Cell

fundamental unit of life. It has property to replicate itself.

Types

- Unicellular

  Bacteria, Amoeba, Paramecium.

- Multicellular

  Humans

  Organization exists,

  cells (neuron, stem, bone)

  ↓

  tissues (adipose)

  ↓

  Organs (kidney)

  ↓

  Organ System (circulatory, digestive)

  ↓

  Organism.

Robert Hook discovered cell. He magnified cork pieces & found cellulae (honeycomb like)

Somatic cells (diploid) $2n \rightarrow 46$

Germ cells (haploid) $n \rightarrow 23$.

Both of these replicate.

Germ cells (sperm & ova) participate only in reproduction & Somatic cells participate in everything else.

Histones are proteins & assist in packaging of DNA.

Ribosomes help in protein synthesis.

Totipotent

Capability of a somatic nucleated cell to give rise to an entire organism is referred to as cellular Totipotency

e-nucleated cell can't give rise to an organism. (nucleus removed)

Only stem cells are totipotent.

Schliden & Schwann proposed a cell theory.

	Prokaryotic (primitive)	Eukaryotic
Size	0.1-0.5 μm. Small	large. 100-500 μm
Membrane Bound Organelles	absent histones absent	present histones present
Cytoskeleton (MT, MF, IF)	less developed	well developed.
Mode of Cell division	Cell fission ⊙→ ⊙⊙ → ⊙ ⊙	Mitosis / Meiosis

Central dogma of Cell

Uni-directional in nature

DNA
↓ Transcription
RNA
↓ Translation
Proteins

Ribosomes help in translation

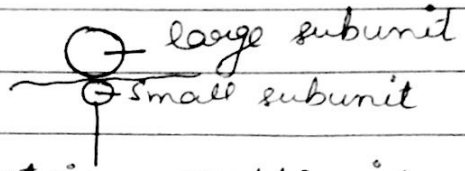
AUGC - RNA ADGC - DNA

stored information in these types.

Ribosome helps to convert AUGC & AGDC to amino acids.

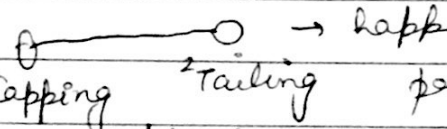
Ribosomes 70S $\left\langle \begin{matrix} 50S \\ 30S \end{matrix} \right.$ 80S $\left\langle \begin{matrix} 60S \\ 40S \end{matrix} \right.$

'S' means Sewedberg's unit. Measurement of ribosomes

Ribosomes → 

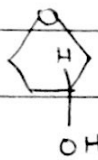
'S' is also sedimentation coefficient. It is not additive in nature.

Processing of RNA.

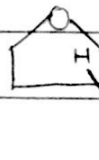


little Extensive.

RNA is more prone to hydrolysis as it has Oxygen present.

Pentose Sugars → DNA 

Oxygen absent



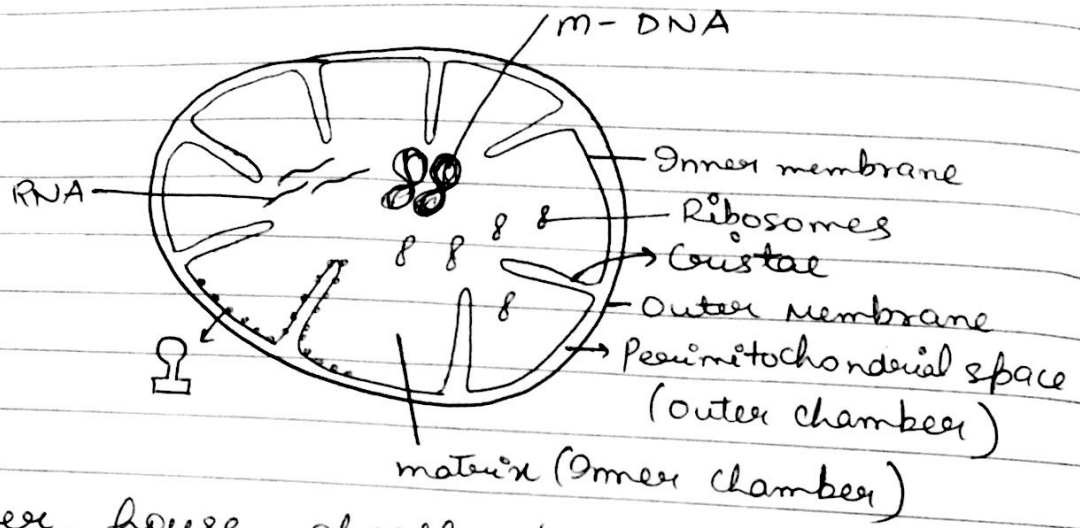
RNA
Oxygen present

Cell Organelles

1) Mitochondria

double membraned.

replicates by itself.



