

A-Level Biology Notes

1st Edition

Author

Dr. Saira

Co-authors

Ibrahim Khalid

Maha Ali

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PREFACE

Biology is a captivating subject that deals with the study of living organisms, their structure, functions, and interactions within ecosystems. A Level Biology is an exciting journey into the world of cells, genetics, ecology, and the applications of biological concepts in various fields.

We are delighted to present this comprehensive AS - Level and A-Level Biology notes, co-authored by Ibrahim Khalid, Maha Ali and authored by Dr Saira. This book provides a lucid and comprehensive grasp of the fundamental principles of Biology and their real-world implications. The content has been meticulously tailored to cater to the requirements of A - Level students and covers a wide array of essential topics, ranging from cellular biology to genetics, ecology, and beyond.

The authors have taken meticulous effort to ensure that the language and presentation of the material are accessible and stimulating, thus rendering the subject more relatable and less daunting. The text is augmented by a plethora of illustrations, diagrams, and instances, aiding students in visualizing and comprehending intricate concepts.

We anticipate that this book will stand as a priceless asset for AS and A Level students, kindling their passion for Biology. We are confident that it will serve as an exceptional resource for both students and educators alike, forming a robust foundation for further exploration in the realm of biology.

We would like to extend our heartfelt appreciation to **Dr Saira** for her invaluable guidance and support during the creation of this book. Our gratitude also goes to **MS Books** for their steadfast commitment to publishing top-tier educational materials.

