

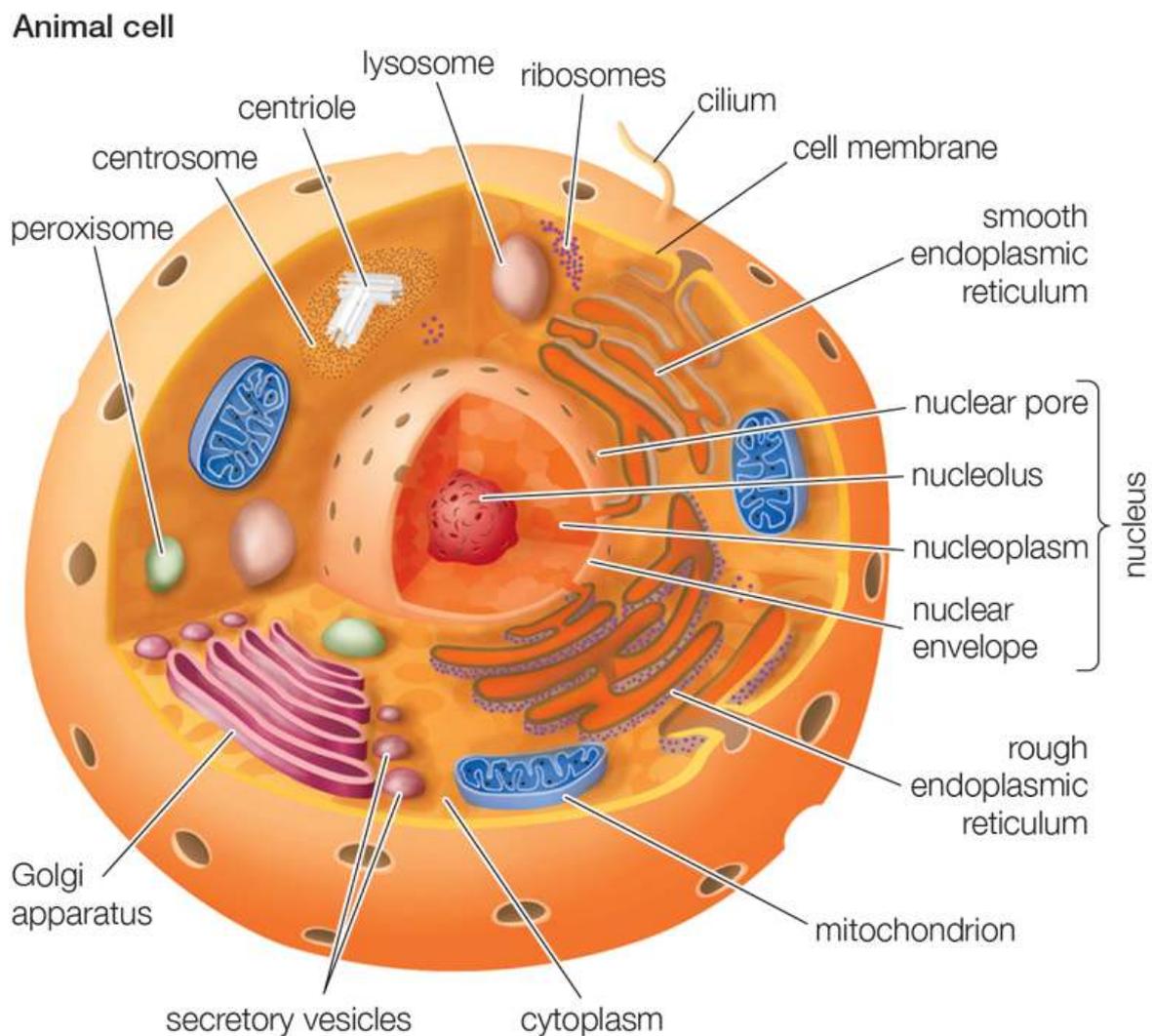
Cell structure

The basic structure of a cell

The cell is the basic unit of life. Cells build up an organism just like bricks build up a house. They work together to keep an organism alive. There are many different types of cells. Our body alone is made up of more than 200 types of cells. The shape and size of cells vary, but some features are common to all.