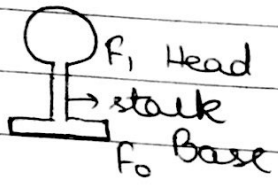
Power house of cell because it can synthesize ATP.

ATPase / ATP synthetase

f_o-f_1 complex

(elementary particles)

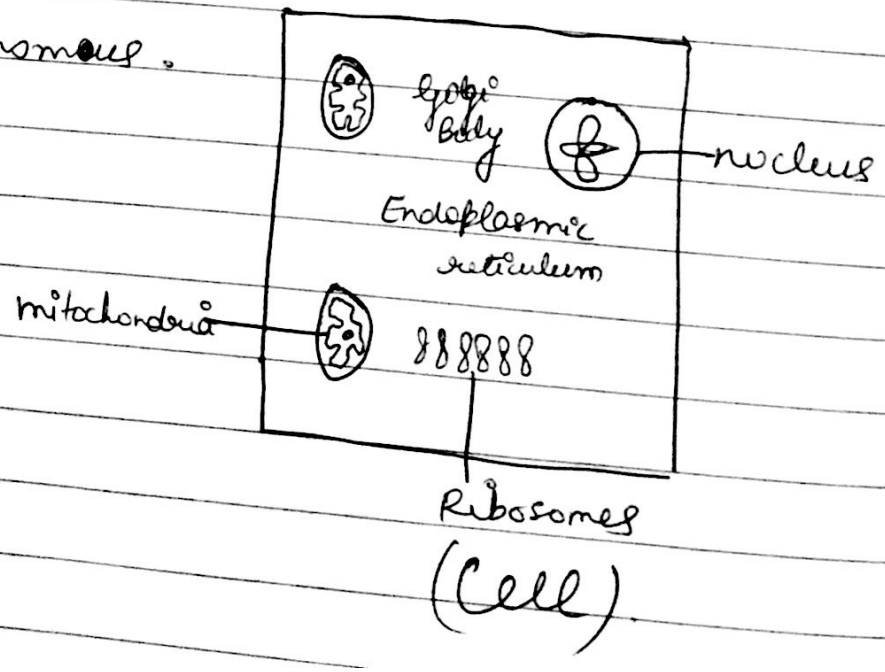
Happens only on the inner membrane.



Mitochondria is a semi-autonomous organelle.

It has its own DNA (m-DNA).

It has capability of independent existence but is inside the cell, hence is called Semi-autonomous.



Amoeba. Mitochondria, Cytoplasm can exist independently.

Sperm does not contribute in Mitochondrial (genes) DNA. Only egg does.
Therefore, Mitochondria follows Maternal Inheritance.

DNA in Mitochondria is Circular. (O) (Naked)
DNA in Nucleus is a line (—)

Mitochondrial DNA is naked because it is circular, has no free end & hence no enzymes attached.