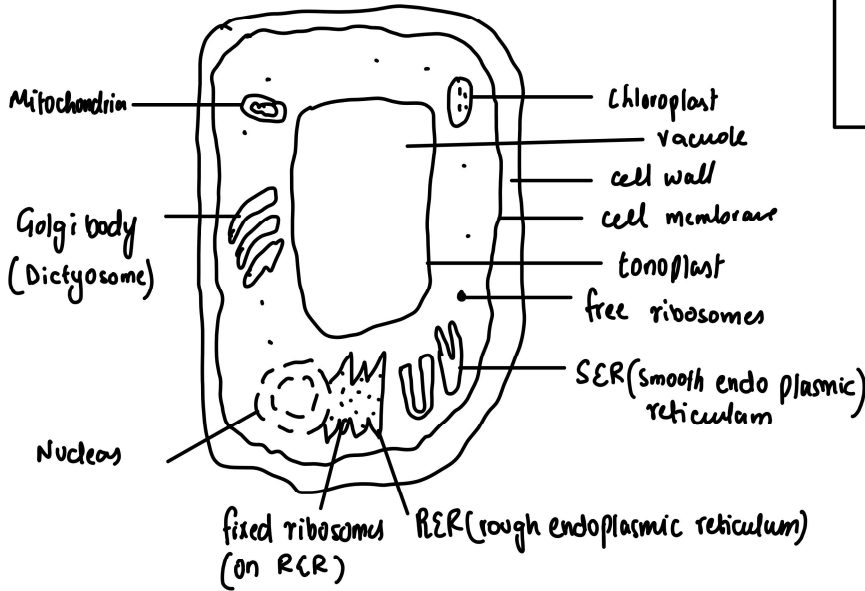
Ibrahim Khalid, Maha Ali and Dr Saira

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CELL STRUCTURE

Plant cell

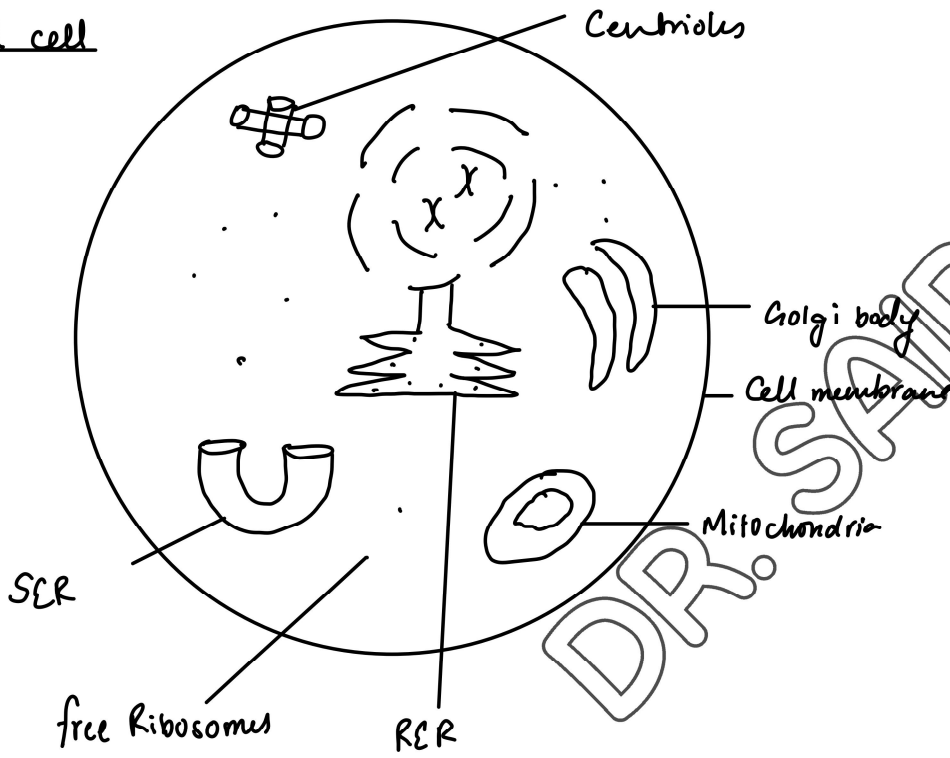


Note: Cell wall is 500 times thicker than cell membrane

