



BGCSE Biology

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What to expect in this lesson?

- ✓ Building blocks of Organism
- ✓ Animal cells versus plant cells
- ✓ Cell Specialization
- ✓ Structure of the Organism



Cells

(The Foundation of Life)

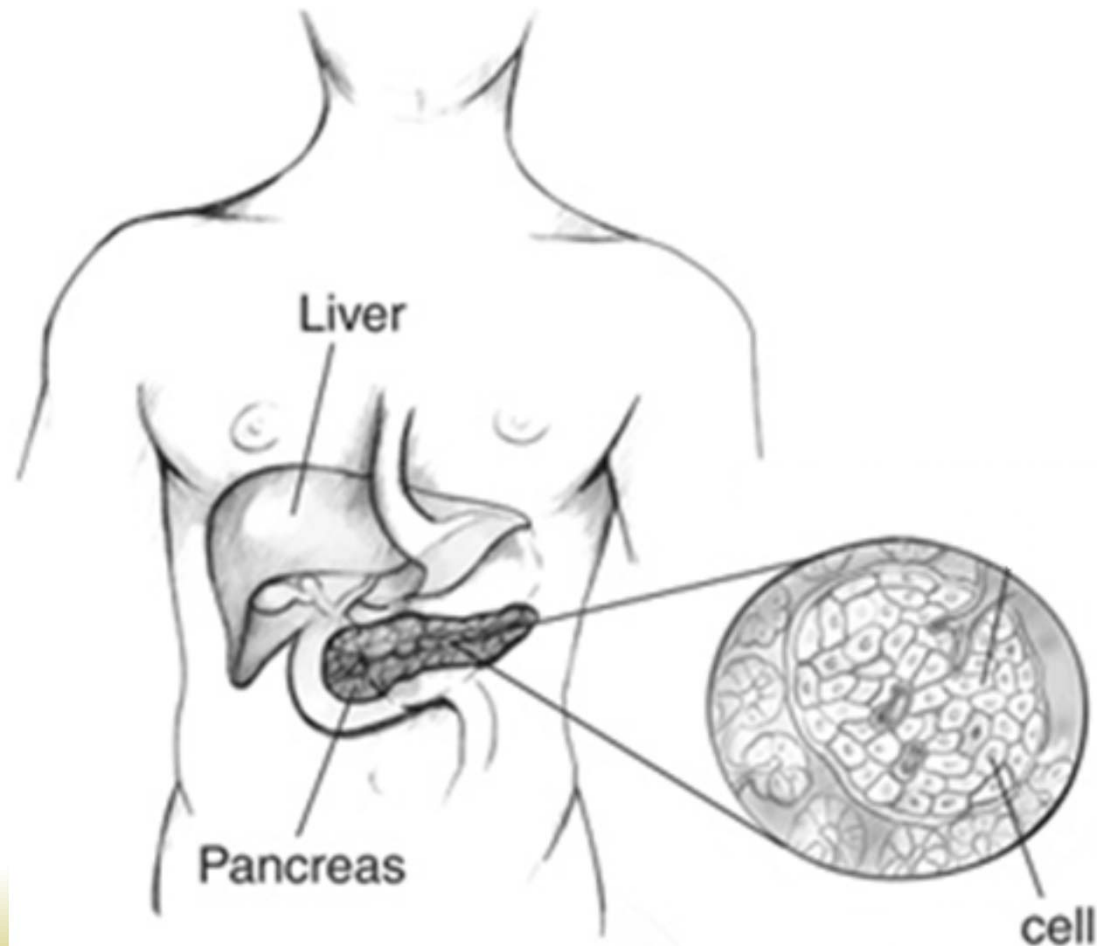
Cells – The building blocks of living things



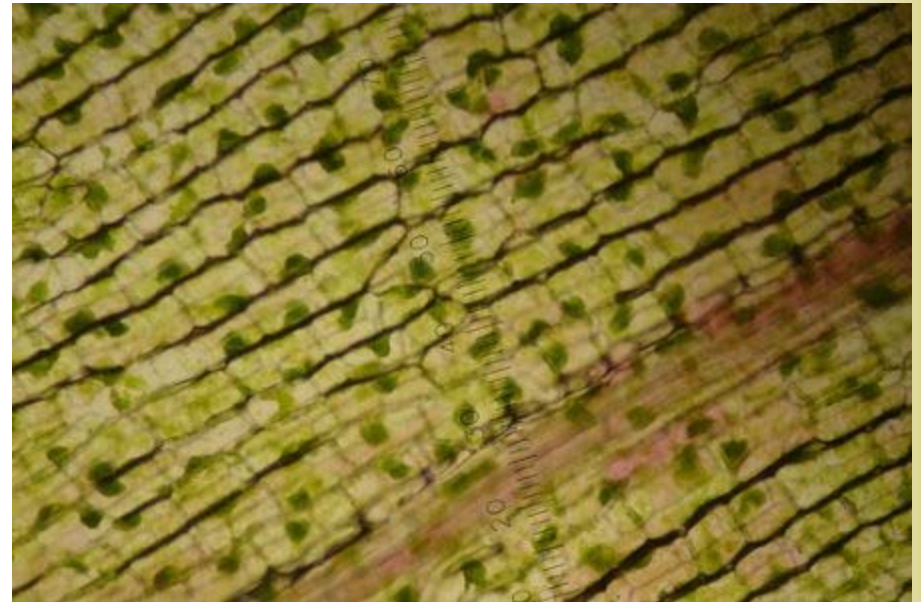


- ❧ Before you can understand what cells are, let's look at the organisms as a whole.
- ❧ Each organism is made up of smaller units called cells.
- ❧ We can compare the organism to a building which also has smaller units like bedrooms, bathroom, living room, foyer etc. Each unit/room is made from even smaller units called building blocks.
- ❧ Just like a building, the bodies of organisms can be viewed in smaller units as well.
- ❧ The organisms' cells create tissues which form organs which form systems which make up the entire organism.
- ❧ Cells are found everywhere in animal and plant bodies.
- ❧ Each group of cells have a different structure and purpose. This difference in structure and purpose results in a difference in structure and purpose of body parts.

Cells -The Building Blocks of Animals



Cells – The Building blocks of Plants



Light microscope

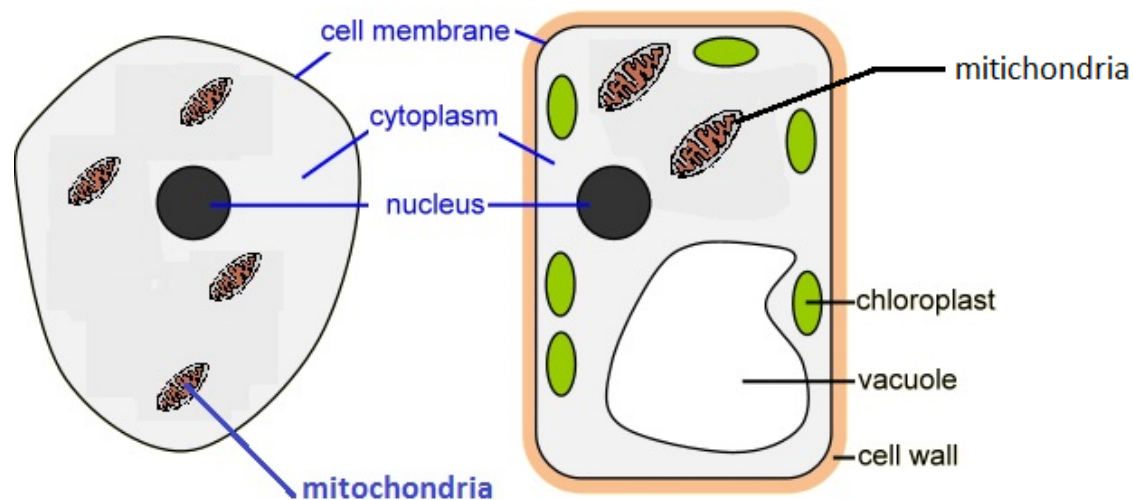


Electron microscope



Animal Cell versus Plant Cell

Do you expect animal cells to be the same as plant cells? What are the differences and the similarities?



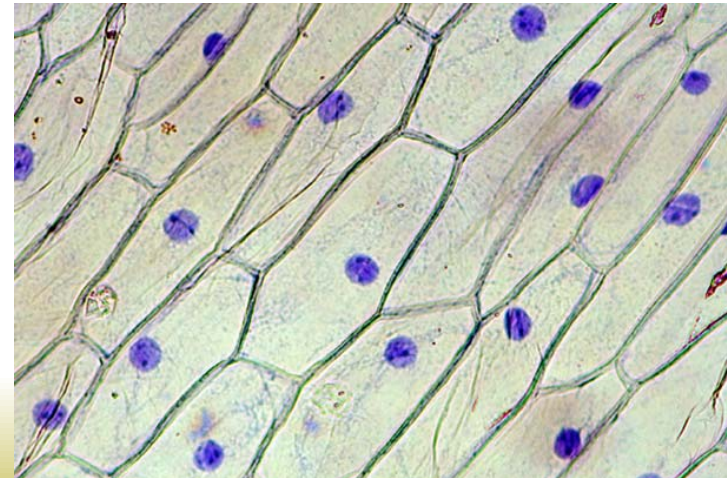
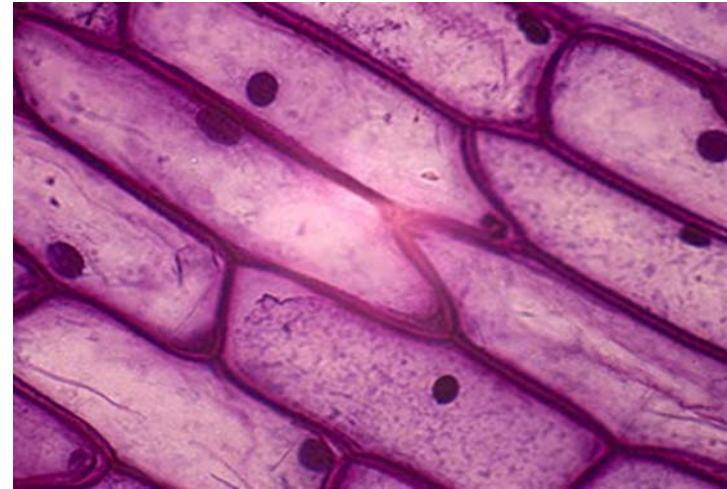
ANIMAL CELL

