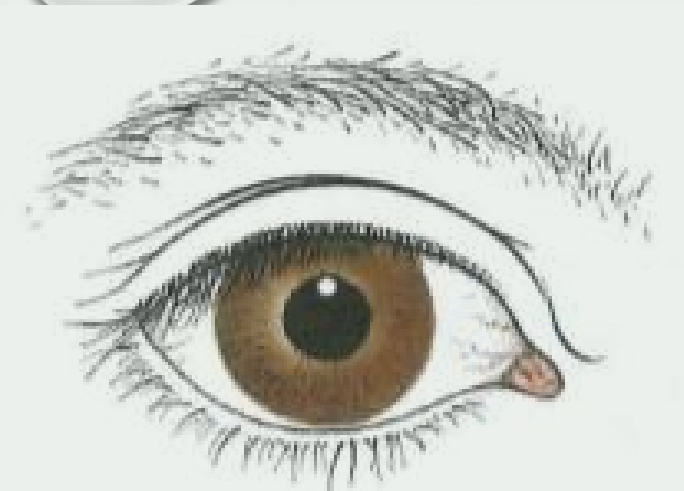
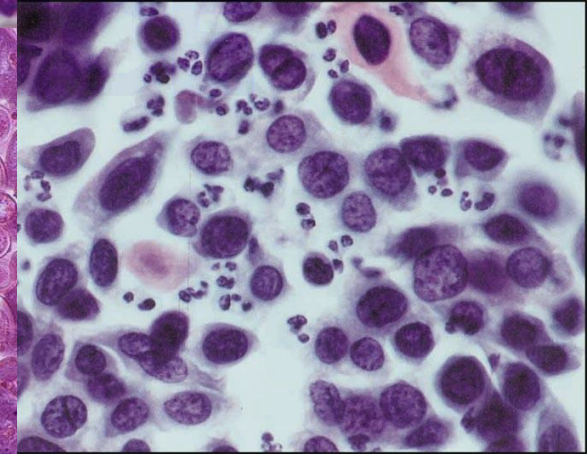
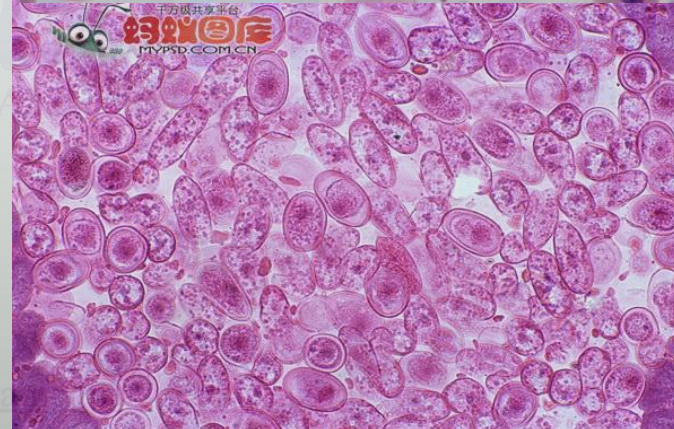
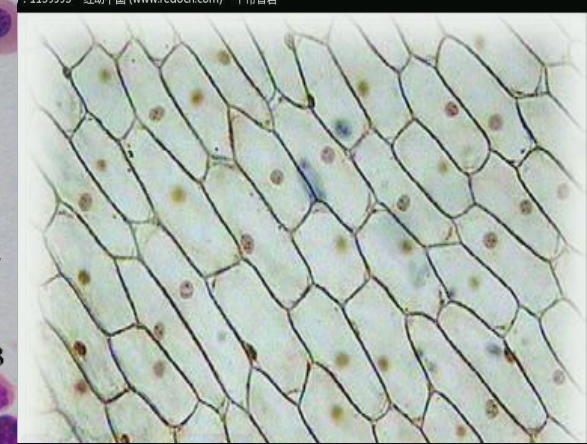
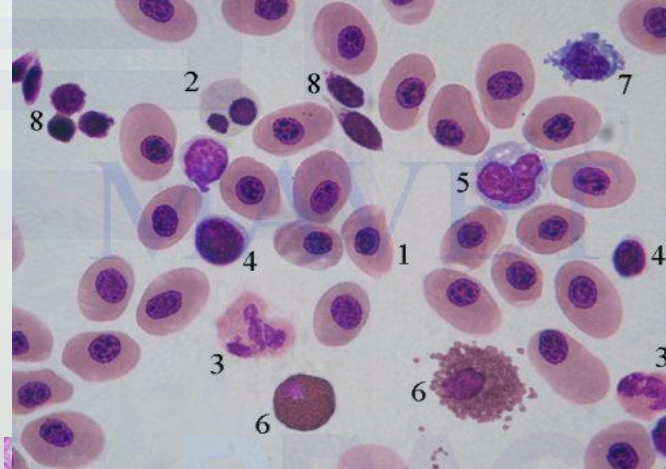
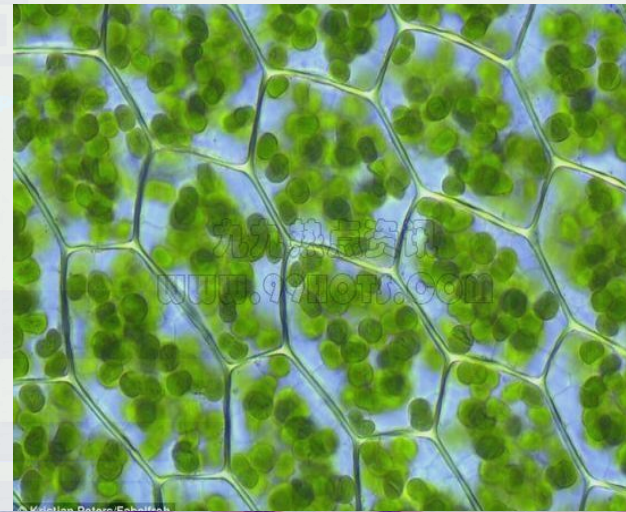


cells

Cell structure

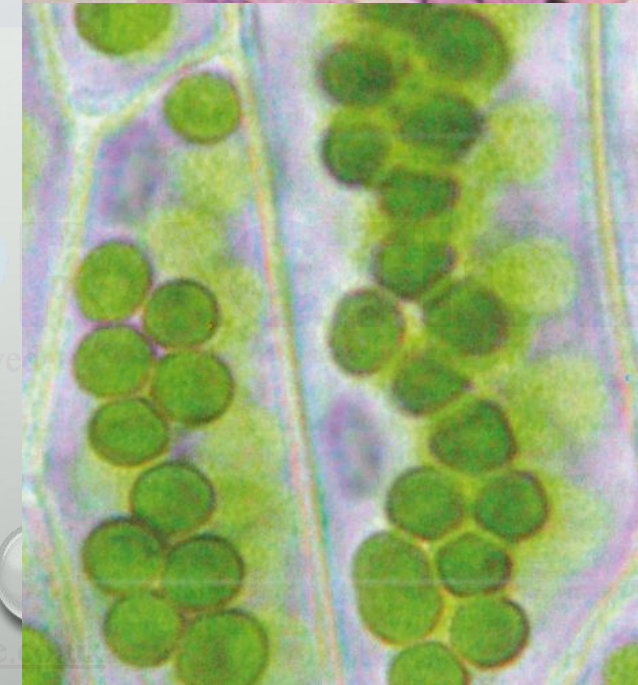
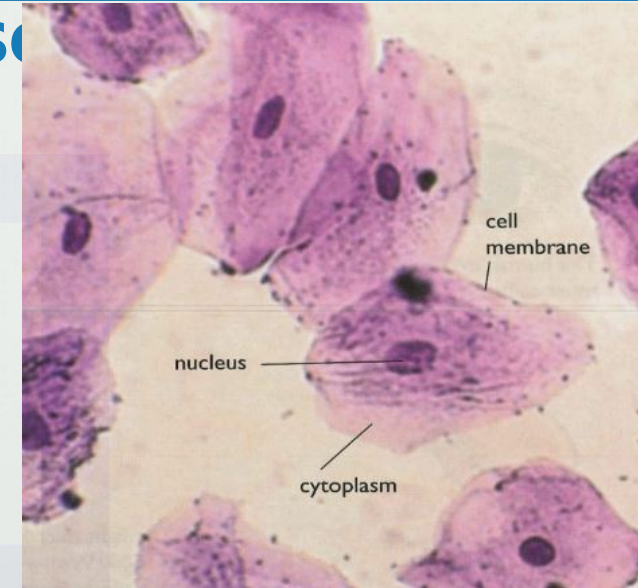


