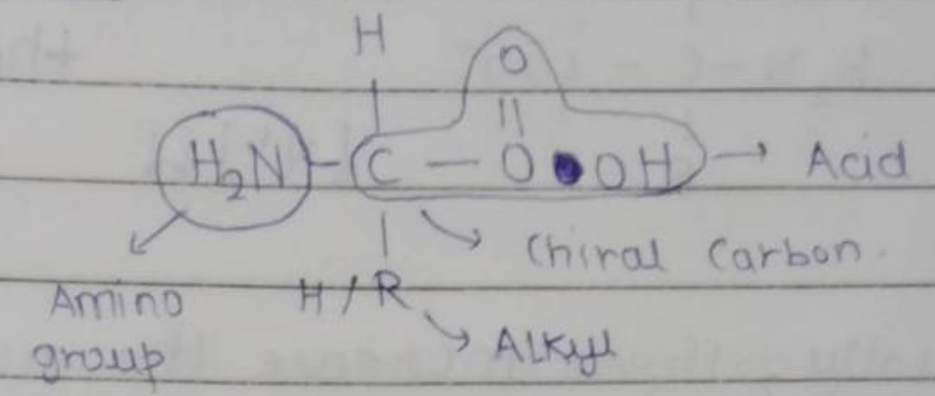
OR.

The flying of bird and an Aircraft. (Already submitted)

Proteins

* Proteins are made up of amino acids.

Structure of Amino Acids -



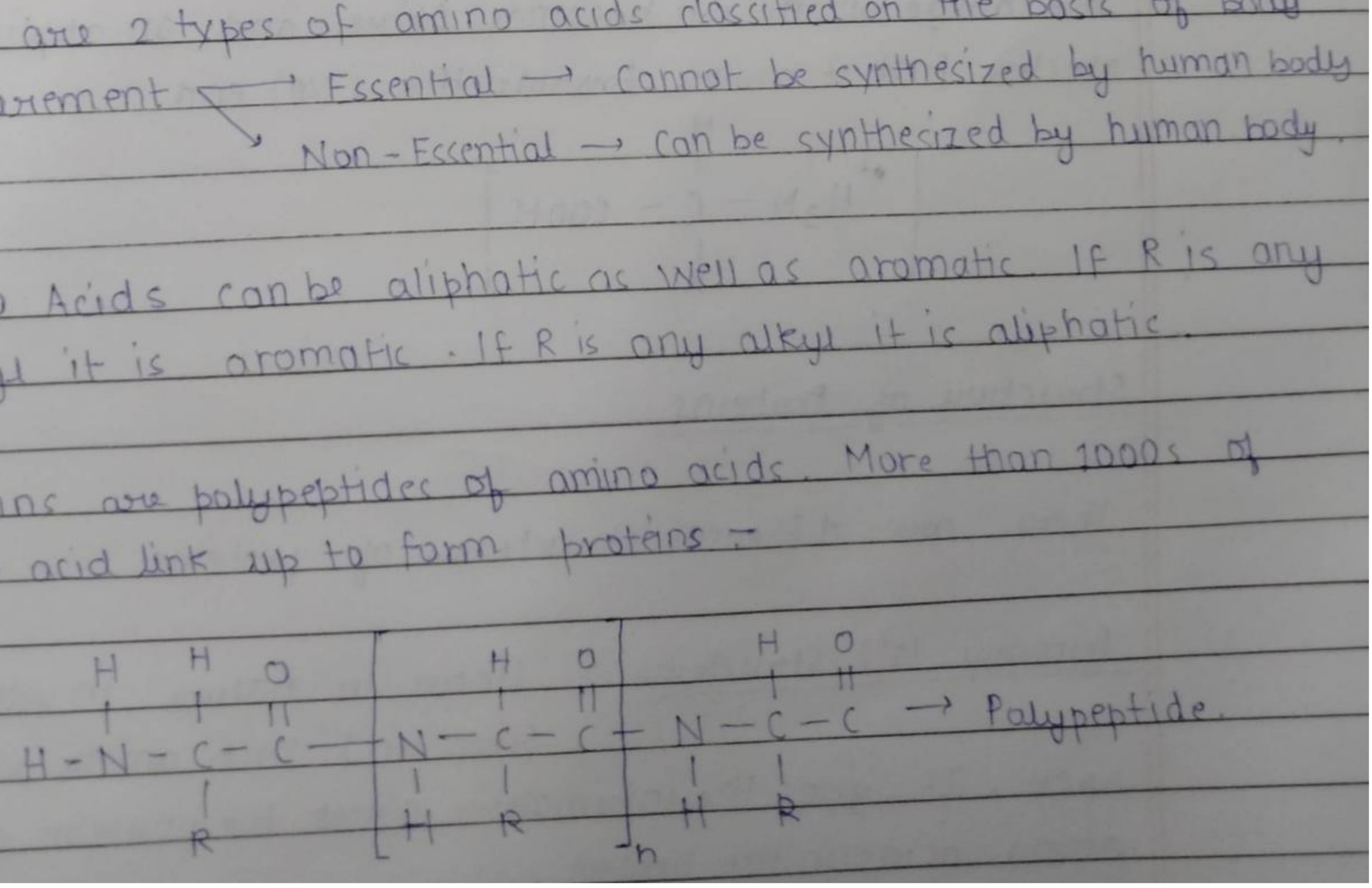
* If R is a -COOH group the amino acid becomes acidic in nature
* If R is a $-NH_2$ group the amino acid becomes basic.
* If there is no -COOH and $-NH_2$ group present in the amino acid then the amino acid is neutral.

