

THE BASIC STRUCTURE OF A CELL

BIOLOGY A MODERN APPROACH

3

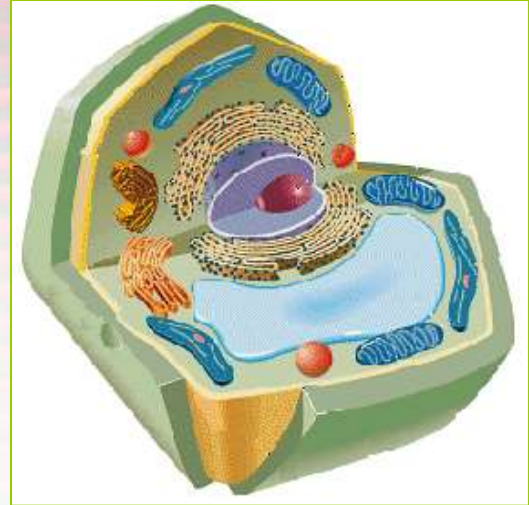


Introduction

- **Cells are the basic units of organisms**
 - **Cells can only be observed under microscope**
- **Two basic types of cells:**



Animal Cell



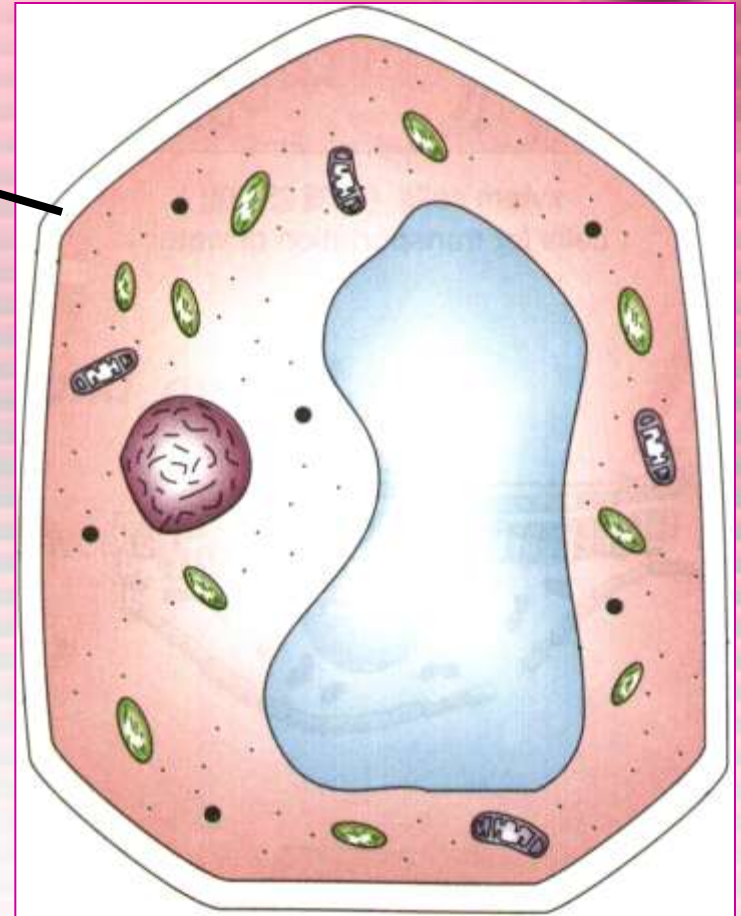
Plant Cell



THE BASIC STRUCTURE OF A CELL

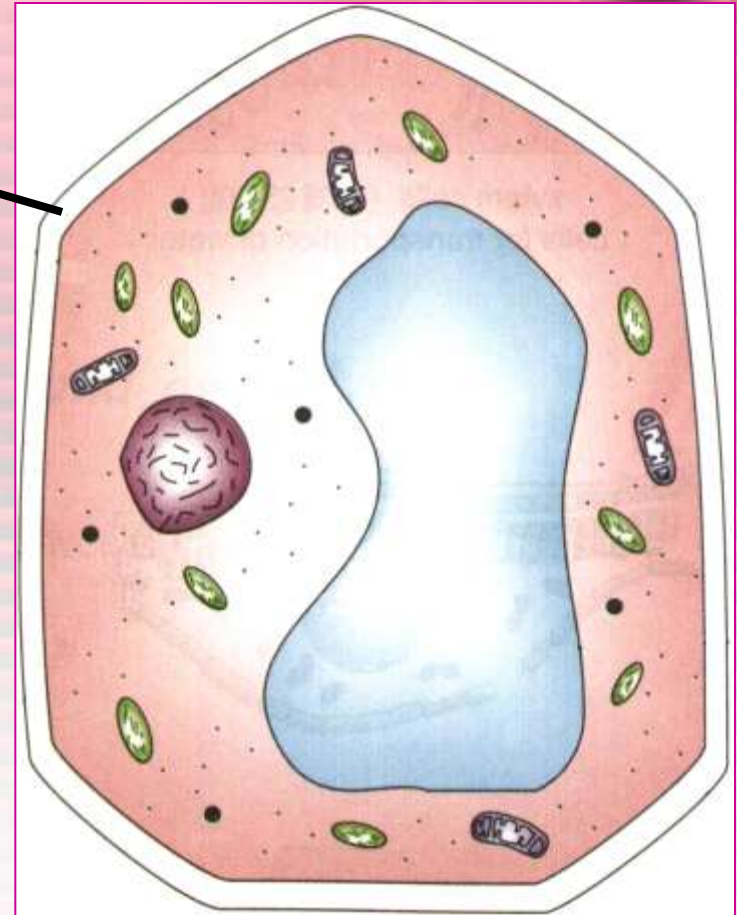
Plant Cell

- **Cell wall**
 - Made of cellulose which forms very thin fibres
 - Strong and rigid
 - In plant cells only



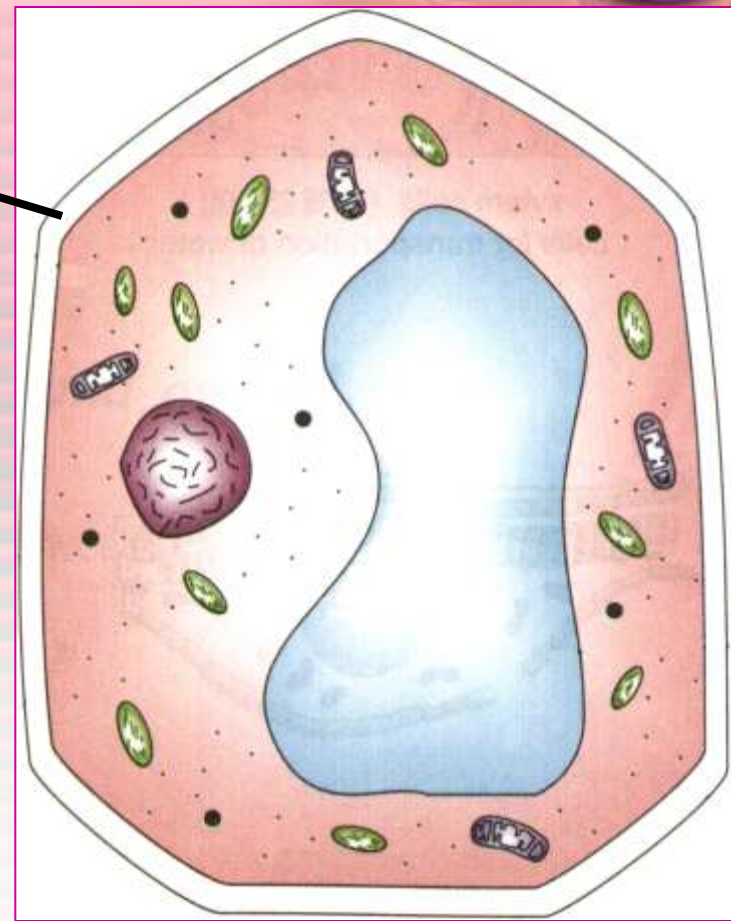
Plant Cell

- **Cell wall**
 - **Protect and support the enclosed substances (protoplasm)**
 - **Resist entry of excess water into the cell**
 - **Give shape to the cell**



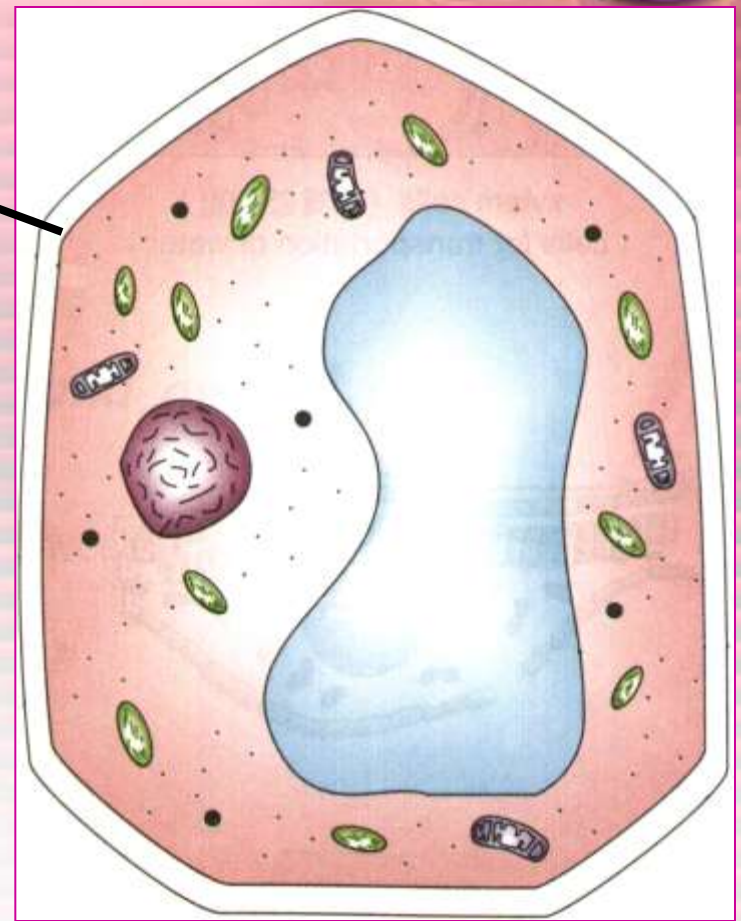
Plant Cell

- **Cell wall**
 - A dead layer
 - Large empty spaces present between cellulose fibres
 - ∴ **freely permeable**



