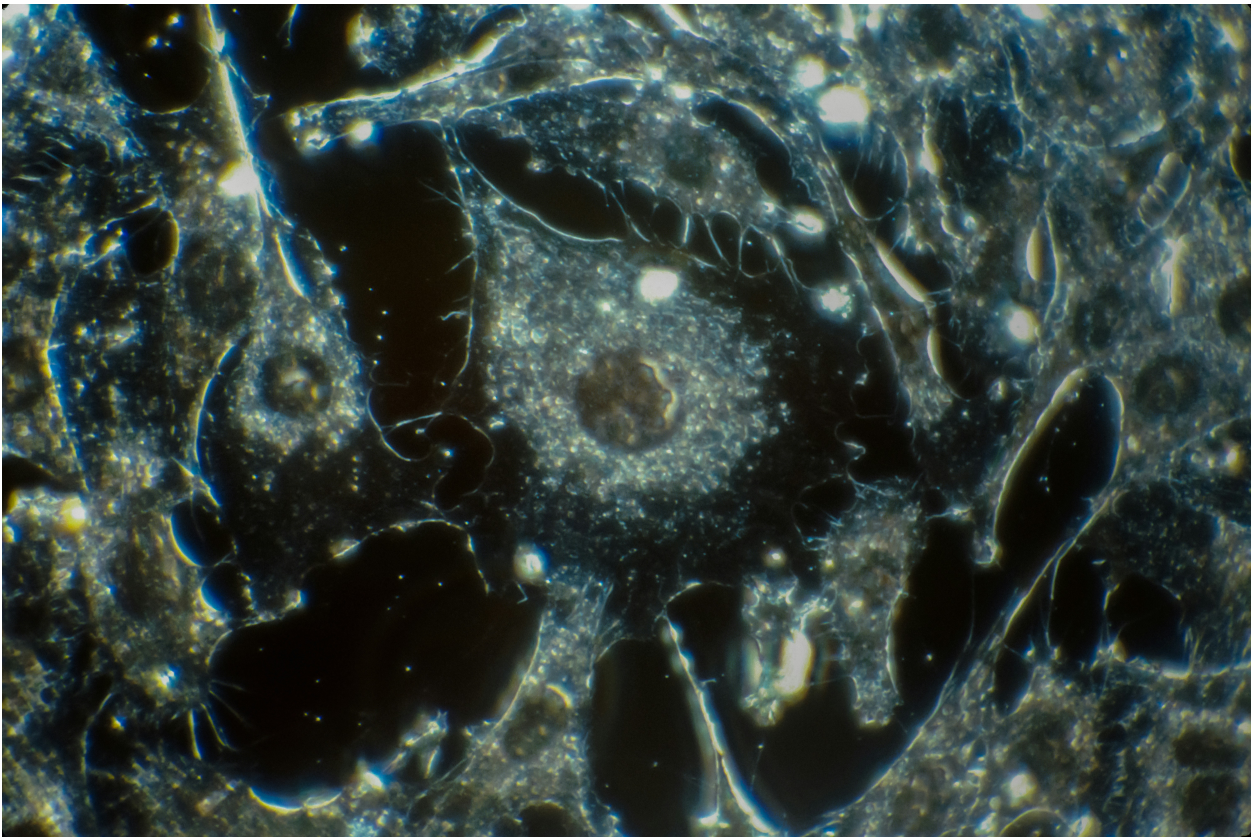




Cell structure

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Structure of nucleus vs chloroplast

Similarities [any 1]:

1. Both of them are bound by double membrane.
2. Both of them contain DNA (and RNA).

Differences [any 1]:

3. Nucleus has linear DNA while chloroplast has circular DNA.
4. Nucleus does not thylakoids while chloroplast has thylakoid membranes inside.
5. Nucleus does not contain ribosomes but chloroplast contain 70S ribosomes.
6. Presence of chlorophyll pigments/photosystems in chloroplasts vs absent in nucleus
7. Nucleus is larger / denser than chloroplast.

