The Cell Theory

The cell theory: one of the fundamental principles of modern biology, was not formulated until after the invention of the microscope in the seventeenth century.
For all organisms the cell is the basic unit of structure. The scientists Schlieden and Schwann (1838-1839) they are suggested three basic features that :

1. All organisms consist of one or more cells.
2. The cell is the basic unit of life in all living things.
3. All cells arise from pre-existing cells by division.

Modern Cell Theory consists of the 3 basic components of cell theory, plus 4 additional statements:

4. The cell pass information from cell to cell during cell division using DNA.
5. All cells have basically the same chemical composition and metabolic activities.
6. All cells have basically the same chemical and physiological functions (movement, digestion, etc).
7. Cell activity depends on the activities of structures within the cell (organelles, nucleus, plasma membrane).

The shape and description of cells:

The cell: is the major structural and functional unit of biology. most chemical reactions take place within cells.
Types of cells: Cells can be subdivided into the following subcategories:
1.**Prokaryotes:** The simplest type of cells were the first type of cells that formed on Earth.
2. **Eukaryotes:** The much more complex, type of cell. Like prokaryotic cells, eukaryotic cells have cell membranes, cytoplasm, ribosomes, and DNA. There are many more organelles within eukaryotic cells. Cell walls can also be found surrounding some types of eukaryotic cells.

Most eukaryotic organisms are multicellular. This allows the eukaryotic cells within the organism to become specialized. There are a few unicellular eukaryotes as well. Eukaryotes may use either asexual or sexual reproduction depending on the organism's complexity. Eukaryotic organisms include all animals, plants, protists, and fungi.

Animal cells in particular come in all kinds of shapes and sizes. Plant cell shapes tend to be quite similar to each other because of their rigid cell wall. We can learn a lot about what a cell does by looking at its shape and size, and microscopes are the ideal tool for this.

Cells within the same organism show enormous diversity in :

1- Size.
2- Shape.
3- Internal organization.

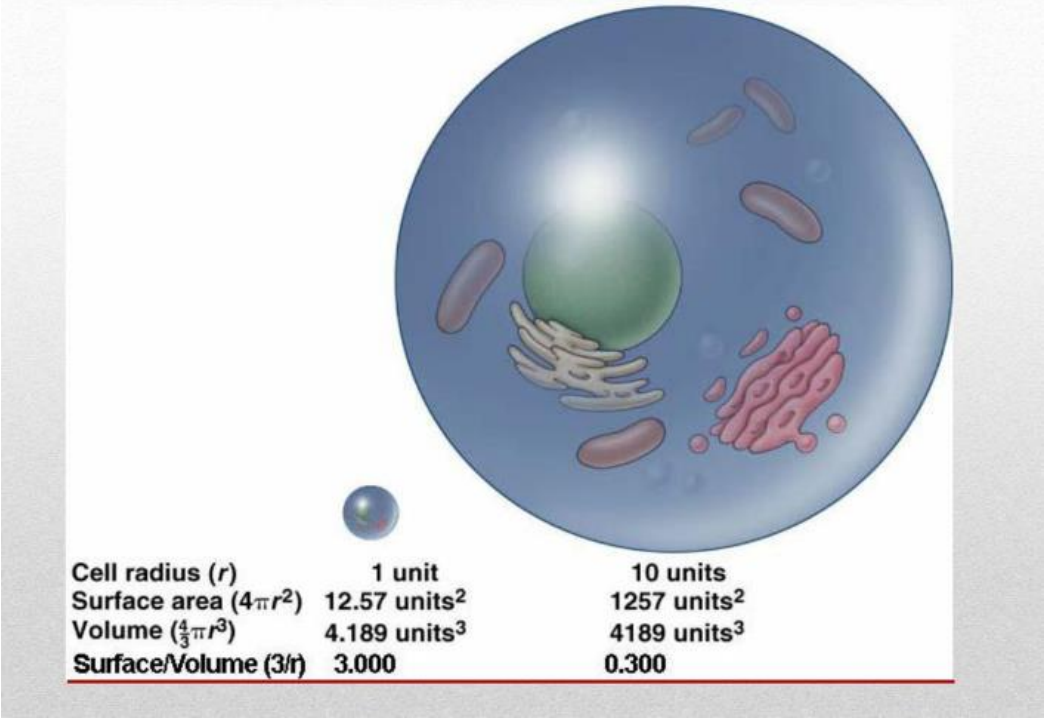
A few types of cells are large enough to be seen by naked eye. The human egg is the largest cell in the body, and can be seen without microscope.

The cell size:

Most cells are small for two main reasons:

a- The cell's nucleus can only control a certain volume of active cytoplasm.
b- Limited in size by the **Ratio** between their outer surface area and their volume. A small cell has more **Surface area** than a large cell for a **Given Volume** of cytoplasm.

The smallest cells are known bacteria called Mycoplasma which diameters of between 0.1-1 µm. most bacteria are 1-10 µm in diameter. Eukaryotic cells are 10 -100 µm.



Cell radius (r)	1 unit	10 units
Surface area ($4\pi r^2$)	12.57 units^2	1257 units^2
Volume ($\frac{4}{3}\pi r^3$)	4.189 units^3	4189 units^3
Surface/Volume (3/r)	3.000	0.300

The cell shape:

The shape of a cell depends on its function. Cells have different shapes because they do different things. Each cell type has its own role to play in helping our bodies to work properly, and their shapes help them carry out these roles effectively.

The following cell types all have unusual shapes that are important for their function.

1)**The muscle cells** have a special structure which represented by the actin and myosin filament that perform special function (muscular contraction).

2)**The fatty connective tissues** have a large space in the cytoplasm which permit a formation of large fat drop in it and these cells perform special function (storage fatty energy and thermal barrier)

3)**The nervous cells** in the brain and nervous system, they have astral shape due to presence of branches which called dendrites, Their job is to carry electrical messages all the way from the brain to the rest of the body and back (almost like electrical wire).

4)**The photoreceptor cells** (rods and cones) are cells in the eye that detect light.

5)**The immune cells** are cells that respond when the body is infected (by a bacterium, for instance). To do their job, they need to be able to change shape.