What is the structure of animal cells?

Animal cells share the same basic structure. The major part of the cell is a watery fluid called cytoplasm. The cytoplasm is bounded by a cell membrane.



Various organelles (細胞器) are held in the cytoplasm.

1 Cell membrane

- It is a thin and flexible membrane surrounding the cell.
- It is differentially permeable meaning that it only allows some substances to pass through. In other words, it controls the movement of substances into and out of the cell.

2 Cytoplasm

- It is a jelly-like substance consisting of water, proteins and other chemical substances.
- It holds all the organelles (e.g. nucleus, endoplasmic reticulum, mitochondria and vacuole).
- Many chemical reactions take place here.

3 Organelles (refer to the structures in which certain functions are localized)

a. Nucleus

- It is round-shaped and bounded by the nuclear membrane (核膜), which is a double membrane.
- It contains DNA, the genetic material of life.
- It controls all activities of the cell.

b. Mitochondrion(singular form) mitochondria (plural form)

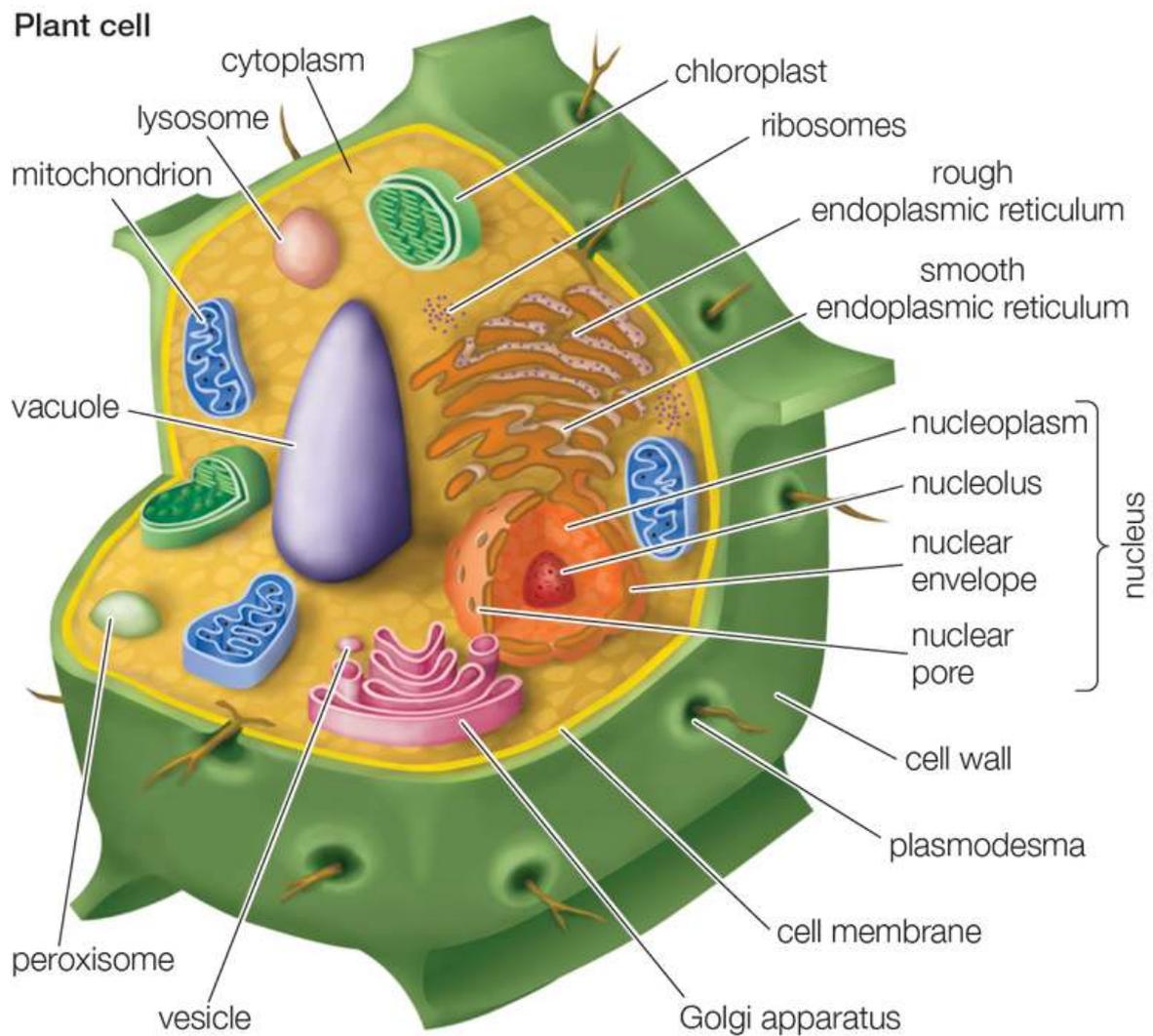
- It is rod-shaped and bounded by a double membrane.
- The inner membrane is folded into finger-like projections.
- It is the main site where the energy-releasing stage of respiration takes place.
- Mitochondria are abundant in active cells such as sperm cells and muscle cells.