AVP:

A outer membrane is continuous with RER, but not B
B has electron carriers / ATP synthase but not A
B has starch grains but not A

▼ Notes

- Structure of nucleus:
 - Surrounded by a double membrane
 - Contains linear DNA
 - A large and dense starch
 - Outer membrane continuous with RER
- Structure of chloroplasts:
 - Surrounded by a double membrane
 - Contains circular DNA
 - Contains 70s ribosomes
 - Consists of thylakoid membranes which consists of chlorophyll, ATP synthesis and electron carriers
 - Consists of starch grain

Why are there more mtDNA than nuclear DNA

- (i) Explain why there are usually more than 100 copies of mtDNA in a cell, but only two copies of nuclear DNA.

..... [2]

1. many mitochondria per cell but only one nucleus ;
2. cell is diploid / has two copies of each chromosome (in nucleus) ;

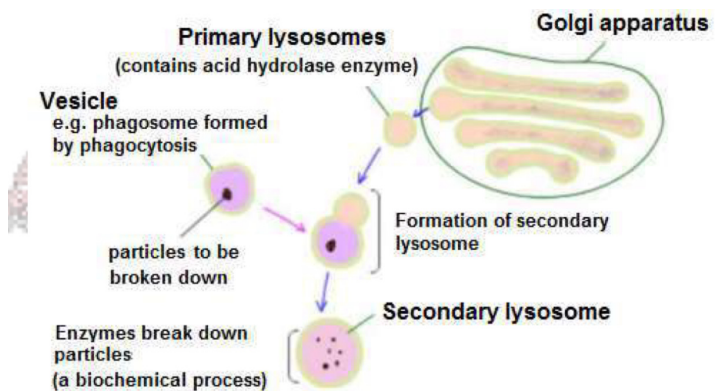
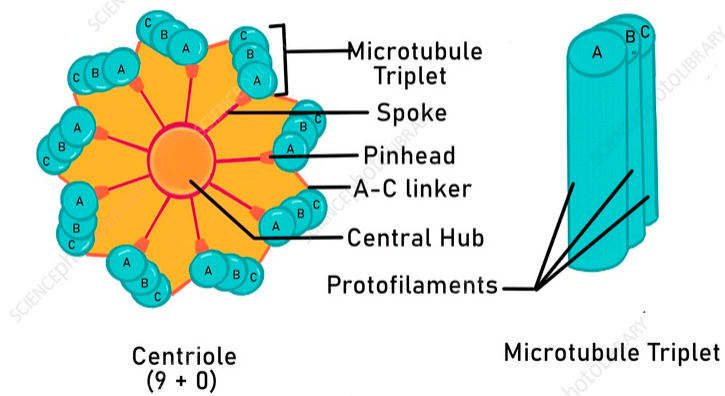
Functions and features of organelles

Organelle	Features	Functions
Mitochondrion	1. Double membrane 2. highly folded inner membranes called cristae	Site of aerobic respiration where ATP synthesis occurs
Rough endoplasmic reticulum	1. Flattened sacs called cristae studded with ribosomes 2. Continuous with outer membrane of nuclear envelope	1. Translation of mRNA to protein/ protein synthesis by bound ribosomes 2. Glycosylation of proteins 3. Transportation of proteins in transport vesicles to Golgi apparatus
Smooth endoplasmic reticulum	1. Consist of tubular network of membranes, cisternae	
Golgi body/ Golgi apparatus	1. stacks of flattened sac of membranes 2. Presence of vesicles at the end of the membrane that uniform in shape	1. To sort and package proteins into different vesicles and target the proteins to different parts of the cell or for secretion 2. To form lysosomes 3. To synthesise polysaccharides which is transported in vesicles to the membrane 4. to glycosylate proteins and lipids to form glycolipids and glycoproteins 5. To modify existing glycoproteins and