PLANT CELL

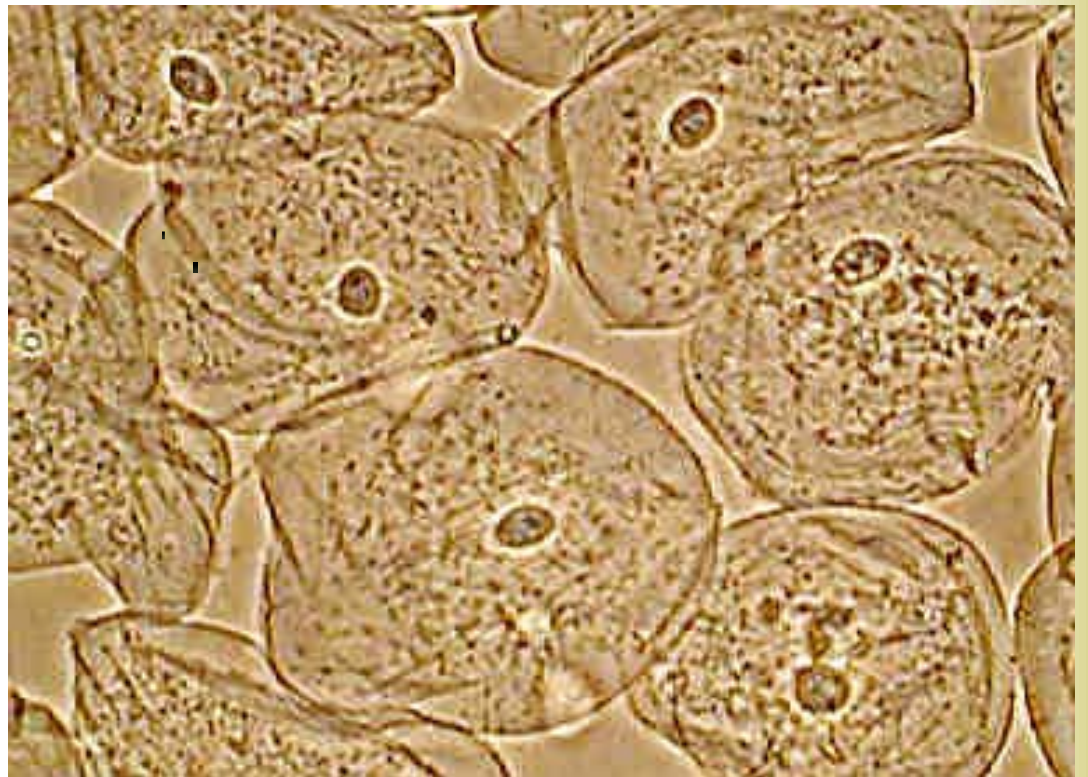


Plant Cells	Animal Cells
Larger	Smaller
Has Cell Wall	Has Cell membrane (no cell wall)
Has chloroplasts	No chloroplasts
One large vacuole	Many small vacuoles

A “Typical” Plant cell – Onion scale cell



A “Typical” Cell – Animal cheek cell

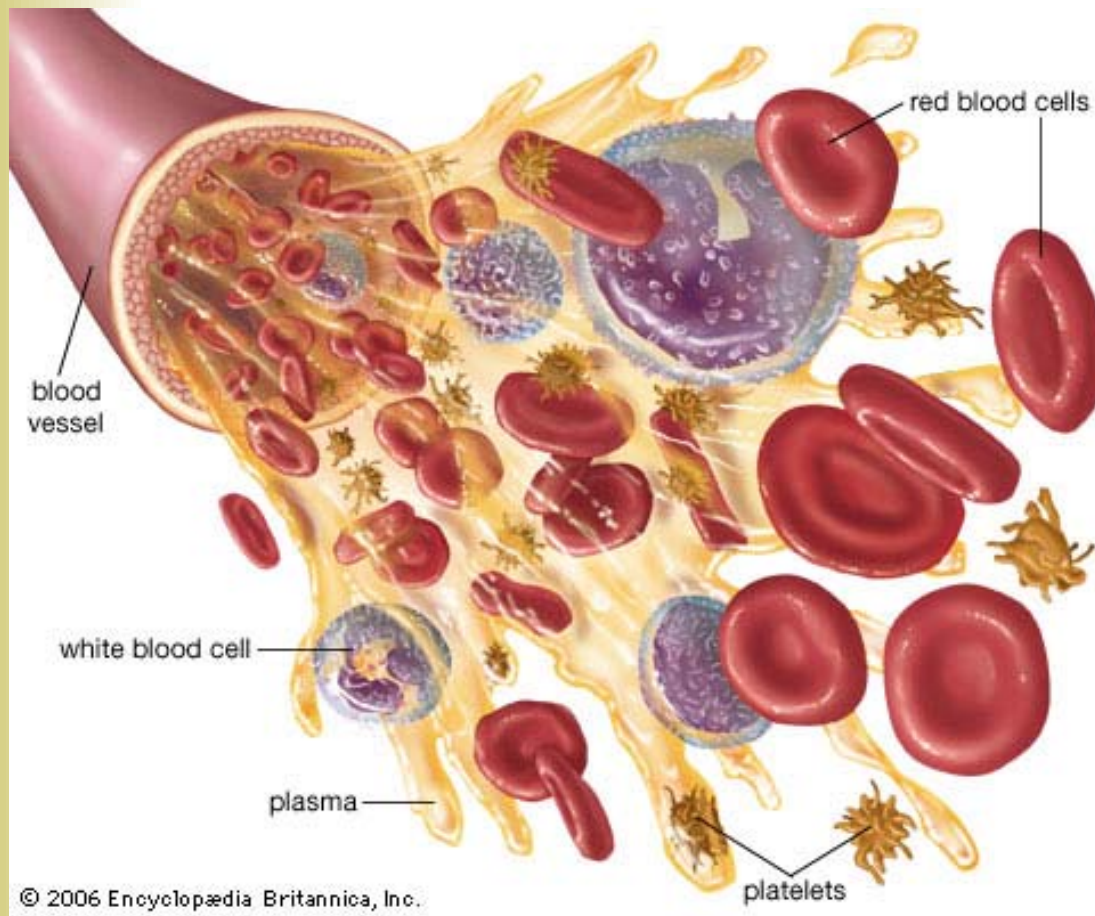


Parts of “Typical” Cells

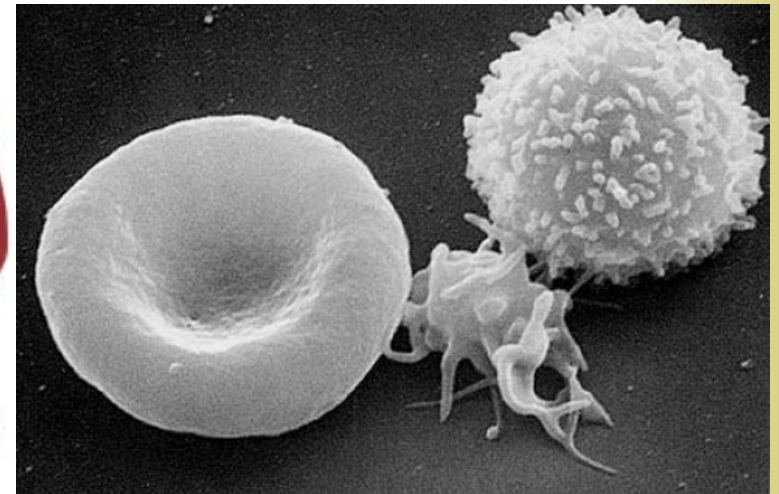


- ❧ Cell Wall (plants only) – Non living, not selective, made of cellulose. Not found in animal cells.
- ❧ Cell Membrane – Selectively permeable, thin flexible membrane. Controls what goes in and out the cell.
- ❧ Cytoplasm – Jelly like substance. Chemical processes of life occur here. In plants, it contains structures with chlorophyll (chloroplasts).
- ❧ Vacuole – In plants , it's filled with a watery solution of sugars, salts and pigments (cell sap). Pressure makes the cells firm, animal cells have small vacuoles.
- ❧ Mitochondria – Produces energy for the cell's living processes – like respiration
- ❧ Nucleus – Always embedded in the cytoplasm. Determines the shape, size and function of a cell. The power house of the cell. It initiates the process of cell division.

Not Flat!



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Not Flat!