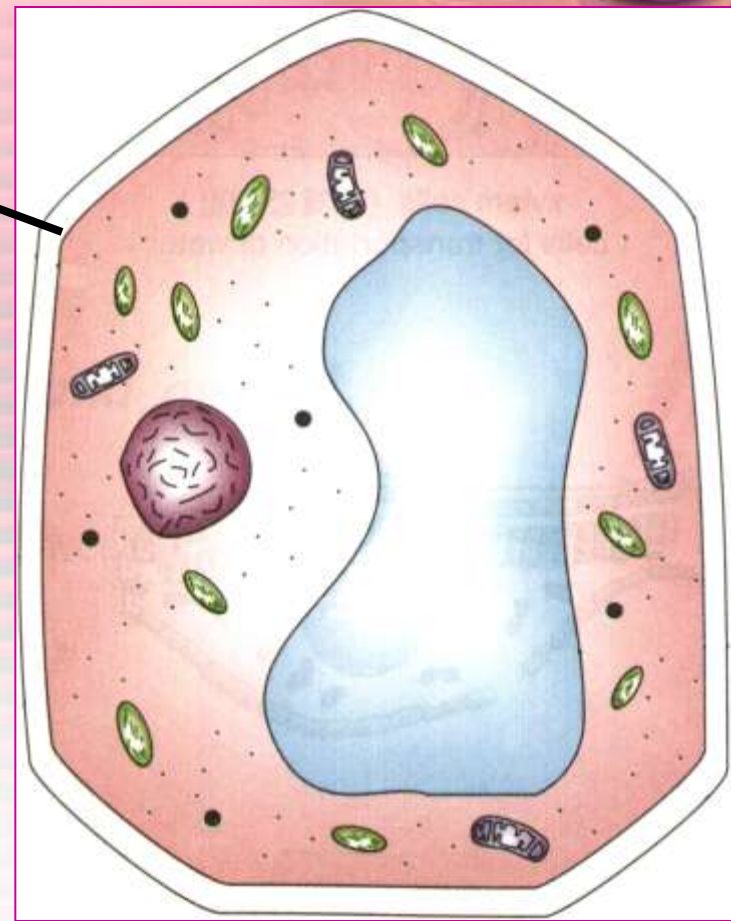
Plant Cell

- **Cell membrane**
 - Lies immediately against the cell wall
 - Made of protein and lipid ∴ Selectively permeable



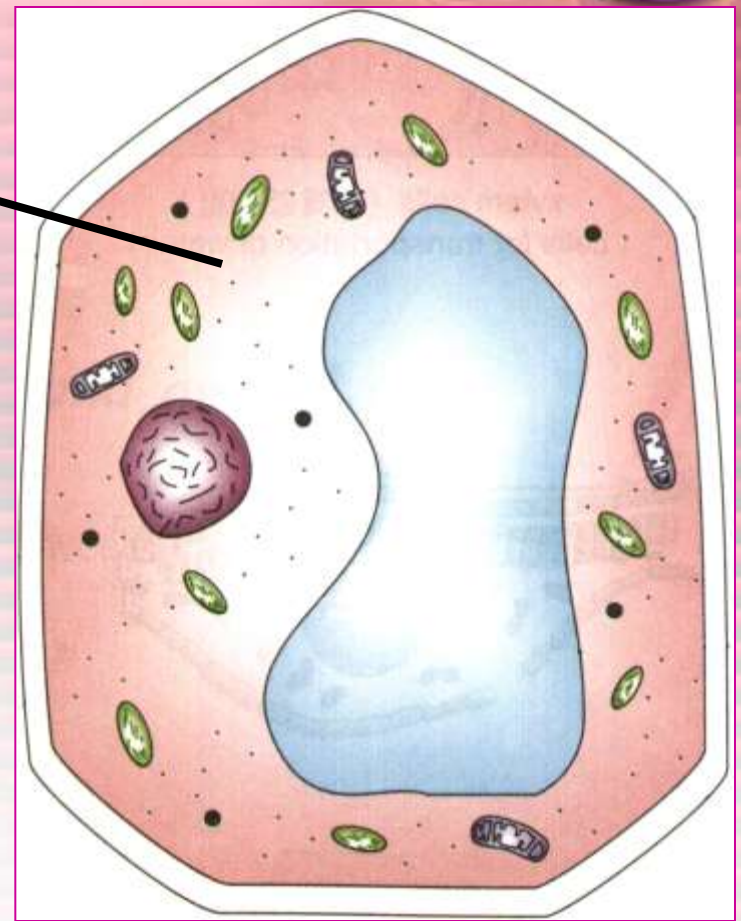
Plant Cell

- **Cell membrane**
 - **A living layer**
 - **Can control the movement of materials into and out of the cell**



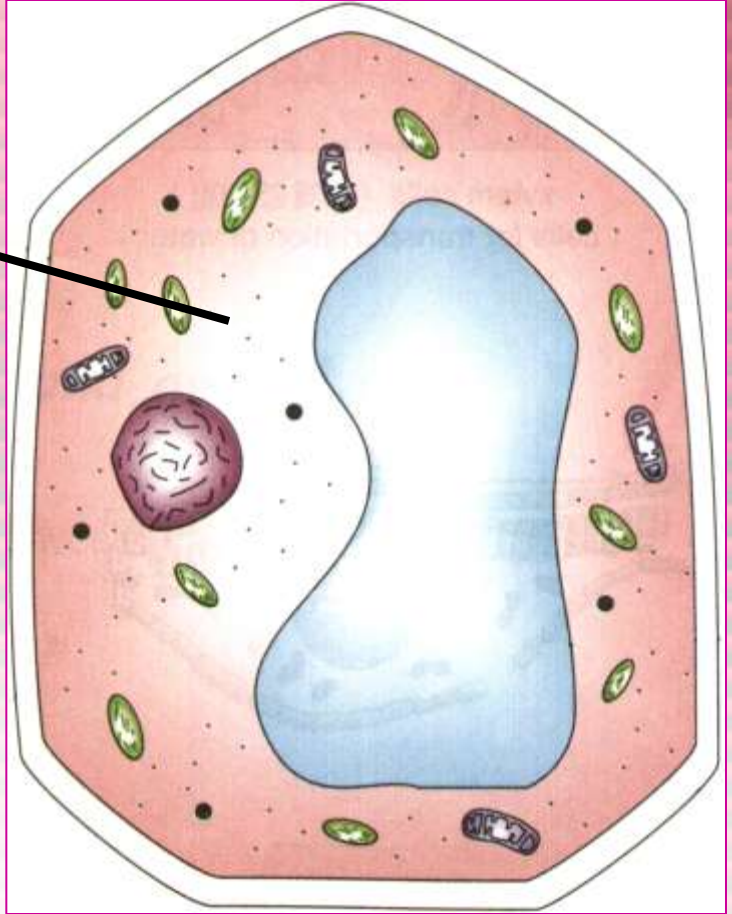
Plant Cell

- **Cytoplasm**
 - **Jelly-like substance enclosed by cell membrane**
 - **Provide a medium for chemical reactions to take place**



Plant Cell

- **Cytoplasm**
 - **Contains organelles and granules :**
 - **e.g. chloroplast**
 - **e.g. mitochondrion**



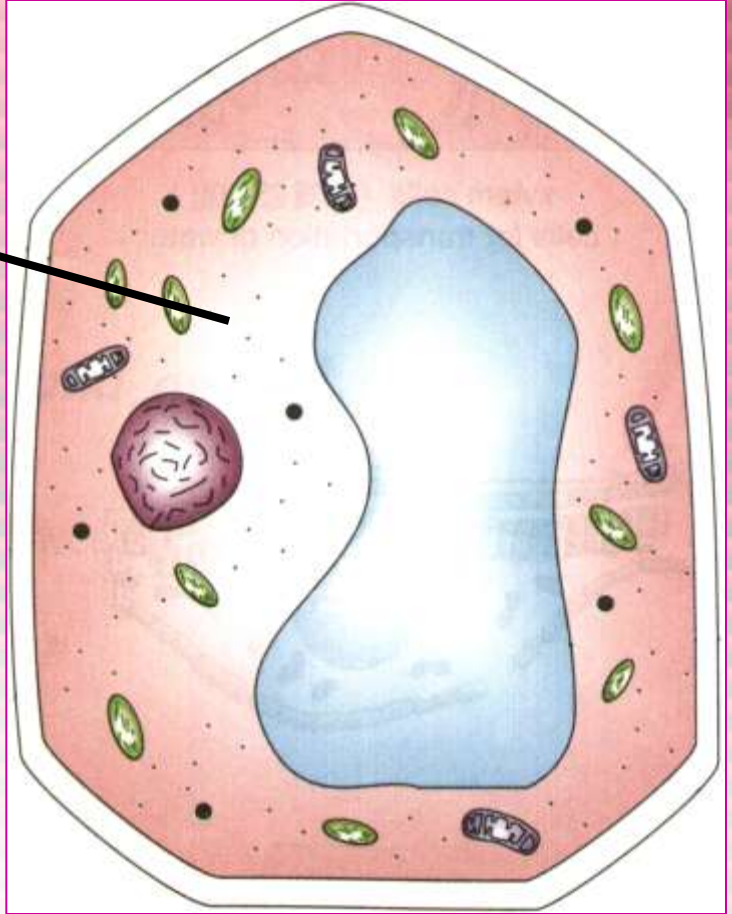
Organelles

- ✈ **very small size – can only be observed under electron microscope**
- ✈ **has specific functions**
- ✈ **in cytoplasm**