1cm = 10mm
 1mm = 1000µm
 1µm = 1000nm

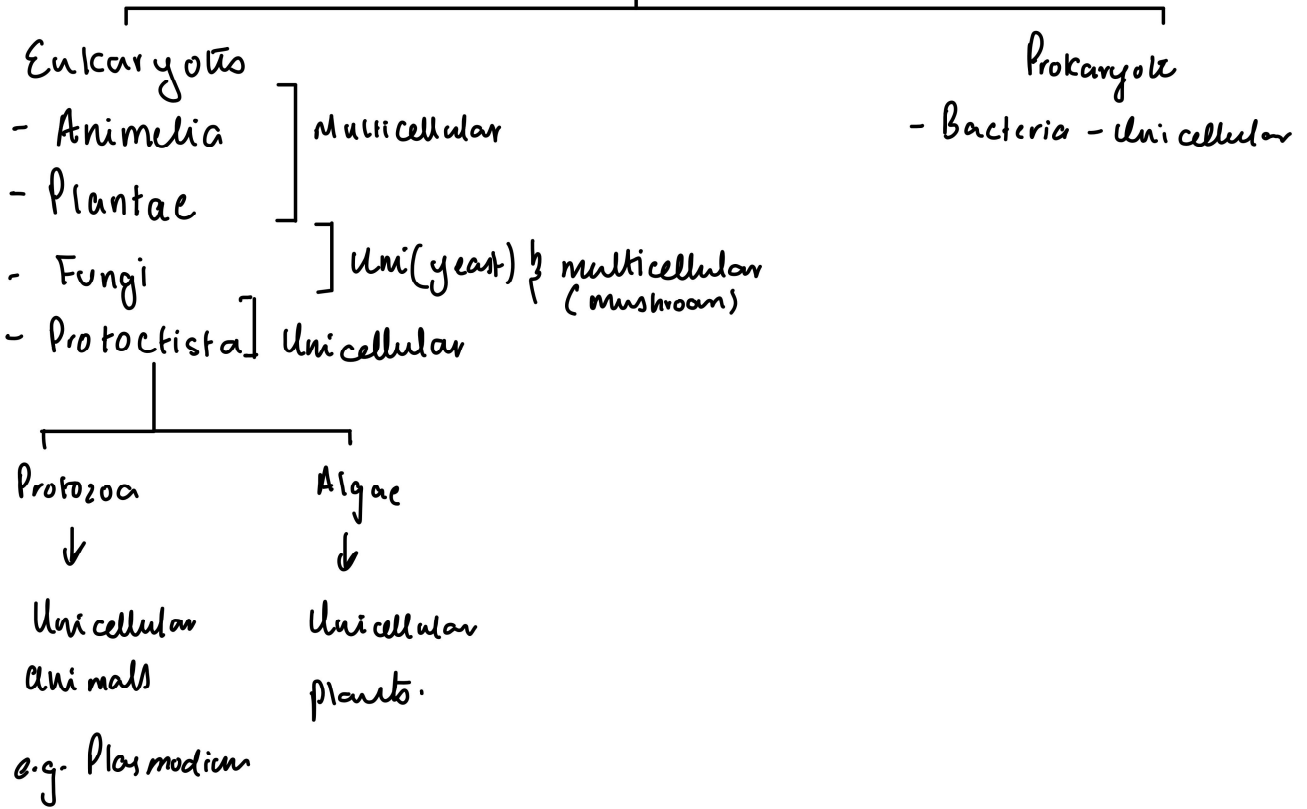
Ribosomes is the site of protein synthesis
 → free ribosomes make protein which is used by the cell itself.
 → fixed ribosomes make protein that are exported out of cell.

