Cells

The cell is the basic unit of life. Different cells have different functions.

Cell membrane

- Separates and protects a cell from its surrounding environment.
- Partially permeable and controls how substances move in and out of the cell.

Fluid mosaic model is used to describe the structure of the cell membrane. The cell membrane is always moving. The cell membrane is fluid in that phospholipids and proteins are not stationary, but can move rapidly across the surface of the membrane. The cell membrane is a mosaic in that many different protein molecules are randomly scattered and embedded throughout the phospholipid layer.
Due to the nature of the phospholipids, only small hydrophobic molecules can pass through the phospholipid bilayer. Hence, transport proteins are required for hydrophilic or water soluble molecules to pass through the phospholipid bilayer.

Cytoplasm

The components of the cytoplasm include:

1) Cytosol
   Aqueous solution of essential ions, soluble proteins such as enzyme and soluble organic compounds such as sugars or amino acids
2) Cytoskeleton
   Network of protein fibres that give support, mobility and regulation to the cell
3) Organelles

Cell wall

Only found in plant cells, fungi and bacteria
It is **fully permeable**
Made of cellulose(A polymer. Monomer is glucose)
Function:
-To provide mechanical support for plant cells and to the plant, especially for plants with soft stems.
-To resist expansion when water enters by osmosis, ensuring integrity of plant cell and to provide turgidity

Membranous cell organelles

Nucleus

The nucleus is the largest organelle within the eukaryotic cell. It consists of a nuclear envelope which separates the nucleus from the cytoplasm. It also contains the nucleolus which synthesises ribosomes. It contains DNA. The nucleus is found in almost all eukaryotic cells, except for maturated blood cells.

Function: Contains the hereditary material (DNA) and controls activities of the cell

Endoplasmic reticulum

Rough endoplasmic reticulum(RER)	A system of flattened membrane-bound sacs. It appears rough under the electron microscope due to the presence of ribosomes on its surface.	Modifies proteins made by bound ribosomes and transports them to Golgi apparatus via transport vesicles
Smooth endoplasmic reticulum (SER)	Consists of fine tubules	Lipid synthesis, detoxification of drugs and poisons Storage and release of calcium ions

Golgi apparatus

Note: The ¨Golgi¨ must be a capital G
The Golgi apparatus consists of stacks of flattened membrane bound sacs.

Function: The Golgi apparatus chemically modifies the products it receives from the endoplasmic reticulum and packages them before sending them to destinations inside or out of the cell during vesicles.

Lysosomes

Lysosomes are small,spherical vesicles that are surrounded by a single membrane. Lysosomes contain hydrolytic enzymes such as lipases, proteases and nucleases.

Function: To digest materials made in the cell or taken in from outside by phagocytosis, or to digest worn-out organelles in the cell. This process is known as autophagy

Vacuoles

Animal	Fluid-filled sac bound by a single membrane. Formed either by the pinching-off part of the cell membrane, or by enlargement of a vesicle from the Golgi apparatus. It is usually relatively smaller as compared to the plant vacuole, and exists temporarily.	Food vacuoles are formed by phagocytosis(eg. In the case of intracellular digestion by macrophages)
Plant	Very big, central, surrounded by membranes. It occupies over 80% of the cell volume. It is enclosed by a single, partially permeable membrane known as the tonoplast. The vacuole is filled with cell sap, a solution made up of sugars, ions, waste products and pigments.	Storage site for nutrient such as protein storage in seed and inorganic ions eg. K^+ and Cl^- The vacuole is also a disposal site for metabolic by-products that would endanger the cell if they remained in the cytosol. May contain colour pigments

Mitochondria

Mitochondria(plural)
Mitochondrion(singular)
The mitochondria is rod-shaped or cylindrical. It is bounded by a double membrane which provides increased surface area for chemical reactions to take place.

Function: Mitochondria is involved in aerobic respiration.

Release of energy in the form of adenosine triphosphate(ATP) molecules. ATP is the energy used by all living things. Cells which require a constant supply of energy would contain a large number of mitochondria, such as liver and muscle cells.
Do not write ¨produce¨ energy as it implies that energy can be created or destroyed. Energy cannot be created or destroyed.

Chloroplasts

Chloroplasts are bounded by a double membrane. It contains chlorophyll and contains thylakoids and stoma.
Function: Site of photosynthesis

Non-membranous organelles

Ribosomes

Ribosomes are small round structures found in all cells. They may occur as free ribosomes suspended in the cytosol or bound to rough endoplasmic reticulum.

Function: Ribosomes are the sites of polypeptide synthesis. Free ribosomes generally make proteins that will function within the cytosol. Bound ribosomes generally make proteins that are destined for insertion into membranes, for packaging within certain organelles such as lysosomes or for export from the cell.

Centrioles

Centrioles are small hollow cylinders which occur in pairs. They are found in animal cells, but absent in plant cells.
Function: Play a role in cell division in animal cells

Processes in a cell necessary for life

Protein Synthesis

Polypeptide chains are synthesised at the ribosomes and folded at the rough endoplasmic reticulum. Transport vesicles containing substances made by the endoplasmic reticulum pinched off from the ER. These transport vesicles then fuse and release their substances into the Golgi apparatus where they are chemically modified and packaged .
Secretory vesicles containing these modified substances are pinched off from the Golgi apparatus. The secretory vesicles move towards and fuse with the cell membrane, releasing the substances outside the cell by exocytosis.
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Formation of lysosome

Enzyme contents are synthesised on the rough endoplasmic reticulum and transported via transport vesicles to the Golgi apparatus for further processing. A vesicle containing the processed enzymes buds off from the Golgi apparatus, forming a lysosome. The enzymes have to be kept apart from the rest of the cell, or else they would destroy the cell.

Division of labour

Division of labour is the sharing of different functions in an organism among its cells, tissues, organs and systems. It also ensures smooth running and effective working of the different parts in an organism as well as the organism as a whole.
Disadvantages of division of labour: If one part of the system breaks down, the entire system might be unable to function smoothly.