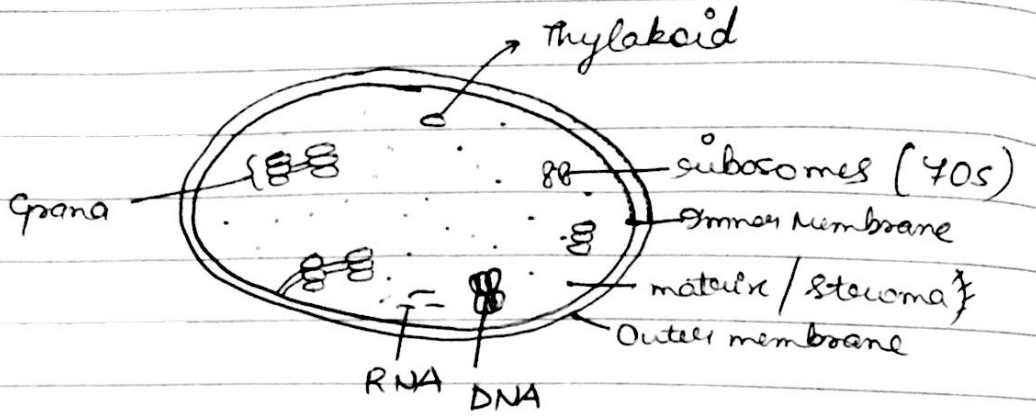
Mitochondrial DNA are associated with histones.
Mitochondria can store & release Calcium when needed by cell.
Mitochondria has many enzymes for fatty (Matrix)
acids enzymes.
Mitochondria participates in synthesizing of amino-acids.

Plastids

Semi-autonomous

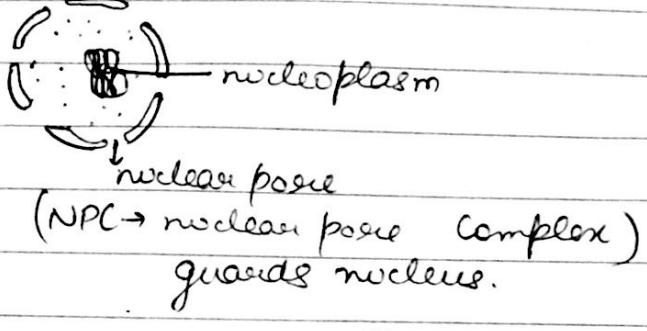
1) Leucoplast
   - amyloplast (starch)
   - elaioplast / lipidoplast (fat)
   - aleuroplast / proteinoplast (protein)
2) Chromoplast (red yellow coloured)

3) Chloroplast (green)



Nucleus.

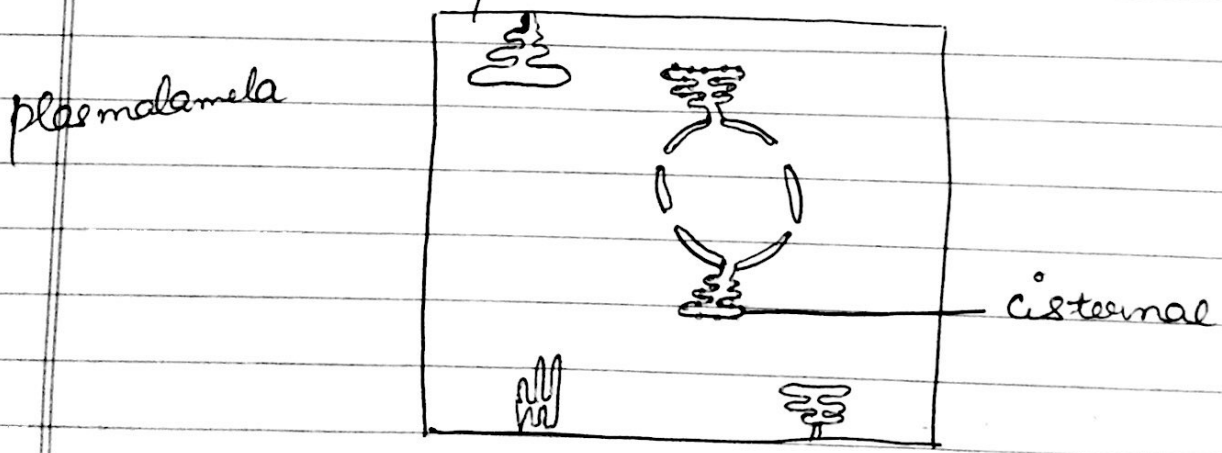
Occupies 10% of total cell volume.



Transcription :- DNA ⟶ RNA
RNA polymerase

. Present in Eukaryotes.
absent in Prokaryotes.