* Chirality is there in amino acid because there are 4 different groups attached to the central carbon atom. Chirality is the reason behind optical activity of amino acids. There are two types of optically active amino acids - Laevorotatory & Dextrotatory.

- There are 2 types of amino acids classified on the basis of body requirement
  - Essential → Cannot be synthesized by human body
  - Non-Essential → Can be synthesized by human body.

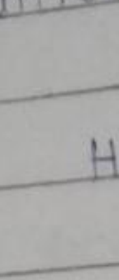
Amino Acids can be aliphatic as well as aromatic. If R is any benzyl it is aromatic. If R is any alkyl it is aliphatic.

* Proteins are polypeptides of amino acids. More than 1000s of amino acid link up to form proteins :-



Expt

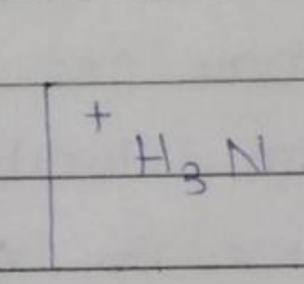
- At first if in a basic solution we keep amino acid, the condition of amino acid is



On application of electric field the ion moves towards the positive terminal.

$[H^+] \downarrow\downarrow$

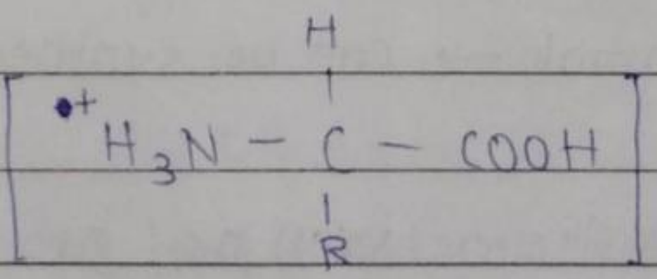
- Gradually, if we increase the acidity of the solution then there comes a state when ~~the~~ on electric dipole is created within the molecule and the molecule neither moves towards the positive pole nor towards the negative pole on application of electric current. This ion is known as Zwitter-ion and the pH at which the phenomenon occurs is known as Iso-electric point



Zwitter ion.

$[H^+] \uparrow$ (pH → Iso Electric Pt)

- If we further increase the acidity of the medium then the charge on the ion becomes (+)ve and on application of electric field it moves towards the (-ve) end.



Structure of Proteins

There are different structures of proteins.

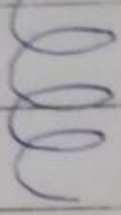
1) Primary (1°) structure - Linear in nature in which the first and last amino acid are open. It gives the information about the position of the amino acids in the protein.