c. Vacuole

- It is a space containing water and dissolved substances such as food and enzymes.
- It is bounded by a differentially permeable membrane.
- Most animal cells have only a few small or even no vacuoles.

What is the structure of plant cells?

The basic structure of plant cells is similar to that of animal cells. Both a plant cell and an animal cell have a cell membrane, cytoplasm, a nucleus, mitochondria and endoplasmic reticulum. In addition, plant cells have a cell wall and a large vacuole. Some plant cells also contain chloroplasts.



- 1 Cell wall
 - It is a thick, rigid layer covering the cell membrane.
 - It is mainly made up of cellulose (纖維素).
 - It is fully permeable, i.e. allows all types of substances to move across.
 - It protects, supports and gives shape to plant cells.

- 2 Organelles that found in plant cells ONLY
 - a. Large central vacuole
 - It contains cell sap which is a solution of dissolved substances such as food, pigments and waste.
 - It is usually large and located at the centre of the cell.
 - When it is full of water, the cell becomes turgid (硬脹). This provides support to the plant.

 - b. Chloroplast
 - It is bounded by a double membrane.
 - It contains a green pigment called chlorophyll.
 - Chlorophyll absorbs light energy for photosynthesis.

Organisms are made up of cells. Cells are very small and cannot be seen with the naked eye. People did not even know that cells existed until the microscopes were invented.

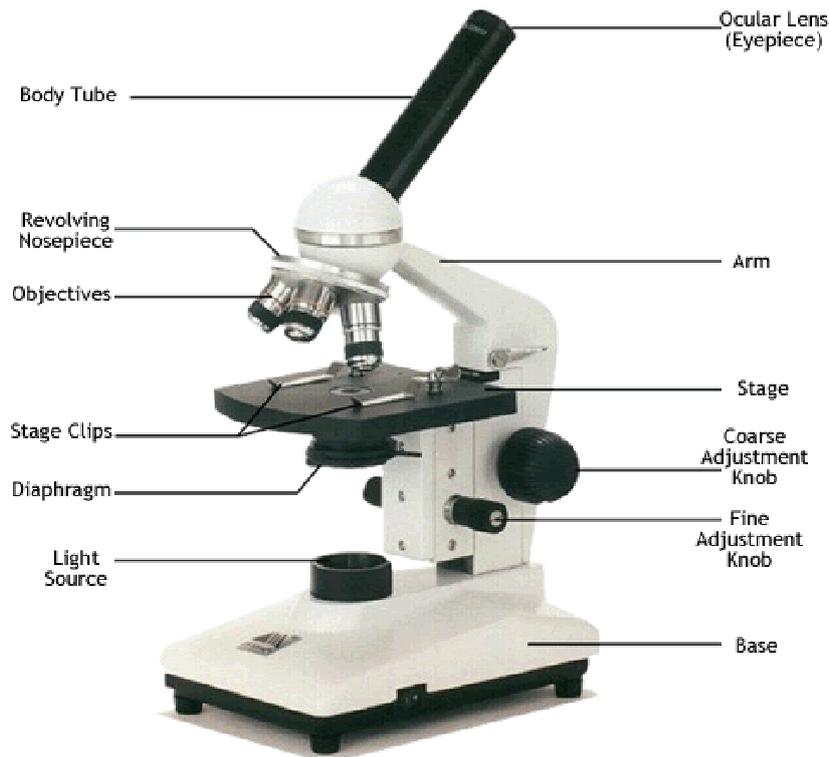
Microscope

A microscope is an instrument used to see objects that are too small for the naked eye. The science of investigating small objects using such an instrument is called microscopy. Microscopic means invisible to the eye unless aided by a microscope.

