

The **cell theory** proposed by Schleiden and Schwann in 1838 states that:

- All living things are composed of one or more cells.
- Cells are the basic units of structure and function in living things. It is the smallest form of life.
- All cells come from preexisting cells

**Basic Cell Structures** – most cells have:

- Cell membrane or outer boundary of the cell
- The nucleus or the control center
- Cytoplasm or material between the cell membrane and the nucleus and holds the organelles

**Prokaryotes** - Organisms whose cells lack nuclei

**Eukaryotes** - Organisms whose cells contain nuclei

<b>Name</b>	<b>Function</b>	<b>Made up of</b>	<b>Location</b>	<b>Present in</b>
<b>Cell membrane</b>	Regulates what enters and leaves the cell; also aids in protection and support of the cell	Lipids, proteins and carbohydrates	Boundary of the cell	Plants & Animals
<b>Cell wall</b>	Protect and support the cell	Pectin, cellulose and lignin.	Outside the cell membrane	Plants, algae and bacteria
<b>Nucleus</b>	Information center of the cell; controls functions of the cell	DNA, RNA, proteins and two membranes	Center of the cell	Plants & Animals
<b>Nuclear envelope</b>	Protects the nucleus and transfers substances	Protein and double membrane	Around nucleus	Plants & Animals
<b>Nucleolus</b>	Indirect role in making proteins	RNA and proteins	Within nucleus	Plants & Animals
<b>Chromosome/ Chromatin</b>	Passes the genetic information to each new generation of cells	DNA and proteins	Within nucleus	Plants & Animals
<b>Cytoplasm</b>	Holds organelles in place; maintains the shape and consistency of the cell	Organelles, vacuoles, cytoskeletons and membranes	Between the cell membrane and nucleus	Plants & Animals

### Cytoplasmic Organelles:

A tiny structure that performs specialized functions in a cell.

<b>Name</b>	<b>Function</b>	<b>Made up of</b>	<b>Location</b>	<b>Present in</b>
<b>Mitochondria</b>	Produces energy for cell to use	Two special membranes	Cytoplasm	both plant and animal cell
<b>Chloroplasts</b>	Traps energy from sunlight and converts it to chemical energy	Three membranes – one of which changes the radiant energy to chemical energy	Cytoplasm	Plant cells and algae
<b>Ribosomes</b>	Makes proteins	RNA and protein	Some are attached to membranes (chloroplast, mitochondria and ER) and some are free in cytoplasm	both plant and animal cell
<b>Endoplasmic reticulum (ER)</b>	Transport materials through the inside of the cell and synthesis of proteins	Membranes, proteins, special enzymes and chemicals	Cytoplasm	both plant and animal cell
<b>Golgi apparatus</b>	Modifies, collects, packages, and distributes molecules	Flattened stack of membranes	Cytoplasm	both plant and animal cell
<b>Lysosomes</b>	Breaking down or digesting foreign materials	Small membrane that contains chemicals and enzymes	Cytoplasm	Animal cells
<b>Vacuoles</b>	Stores materials such as water, salts, proteins and carbohydrates	Saclike structure filled with liquid	Cytoplasm	both plant and animal cell
<b>Plastids</b>	Storage of food and pigments	Chloroplast, leukoplast, and chromoplasts	Cytoplasm	Plant cells
<b>Cytoskeleton</b>	Movement	Filaments and fibers	Cytoplasm	both plant and animal cell

### **Transport of materials through the cell membrane:**

- **Passive Transport** – molecules move from areas of higher concentration to areas of lower concentration.
  - Diffusion
  - Osmosis
  - Facilitated Diffusion
- **Active Transport** – requires energy to move materials across a cell membrane against a concentration difference.

### **Levels of organization and Cell specialization:**

The **levels of organization** (developed by biologists) in a multi-cellular organism include: cells, tissues, organs and organ systems that make up the organism.

The design and shape of a cell is very much dictated by its function and the conditions under which it works. Cells uniquely suited to perform a particular function within the organism are called **cell specialization**.