$NH_2 - aa - aa - aa - COOH$

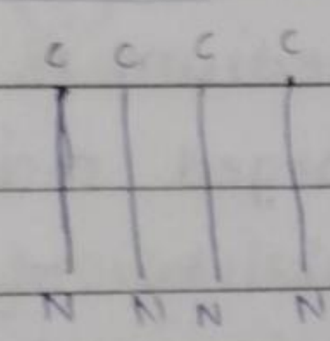
2) Secondary (2°) Structure - 1 2 3 4 5 6 7 8 9 → The molecule bends

- H Bond

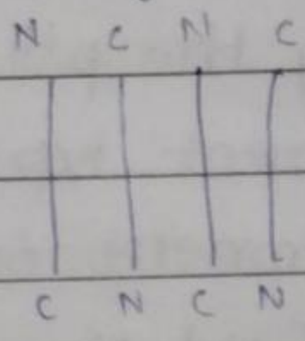
and forms an α - helix structure



or a β - Pleated structure in which many sheets of protein are linked together



Parallel β - Pleated



Anti - Parallel β - Pleated

3) Tertiary (3°) Structure - Looks like a hollow ball of cotton. It contains Hydrophilic & Hydrophobic linkages. It has a random structure. → structure of 3° protein

4) Quaternary (4°) structure - If a protein has only 1 polypeptide

Q) Suppose an amino acid is kept in a basic solution and gradually the pH of the medium is changed. What are the different types of charged moites that are formed. Also comment on the mobility of these moites in electric field thereby explaining the isoelectric point of an amino acid.

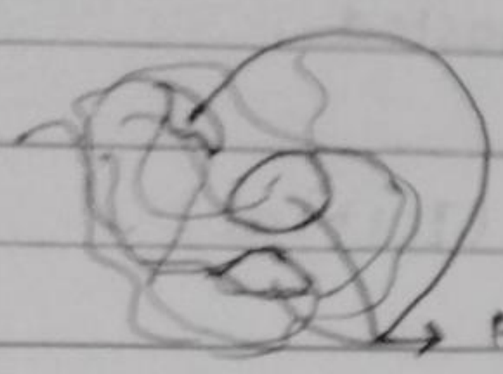
OR.

which biomolecule is not considered to be true macro-molecule? Why do you still get it in the macromolecular fraction?

Enzymes (Bio - catalyst)

peptidyl transferase.
↑
1) Most enzymes are proteinaceous in nature - Eg - 23srRNA (catalyses the formation of peptide bond).

Structure of Enzymes.



Active sites in enzymes.

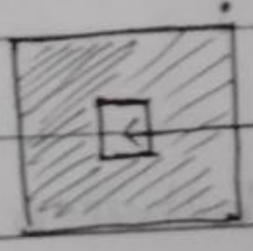
* When a group of amino acid come together some times they become active and become responsible for creating active sites in enzymes.

* Types of active sites in enzymes ⟶ Catalytically Active.
Buttpressing Group.

- Types of model for enzyme to act as catalyst.

Only special substrates can fit in the active sites of the ~~cata~~ enzyme.

① Lock & Key Model -



substrate has to fit at this position.

② Induced Fit Model - According to this model, the active site of an enzyme can change its shape in order to fit different substrates in it. The part of enzyme interacting with the substrate is known as catalytically active whereas the rest of the parts of the enzyme is buttpressing group.

$R \underset{K_b}{\overset{K_f}{\rightleftharpoons}} P$

K_f, K_b are known as equilibrium constant

* Enzyme doesnt change the overall equilibrium contant of the reaction. If it boosts the forward reaction, then backward reaction is also boosted.