There are many types of microscopes, the most common and first to be invented is the optical microscope which uses light to image the sample. Other major types of microscopes are the electron microscope (both the transmission electron microscope and the scanning electron microscope) and the various types of scanning probe microscope.

History

The first microscope to be developed was the optical microscope, although the original inventor is not easy to identify. An early microscope was made in 1590 in Middelburg, Netherlands. Two eyeglass makers are variously given credit: Hans Lippershey (who developed an early telescope) and Zacharias Janssen. Giovanni Faber coined the name microscope for Galileo Galilei's compound microscope in 1625 (Galileo had called it the "*occholino*" or "*little eye*").



How to use a light microscope

1. Take out a microscope from a bag/ wooden box by holding its arm and supporting its base.
2. Adjust the amount of light by controlling the mirror and diaphragm / by turning the knob for the illumination.
3. Clip a prepared slide on the stage.
4. Make low power observations:
 - 4.1 Select a low power objective.
 - 4.2 Observe the stage from one side and lower the body tube by controlling the coarse adjustment knob until the objective nearly touches the coverslip.

- 4.3 Look down the eyepiece and raise the body tube with the coarse adjustment knob until the image becomes clear.
- 4.4 Focus using the fine adjustment knob until the image becomes sharp.
5. Make high power observations:
 - 5.1 Focus the specimen with low power first .
 - 5.2 Move the slide until the object you want to observe is at the centre of the field of view.
 - 5.3 Change for a high power objective.
 - 5.3 Focus the image with the fine adjustment knob.
 - 5.4 Adjust the amount of light if necessary (open the diaphragm).

Remember to remove the slides on the stage after your observation!

The total magnification of the microscope is the product of the magnification of the eyepiece and that of the objective. For example:

Eyepiece	Objective	Total magnification
5X	4X	20X
10X	10X	100X
15X	40X	600X

The image observed under the microscope is inverted upside down and laterally. For example, if you observe the letter 'p' under the microscope, the image becomes 'd'.

Making a Good Biological Drawing

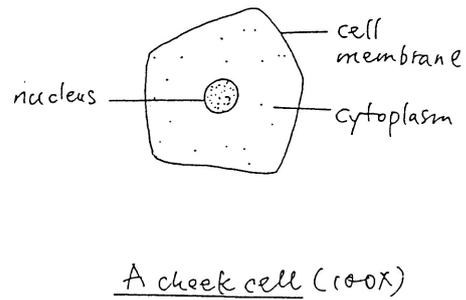
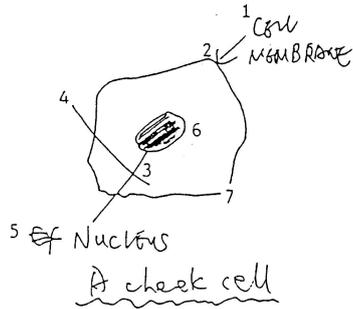
The purpose of making biological drawings is to record the observed structures of living organisms. In making such drawings, we have to follow a number of rules:

- a. Use sharp pencils. Never use pens.
- b. Make large drawing. Ensure that all parts are in good proportion.
- c. Draw lines with free hand. Do not use ruler! Lines should be thin, firm and continuous.
- d. Shading is not allowed. You may use dots if necessary.
- e. Labels
 - i. Label the structures you can see.
 - ii. Use a ruler and pencil to draw straight labelled lines.

- iii. Do not place labels inside the drawing.
- iv. Use small letters for labels.
- f. Give a proper title for your drawing: name of specimen (power)
 - e.g. onion epidermal cells (100x)
 - ox corneal cells (400x)

Examples of good and poor drawings

1. Drawing of a cheek cell



2. Drawing of onion epidermal cells