cells



cells

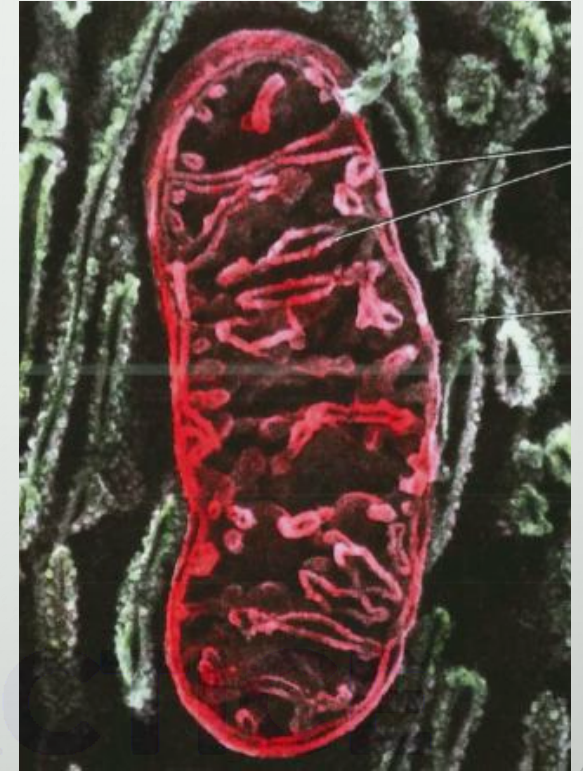
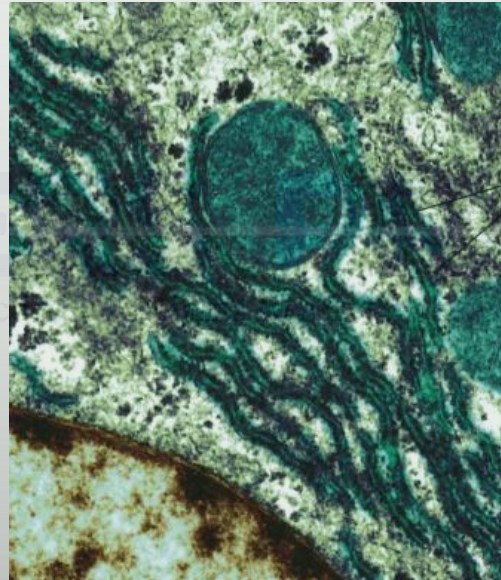
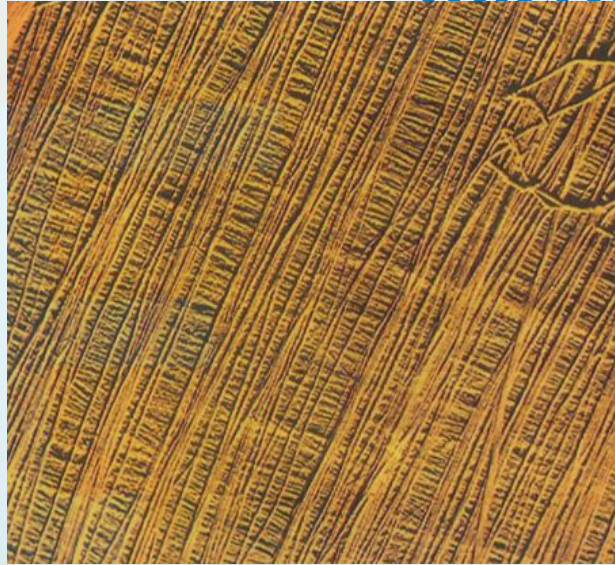
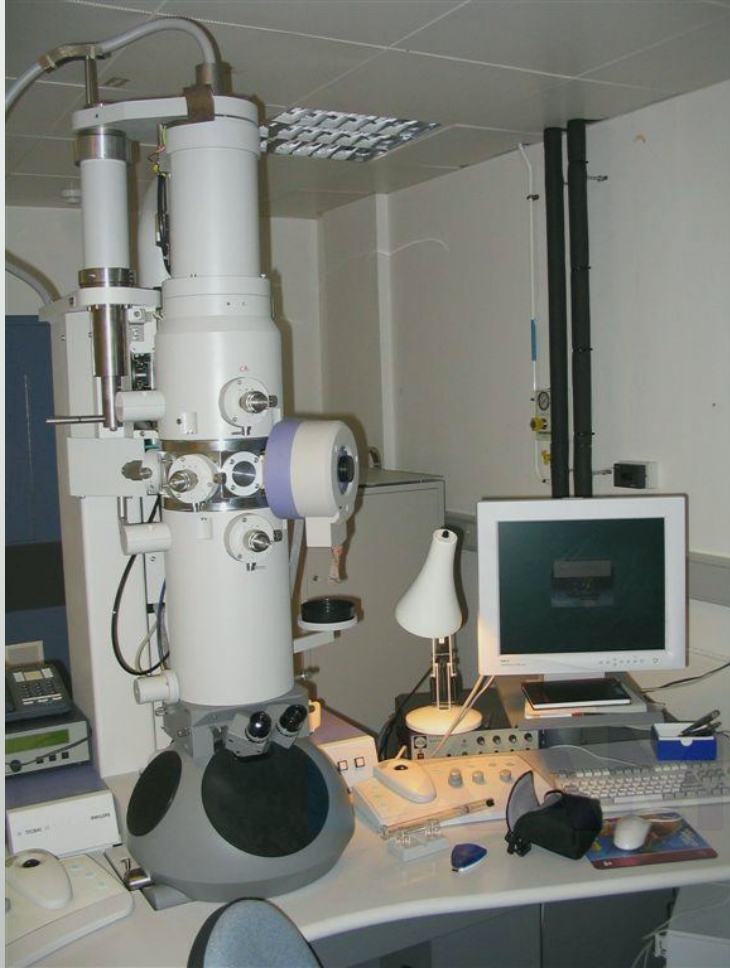
Cell structure— microscope



microscope 显微镜
light microscope 光学显微镜

cells

Cell structure—— microscopes



electron microscope 电子显微镜

cells

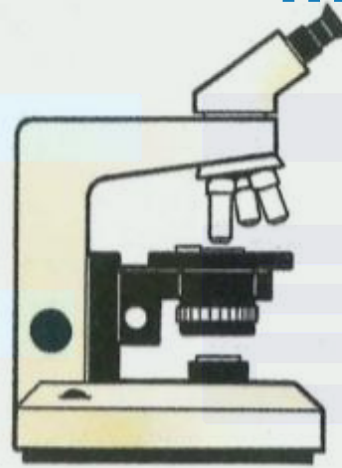
Cell structure— microscopes



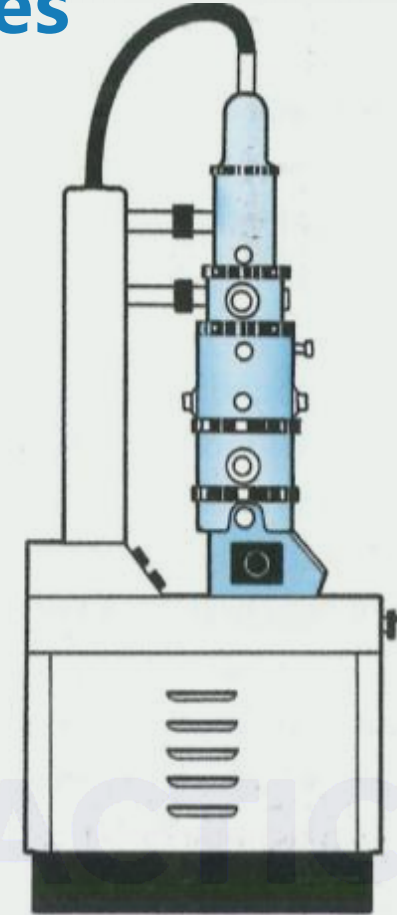
The human eye cannot see most cells.



A hand lens magnifies about $\times 10$. Cells can often be seen as dots.



The light microscope magnifies up to $\times 1500$. With a light microscope you can see some structures inside a cell, such as a nucleus.



An electron microscope magnifies up to $\times 10$ million. With an electron microscope much more detail can be seen.