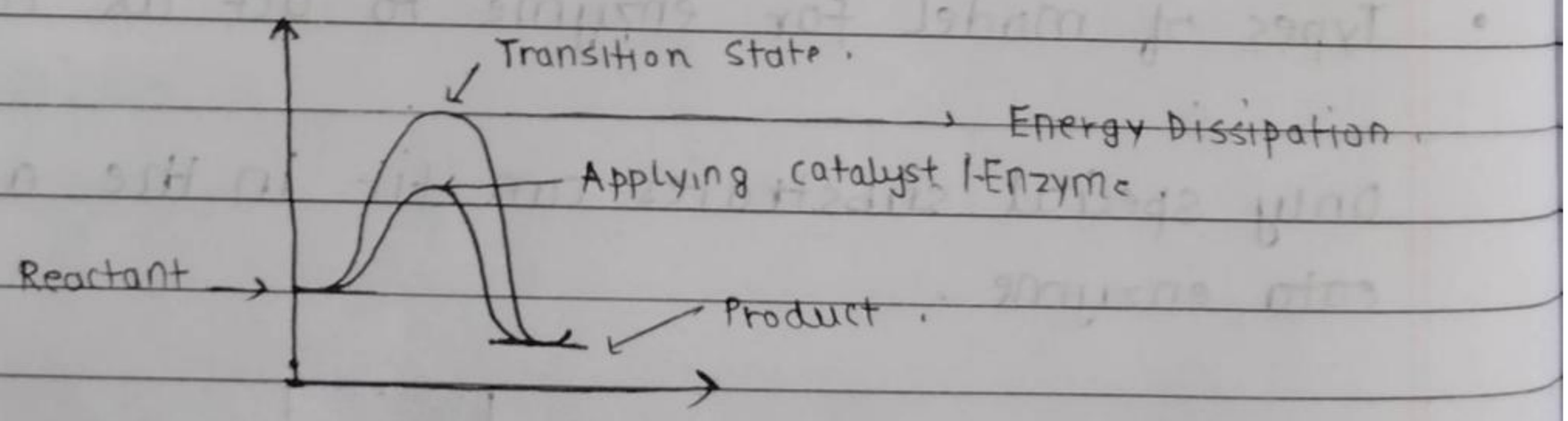
$K = \frac{K_f}{K_b} = \frac{5}{2} = 2.5$ (Initial).

$K = \frac{K_f}{K_b} = \frac{5 \times 10}{2 \times 10} = 2.5$ (After adding Enzyme).

* Enzyme lowers the activation energy of reaction. (similar to catalyst).

(1) K.E (Kinetic Energy).

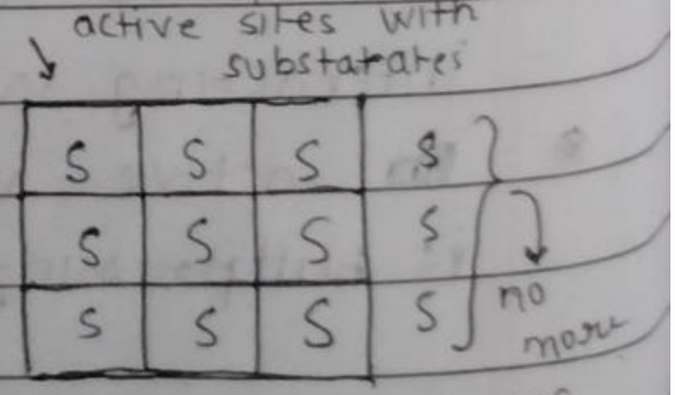
(2) Face.



The energy gap between reaction and 'transition state' is known as 'activation energy'. Reactant must react the transition state before getting converted into product. Enzymes reduce the activation.

Michael - Menton Equation.

$V_0 = \frac{V_{max}[S]}{K_m + [S]}$



Assignment

Q) What ~~the~~ are the different biological functions proteins are associated with in a living system?

Ans) The different biological functions proteins are associated with in a living system are -

(1) Antibody - Antibodies bind to specific foreign particles, such as viruses and bacteria, to help protect the body. Eg - Immunoglobulin.

(2) Enzyme - Enzymes carry out almost all of the chemical reactions that take place in cells. They also assist with the formation of new molecules by reading the genetic information stored in DNA (Deoxy - Ribonucleic Acid). Eg - Phenylalanine hydroxylase.

(3) Messenger - Messenger proteins, such as some types of hormones, transmit signals to coordinate biological processes between different cells, tissues and organs. Eg - Growth Hormones.

(4) Structural Component - These proteins provide structure and support for cells. On a larger scale, they also allow a living organism to move. Eg - Actin.

(5) Transport / Storage - These proteins bind and carry atoms and small molecules within cells and throughout the body. Eg - Ferritin.

submitted

Class Assignment

Q1) Highlight the fundamental importance of observation in any scientific enquiry by using examples of Brownian motion or the origin of thermodynamics by referring to the original observation of Robert Brown or Julius Mayor.

Classification

Type of cells

- Prokaryotic → 'Pro' means Primitive.
- Eukaryotic → 'Eu' means True

KARYON means Nucleus

* Cells in which nucleus is devoid of nuclear membrane is called nucleoid.
* Cells in which nucleus is surrounded by nuclear membrane is called nucleus.