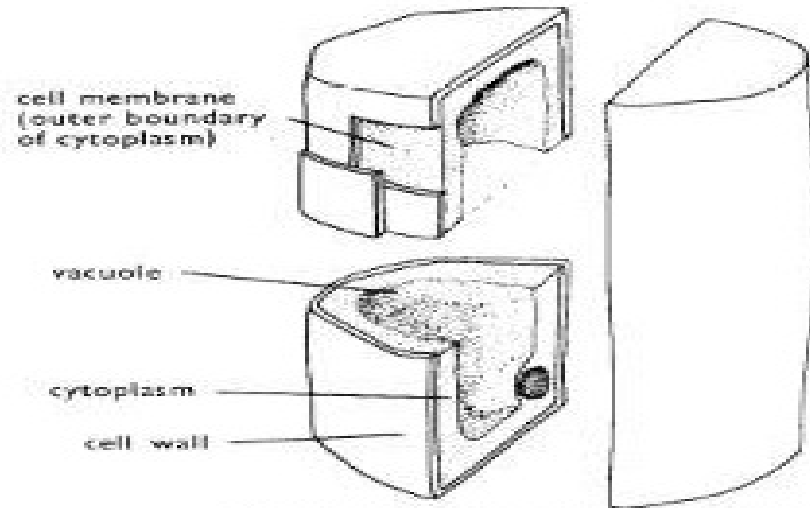


Fig. 3.4(a) Stereogram of one plant cell

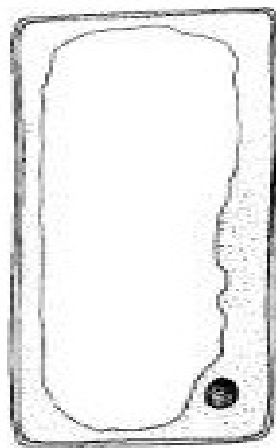


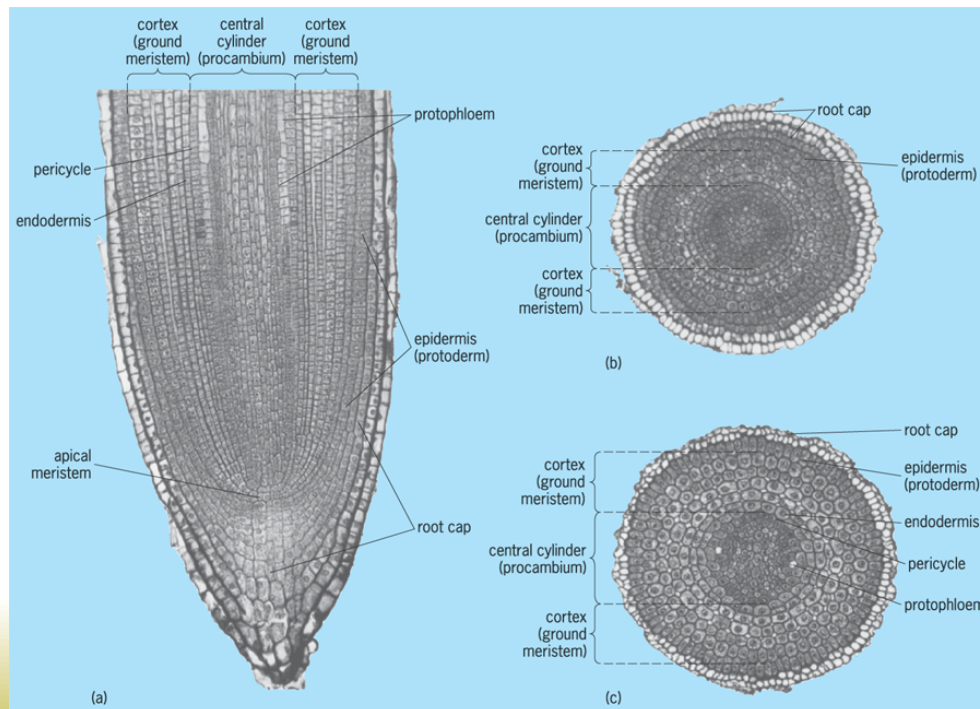
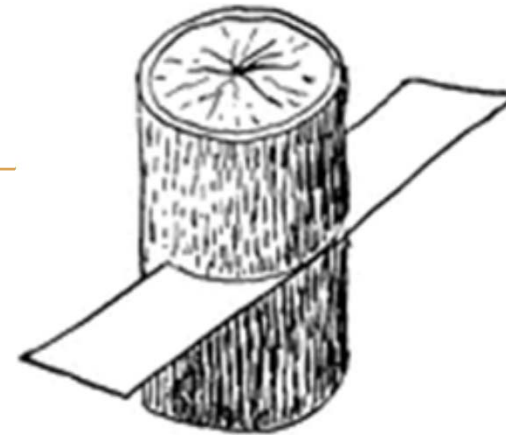
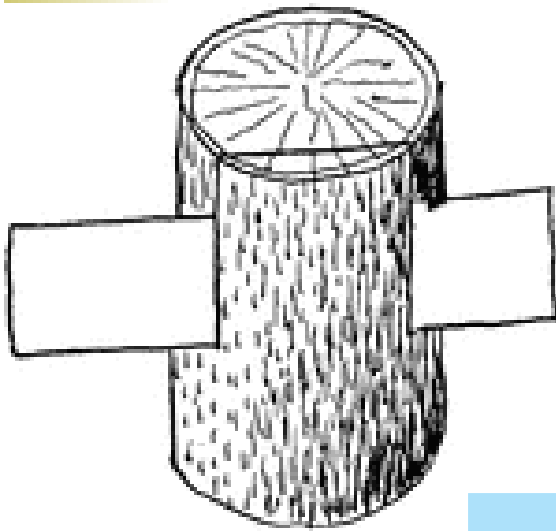
Fig. 3.4(c) Longitudinal section



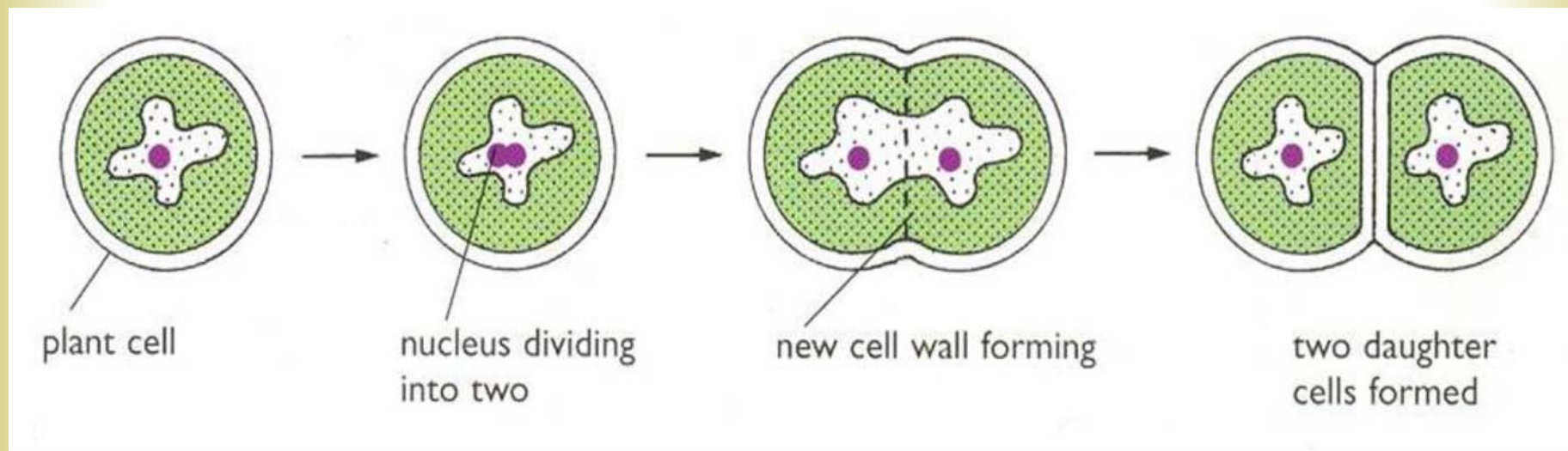
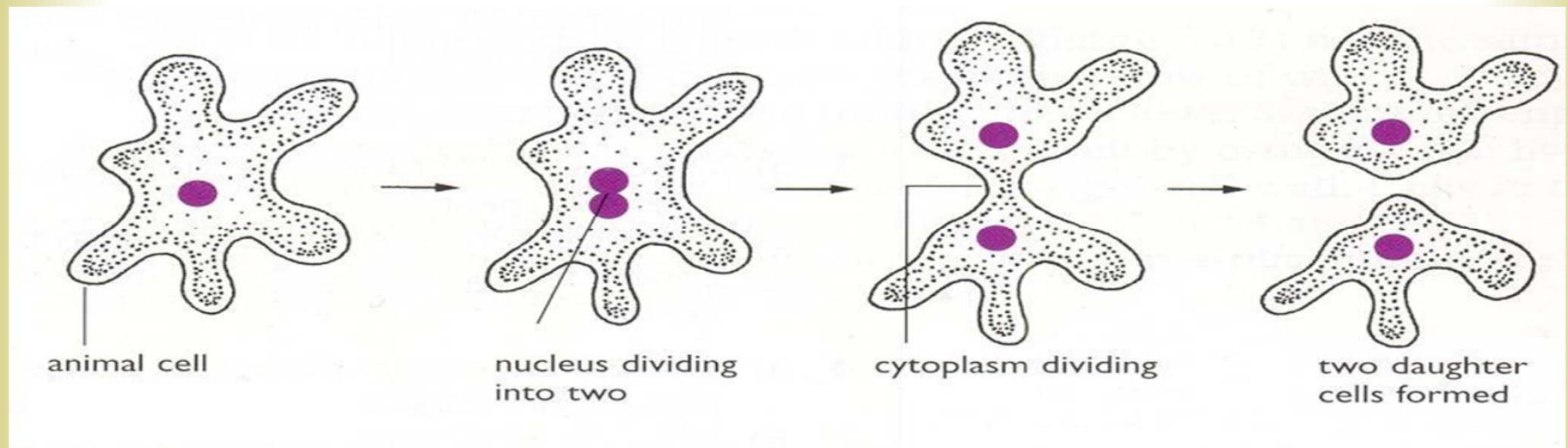
Fig. 3.4(b) Transverse section

If the cell at (a) is cut across, it will look like (b) under the microscope; if cut longitudinally it will look like (c).