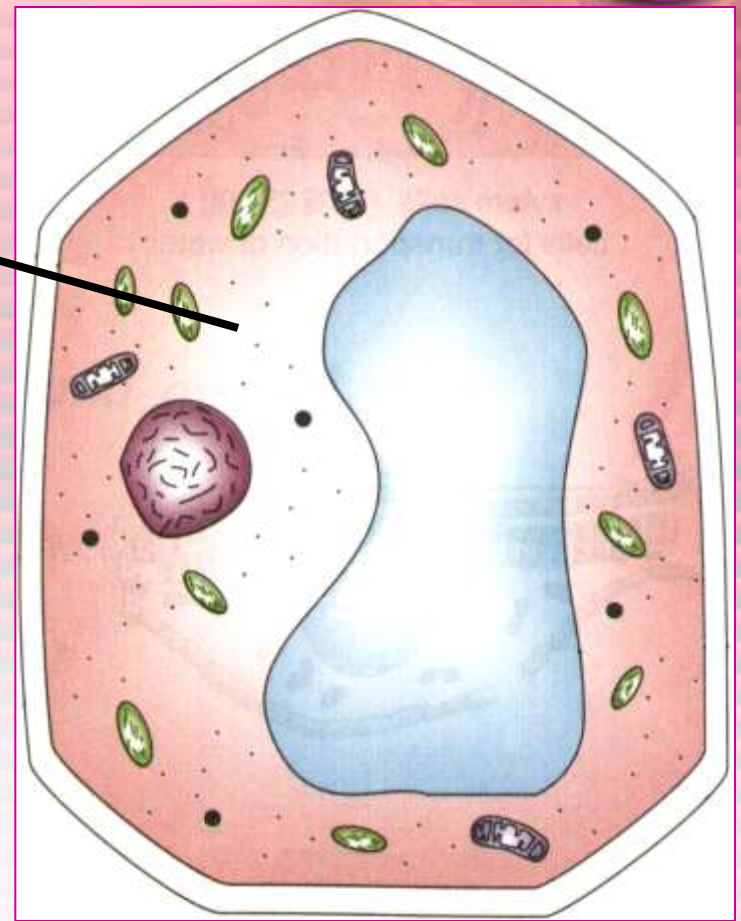
Plant Cell

- **Chloroplast**
 - **Contain the green pigment chlorophyll**
 - **To trap light energy, to make food by photosynthesis**



Plant Cell

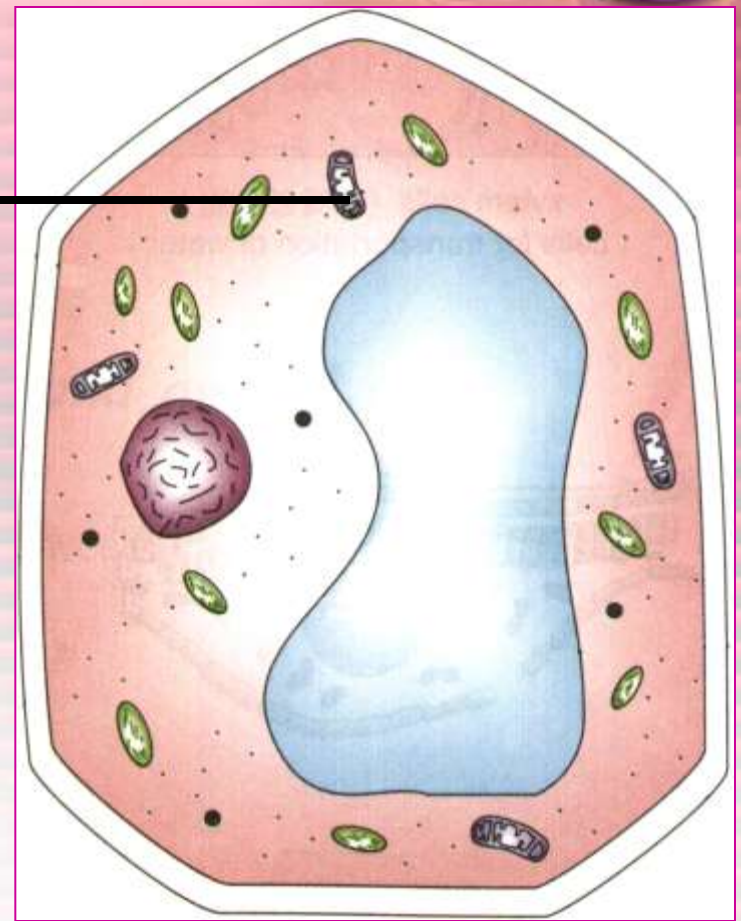
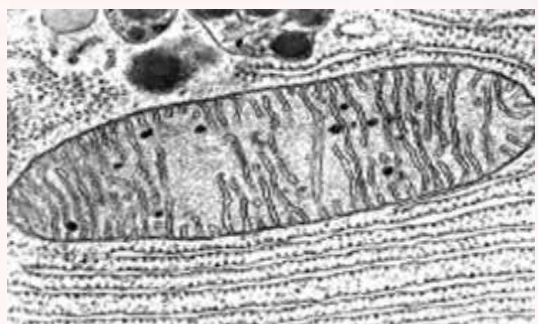
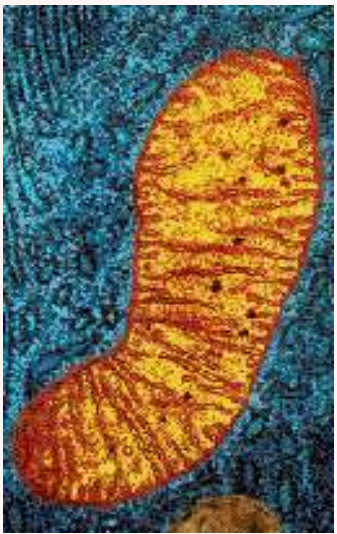
- **Chloroplast**
 - **Contain starch grains**
(products of photosynthesis)



Plant Cell

- **Mitochondrion (mitochondria)**

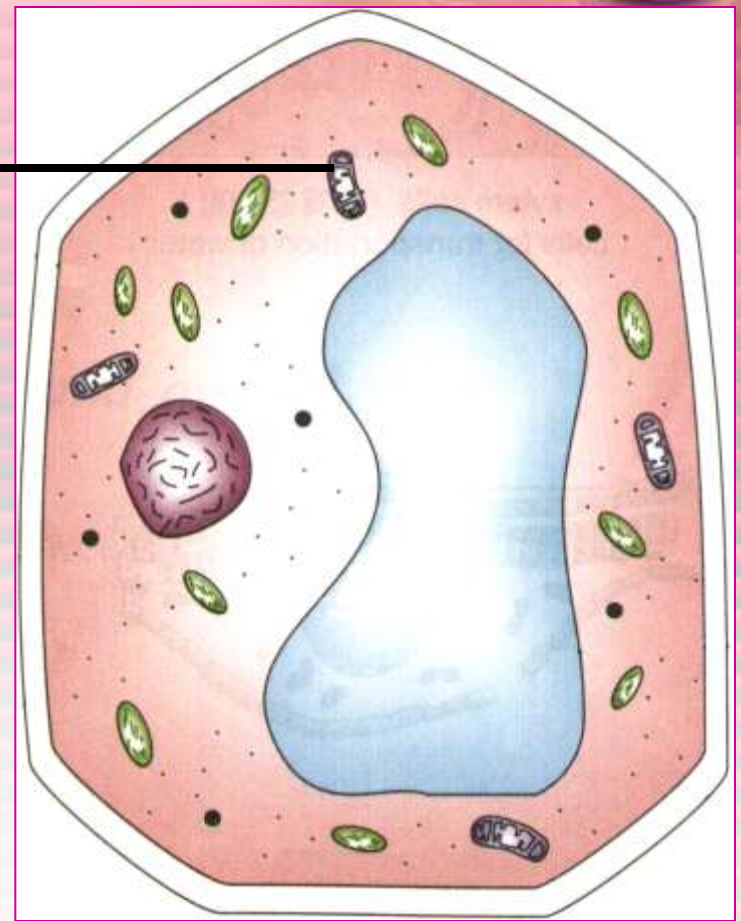
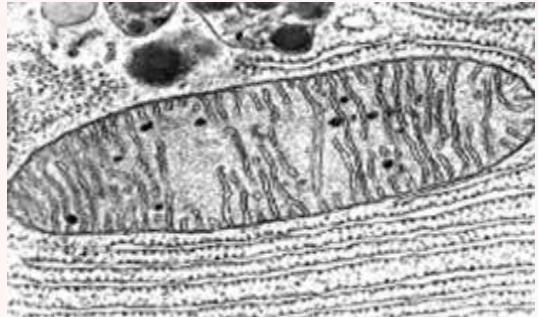
- **Rod shape**
- **For respiration**



Plant Cell

- Mitochondrion (mitochondria)**

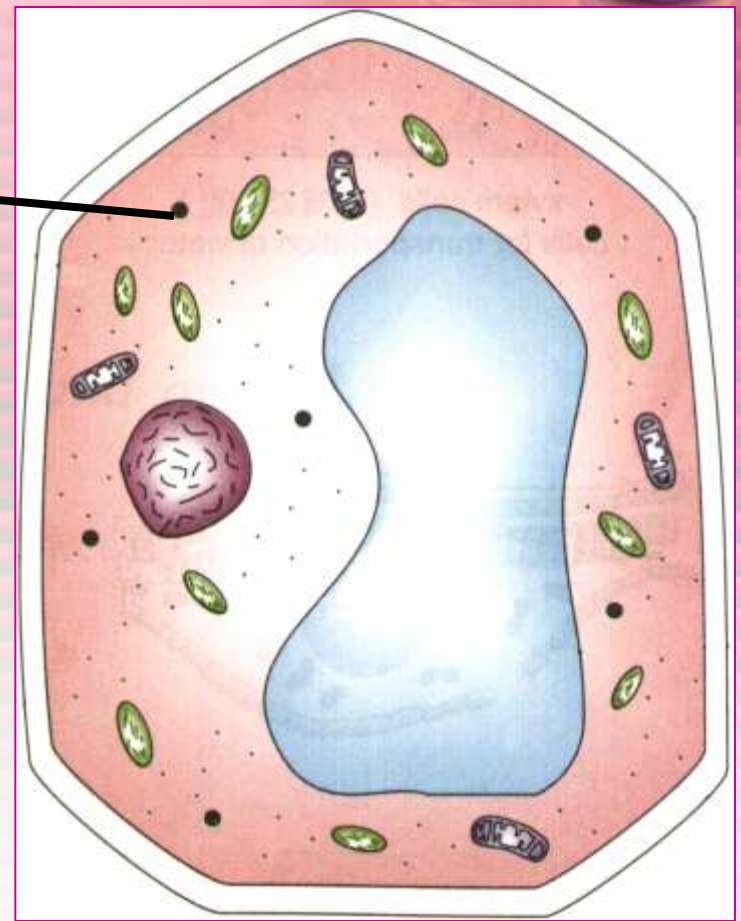
– Active cells (eg. sperms, liver cells) have more mitochondria