If an object was 1mm across, how big would it look if it was magnified 10 times?

cells

Cell structure

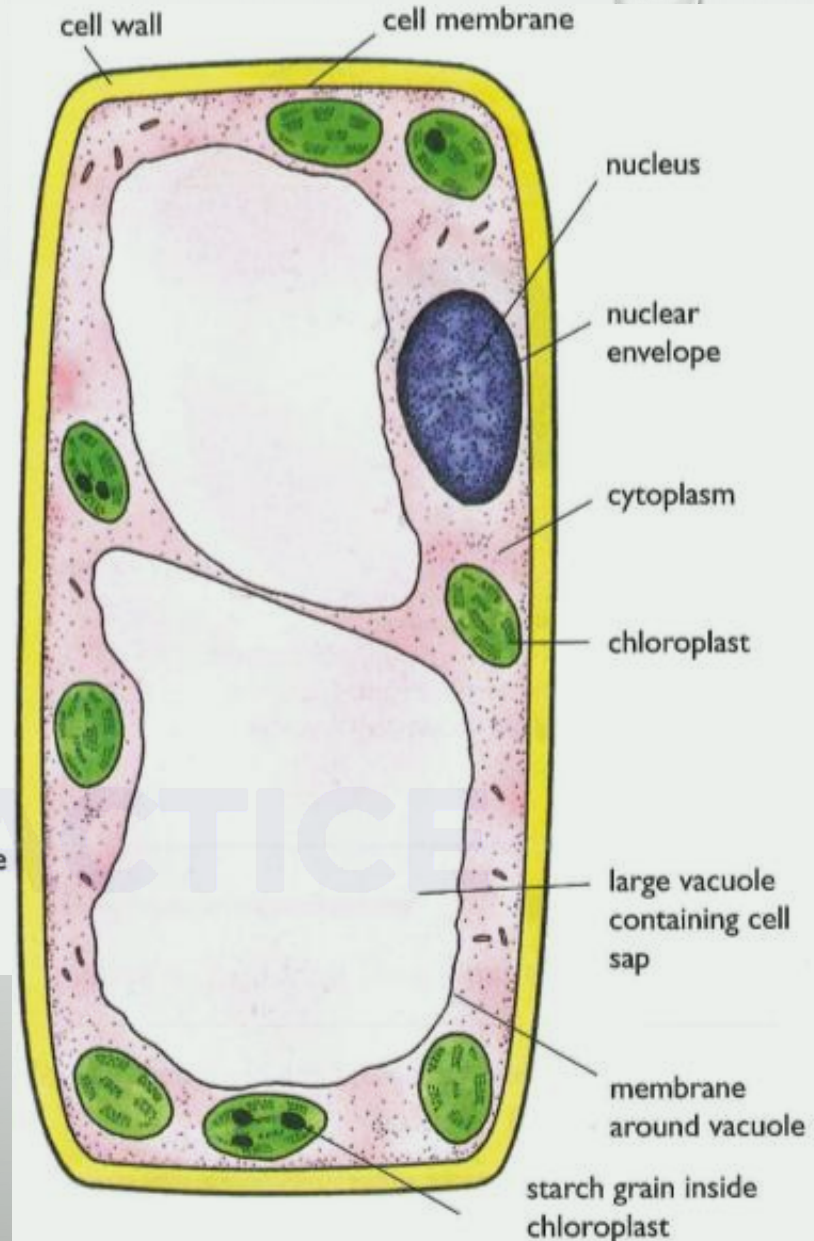
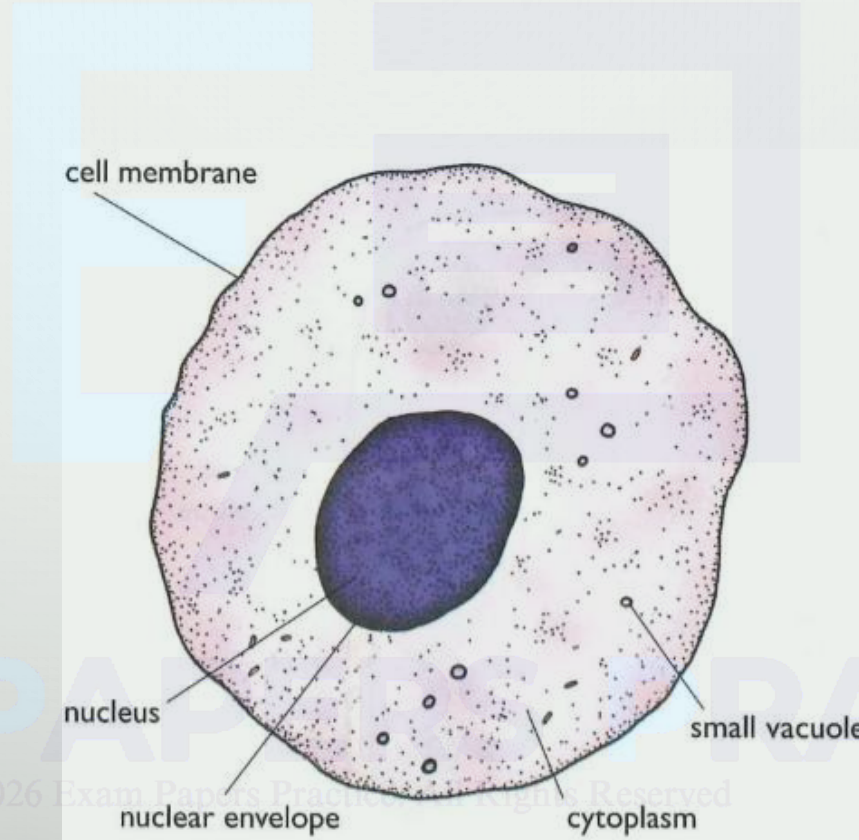
Cell membrane

Cytoplasm (organelles)

nucleus

Cell wall

organelle 细胞器

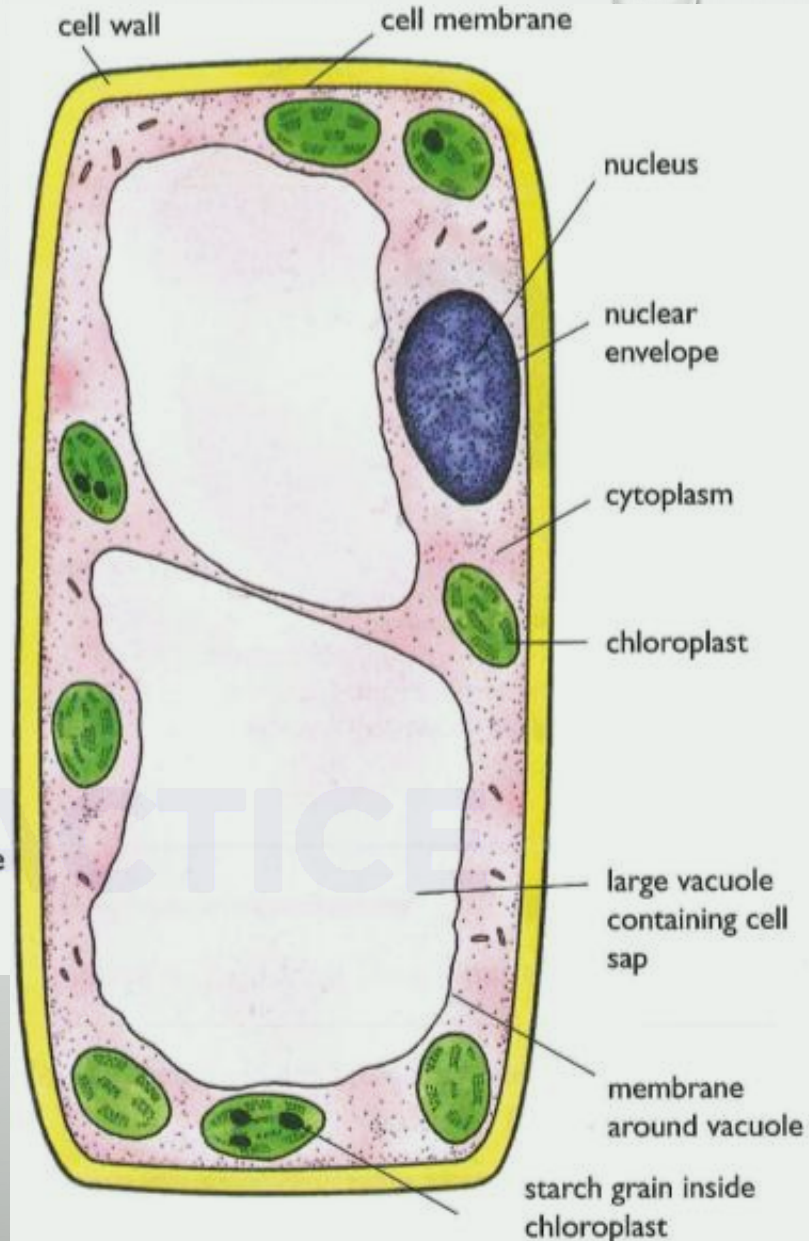
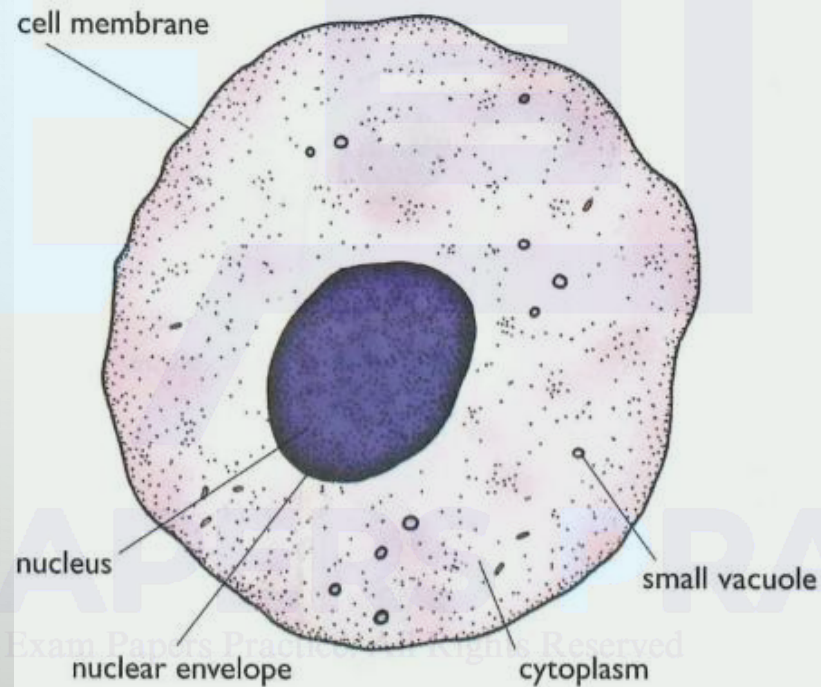