Plant Root - Taking Sections



Basic Cell Division – Why do cells divide?



Cell Divison



- ❧ Growth is a result of cell division, enlargement and specialization.
- ❧ Cells divide for two main reasons 1. replace dead and worn out cells and 2. repair tissue (e.g. cut skin or broken bones)
- ❧ At the end of cell division, both daughter cells may divide again, but usually one cell grows, change shape and structure and become adapted to do a particular job (specialization), while the other daughter cell is still able to divide, therefore resulting in production of new cells and growth of the tissue.

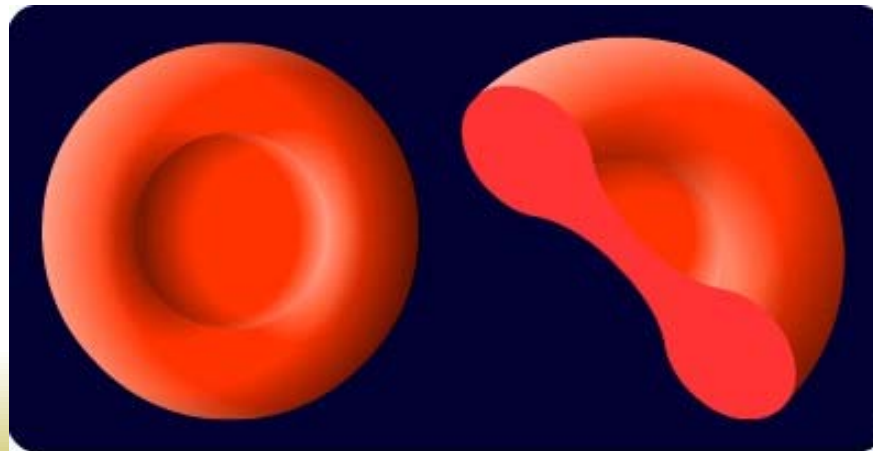
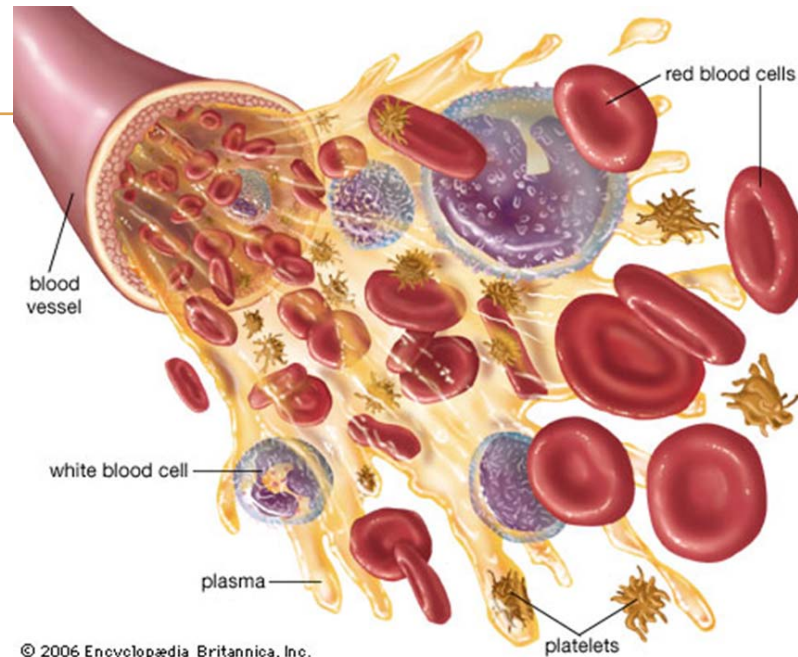
(APPLICATION - This is why its so important to feed our bodies the right substances which cells require to grow and divide.)

Cell Specialization



- ❧ We can also compare the cells of an organism to the workings of a business like a restaurant.
- ❧ Each employee is a cell contributing to the overall success of the restaurant which is like our bodies.
- ❧ Some employees job titles are cook, wash dishes, serve, likewise there are different titles with types of cells in our bodies like epithelial, muscle, blood and reproductive. In plants we see special root cells, palisade, reproductive, vascular etc.
- ❧ Notice each are different in their appearance and structure. However, all the cells of a tissue are alike. Lets talk about each type of cell and what makes them suited for their job responsibility.

Cell Specialization – Red blood cells

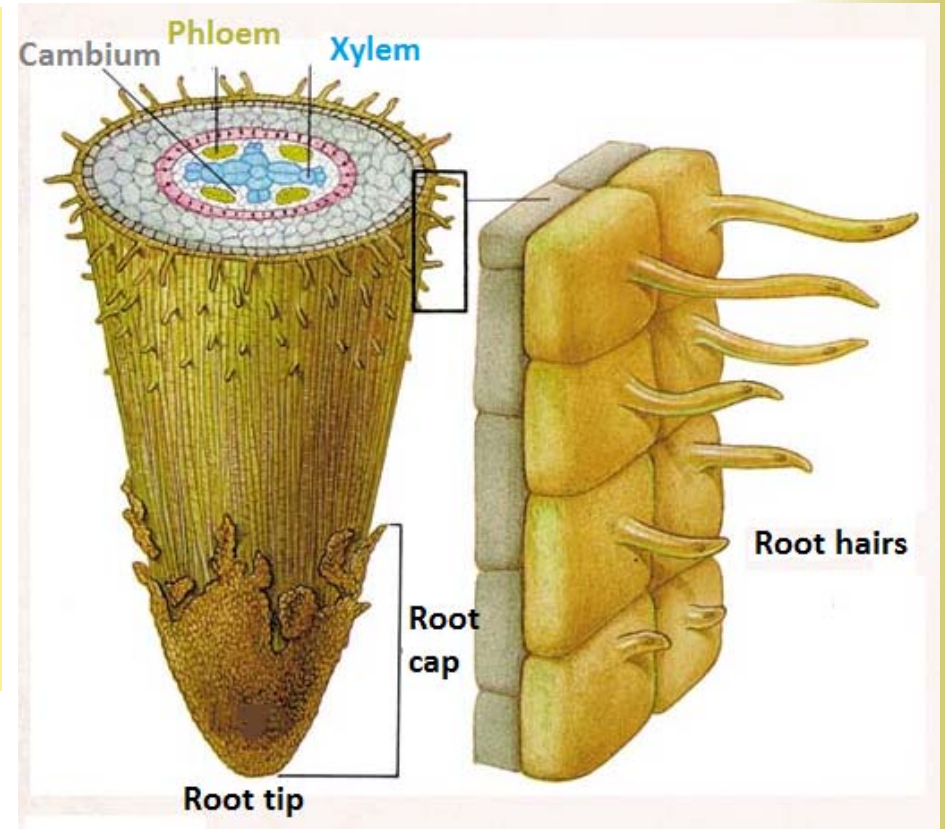
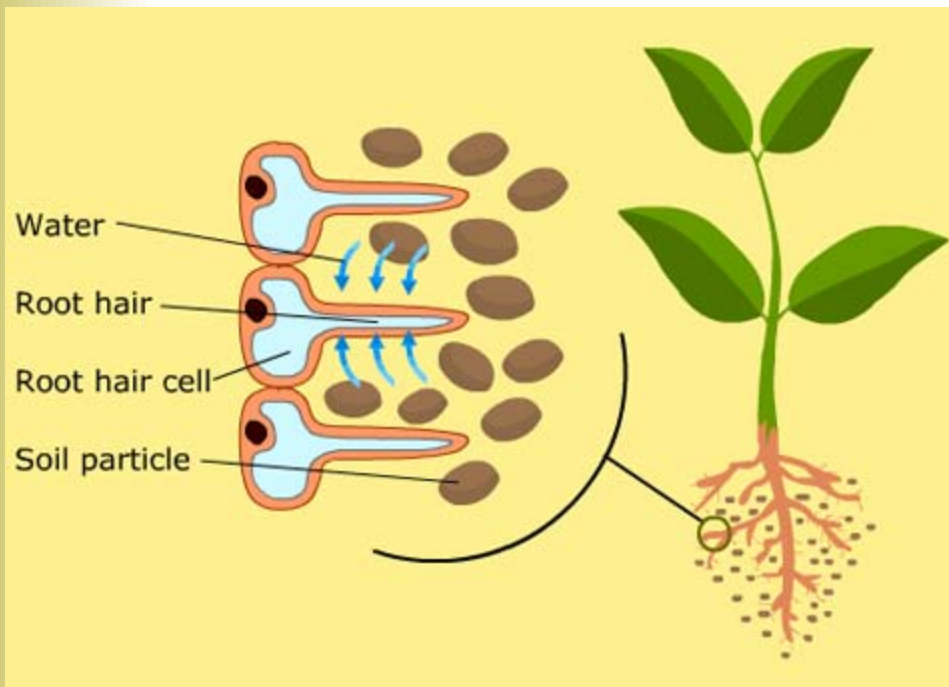


Red Blood Cells



- ❧ They do not respire aerobically as this would use up the oxygen they carry.
- ❧ They carry oxygen from the lungs to respiring tissues.
- ❧ They are specialized in several ways for their function.
- ❧ They contain large amounts of Haemoglobin, that holds oxygen.
- ❧ Many of the organelles (including the nucleus) present in normal cells are not present in red blood cells (Erythrocytes). This is to make space for more Haemoglobin.
- ❧ Their shape is biconcave, which maximizes surface area, and so the speed of movement of Oxygen into and out of the cell.