THE BASIC STRUCTURE OF A CELL

Plant Cell

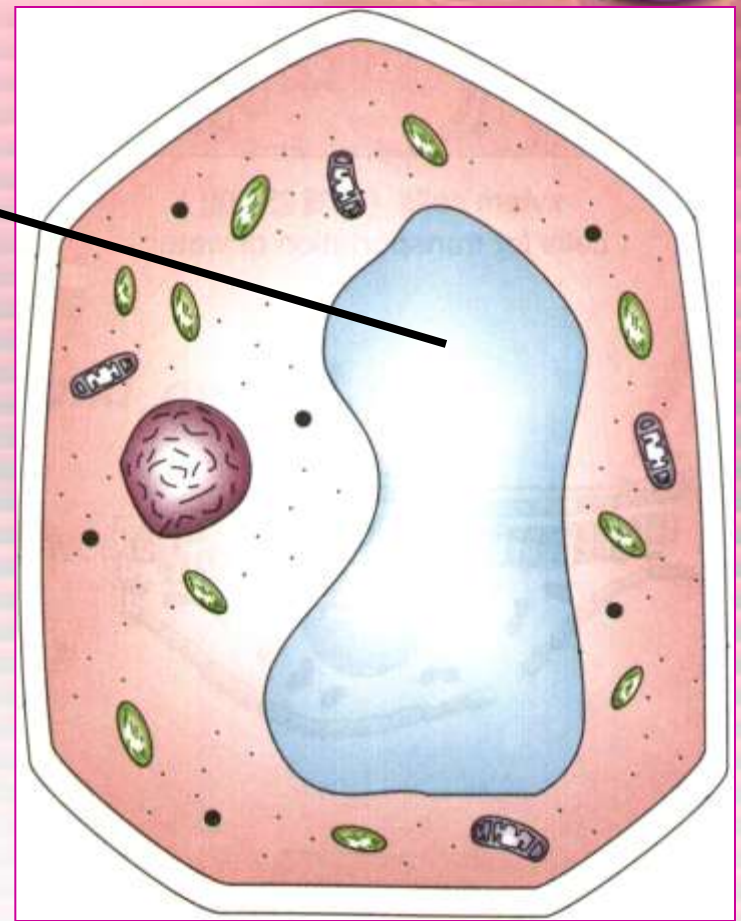
- **Non-living granules**
 - Starch granules
 - Oil droplets
 - Crystals of insoluble wastes



THE BASIC STRUCTURE OF A CELL

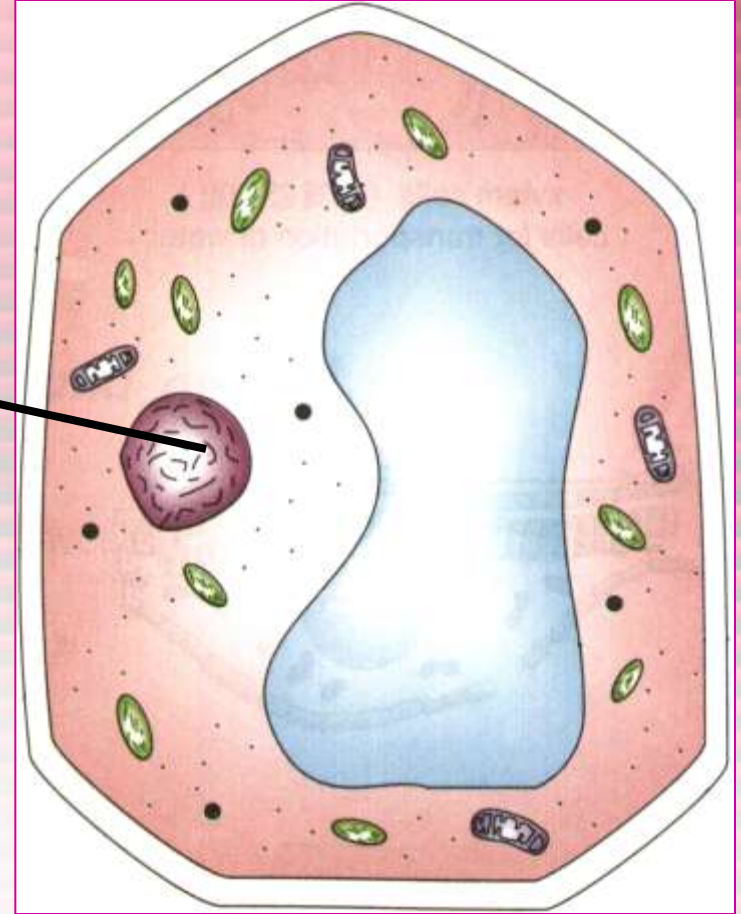
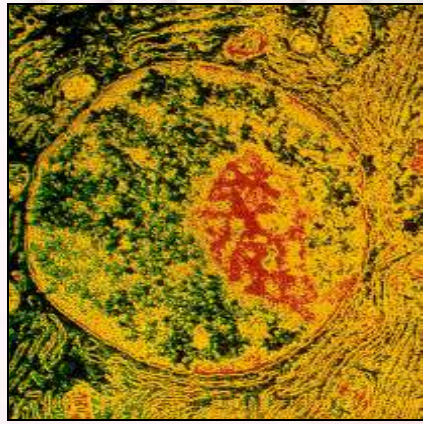
Plant Cell

- **Vacuole**
 - large central vacuole
 - Surrounded by tonoplast
 - Contains cell sap
 - a solution of chemicals (sugars, proteins, mineral salts, wastes, pigments)



THE BASIC STRUCTURE OF A CELL

Plant Cell

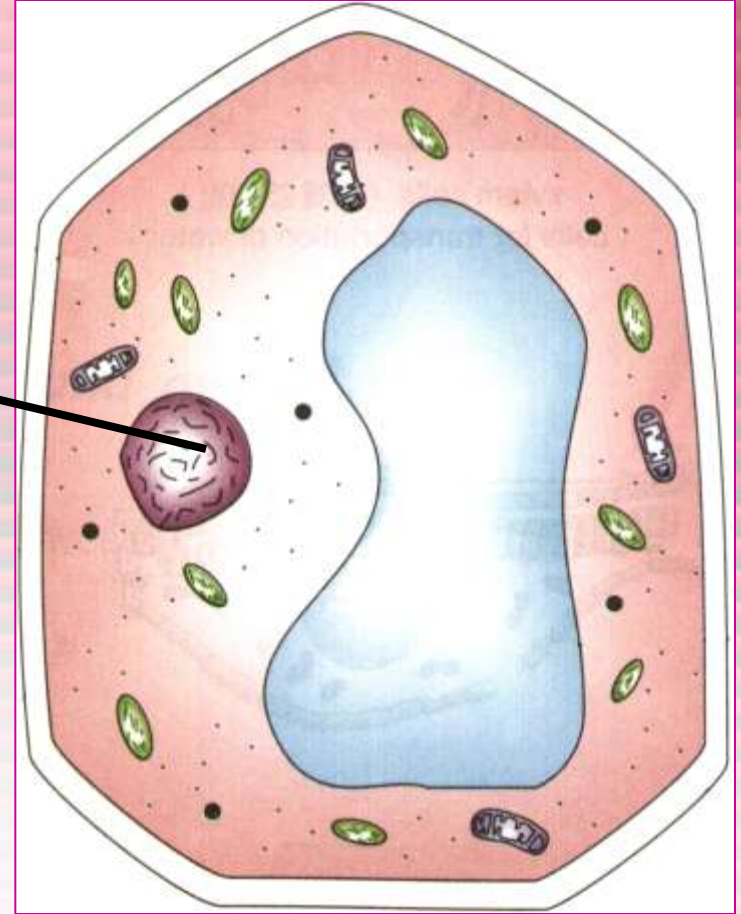
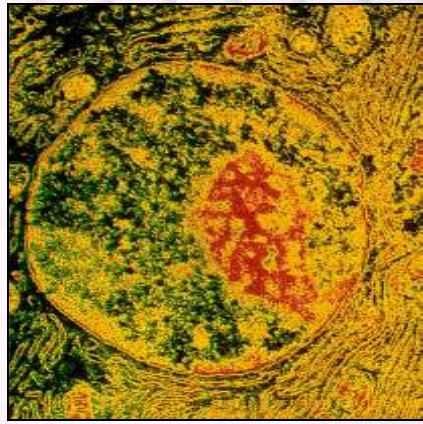


- **Nucleus**
 - **Control the normal activities of the cell**
 - **Bounded by a nuclear membrane**
 - **Contains thread-like chromosomes**



THE BASIC STRUCTURE OF A CELL

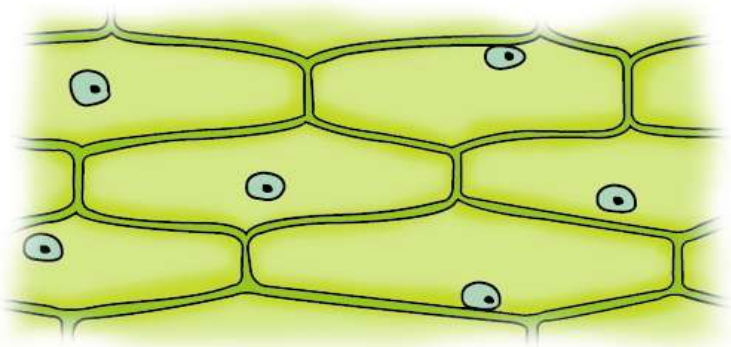
Plant Cell



- **Nucleus**
- Each cell has fixed number of chromosomes
- Chromosomes carry genes
- genes control cell characteristics