cells

Cell structure

Cell membrane

- ◆ **component** : protein and fat
- ◆ **function** : control what goes in and out of cell
- ◆ partially permeable



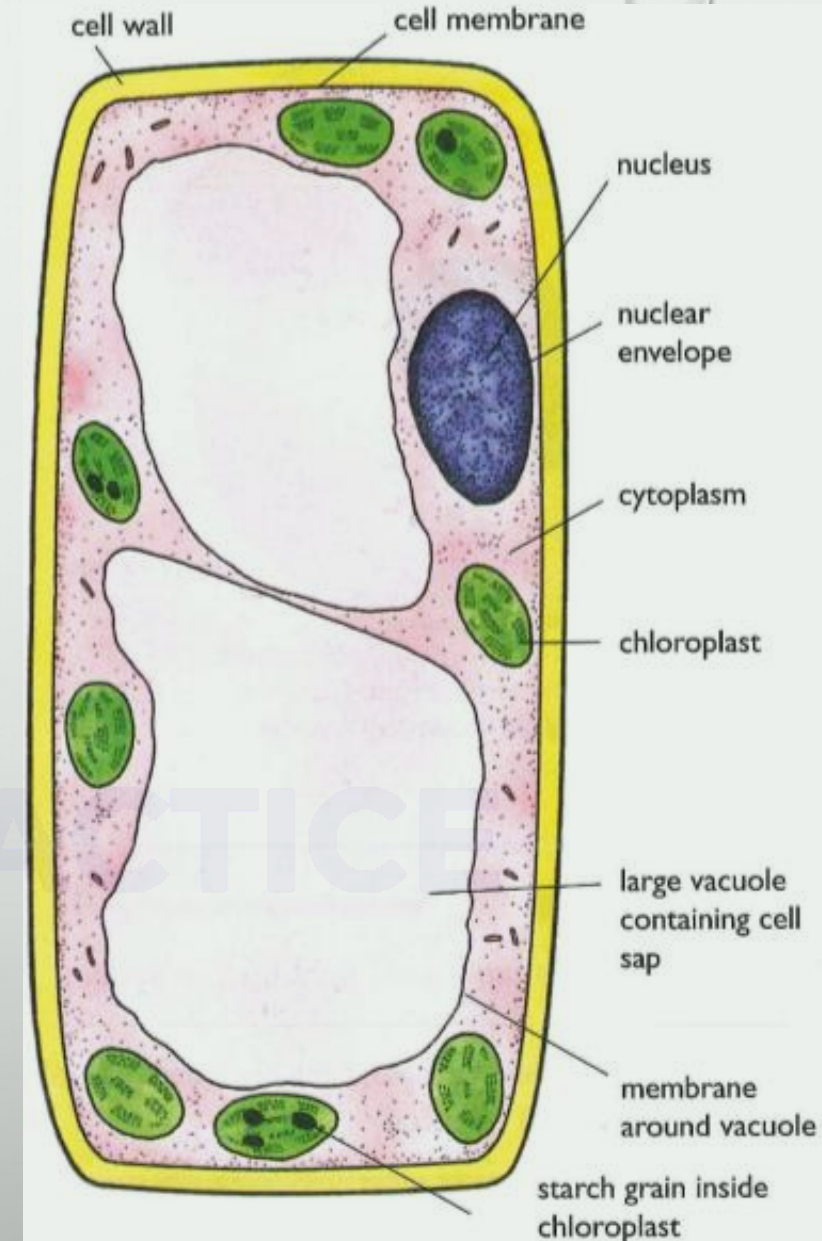
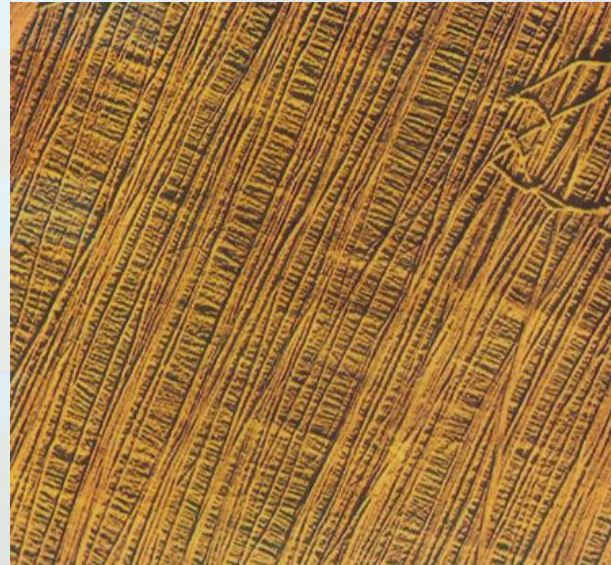
cells

Cell structure — cell wall

Cell wall

- ◆ **component** : cellulose (polysaccharide)
- ◆ **function** :
Protect
support
- ◆ fully permeable