Cell Specialization – Root Hair Cells

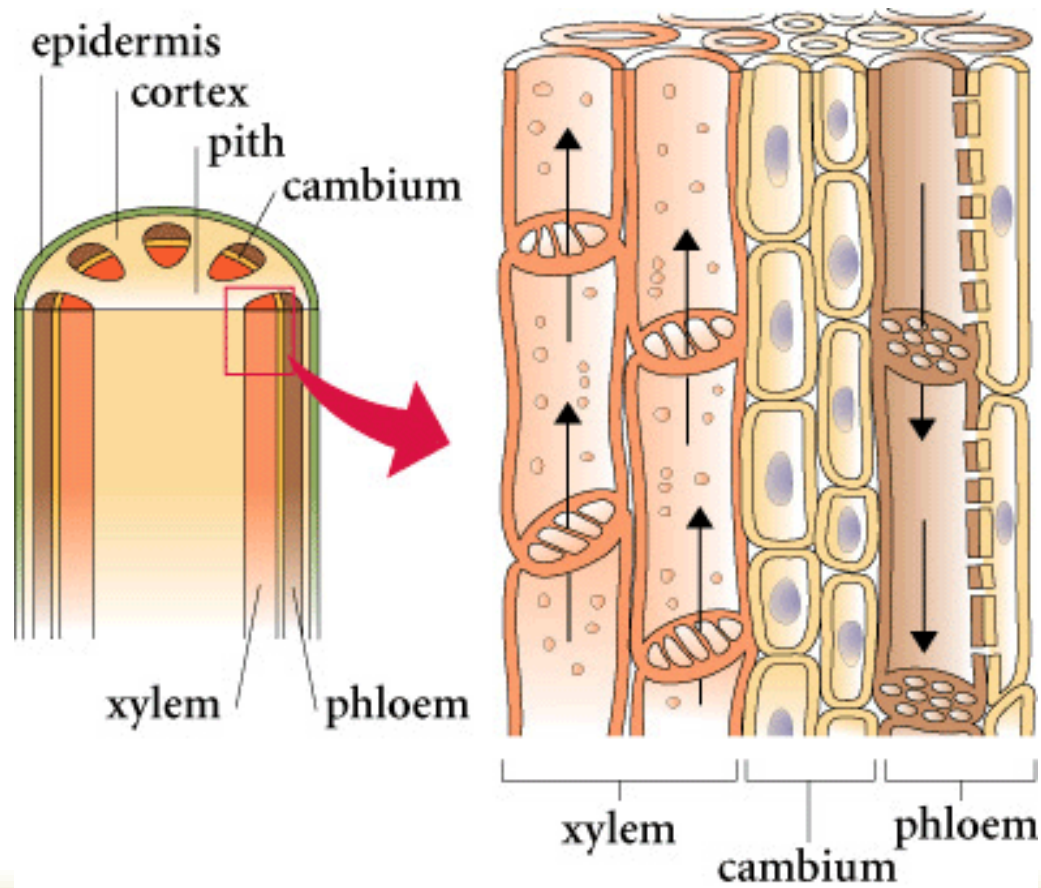


Root Hair Cells



- ❧ Root Hair Cells are found in the roots of plants.
- ❧ Their role is to absorb water and minerals in the soil.
- ❧ They have a large surface area, due to their hair-like projections, which eases uptake.
- ❧ They also have a large amount of Mitochondria, which provide more energy for Active Transport.

Cell Specialization - Xylem



Elizabeth Morales

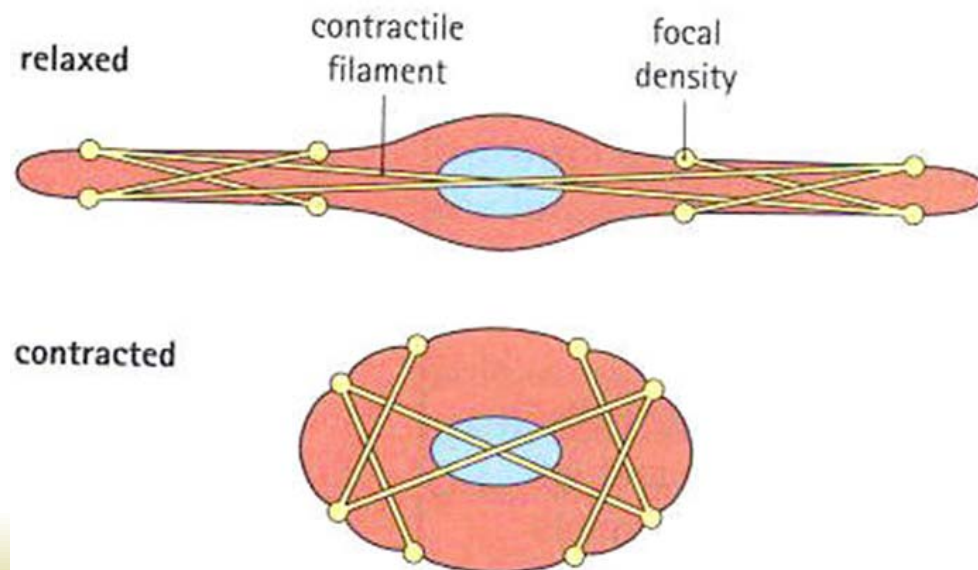
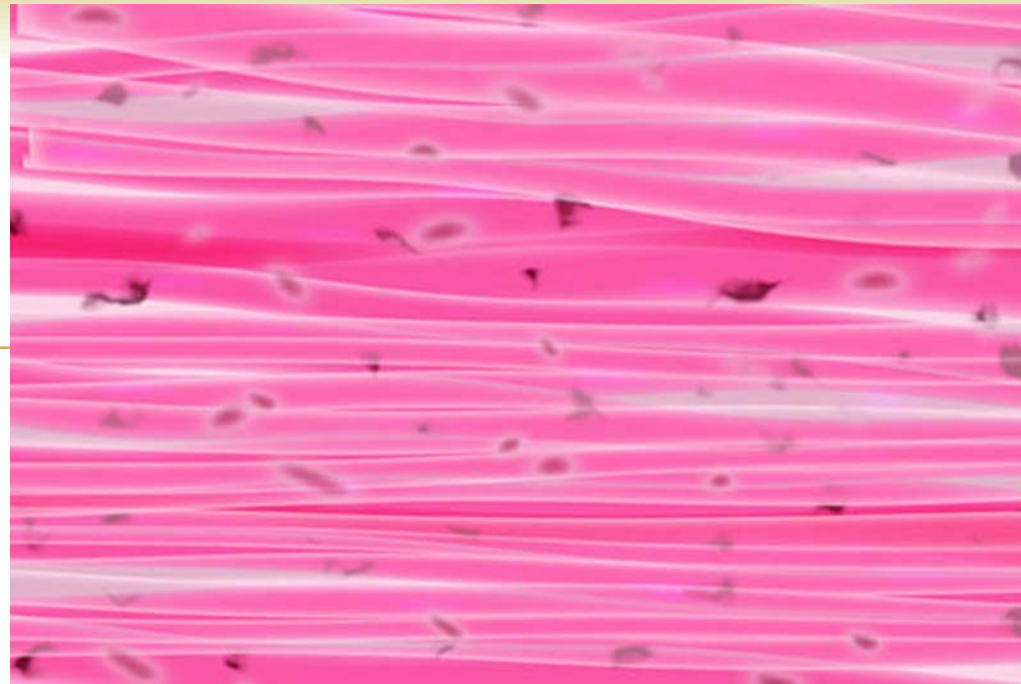
Xylem



- ❧ Their function is to transport water and minerals from the roots to the leaves and to the rest of the plant through the stem.
- ❧ The xylem also supports the plant.
- ❧ They are adapted in two (2) ways. Firstly, they are hollow to allow water and minerals to pass through them with no resistance. Secondly they are strong and lignified to support the plant.
- ❧ Xylem Tissue consists of Xylem Vessels and Parenchyma Cells.
- ❧ Xylem Vessels are made of dead cells that have become elongated and reinforced and waterproofed with deposits of Lignin. The dead cells also do not have any ends, so that successive cells form a tube with wide Lumen.
- ❧ Xylem transports water up the plant and helps to support it.