Different kinds of plant cells



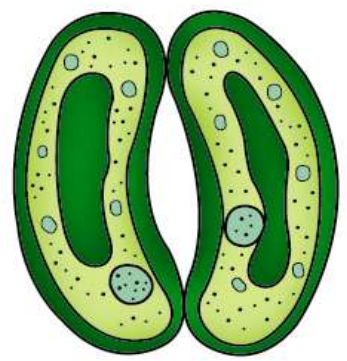
Onion Epidermal Cells

root hair



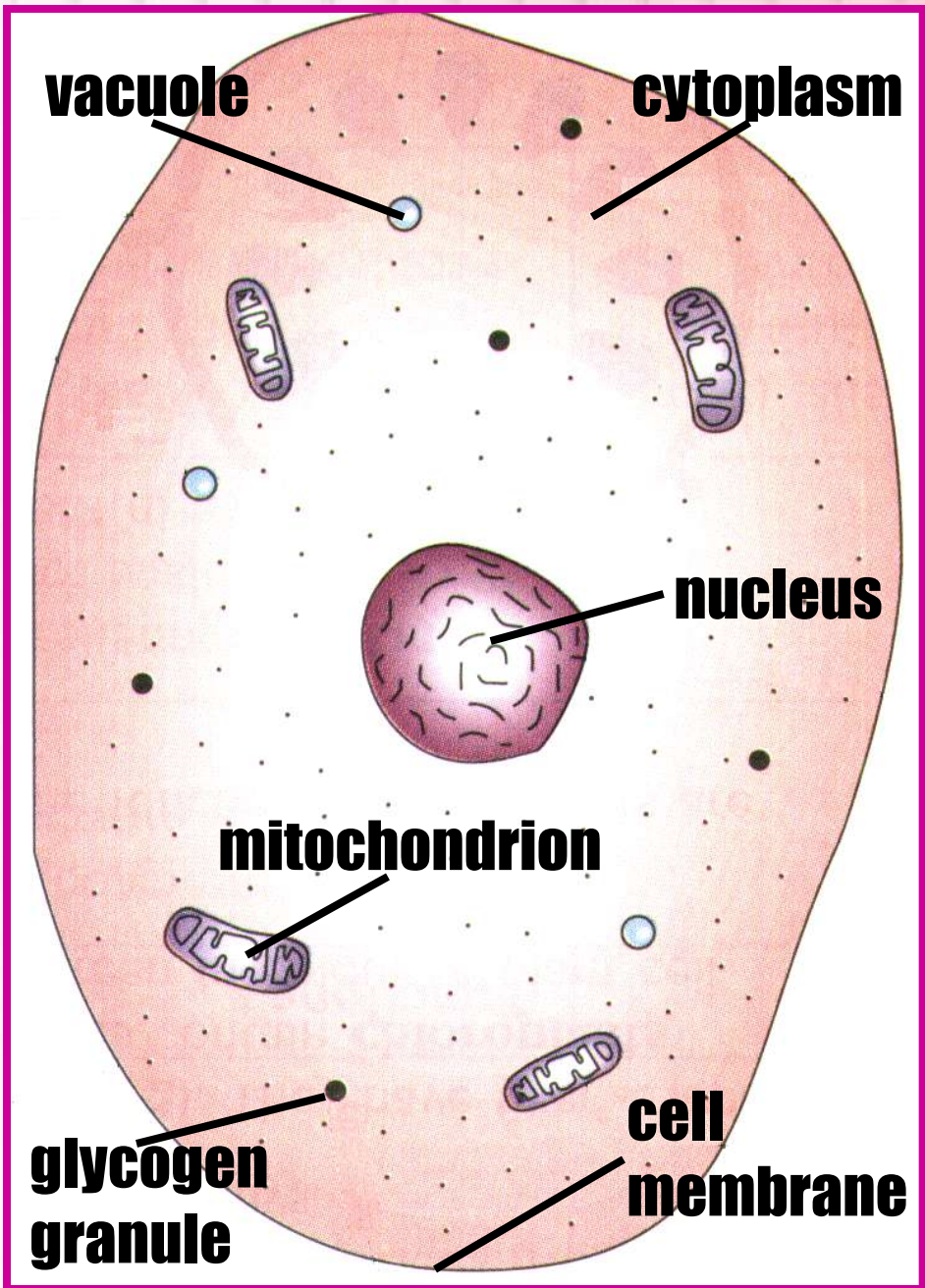
Root Hair Cell

Guard Cells



THE BASIC STRUCTURE OF A CELL

Animal cell



- **No cell wall and chloroplast**
- **Stores glycogen granules and oil droplets in the cytoplasm**



THE BASIC STRUCTURE OF A CELL



Different kinds of animal cells

The diagram illustrates eight different types of animal cells and microorganisms. Each cell is shown with a detailed illustration and a corresponding label in a blue box below it. The cells are arranged in a grid-like fashion. The labels are: white blood cell, red blood cell, cheek cells, sperm, nerve cell, muscle cell, Amoeba, and Paramecium.

- white blood cell**: A large, irregularly shaped cell with a multi-lobed nucleus and granules.
- red blood cell**: A small, biconcave disc-shaped cell.
- cheek cells**: A cluster of several small, roughly spherical cells.
- sperm**: A small, tadpole-shaped cell with a head and a long tail.
- nerve cell**: A large cell with a central cell body and several branching processes.
- muscle cell**: A long, spindle-shaped cell with a central nucleus.
- Amoeba**: A large, irregularly shaped, green cell with a nucleus and granules.
- Paramecium**: A large, bean-shaped, green cell with cilia and internal organelles.



Similarities between plant cells and animal cells

☆ Both have a cell membrane surrounding the cytoplasm

☆ Both have a nucleus

☆ Both contain mitochondria





Differences between plant cells and animal cells

Animal cells	Plant cells
Relatively smaller in size	Relatively larger in size
Irregular shape	Regular shape
No cell wall	Cell wall present



Differences between plant cells and animal cells

Animal cells	Plant cells
---------------------	--------------------

Vacuole small or absent

Large central vacuole

Glycogen granules as food store

Starch granules as food store

Nucleus at the centre

Nucleus near cell wall



Microscope

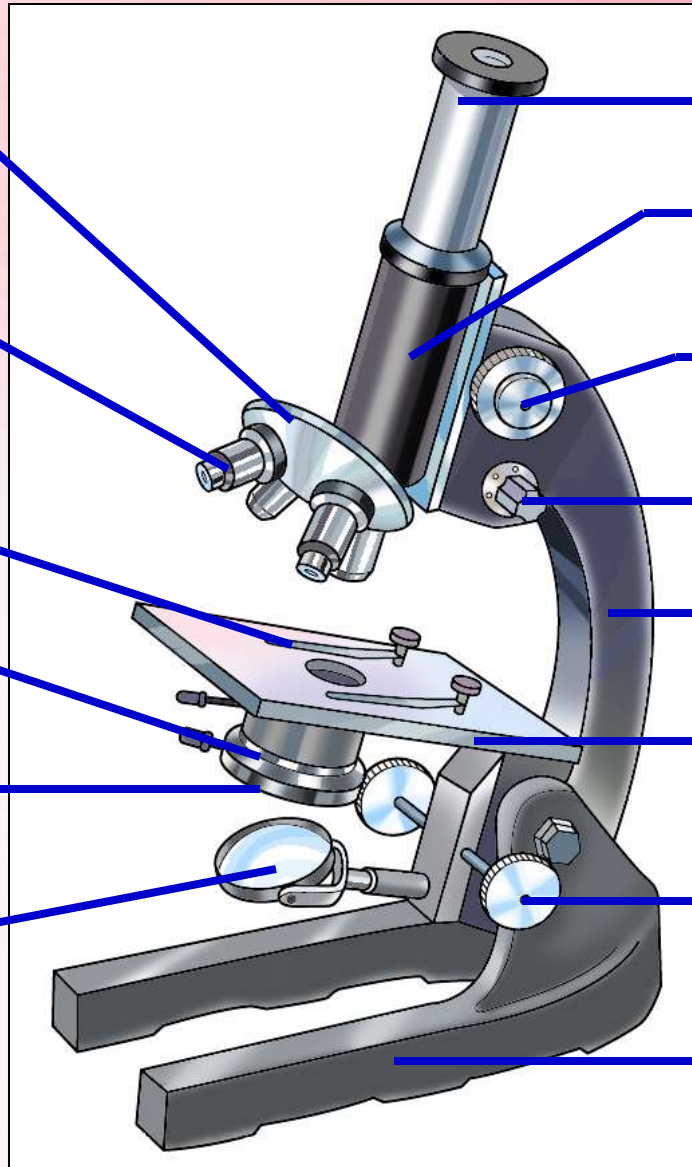
- Instrument for observing small objects



Different parts of a microscope



THE BASIC STRUCTURE OF A CELL



Revolving nosepiece

Objective

Clip

Condenser

Iris diaphragm

Mirror

Eyepiece

Body tube

Course adjustment

Fine adjustment

Arm

Stage

Condenser control knob

Base



The cell as the basic unit of life

- **Cell is the smallest unit of living organisms**
- **Unicellular organisms are made of one cell only**
- **The cells of multicellular organisms are specialized to perform different functions**
 - **e.g. mesophyll cells for photosynthesis and root hair cells for water absorption**



Levels of organization

- **Cells are grouped together and work as a whole to perform special functions**



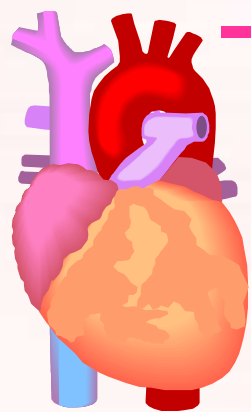
Tissue

- **A group of similar cells to perform a particular function**
 - **Animals : epithelial tissue, muscular tissue**
 - **Plants : vascular tissue, mesophyll**