Animal cell

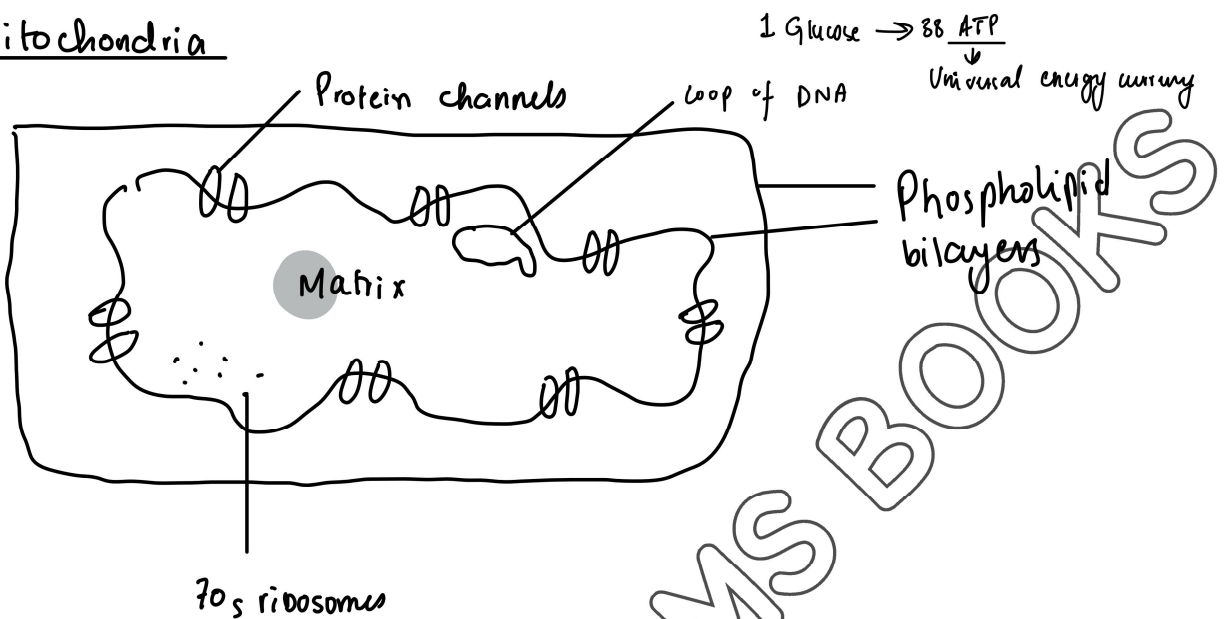


DR. SAPRA

2 Kingdom Classification



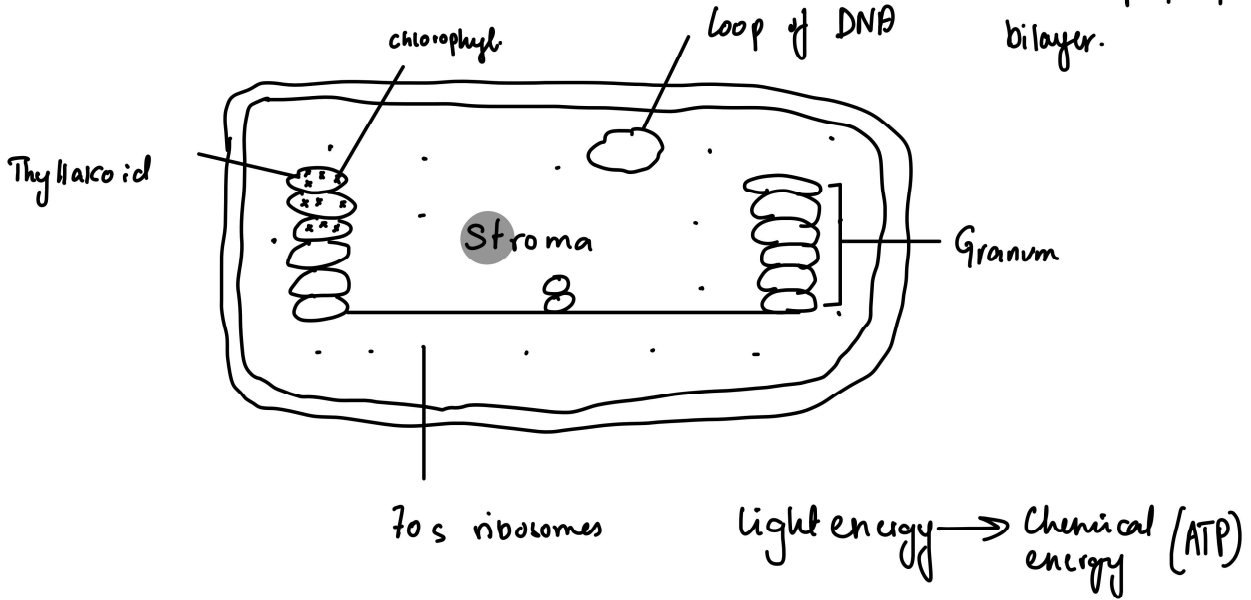
Mitochondria



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Chloroplast

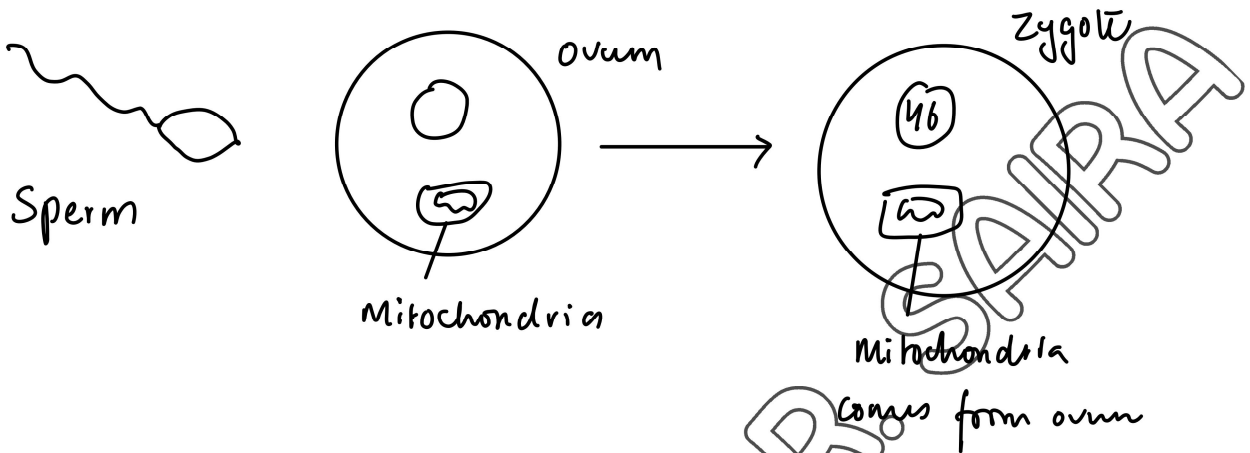
Note: Thylakoid membrane is also a phospholipid bilayer.