polysaccharide 多糖



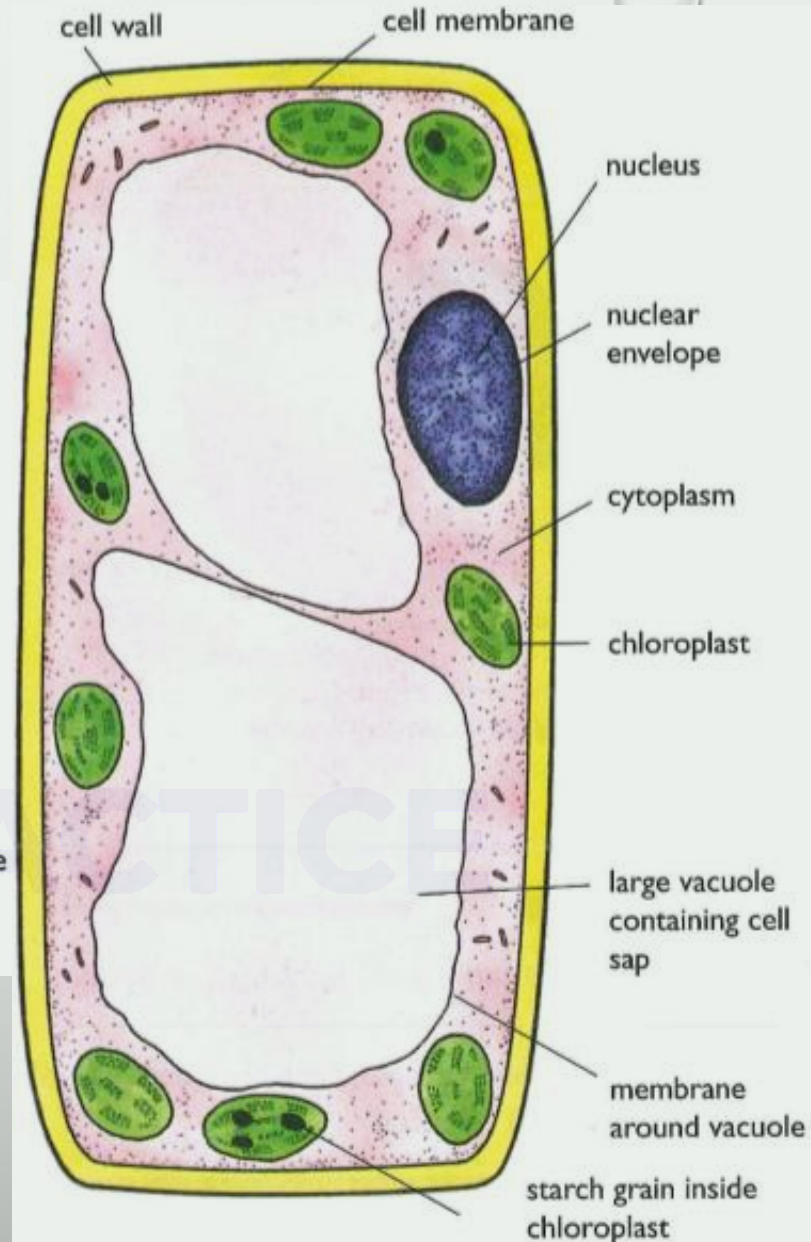
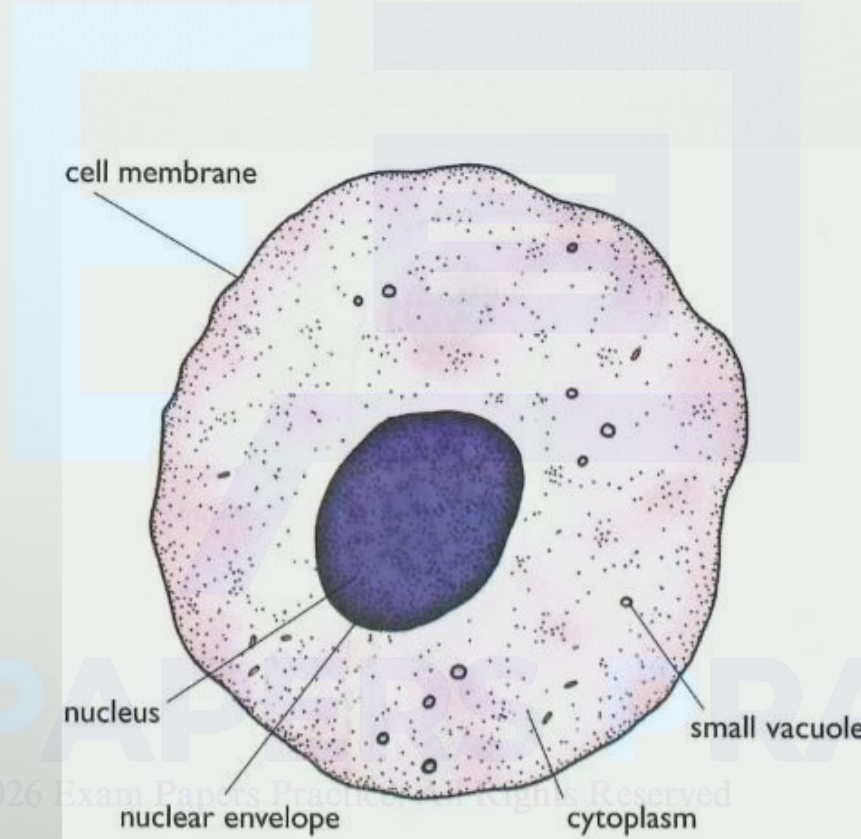
cells

Cell structure — cytoplasm

Cytoplasm

◆ **component** : water; sugar; protein ...

◆ **function** :
Place of metabolic reactions



cells

Cell structure — vacuoles

vacuole

◆ structure:

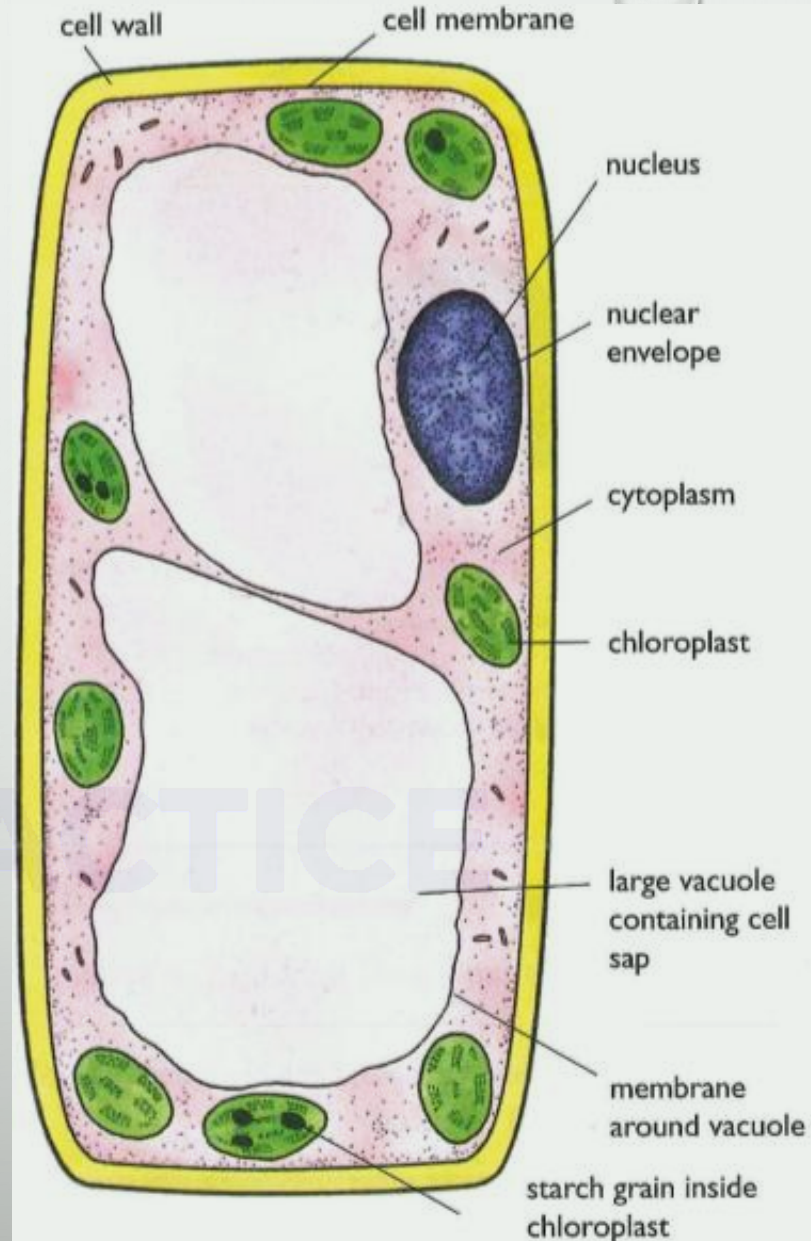
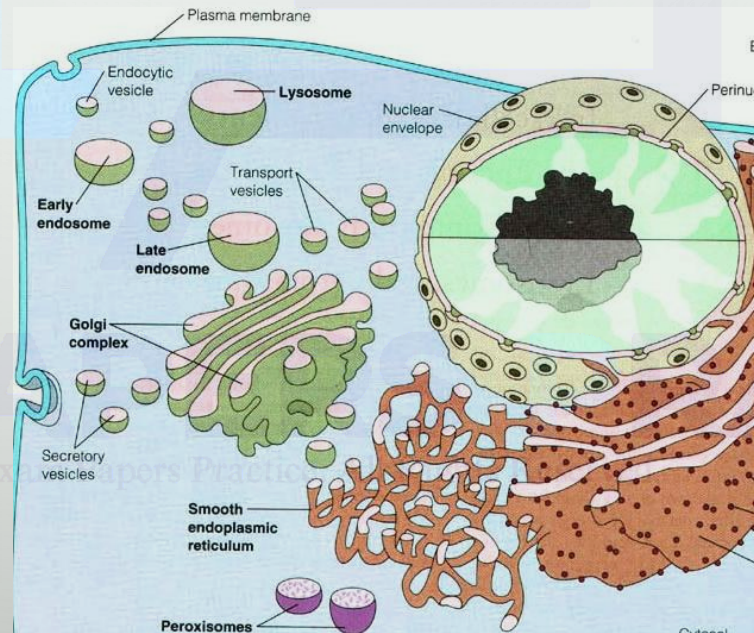
surrounded by a membrane
Contain a solution of sugars and other substances — **cell sap**

◆ function :

Press outwards on the rest of cell and helps to keep it in shape

cell sap 细胞液
vesicle 囊

vesicle



cells

Cell structure — chloroplasts

chloroplast

◆ component :