Cell Specialization - Muscle Cells



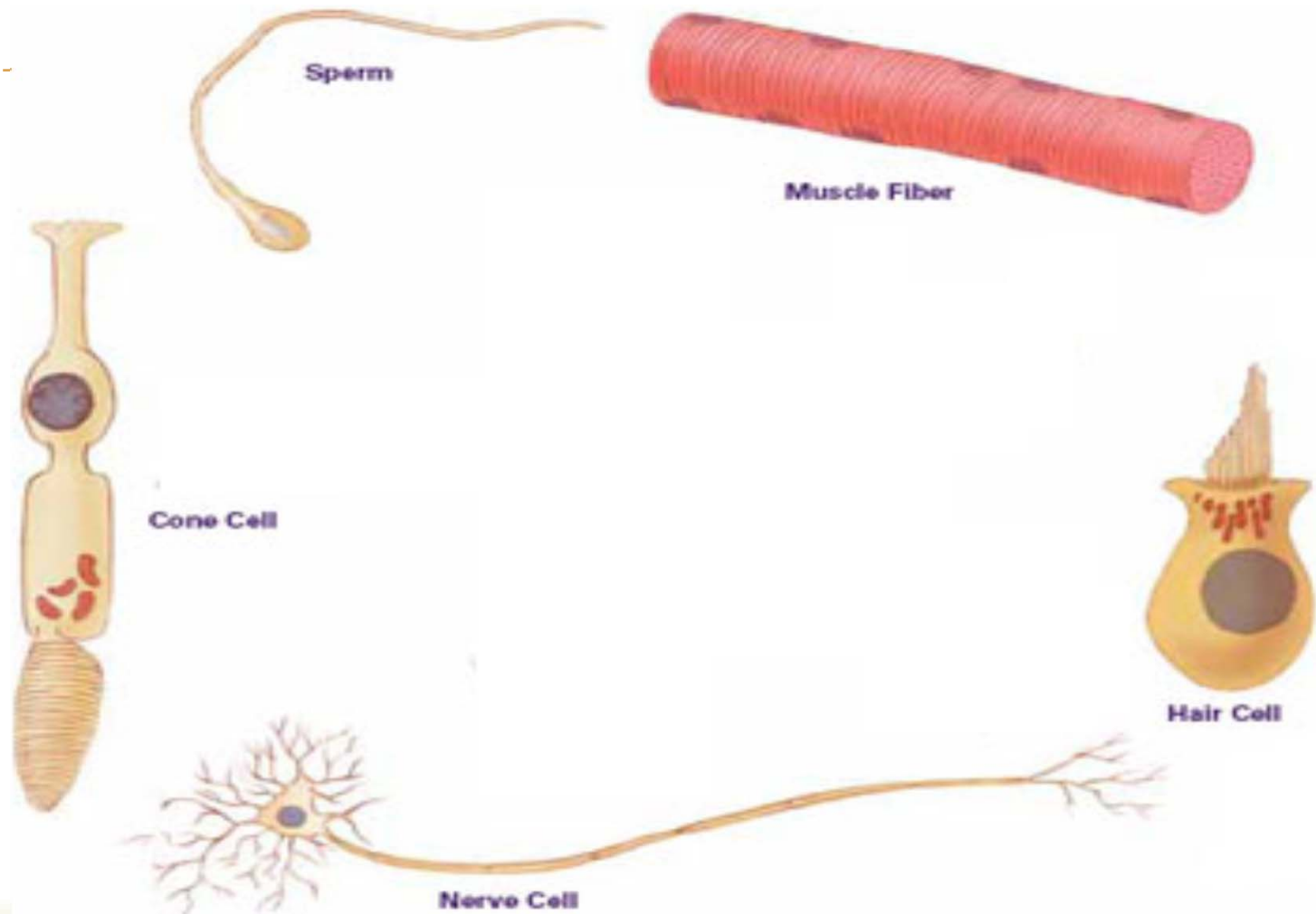


Muscle Cells

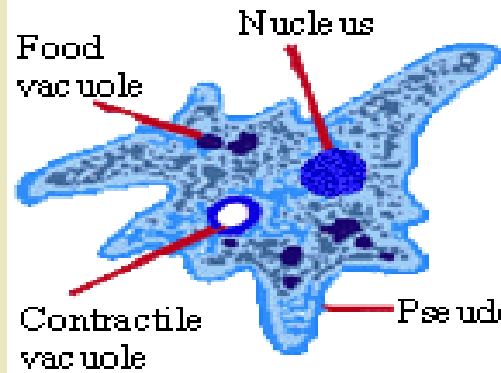


- ❧ These are cells found in muscles in animals, they contract and relax together in order to move the organism.
- ❧ Their functions are to contract, support and move the body.
- ❧ Muscle cells, like all cells, are specialised to carry out their specific functions. Muscle cells need relatively large numbers of mitochondria. This is because they respire more than most other types of cell, in order to release the energy for muscle contraction, and hence movement.

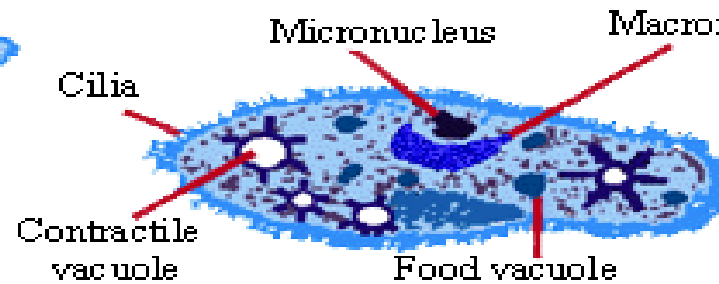
Other Specialized Cells



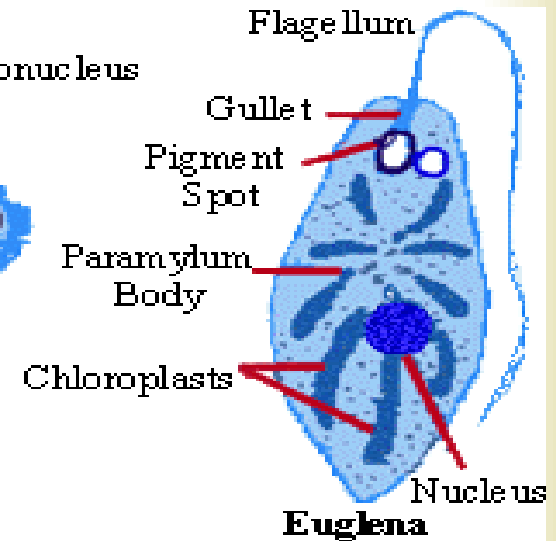
Why do cells specialize?



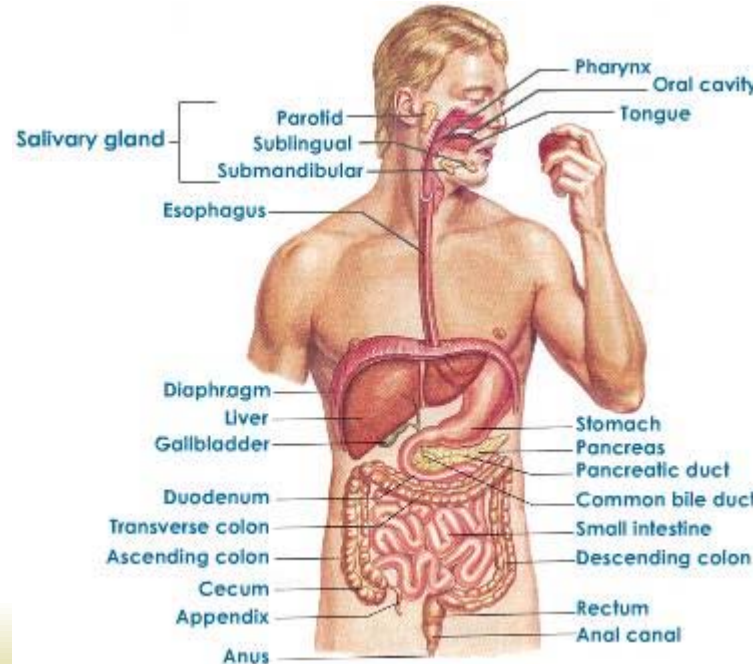
Amoeba



Paramecium



Euglena

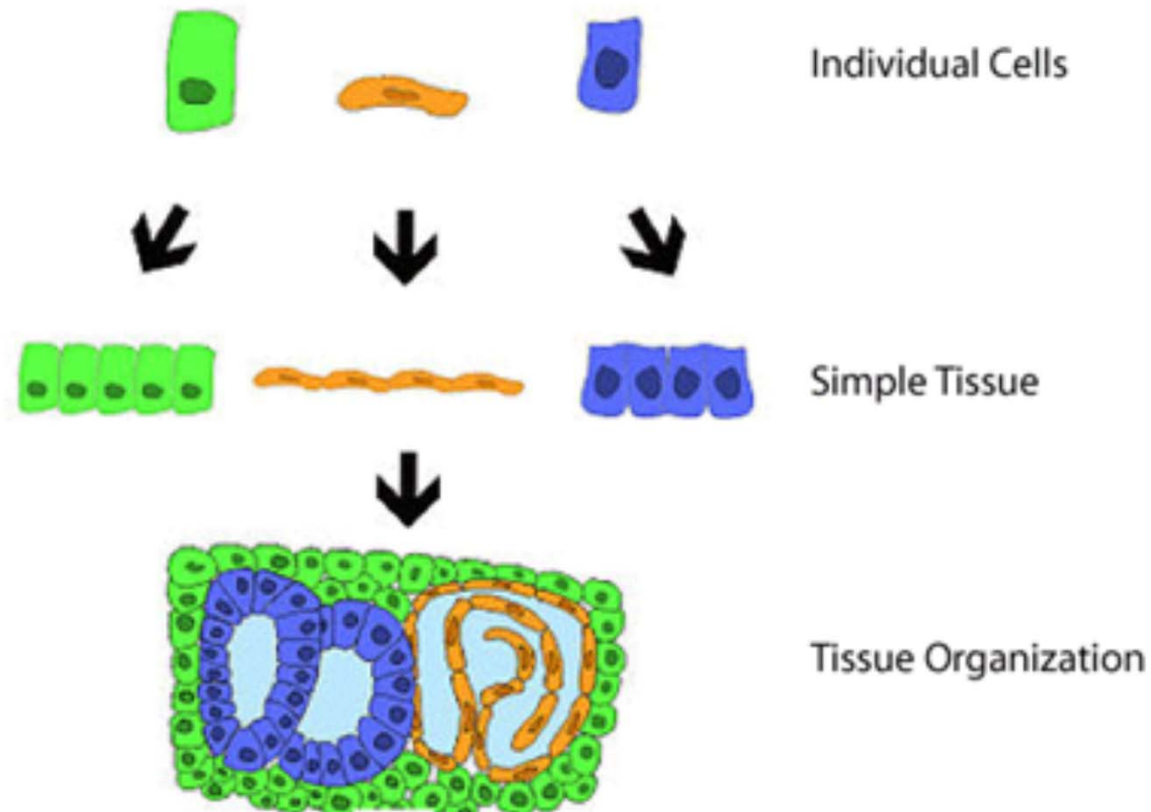


Why do cells specialize?