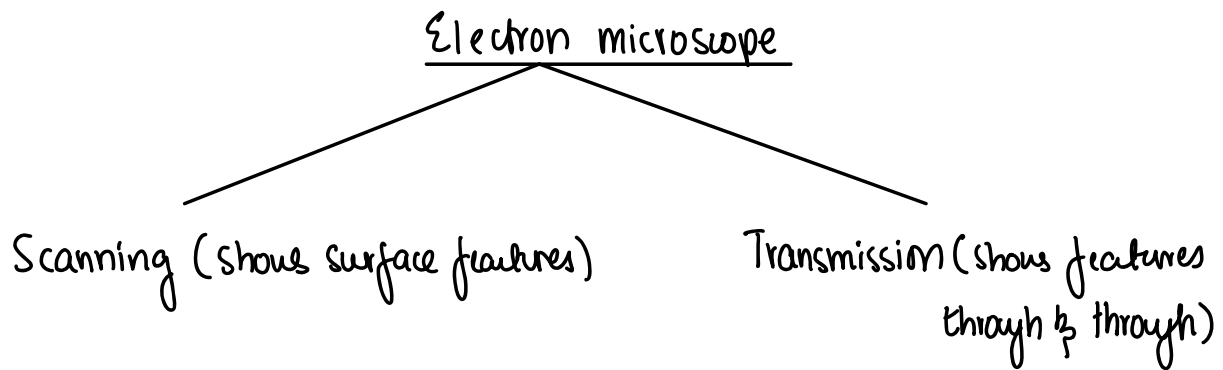


70s ribosome
↓

Svedberg unit (Centrifugation unit)

fixed by free ribosomes → 80s
Mitochondria, Chloroplast & Bacteria → 70s





Photomicrography: Picture that shows what is seen through a microscope.

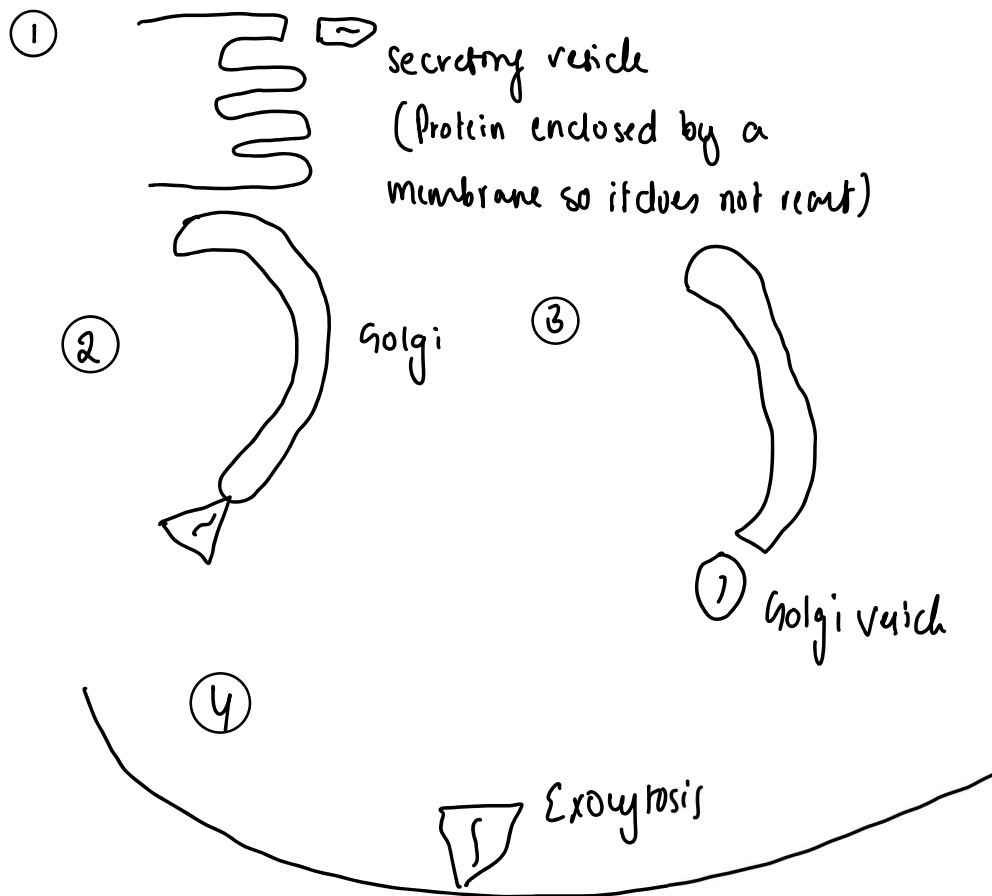
Magnification: Number of times you enlarge/magnify
— Max useful magnification of light microscope is $\times 1500$