Endoplasmic Reticulum

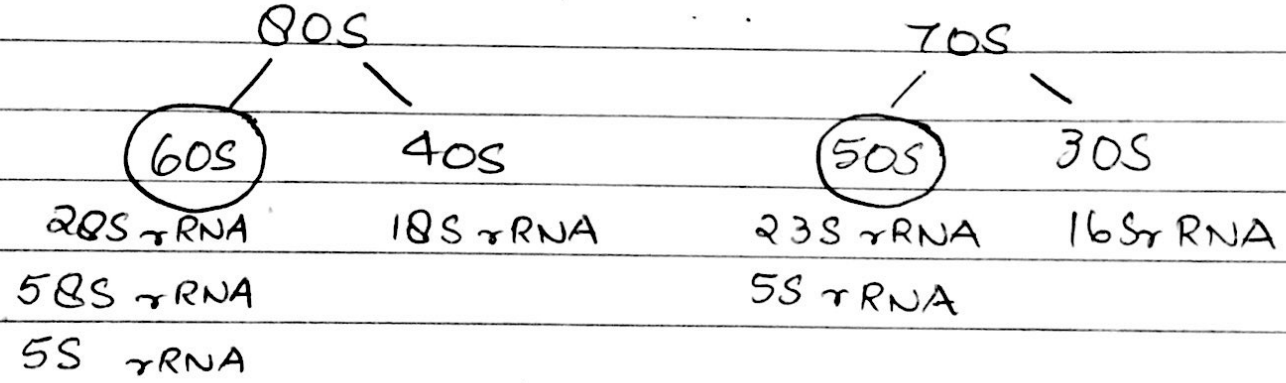


Mostly RER are connected to nucleus. B·coz it has ribosomes which help in transcription (Helps in fast transcription)

Smooth ER	Rough ER
ribosomes absent Hence smooth.	ribosomes present Hence rough.
pores absent	Pores at places of attachment of ribosomes
synthesis of steroids, lipids, glycogen	synthesis of proteins enzymes.

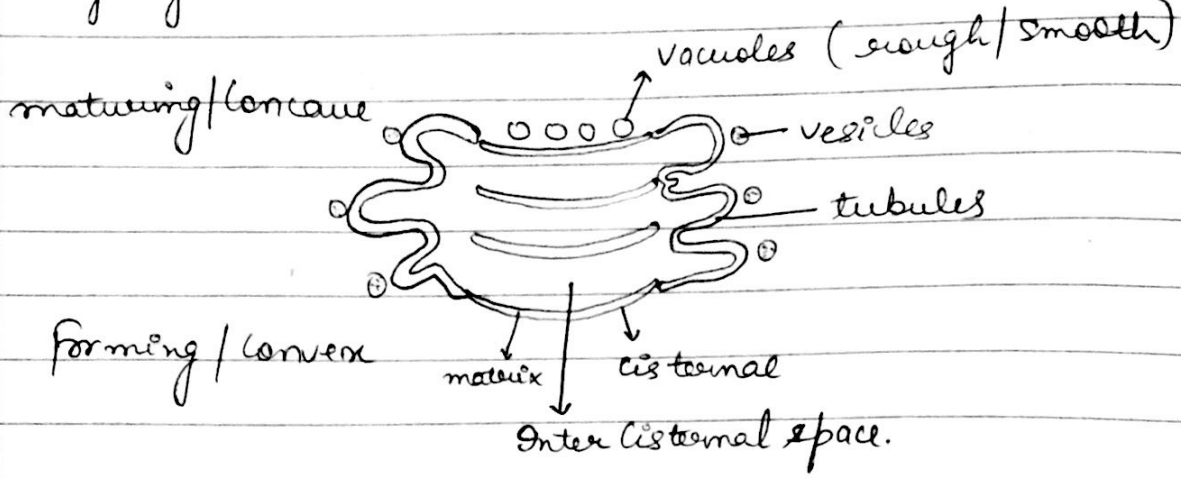
Ribosomes

Ribonucleoprotein complex
1) protein part 2) ribonucleic part



60S & 50S → large subunits are associated with the protein named peptidyl transferase. It catalyzes the formation of a peptide bond.