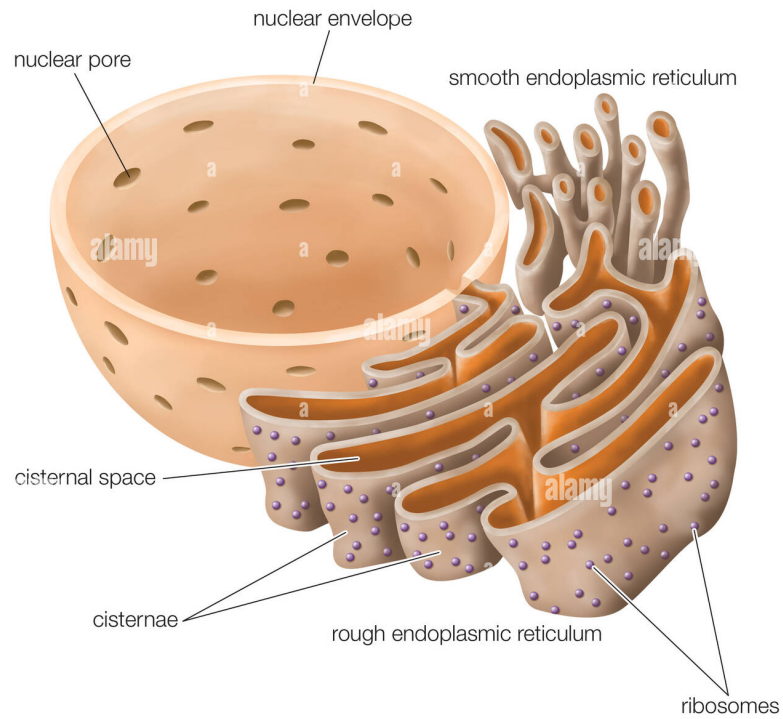
Organelle	Features	Functions
		glycolipids by cleaving sugar chains
Centrioles	A pair of cylindrical, rod like structures which are perpendicular to each other and consists of 9 triplets of microtubules arranged in a ring	1. The two pairs of centrioles move to opposite poles during prophase 2. Becomes a part of the microtubule organising centre in which assembly of spindle fibres occur Which is needed for separation of chromosomes and chromatids in meiosis I and II
Ribosomes	1. Non-membrane bound 2. Composed of rRNA and proteins 3. Consists of large 60s and small subunits 40s 3. Each ribosome has 1 mRNA and 3 tRNA binding sites A,P,E 4. Contains Peptidyl transferase in the large ribosomal unit	
Lysosome		1. Autophagy 2. Autolysis 3. Contain hydrolytic enzymes which hydrolyse extracellular content taken in by endocytosis

Organelle	Features	Functions
Nucleus		Contains DNA where transcription occurs to produce mRNA