Resolution: Ability to distinguish b/w two points
— If something is smaller than half the wavelength of light
i.e. 200nm you are unable to see it.

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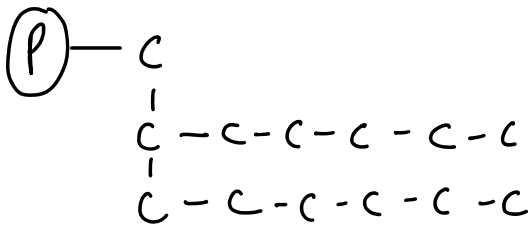
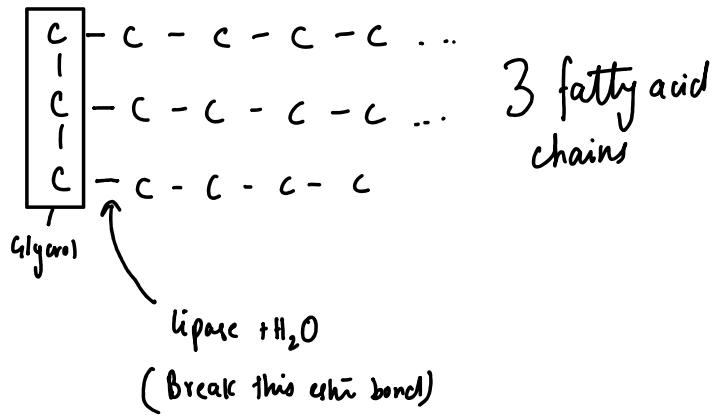
Structure & functions

- ER: Flattened sacs of membranes (cisternae), help in transport of substances within cytoplasm.
- RER: Protein synthesis
- SER: lipid & steroid synthesis
- fixed ribosomes: Extra cellular enzymes
- free ribosomes: Intra cellular enzymes
- Nucleolus: Ribosome synthesis
- Golgi : form golgi vesicles [Modifying, sorting & packing] e.g. Carb + Protein = Glycoprotein
- Lysosome: contain hydrolytic enzymes
 - ↳ Autophagy: purposeful digestion of worn out organelles
 - ↳ Autolysis: lysosome releases enzyme which digests the entire cell
- Nucleus: Synthesis of ribosomes & rRNA, Brain of cell
- Vacuole: Osmoregulation, storage etc.
- Centrioles: Absent in plant cell, A pair is present near nucleus & each is perpendicular to each other, Involved in cell division
- Microtubulus: Centrioles made up of these, provide structural support. Made up of tubulin, Actin filament & Intermediate filament.
- Microvilli: finger like extensions of cell membrane
- Cell wall: Bacteria - peptidoglycan, Fungi - chitin, Plant - cellulose
Provide support, give shape, totally permeable, prevents from bursting.
- Pili: feature of prokaryotes (bacteria use it to transfer substances to one another)
- Plasmodesmata: Cytoplasmic connection b/w two adjacent plant cells. Increase rate of transport b/w two adjacent cells.
* Transfer of water through this is diffusion

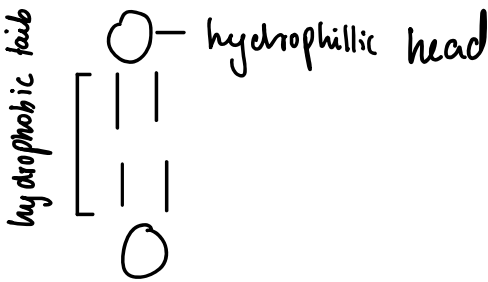


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Phospholipid Bilayer



Phospholipid - one fatty acid chain removed & phosphate attached.