Chlorophyll
Often contain **starch**
grain;

◆ function :

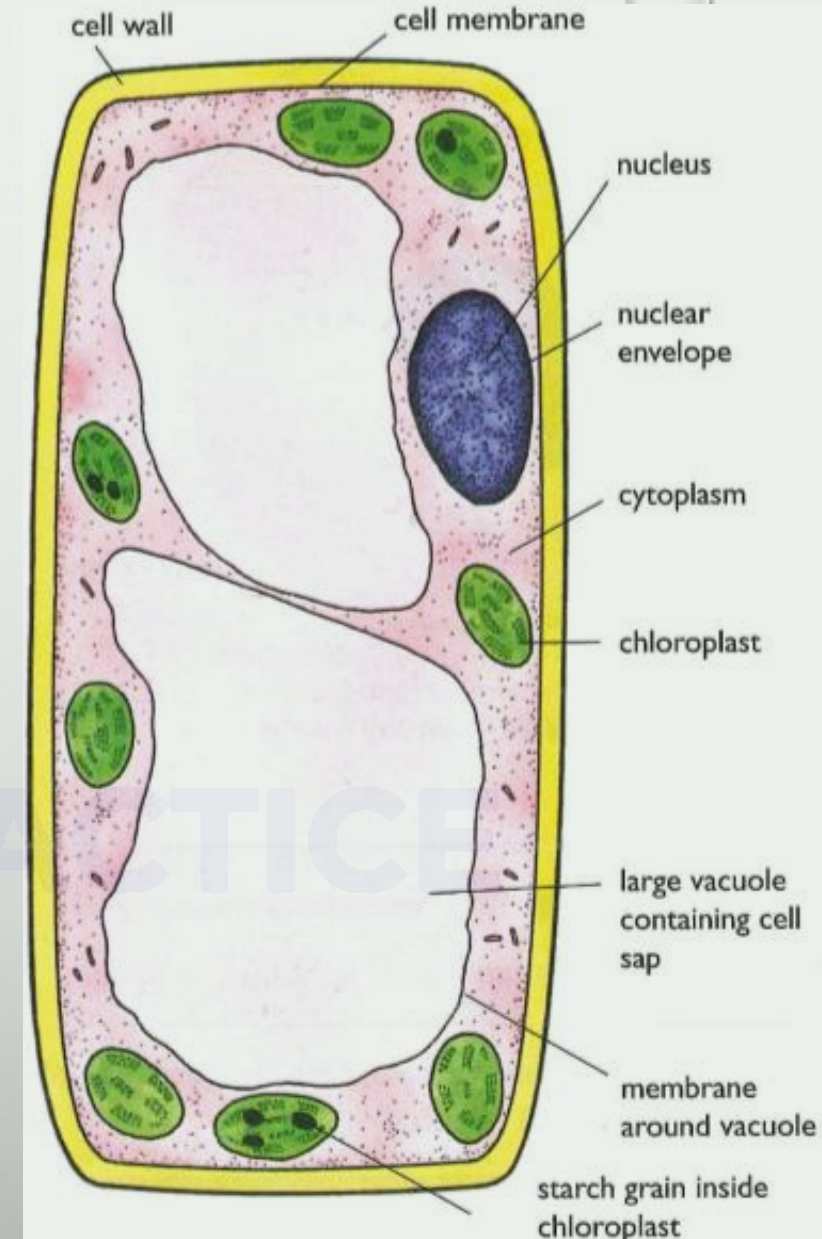
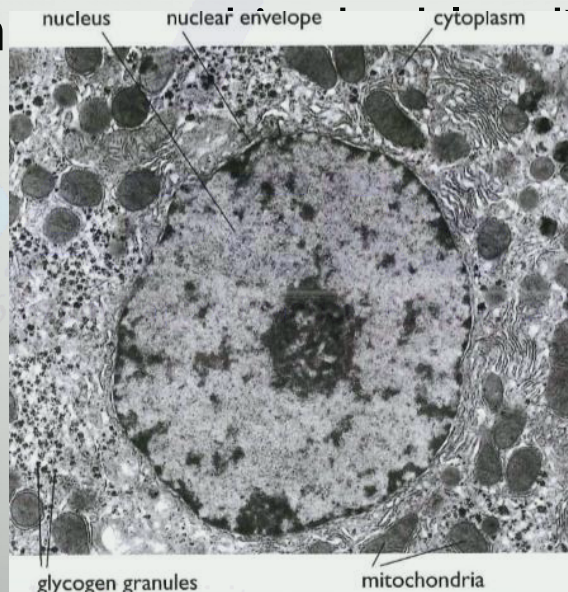
photosynthesis

glycogen 糖原

Glycogen

Reserve fuel in animal cells
(liver)

Glycogen → glucose
(used by liver cells or
tra



cells

Cell structure — nucleus

nucleus

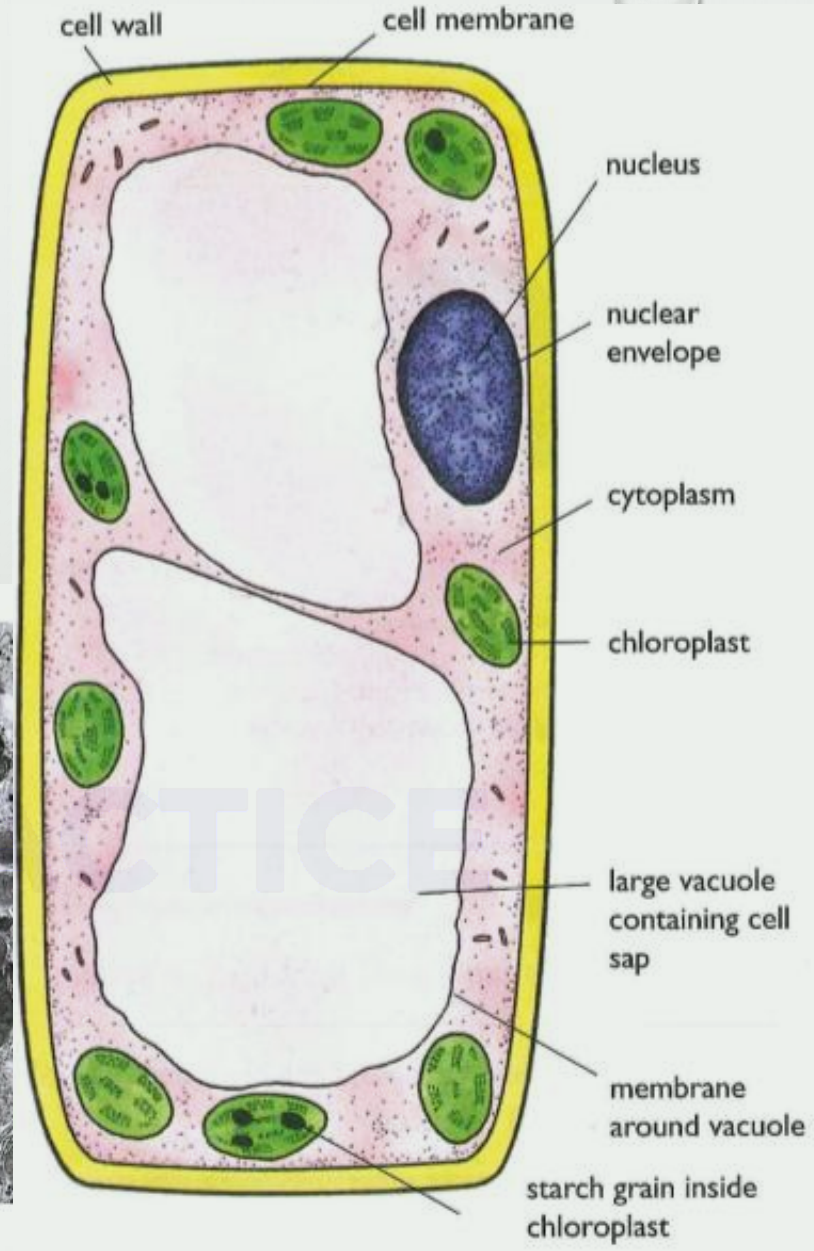
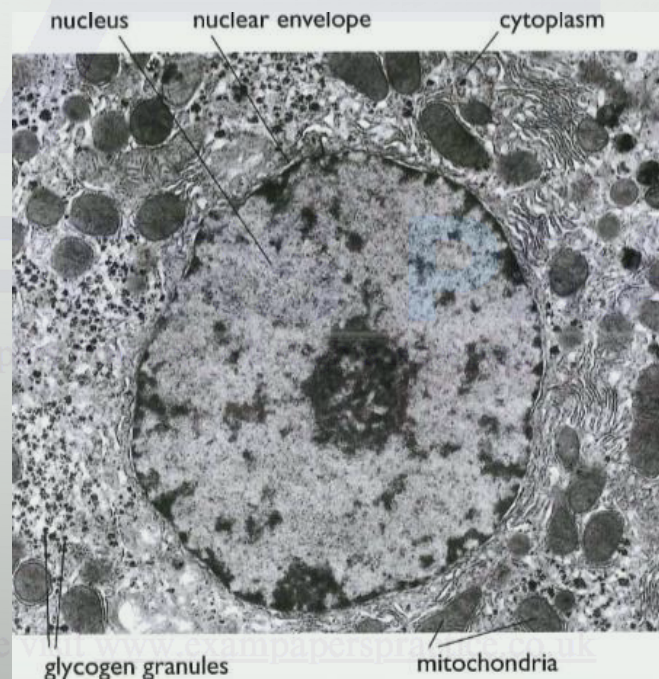
◆ component :