Unicellular Organisms Requirement for Survival

- Energy
  - Phototroph → Light
  - Chemotroph → Chemical
- Electron
  - Inorganic → Lithotroph
  - Organic → Organotroph
- Carbon
  - CO_2 → Autotroph
  - Any other source → Heterotroph

* Autotroph - Those organisms which use CO_2 as the sole source of carbon are known as Autotrophs.

auto

* Chemolithotroph :- Those organism who derive energy from chemicals, get electron from Inorganic sources and utilise CO_2 as their sole source of carbon are known as chemolithoautotrophs.

organization

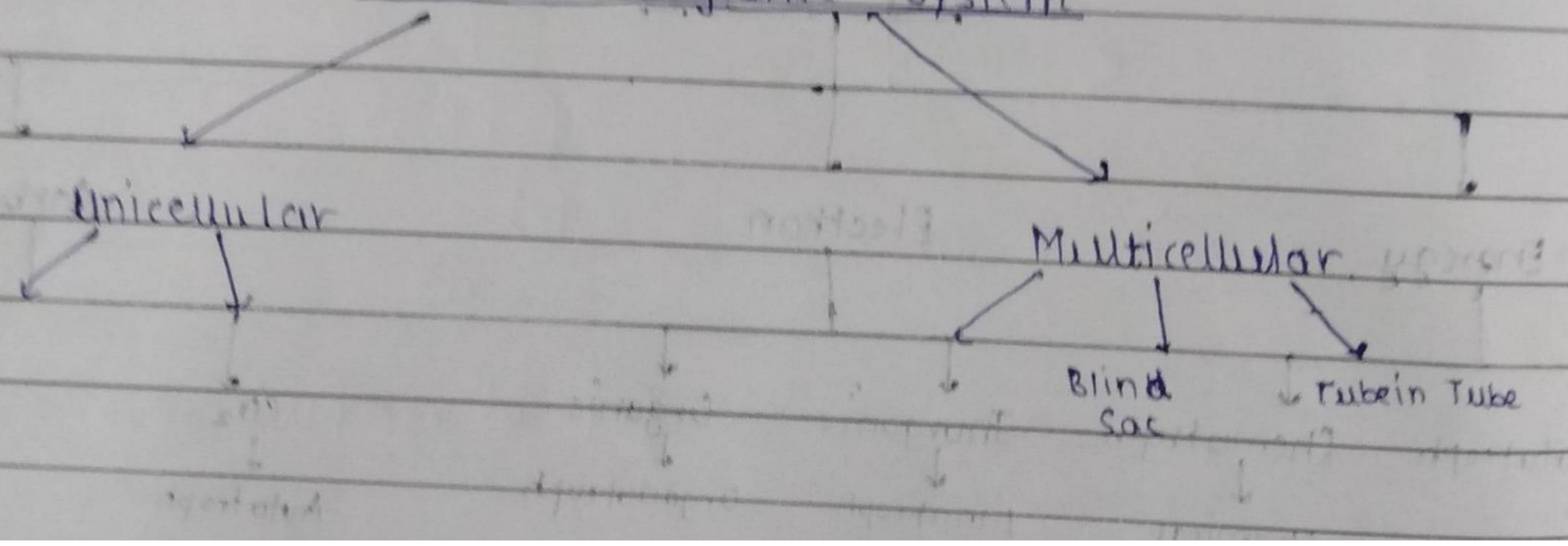
(1) Unicellular (Cell → Tissue → Tissue Group → Organ → Organ System → Organism)

(2) Multicellular.

(*) In case of cellular level of organisation in unicellular organisms, all the functions for living (surviving are performed by a single cell.

(*) In case of cellular level of organisation in multicellular organisms, the functions for survival are performed by different cells of the system. This is know as

(*) Similar types of cells group to form tissue.



important (10 marks question)

NH_3

- aq → Ammonotelic
- Urea (liver converts ammonia into Urea) → (Ureotelic) → Homeostatis (Kidney) (OSMOREGULATION).
- Uric Acid (Uricotelic). {In case of some animals like Bird → combined Excetion and Egestion.

Monera

(1) Cell Wall
- NA Glucosamine
- N Acetyl Minomic. pentaglycine

N + DAP
* Alanine
* Lysine
* Glu.

(2) Fungi → Cell Wall ⟶ Chitin.