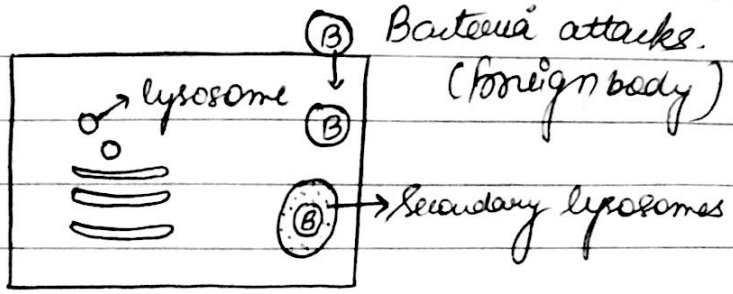
Golgi bodies



Tubules are finger like projections.

Lysosomes
(Suicide Bags)

it fuses to other organelles & loses its identity.



Single membrane bound vesicles which contain hydrolytic enzymes.

which can break complex compounds into simple forms.

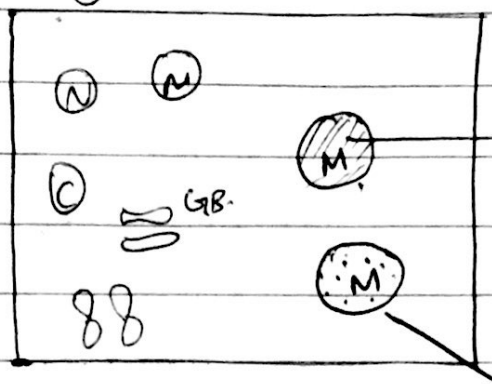
(Eg: Amylase breaks Glucose)

primary lysosome + foreign Body = Secondary lysosome.

pH of lysosome is always at Acidic level (<7). as they work at acidic medium.

Whatever ~~Bacteria~~ lysosome is not able to digest, it accumulates at a place in cell called as residual bodies.

a foreign body attacks.



→ not working mitochondria is attacked by lysosomes. which forms autophagic vacuole.

This is Intracellular digestion.

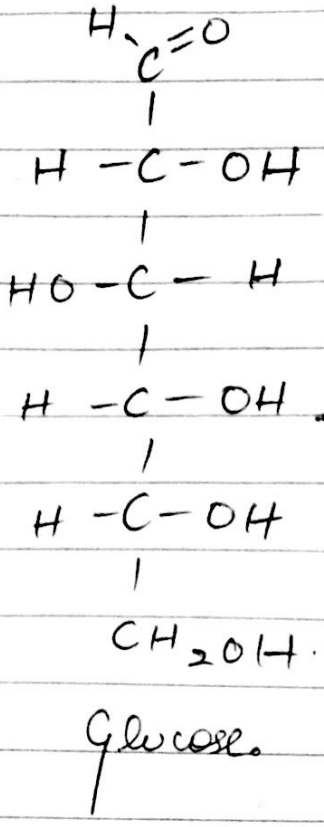
Enzymes present in lysosomes.

Acid phosphatases
Sulphatases
Proteases
Nucleases
lipases
fat molecules
Glycosidases

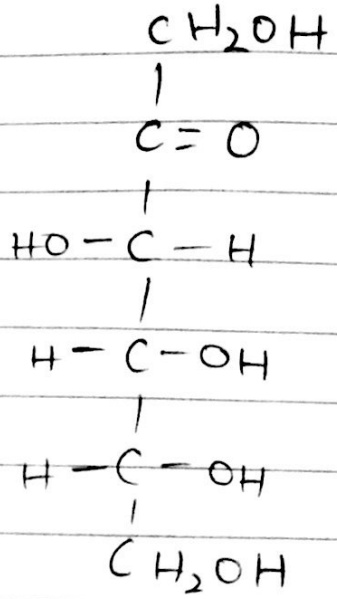
Lysosomes are called as recycling centres because they use malfunctioning mitochondria & other organelles and helps the cell in creation of new organelles.

Carbohydrates $C_n(H_2O)_n$.

Monosaccharides



Glucose.