- ❧ Multicellular organisms must have specialized cells.
- ❧ The cells can rely on other cells to carry out other functions important to the organism. Functions not important to that particular cell.

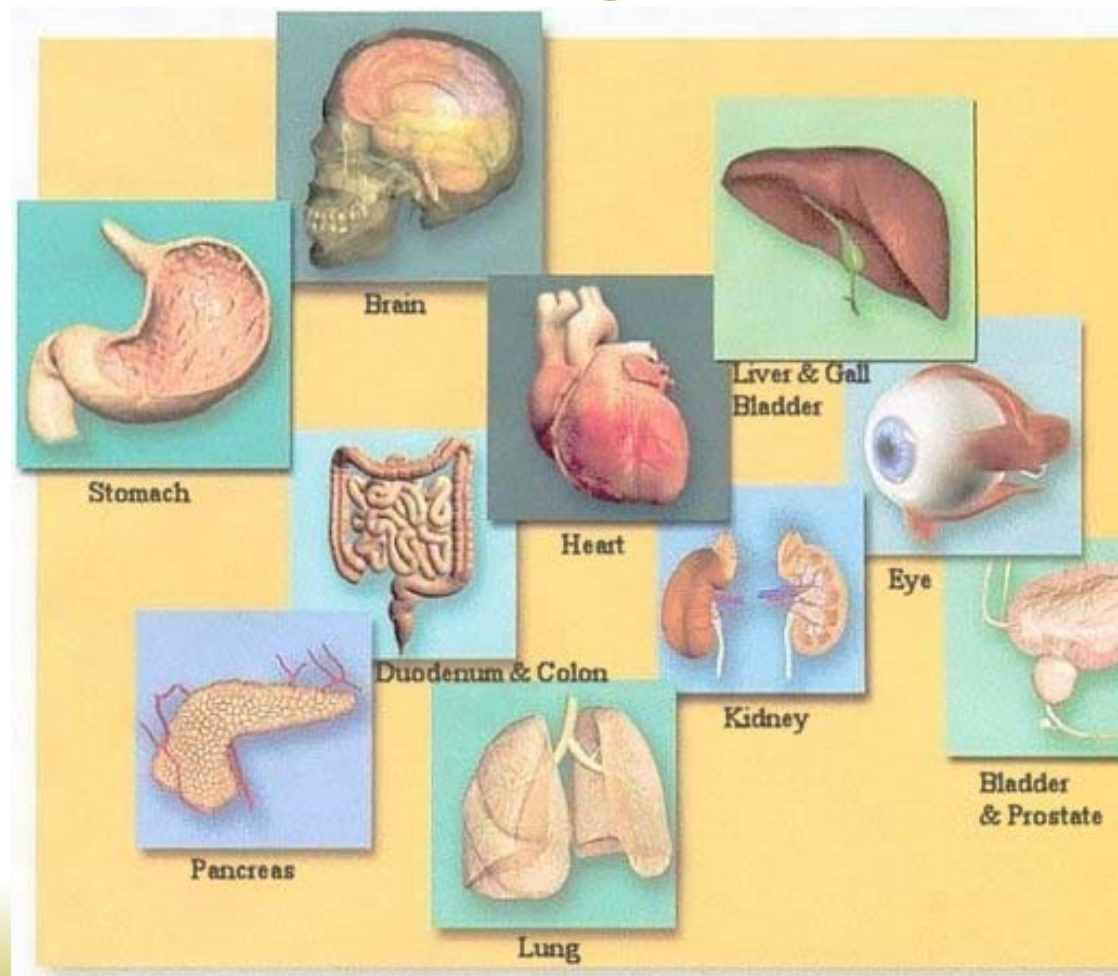
Cells Form Tissues



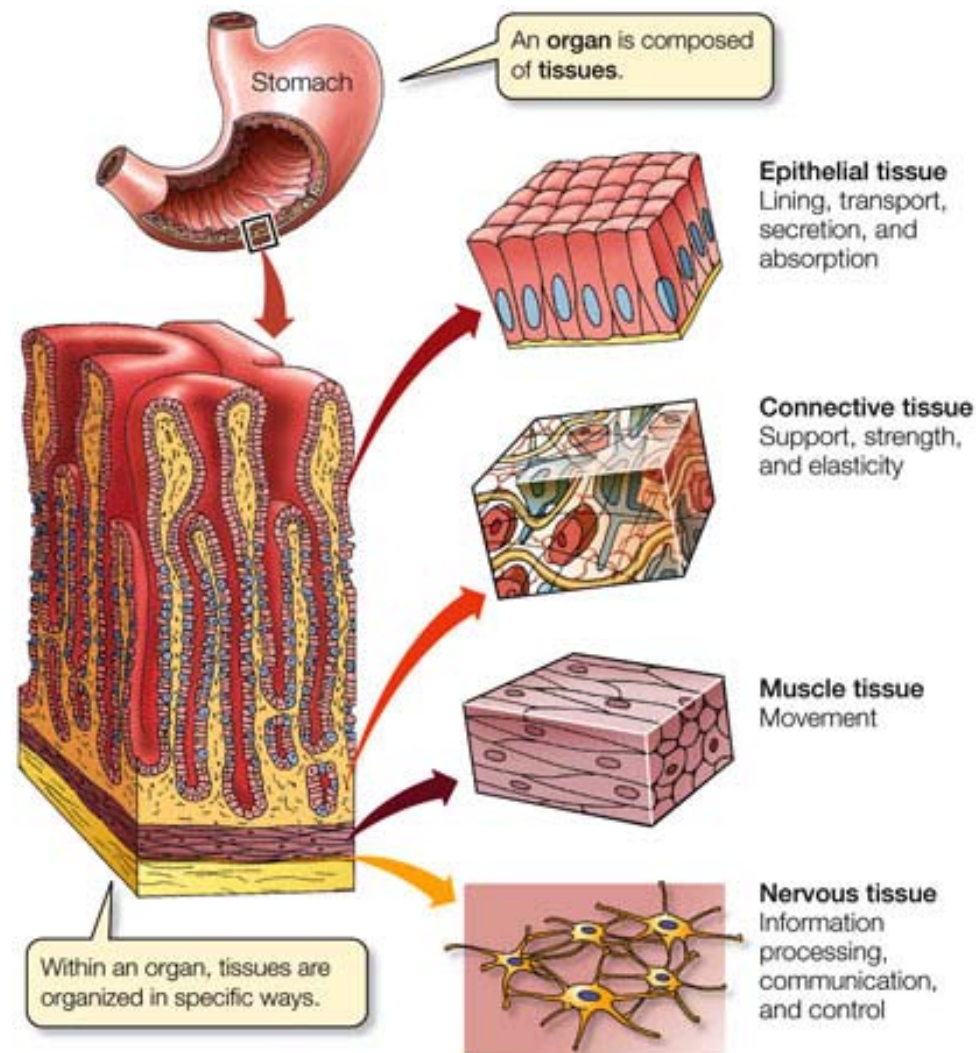


- ❧ In most plants, animals, and fungi, cells are organized into different types of tissues.
- ❧ Examples of tissues are like bone, nerve, or muscles in animals. In plants, tissues are like epidermis , xylem and phloem,
- ❧ Tissues are made up of hundreds of cells of a few types. The cells of each type have similar structures and functions, so that the tissue itself can be said to have a particular function. E.g nerve tissue conducts impulses, phloem tissue carries food in plants.

Tissues form Organs



Tissues of the Stomach



LIFE 8e, Figure 40.7



- ❧ Organs consist of several tissues grouped together to make a structure with a special function,
- ❧ For example - The stomach is an organ which contains tissues made of epithelial cells, gland cells and muscle cells. The stomach also has a nerve supply.
- ❧ In flowering plants – the root, stem and leaves are the organs. The tissues of the leaf are epidermis, palisade tissue, spongy tissue, xylem and phloem.