Chromosome (when cell is dividing, they become short and thick, and can be seen with a good light microscope)

DNA

◆ function :

Store genetic information



	Plant cells	Animal cells
Cell wall		
Cell membrane		
Cytoplasm		
Nucleus		
Chloroplast		
Vacuole		
Starch grains		
shape		

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cells

Cell structure — mitochondria

Mitochondria (mitochondrion)

◆ distribution

Almost all cells except prokaryotes

◆ component :

Chromosome (when cell is dividing, they become short and thick, and can be seen with a good light microscope)

DNA

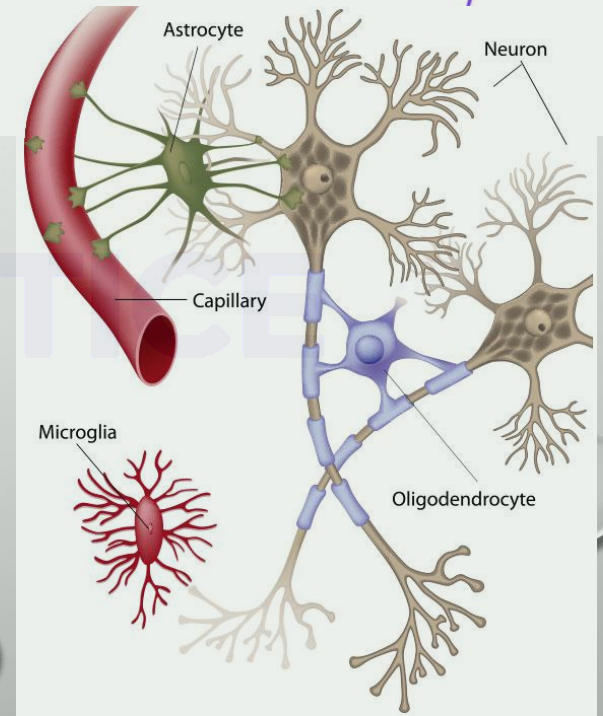
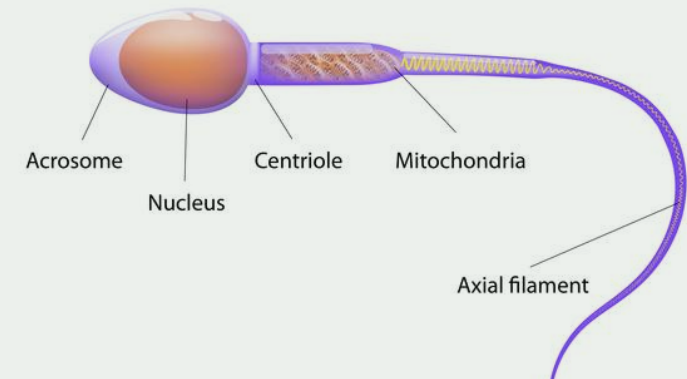
◆ function :

Powerhouse of the cell (aerobic respiration)

electron micrograph 电子显微照片



SPERM CELL



ribosomes

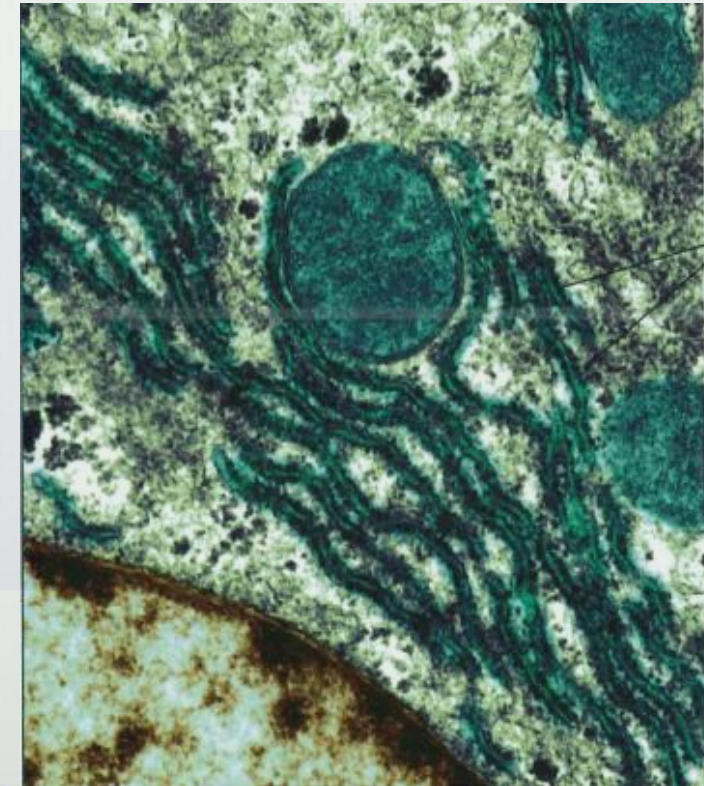
◆ distribution

All types of cells

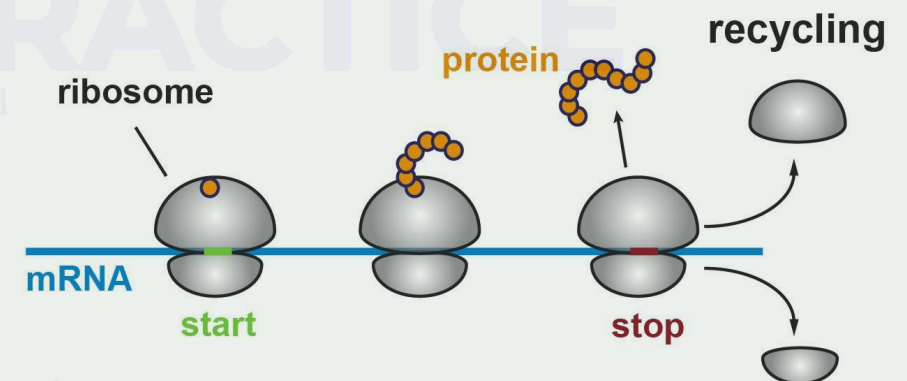
Endoplasmic reticulum (rough/smooth endoplasmic reticulum)

◆ function :

Make proteins according to instructions on DNA



endoplasmic reticulum 内质网
rough endoplasmic reticulum 粗面内质网



micrometers

$$1 \mu\text{m} = 1 \times 10^{-6} \text{ m}$$

$$1 \text{ m} = 10^6 \mu\text{m}$$

$$\text{real size in } \mu\text{m} = \frac{\text{size of the image in } \mu\text{m}}{\text{magnification}}$$

EXAM PAPERS PRACTICE

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- What sort of cells are surrounded by a cell membrane ?
- What are plant cell walls made of ?
- What does fully permeable mean ?
- What is the main constituent of cytoplasm ?
- What is a vacuole?
- What is cell sap?
- What does chlorophyll do?
- What is stored in the nucleus?
- Why can chromosome be seen only when a cell is dividing?

Which types of cells contain mitochondria ?

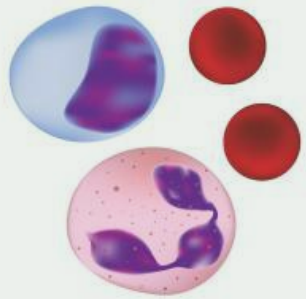
Outline the function of mitochondria ?

Which types of cells contain ribosomes ?