Fructose

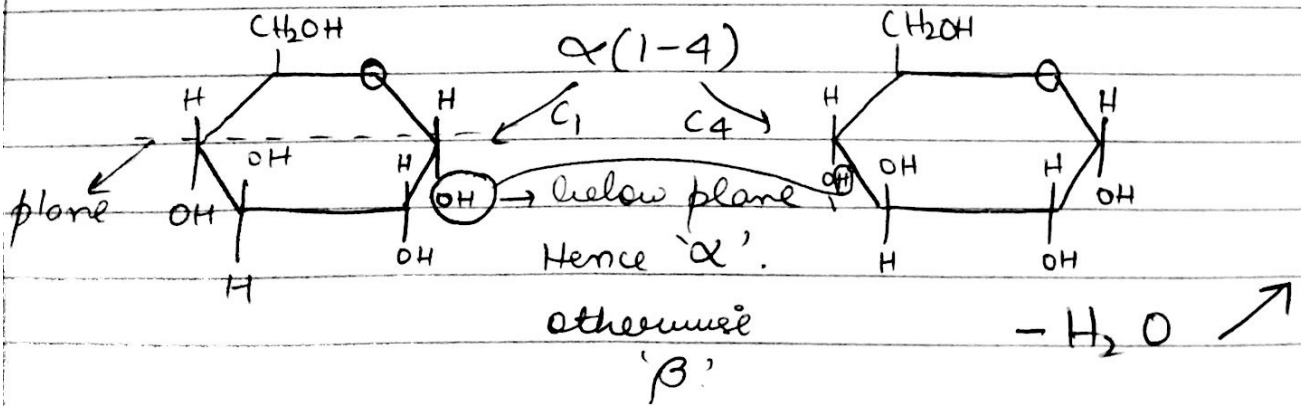
Aldoses

Ketoses

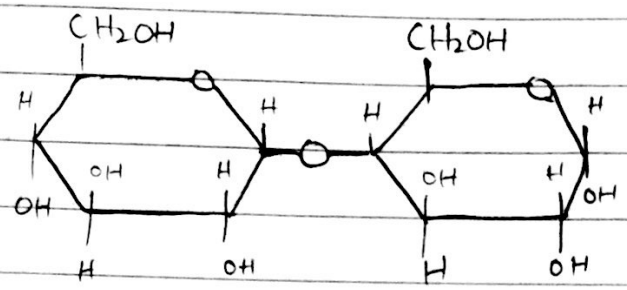
Trioses (3C)
Tetroses (4C)
Pentoses (5C)
Hexoses (6C)
Heptoses (7C)

Sugars can have α & β isomers.

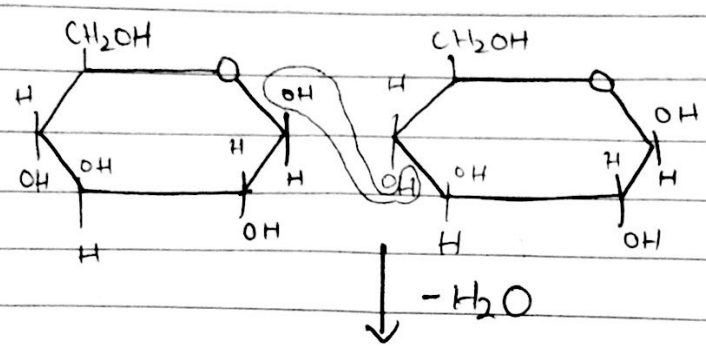
Oligosaccharides (C-O-C Bond). (2-9 Mono.)



phospholipids & its importance



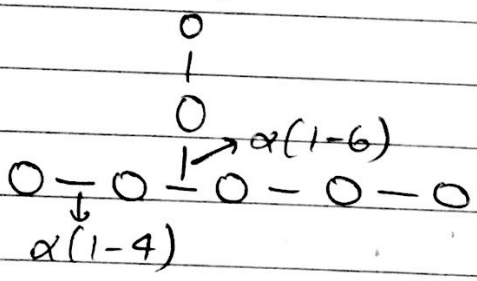
Maltose.
(α-glucose).



Cellobiose
(α1-β2).

Polysaccharides (more than 9 monosaccharides)
Eg: starch, glycogen, cellulose.

Starch



Cellulose β(1→4)

Types of RNA

Minors - Module 1

Proteins

purines & pyrimidines

Reducing Sugars	Non-Reducing Sugars.
free -CHO, -CO-	No free -CHO, -CO-
Eg: All Monosaccharides Maltose	Eg: Sucrose
$Cu^{2+} \rightarrow Cu^{+}$ Do ~~not~~ reduce cupric ions to cuprous	$Cu^{2+} \xrightarrow{X} Cu^{+}$ Do not reduce. Benedict & Fehling's Sol^{n}.