This bilayer does not allow to pass

- ① glucose
- ② Na⁺
- ③ K⁺
- ④ Ca⁺ etc

Only S U M

Small / Uncharged molecules

Can pass through by diffusion

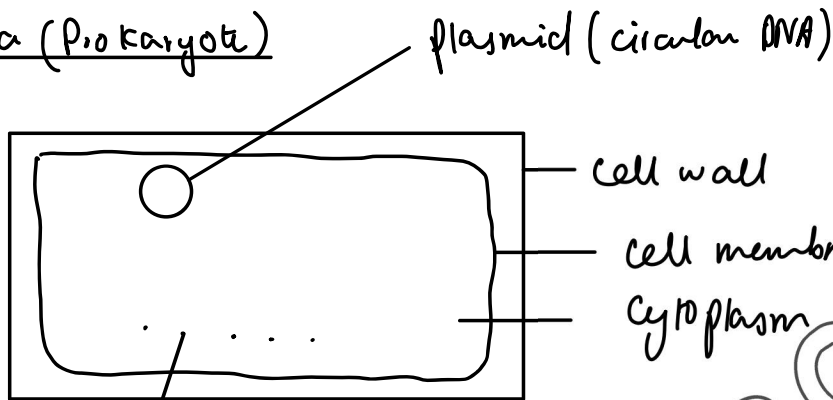
These substances pass through channel proteins by facilitated diffusion.

DR. SAIRA

Size of cell organelles (ascending order)

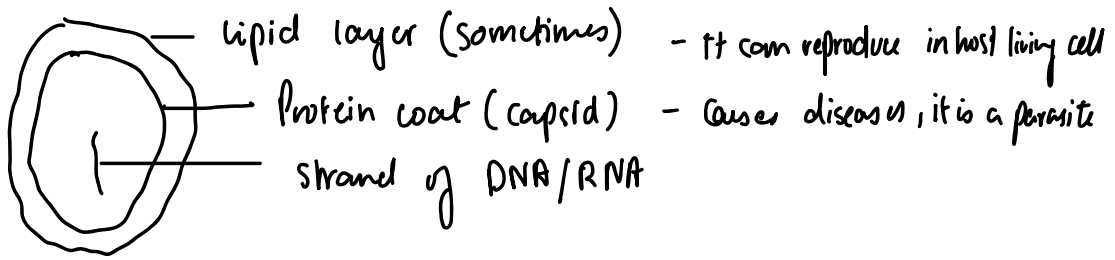
1) Cell membrane	10nm] Not visible under light microscope	
2) Ribosomes	25nm		
3) Microtubules	25nm		
4) Centrioles	200nm		
5) Lysosomes	500nm] Visible under light microscope	
6) Nucleolus	2000nm		2 μm
7) Mitochondrion	2000-5000nm		2.5 - 5 μm
8) Cell wall	5000nm		5 μm
9) Chloroplast	4000 - 10,000nm		4 - 10 μm
10) Nucleus	20,000nm		20 μm

Bacteria (Prokaryote)



- No membrane bound organelle
- Some bacteria surrounded by slimy capsule.

Virus



- Virus injects its DNA into host cell instructing it to make copies. Host's cells enzymes & nucleotides are used. Host cell eventually dies & virus is released.

Prokaryotes

- 0.5 - 5 μ m
- 70s ribosomes - 20nm
- Circular DNA
- Cell wall (peptidoglycin)
- No membrane bound organelles
- Divide by Binary fission.

Eukaryotes

- 40 μ m \rightarrow 25nm
- 80s ribosomes + 70s (mitochondria / chloroplast)
- Linear + Circular DNA
- Cell wall (cellulose if present)
- Membrane bound organelles
- Mitosis, meiosis or spore formation

Organelles/structure

Cell wall

Chloroplast

Mitochondria

found in

Plants - Cellulose, Fungi - Chitin, Bacteria - peptidoglycin
 Plant cell, Protozoa (Algae)
 Eukaryotes