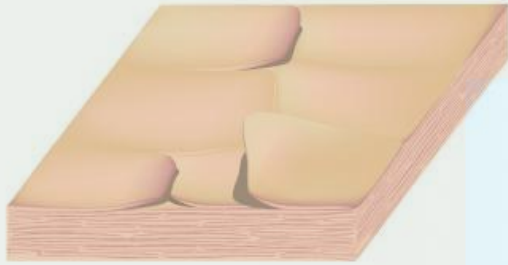
Outline the function of ribosomes ?

cells

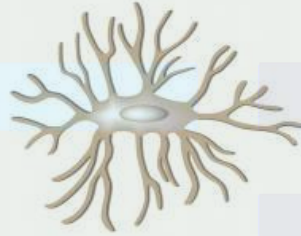
Cells and organisms



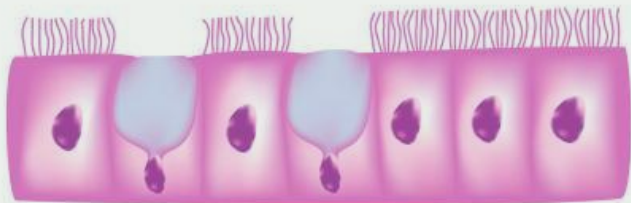
Blood cells



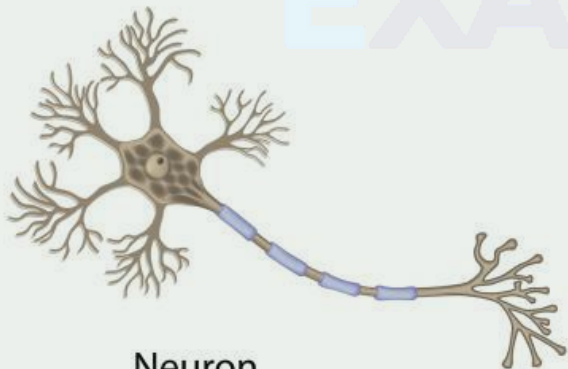
Surface skin cells



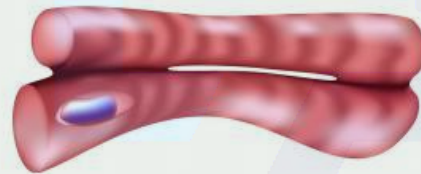
Bone cell



Columnar epithelial and Goblet cells



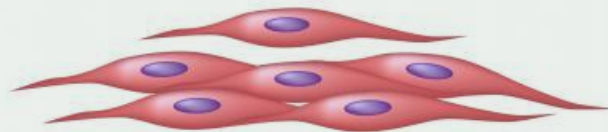
Neuron



Cardiac muscle cell



Skeletal muscle cells



Smooth muscle cells



meristem cell

parenchyme cell



parenchyme cell of epidermis

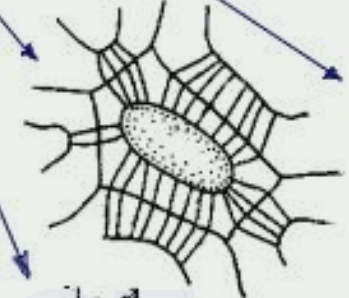


Fiber=
sclerenchyma cell

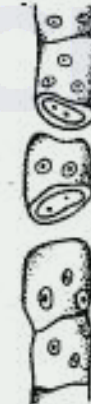


collenchyma cell

sclereid



companion cell



sieve tube



tracheid

CELL DIFFERENTIATION

Type of cell	Where it is found	Function
ciliated cell	lining the trachea and bronchi	move mucus upward
root hair cells	near the ends of plant roots	absorb water and mineral salts
xylem vessels	in stems, roots and leaves of plants	transport water and mineral salts; help in support
palisade mesophyll cells	beneath the epidermis of a leaf	photosynthesis
nerve cells	throughout the bodies of animals	transmit information in the form of electrical impulses
red blood cells	in the blood of mammals	transport oxygen
sperm and egg cells	in testes and ovaries	fuse together to produce a zygote

cells



tissues



organs



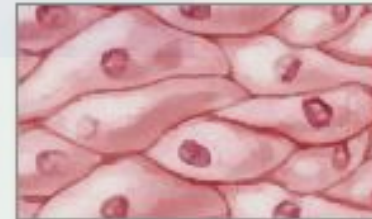
Organ system

A group of cells with similar structures, working together to perform a shared function

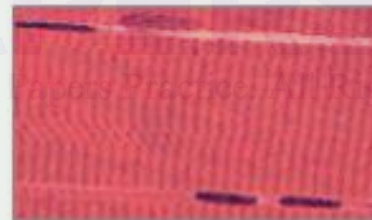
Four types of tissue



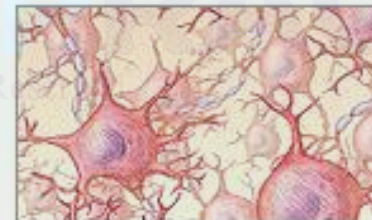
Connective tissue



Epithelial tissue



Muscle tissue



Nervous tissue

cells

Cells and organisms

cells



tissues

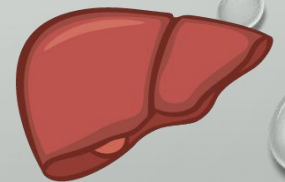
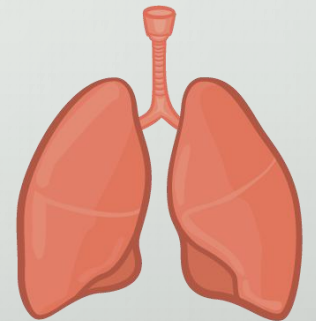
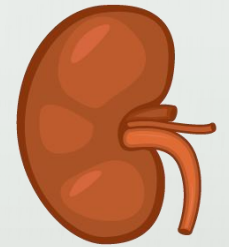


organs



Organ system

A organ as a structure made up of a group of tissues, working together to perform specific functions.



cells

Cells and organisms

cells



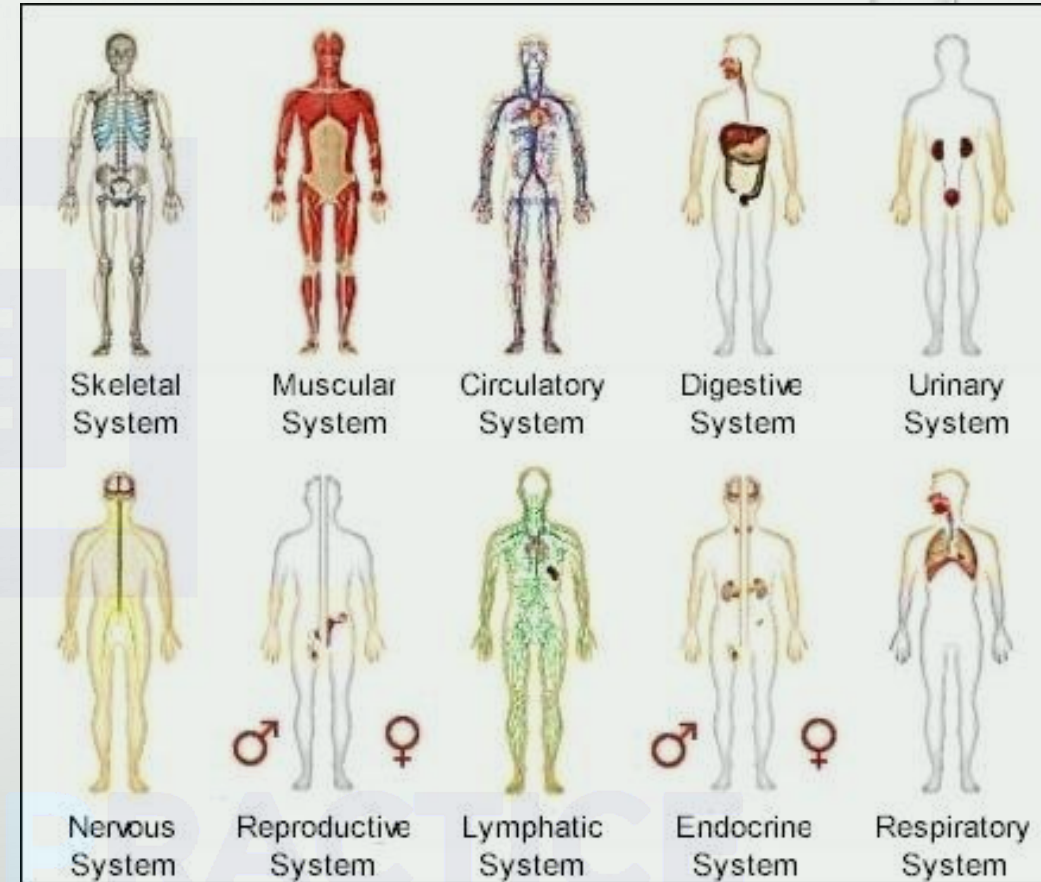
tissues



organs



Organ system



A organ system as a group of organs with related functions, working together to perform body functions.