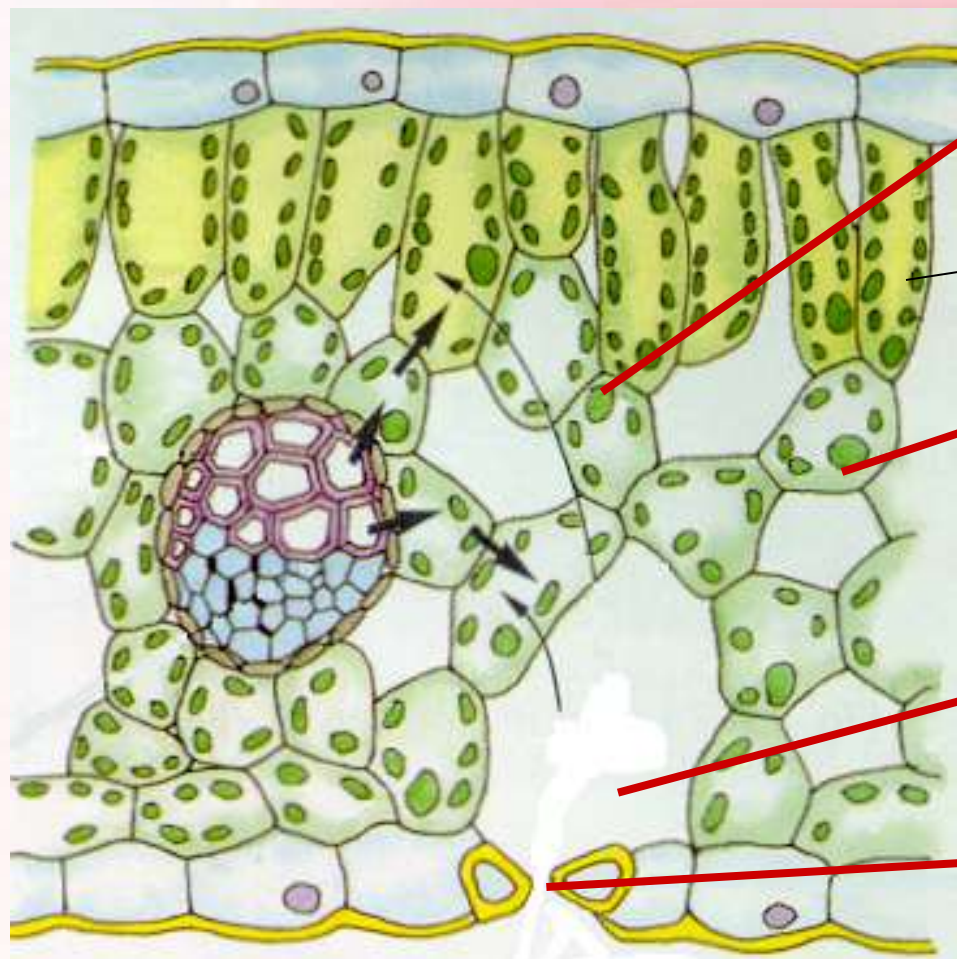


Organ

- **Different tissues group together to carry out specialized functions**
 - **Heart : consists of muscles, nervous tissue and blood vessels**
 - **Leaf : consists of epidermis, mesophyll and vascular tissue**



The Structures of a Leaf OF A CELL



Chloroplast

Palisade Mesophyll Cell

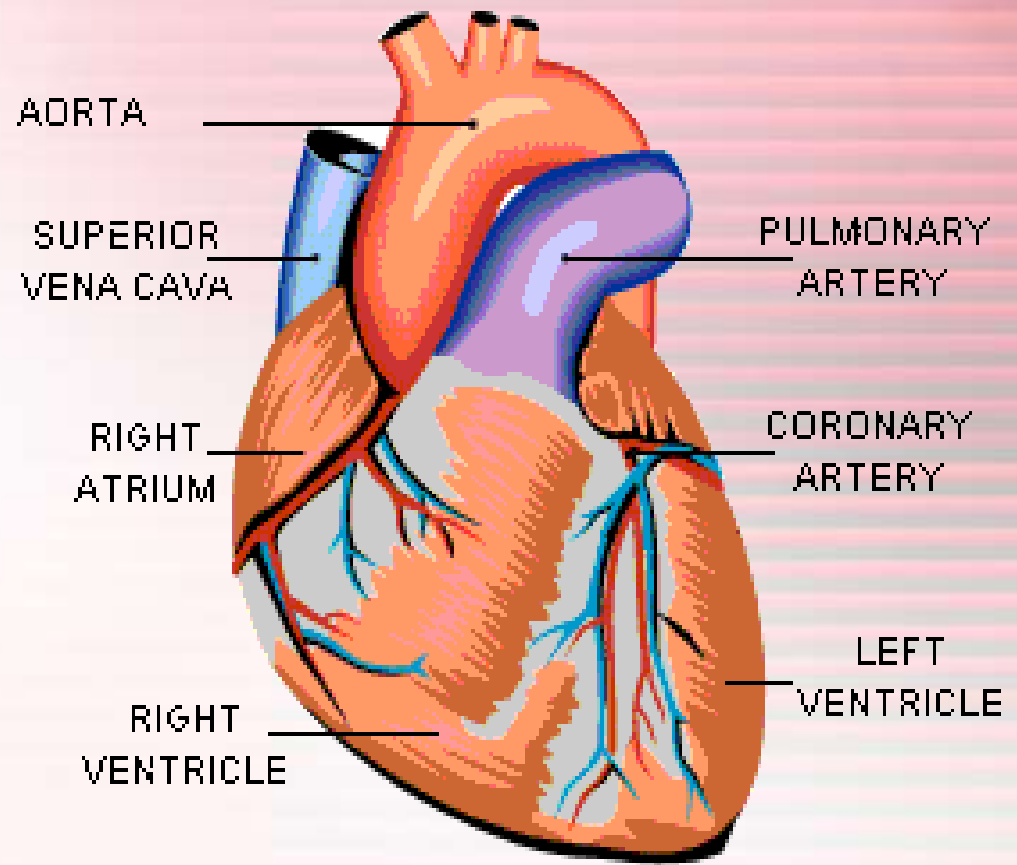
Spongy Mesophyll Cell

Air Space

Stoma



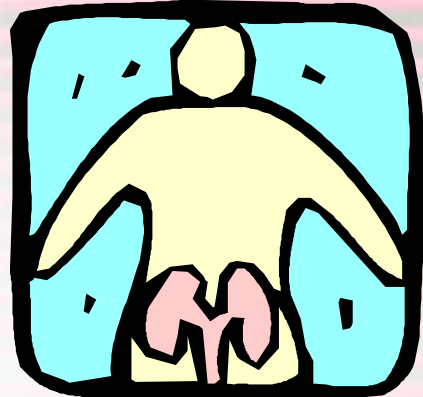
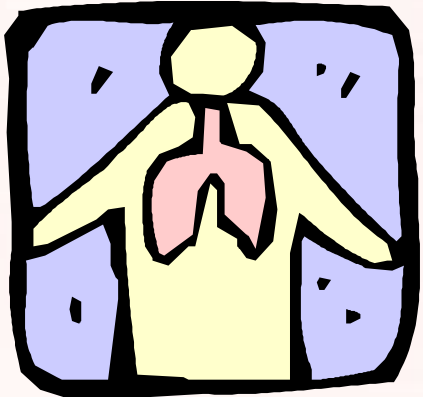
The Structures of a Heart



System

THE BASIC STRUCTURE OF A CELL

- **Several organs and tissues work together to carry out a particular set of functions in a co-ordinated way**
 - **Human : digestive, respiratory, excretory, circulatory and reproductive systems**
 - **Plant : root and shoot systems**



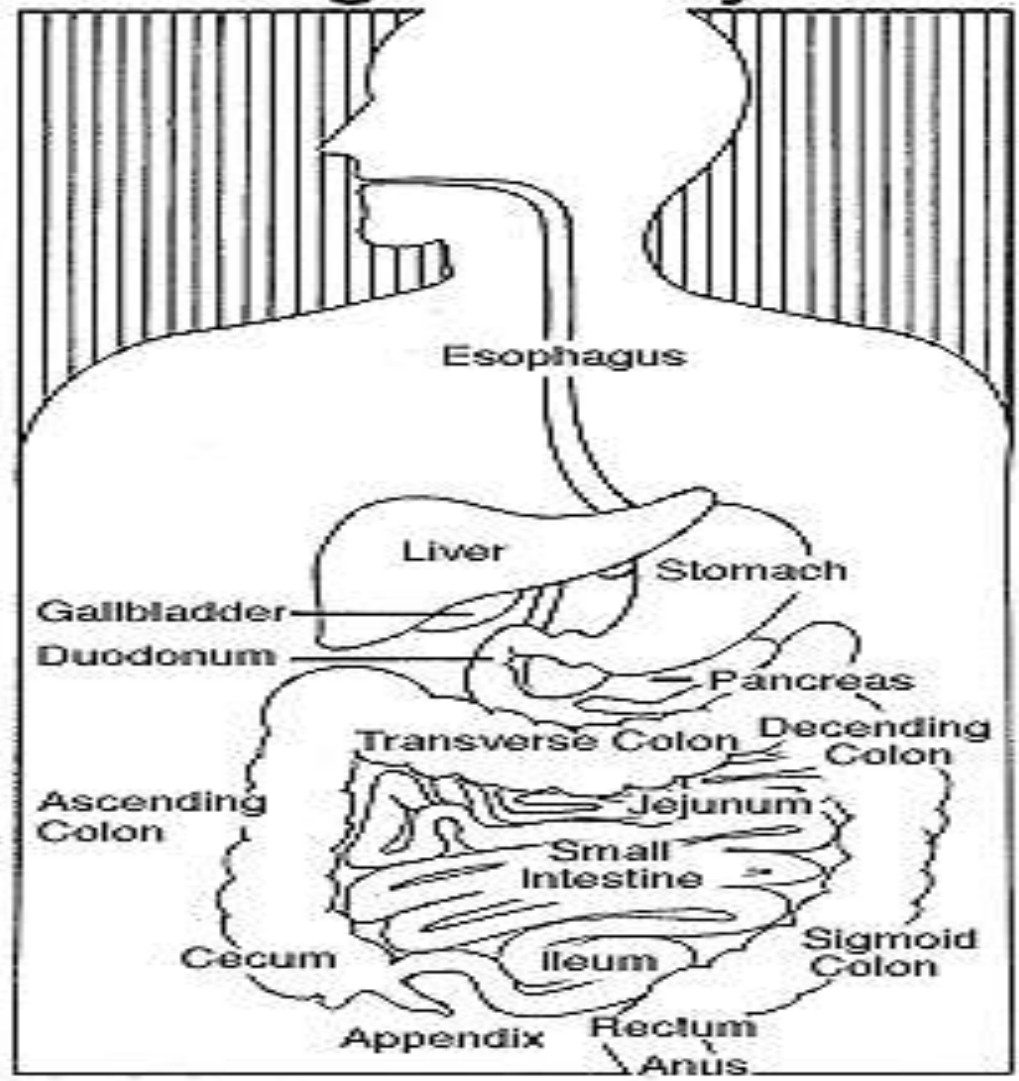
System in our body

- **examples of systems :**
 - ◇ **Digestive System**
 - ◇ **Respiratory System**
 - ◇ **Circulatory System**
 - ◇ **Nervous System**
 - ◇ **Reproductive System**