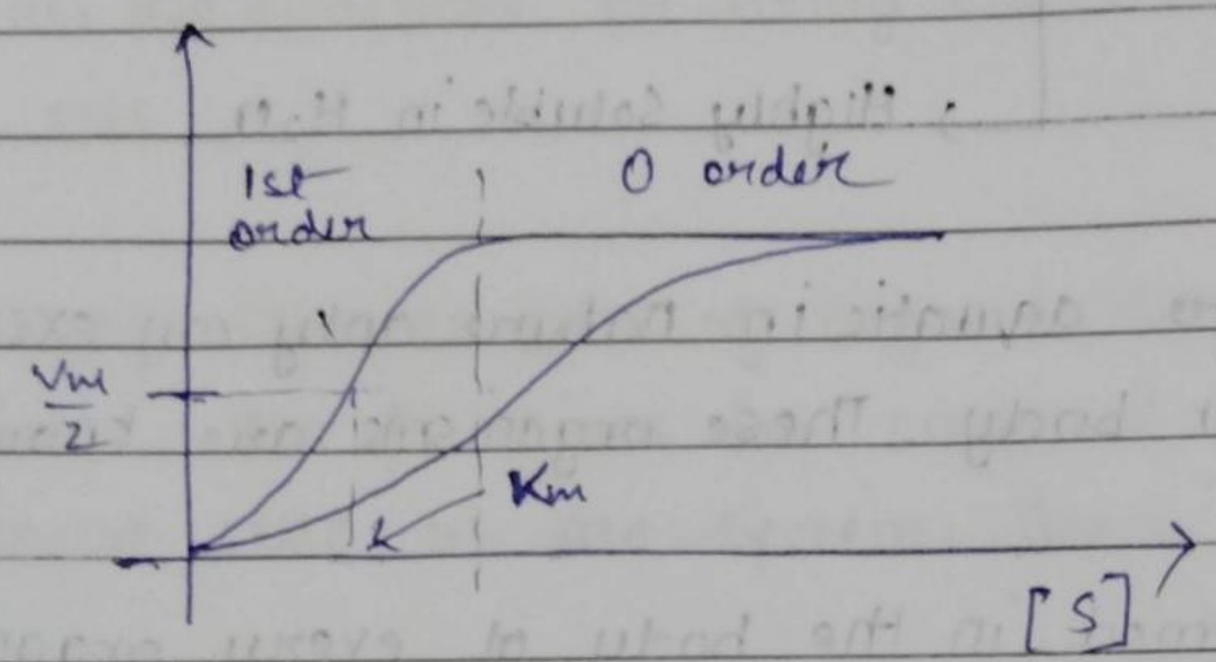
$$V_0 = \frac{V_{max}[S]}{K_m + [S]}$$

$$\frac{V_{max}}{2} = \frac{V_{max}[S]}{K_m + [S]}$$

$$K_m + [S] = 2[S]$$

$$K_m = [S]$$

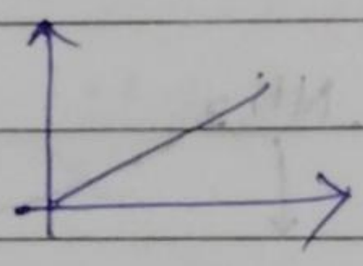
$$K_m \propto \frac{1}{\text{strength of enzyme}}$$



At initial cond^n

$[S] <<< K_m$

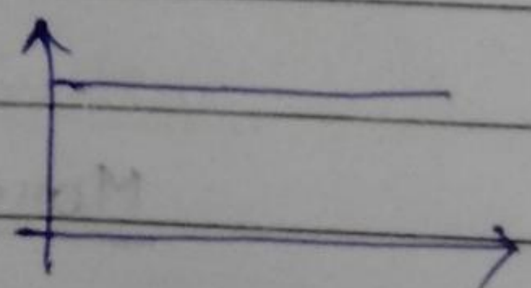
$$V_0 = \frac{V_{max}[S]}{K_m + [S]}$$



$$V_0 = \frac{V_{max}[S]}{K_m} \Rightarrow \text{1st order reaction}$$

After increase in [S]

$$V_0 = \frac{V_{max}[S]}{[S]}$$



$\Rightarrow V_0 = V_{max}$

↳ 0 order reaction