CENTRIOLE

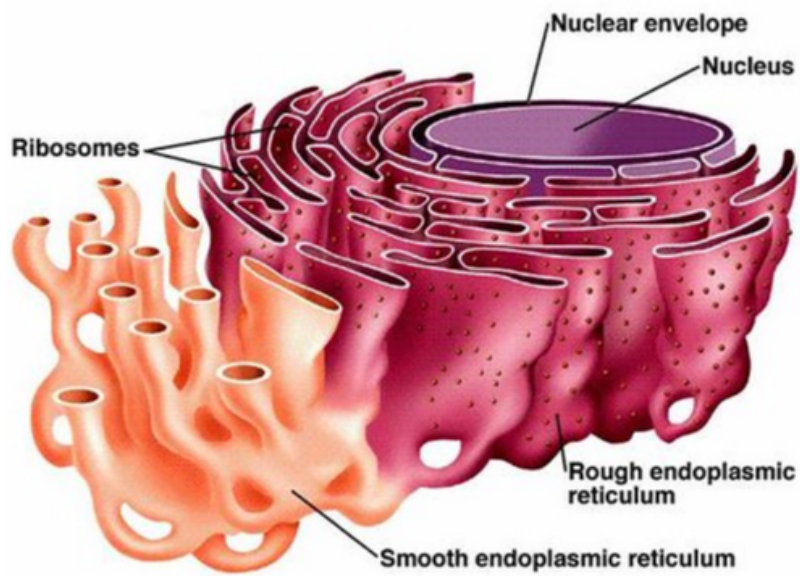


Endoplasmic reticulum

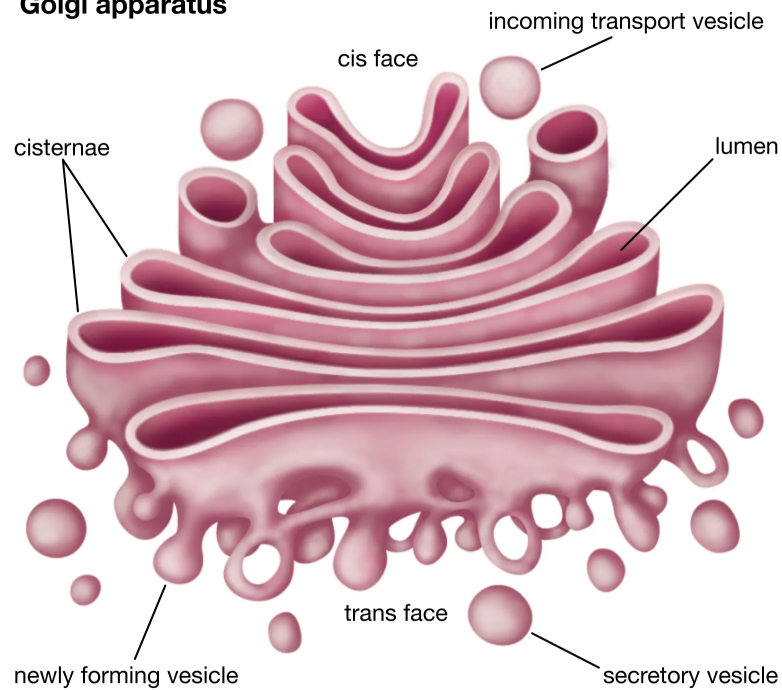


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Golgi apparatus



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Advantages of having membrane bound organelles

- Allows compartmentalisation which allow unique environments to be formed for highly specialised activities such as acidic environment for lysosomes
- Spatial Separation of biochemical processes and thus their sequential operation within a cell such as protein modification in RER and further protein modification sorting and packaging in GA
- Accumulation of ions to high concentration to establish proton gradient for respiration
- Act as surface for chemical reactions to occur in a sequential manner such as the oxidative phosphorylation or chemiosmosis
- Increase surface area for chemical reactions such as cristae in mitochondria to hold more electrons for etc

How are proteins transported in a cell

- Polypeptides are enclosed in a transport vesicle which buds off from the rough endoplasmic reticulum
 - It travels towards the Golgi apparatus and fuses with the cis face of Golgi apparatus where it undergoes chemical modification such as glycosylation and packaging of protein
 - Golgi apparatus targets and sorts the polypeptides and secretory vesicles bud off from the trans face
 - The secretory vesicles move to the cell surface membrane with the help of microtubules/ cytoskeletal elements in the cytoplasm, fuse with cell surface membrane and release polypeptides via exocytosis
-

Explain how and why glycolipids and glycoproteins varies across different membranes in a cell

How:

- contain fatty acid chains of different lengths and degrees of saturation attached to the glycolipid during modifications at the Golgi apparatus (glycolipids only)
- Different arrangements of the carbohydrate chain and different glycosylation patterns during chemical modifications at the Golgi apparatus

Why:

- enables membranes to maintain fluidity allowing embedded membrane proteins to function normally
 - Enables the glycolipids and glycoproteins to bind to a variety of molecules and structures and serve as diverse roles such as cell to cell recognition/adhesion/ cell signalling
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Why is mass of cholesterol in cell surface membrane calculated as a percentage rather than an absolute number

- cell membrane may be of different length/width/size/mass in different organisms

- Allows valid comparisons of values in different animals
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Labelling organelles

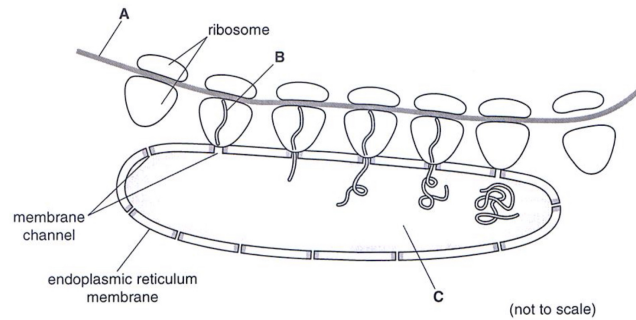


Fig. 1.1

- Empty space in an organelle is called a lumen/ cisternal space
 - C is the lumen of RER
-

Outline main features of cell theory

- The cell is the smallest unit of life
- All known living organisms are made up of cells
- All cells come from pre-existing cells