Do

Appn.s of Oligosaccharides.

Lipids

fatty acid esters of alcohol.

Essential

Non-essential

$$\underbrace{CH_3-(CH_2)_{14}}_{\text{Non-polar}}-\underbrace{COOH}_{\text{polar}}$$

$$\overbrace{C_{16}H_{32}O_2}^{\text{Palmitic.}}-COOH$$

Essential

Linoleic, linolenic, arachidonic.

present in plants & not in animals.

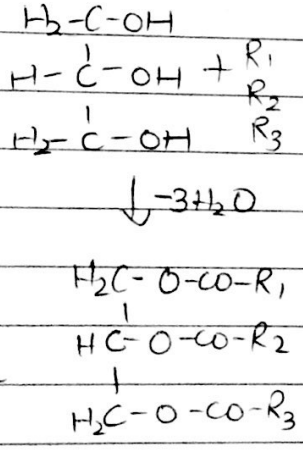
PUFA- Poly Unsaturated fatty Acid.

Amphipathic - has both polar & non polar part

Saturated	Unsaturated
have only single Bonds.	double / tripple bond present.
Straight	Bends occur at double bonds.
Eg: Oleic acid	Eg: Linolenic
have high melting point.	have low melting point
occur as solids in room temp.	exist in form of liquid at room temp.

Simple lipids

a) fats
b) Wax
c) Cutin
d) Suberin

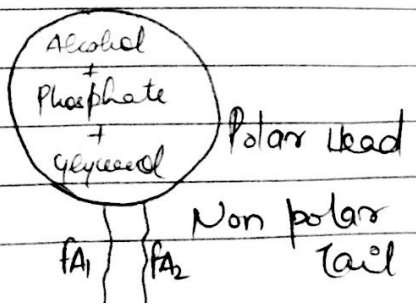


Compound lipids

a) Phospholipids (amphipathic - [O Polar, ‖ Non polar])
b) Glycolipids
c) Lipoproteins
lipid + protein
↓
Glycosylation

Derived lipids

Phospholipids



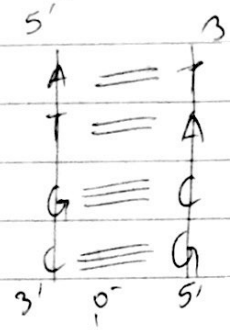
How you classify amino acids in structures, Bonds

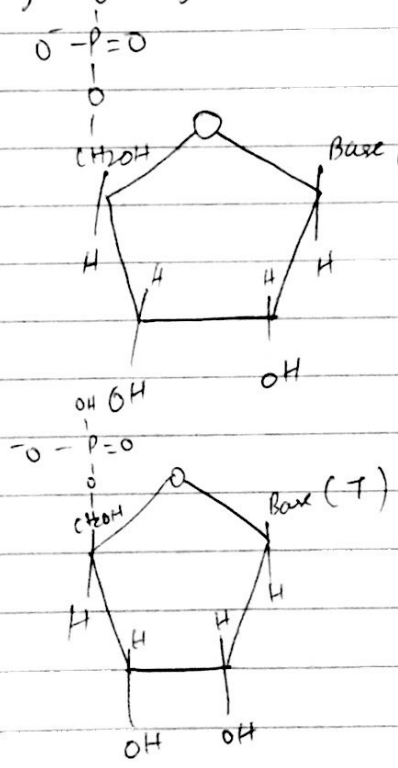
Structures of protein

Nucleic Acids

DNA RNA

{A = T}
{G ≡ C}





Base forms a nucleoside → Base + Sugar.
Nucleotide → Base + Sugar + phosphate
Base & Sugar are held by glycosidic bond.

DNA	RNA
DNA → RNA	RNA → proteins
A/T/G/C	A/U/G/C
deoxyribose Sugar	ribose Sugar
DNA content of a cell is fixed	RNA content of a cell is variable.
DNAase can breakdown DNA	RNA ase can breakdown RNA.
nuclear DNA / extranuclear DNA	mRNA, tRNA, rRNA. (10-80%).
Purine	Pyrimidine
A, G	T, U, C
9 membered ring	6 membered ring.