THE BASIC STRUCTURE OF A CELL

The Digestive System

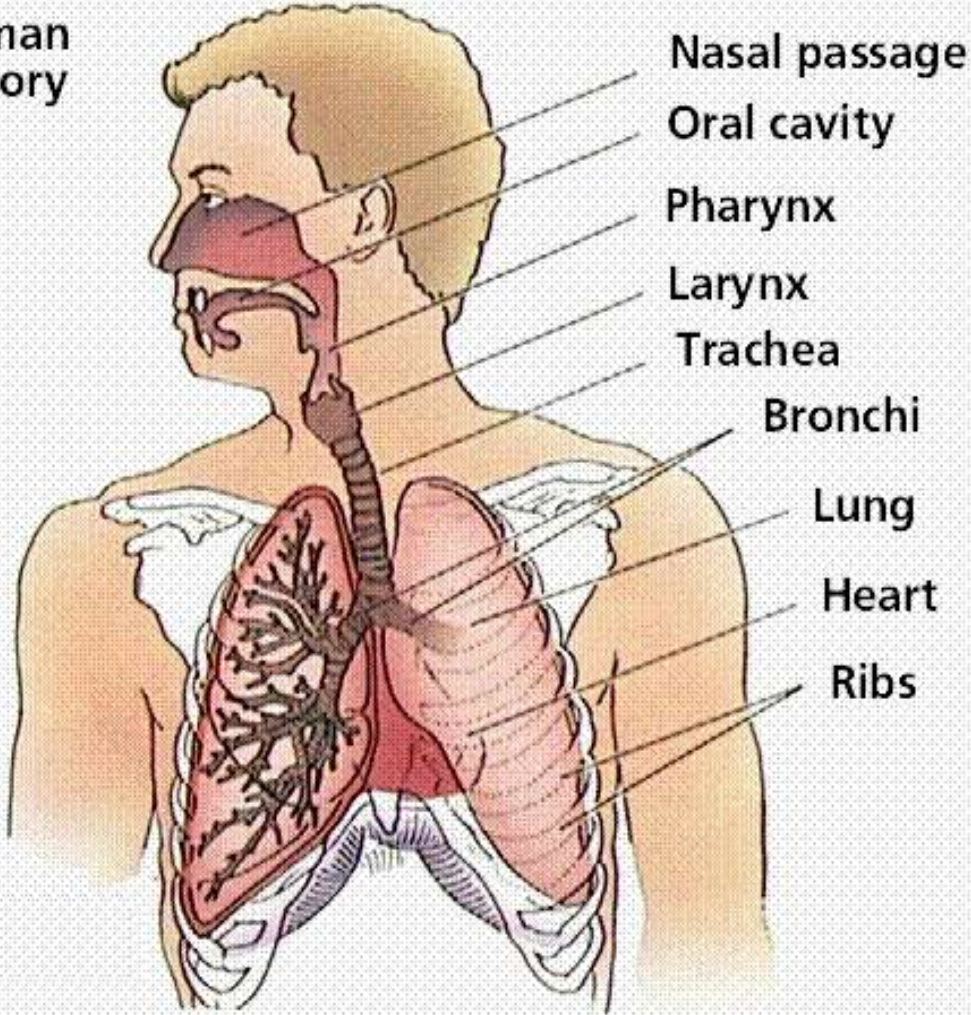


THE BASIC STRUCTURE OF A CELL



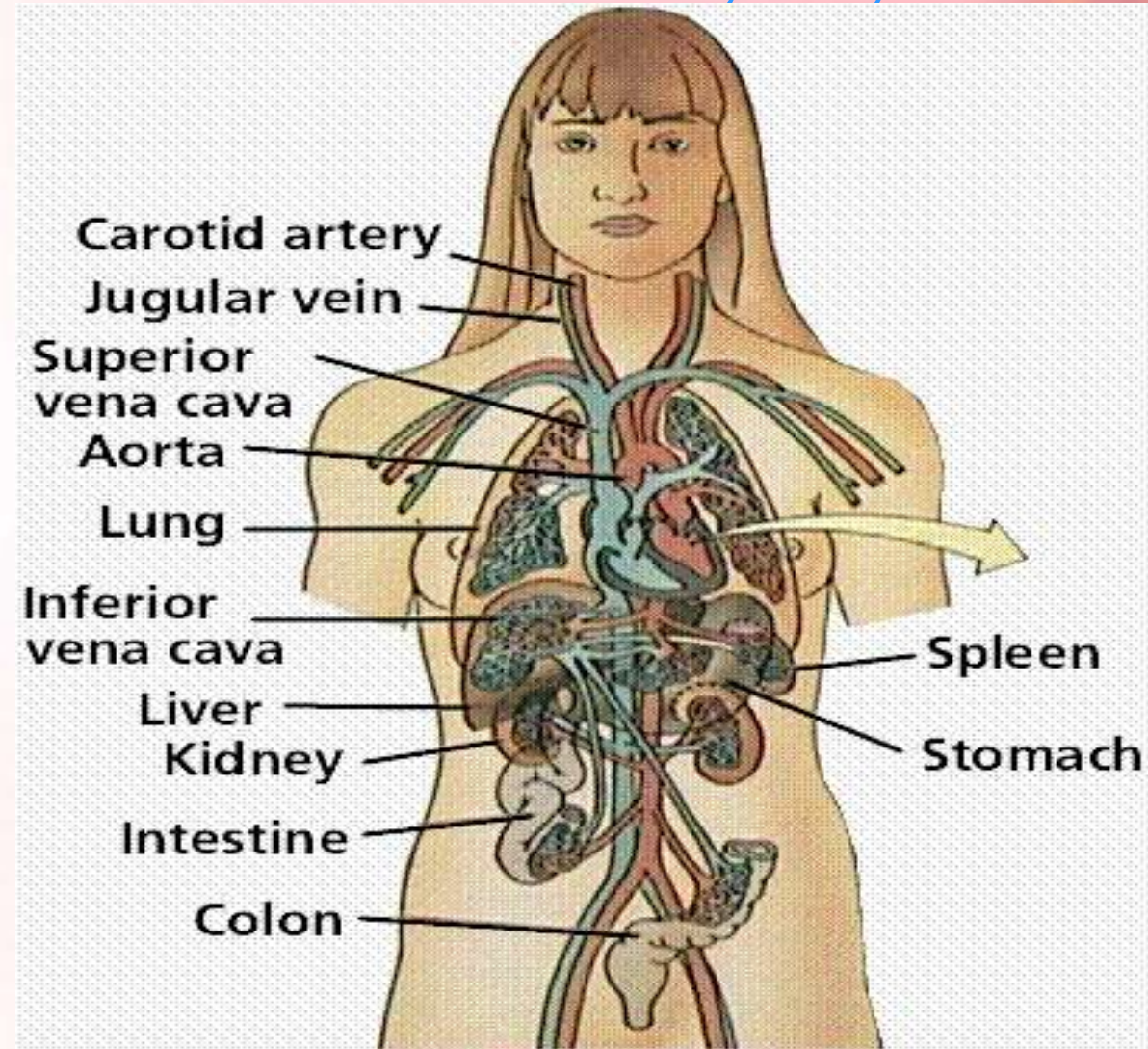
The Respiratory System

The Human Respiratory System



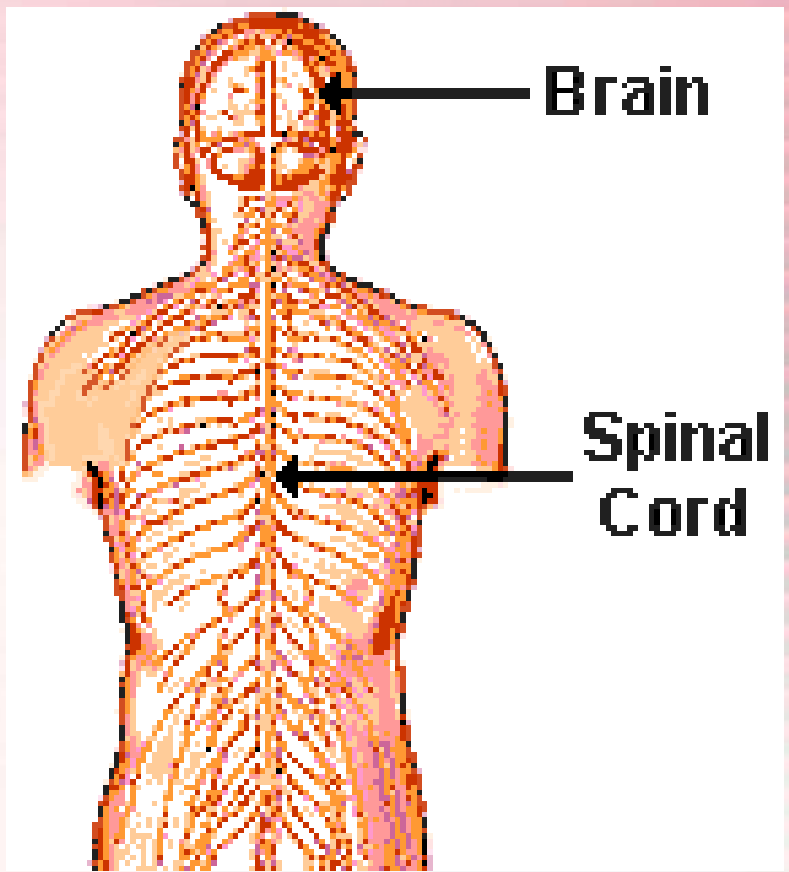
The Basic Structure OF A CELL

The Circulatory System



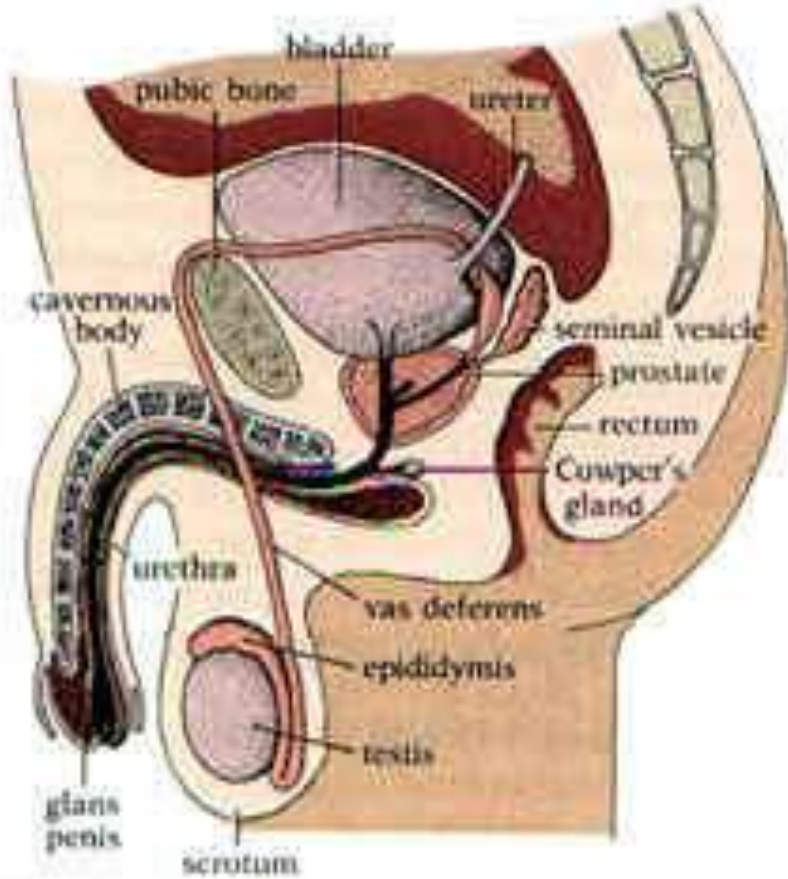
The Nervous System

THE BASIC STRUCTURE OF A CELL



THE BASIC STRUCTURE OF A CELL

Male Reproductive System

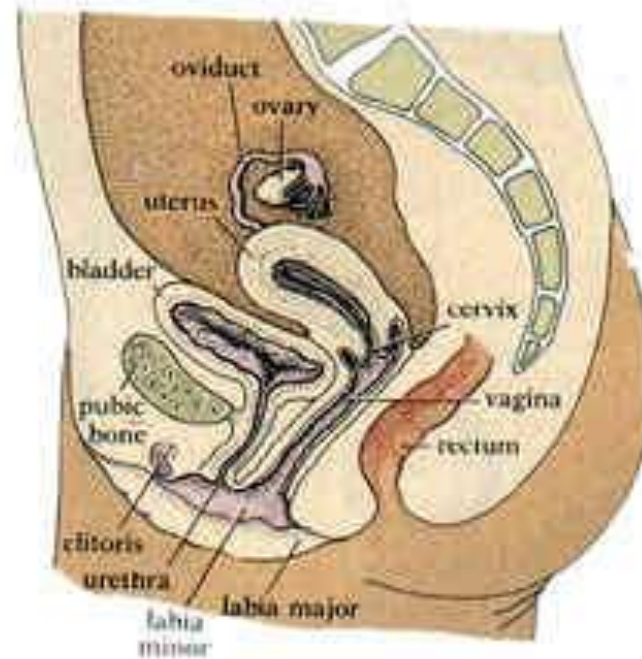
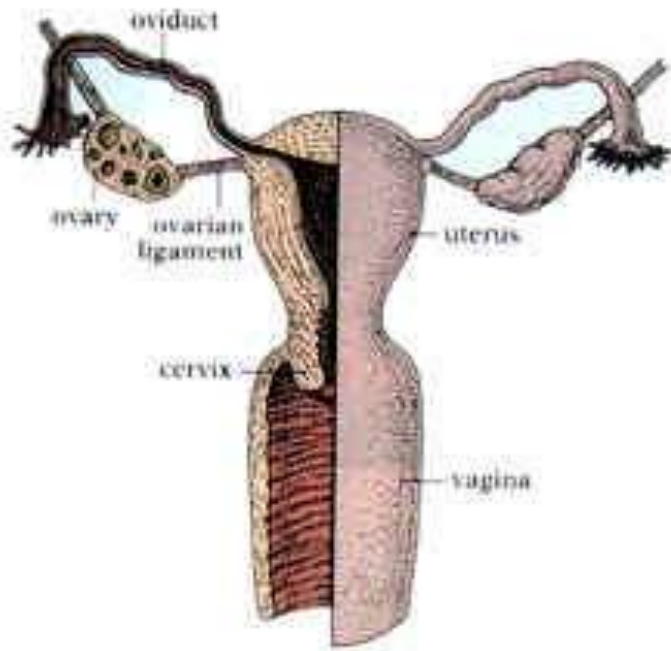


26.8 Reproductive tract of the human male: lateral view



