

### Cell theory

1. all living things are made up of cells  
Cells are small because they need to maintain a larger surface area to volume ratio.
2. cells are the smallest most basic unit of life
3. all cells come from pre-existing cells

### Organelles

cell membrane- the cell membrane, provides protection for a cell. It also provides a fixed environment inside the cell, and that membrane has several different functions.

mitochondria- mitochondria produce the energy necessary for the cell's survival and functioning.

cytoplasm- The cytoplasm is responsible for holding the components of the cell and protects them from damage. It stores the molecules required for cellular processes and is also responsible for giving the cell its shape.

nucleus- The nucleus controls and regulates the activities of the cell (e.g., growth and metabolism) and carries the genes, structures that contain the hereditary information.

ribosomes- Ribosomes are minute particles consisting of RNA and associated proteins that function to synthesize proteins.

rough ER - In general, its function is to produce proteins. The rough endoplasmic reticulum has on it ribosomes, which are small, round organelles whose function it is to make those proteins.

smooth ER- The smooth endoplasmic reticulum functions in many metabolic processes. It synthesizes lipids, phospholipids as in plasma membranes, and steroids.

### Organelles (cont)

golgi apparatus- Golgi apparatus, is a cell organelle that helps process and package proteins and lipid molecules, especially proteins destined to be exported from the cell.

vesicles - Vesicles can help transport materials that an organism needs to survive and recycle waste materials. They can also absorb and destroy toxic substances and pathogens to prevent cell damage and infection.

lysosomes- Lysosomes are involved with various cell processes. They break down excess or worn-out cell parts. They may be used to destroy invading viruses and bacteria.

vacuoles- Vacuoles are often used to store materials used for energy production such as starch, fat, or glycogen. Vacuoles and vesicles also transport materials within the cell and form around particles that enter by endocytosis.

chloroplast- Chloroplasts are plant cell organelles that convert light energy into relatively stable chemical energy via the photosynthetic process.

cell wall- The cell wall surrounds the plasma membrane of plant cells and provides tensile strength and protection against mechanical and osmotic stress. It also allows cells to develop turgor pressure, which is the pressure of the cell contents against the cell wall.

flagella- The primary function of a flagellum is that of locomotion, but it also often functions as a sensory organelle, being sensitive to chemicals and temperatures outside the cell.

### Cellular transport

Cellular Transport: the movement of ions and molecules across membranes. Cells must take up nutrients from the environment and export waste products. The two major types of cellular transport are passive transport and active transport.

### Passive Transport

simple diffusion- Simple diffusion is the movement of molecules through a cell membrane without using the channels formed by integral membrane protein. In the cell, examples of molecules that can use simple diffusion to travel in and out of the cell membrane are water, oxygen, carbon dioxide, ethanol and urea. They pass directly through the cell membrane without energy along the concentration gradient.

osmosis- Osmosis is the spontaneous net movement of solvent molecules through a selectively permeable membrane into a region of higher solute concentration, in the direction that tends to equalize the solute concentrations on the two sides. An example of osmosis is feeling thirsty after having salty foods.

facilitated diffusion- Facilitated diffusion is the process of spontaneous passive transport of molecules or ions across a biological membrane via specific transmembrane integral proteins. The transport of glucose and amino acid from the bloodstream into the cell is an example of facilitated diffusion.

### Active Transport

Primary active transport- Primary active transport, also called direct active transport, directly uses chemical energy to transport all species of solutes across a membrane against their concentration gradient.



### Active Transport (cont)

Secondary active transport- Secondary active transport is a form of active transport across a biological membrane in which a transporter protein couples the movement of an ion down its electrochemical gradient to the uphill movement of another molecule or ion against a concentration/electrochemical gradient.

Endocytosis- Endocytosis is a cellular process in which substances are brought into the cell. The material to be internalized is surrounded by an area of cell membrane, which then buds off inside the cell to form a vesicle containing the ingested material.

Exocytosis- Exocytosis is a form of active transport and bulk transport in which a cell transports molecules out of the cell. As an active transport mechanism, exocytosis requires the use of energy to transport material.

### Water Potential

The formula for calculating water potential is  $\Psi = \Psi_S + \Psi_P$ .

$\Psi$  = water potential

$\Psi_0$  = reference correction

$\Psi_{pi}$  = solute potential

$\Psi_p$  = pressure component

$\Psi_s$  = gravimetric component

$\Psi_v$  = potential due to humidity

$\Psi_m$  = potential due to matrix effects

Water potential is the potential energy of water per unit volume relative to pure water in reference conditions. Water potential quantifies the tendency of water to move from one area to another due to osmosis, gravity, mechanical pressure and matrix effects such as capillary action.

### Prokaryotic vs. Eukaryotic

One chromosome is present, but not true chromosome plastids	Eukaryotic cells contain membrane-bound organelles, such as the nucleus, while prokaryotic cells do not.
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Unicellular	Multicellular
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Prokaryotes are organisms that consist of a single prokaryotic cell.	Eukaryotic cells are found in plants, animals, fungi, and protists.
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