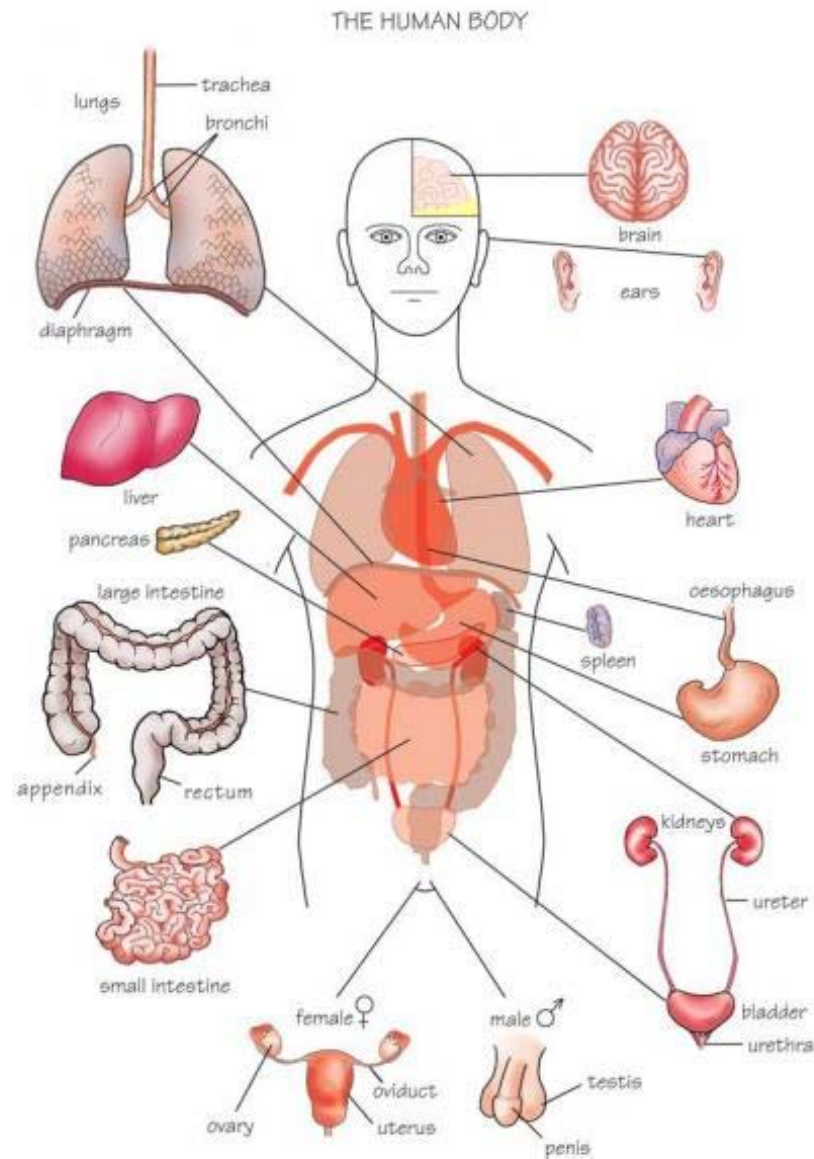
Organs make up Systems



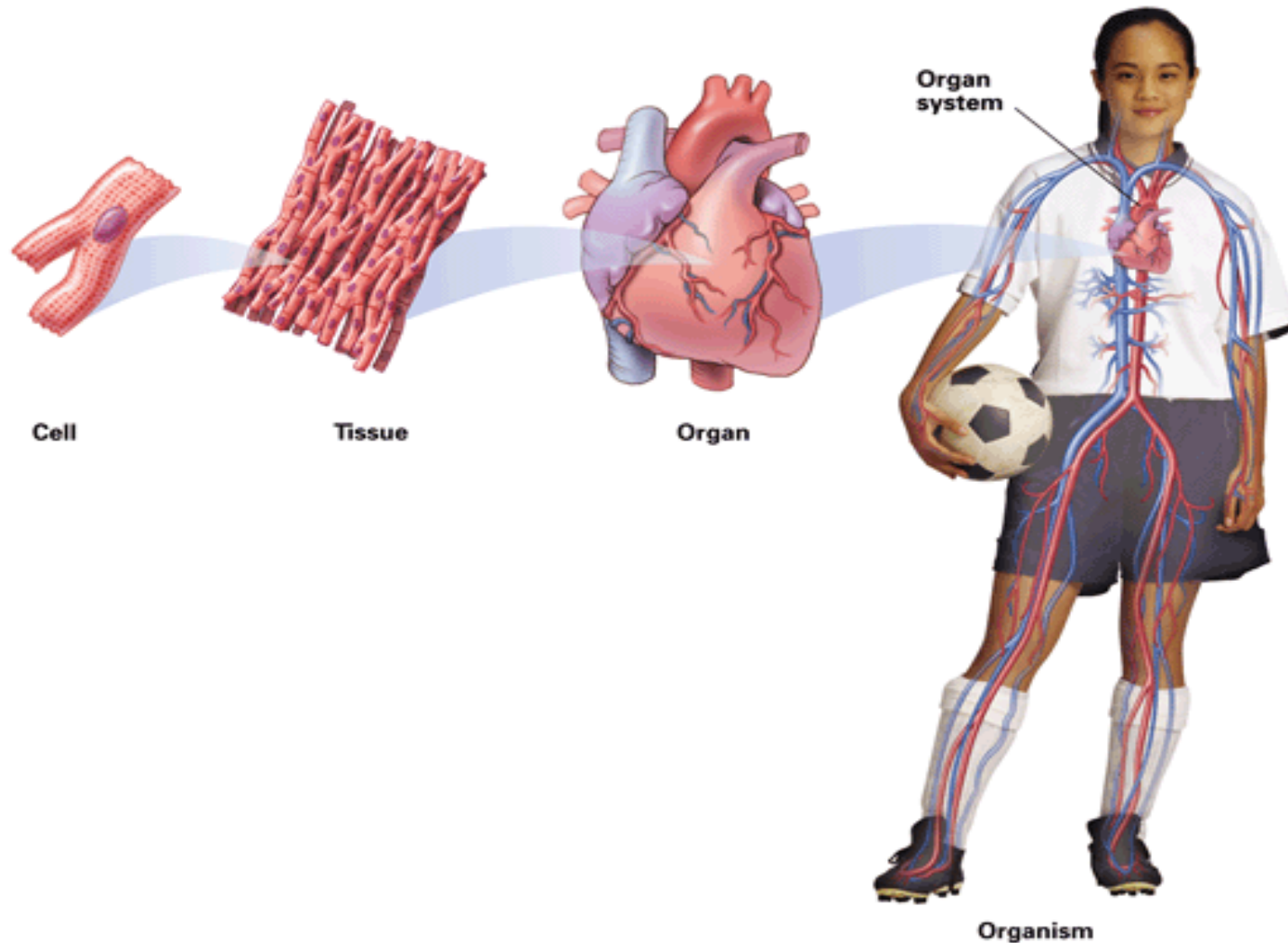


- ❧ A system refers to a group of organs whose functions are closely related. E.g the heart (an organ) and blood vessels make up the circulatory system. The brain, spinal cord and nerves make up the nervous system.
- ❧ In a flowering plant, the stem leaves and buds make up a system called the shoot.

Organs form Systems



Systems form the Organism

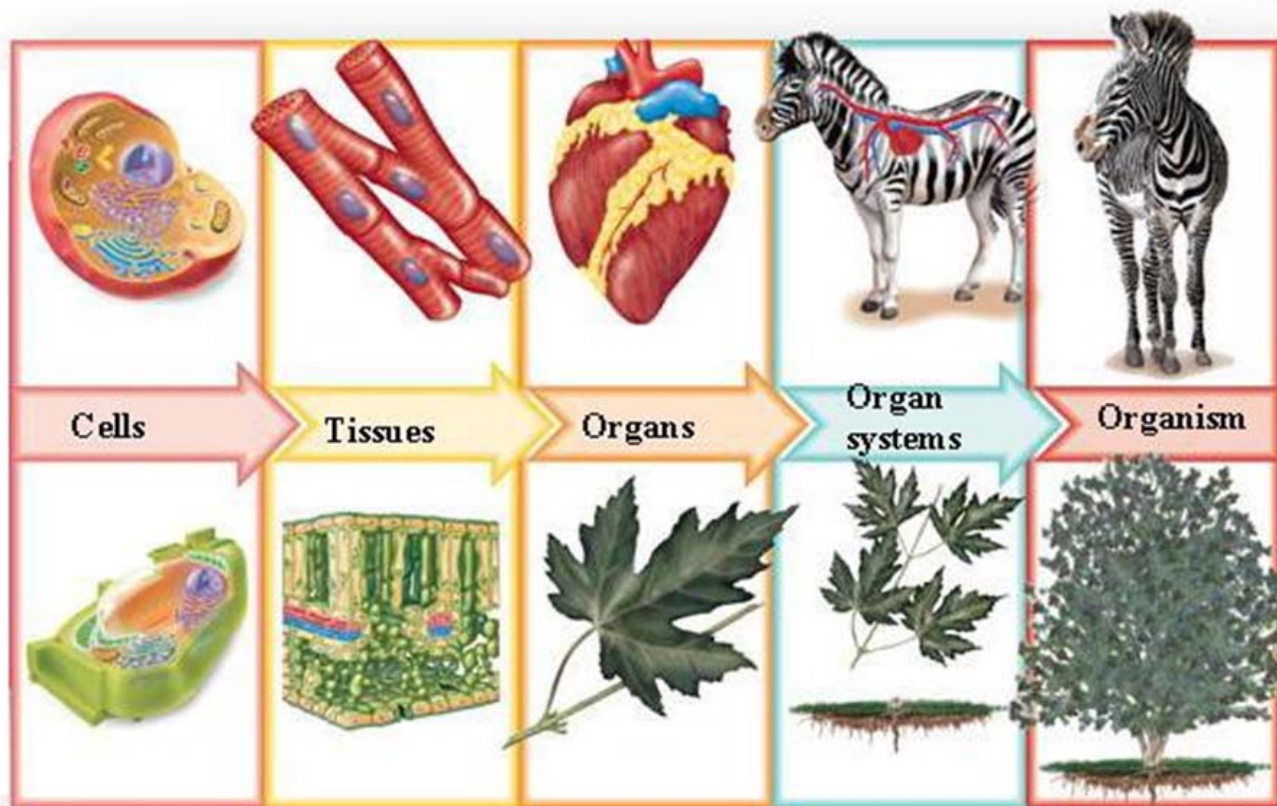




- ❧ An organism is formed by the organs and systems working together to produce an independent plant or animal.
- ❧ This is why “cells” are the building blocks or foundation of an organism. Without cells, there would be no tissues, organs, systems or organism.

Structural Organization

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Recap



- 1) Plants and Animals are made up of millions of microscopic cells
- 2) Cells are the building blocks of organisms
- 3) Cells contain - Cell Wall (plants only) Cell Membrane, Cytoplasm, chloroplasts ,Vacuole, Mitochondria and Nucleus.
- 4) Growth is a result of cell division, enlargement and specialization.
- 5) Multicellular organisms must have specialized cells. These cells rely on other cells to carry out other functions important to the organism. Functions not important to that cell.
- 6) Cells form tissues which form organs which form systems which makes up the entire organism.