THE BASIC STRUCTURE OF A CELL

Female Reproductive System



26.14 Reproductive tract of the human female (A) Frontal view, (B) Lateral view. The wall of one side has been dissected away to reveal the internal structure.



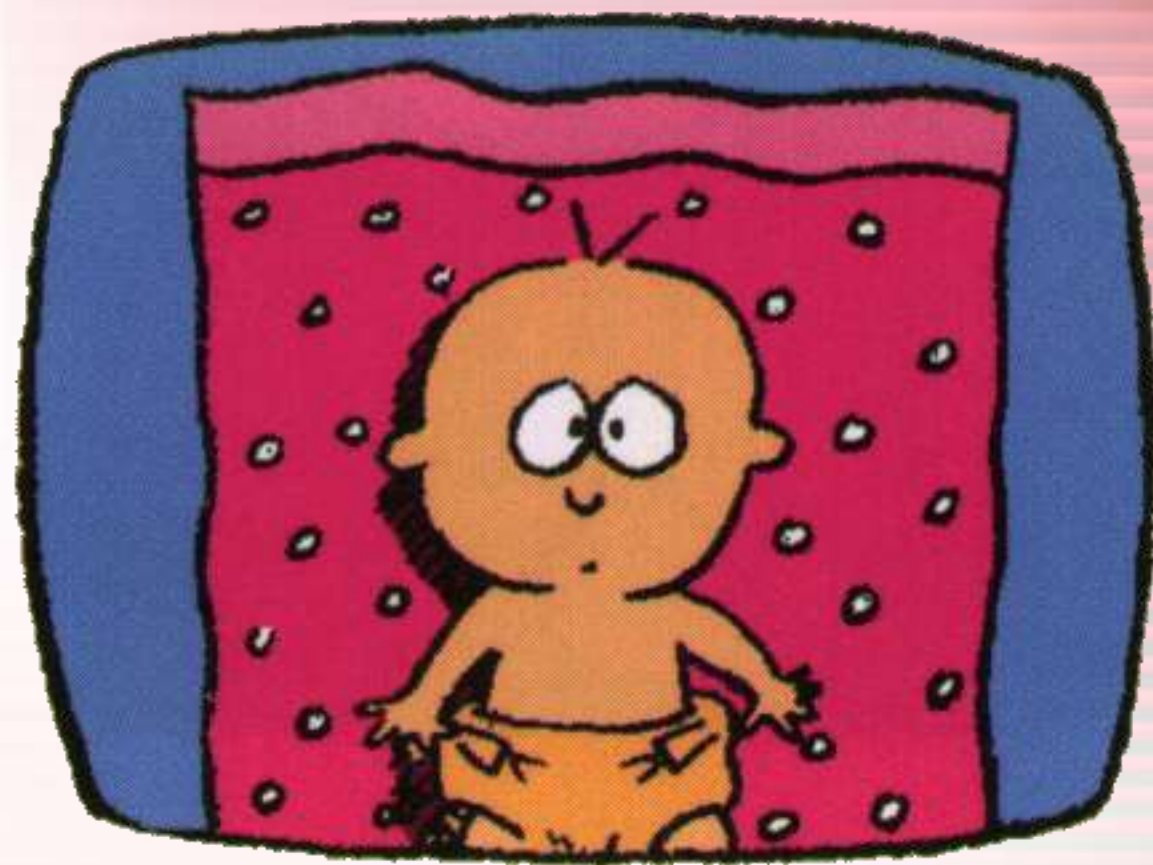
Level of Organization

- ✧ **cells** (e.g. muscle cells, nerve cells)
- ✧ **tissues** (e.g. muscle, epithelium)
- ✧ **organs** (e.g. heart, lungs, stomach)
- ✧ **systems** (e.g. circulatory system)
- ✧ **organisms** (e.g. man)



THE BASIC STRUCTURE OF A CELL

It's You



THE BASIC STRUCTURE OF A CELL



~ **END** ~

