📘 Rules & Regulations for Using Notes

1. **No Redistribution**
   These notes are for **personal use only**. Do not send, forward, or share them with others without my permission.

2. **No Photocopying or Printing**
   You are **not allowed** to photocopy, scan, or print these notes.

3. **No Online Uploading**
   Do not upload these notes to WhatsApp groups, Google Drive, Telegram, or any online platform.

4. **No Claiming as Your Own Work**
   Do not say that these notes are yours. They belong to me.

5. **No Editing Without Permission**
   Do not change, edit, or rewrite the notes and share them as a new version.

6. **For Study Purposes Only**
   These notes are meant only for learning and revision, not for business or selling.

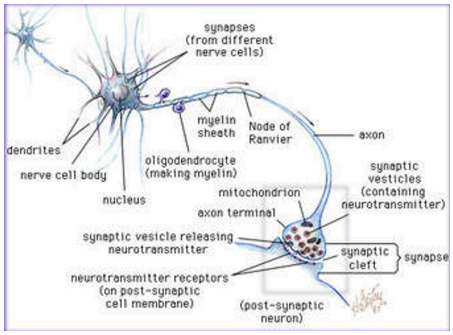
7. **Respect the Effort**
   These notes took time and effort to make. Please respect my hard work.

Ask Before Sharing
If someone wants my notes, tell them to ask me directly.

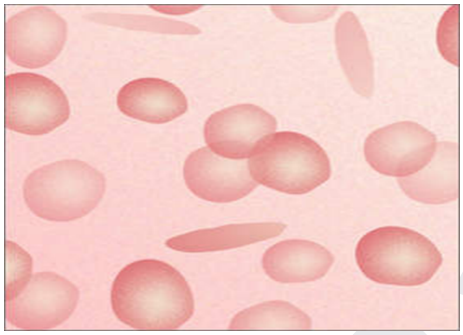
TakeYouToTask

Chapter 1 Cell Structure and Organisation

- Living organisms are made up of small building units of life called cells.
- Cells come in different shapes and sizes



Nerve Cell



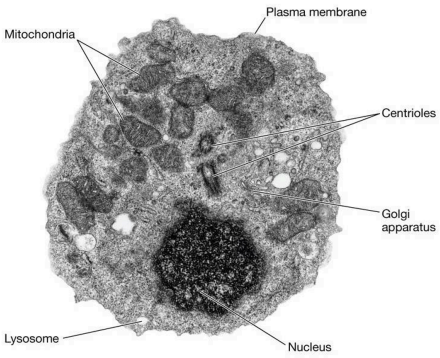
Red Blood Cell

What are Cells?

- Unicellular organism is made up of one cell that carries out all the functions needed by the organism.
- Most bacteria, protozoa (amoeba), some algae (euglena) & some fungi (yeast)
- Multicellular organism, such as a human being, is made of many cells that function together for the survival of the organism.
- Plants & Animals

What's Inside a Cell?

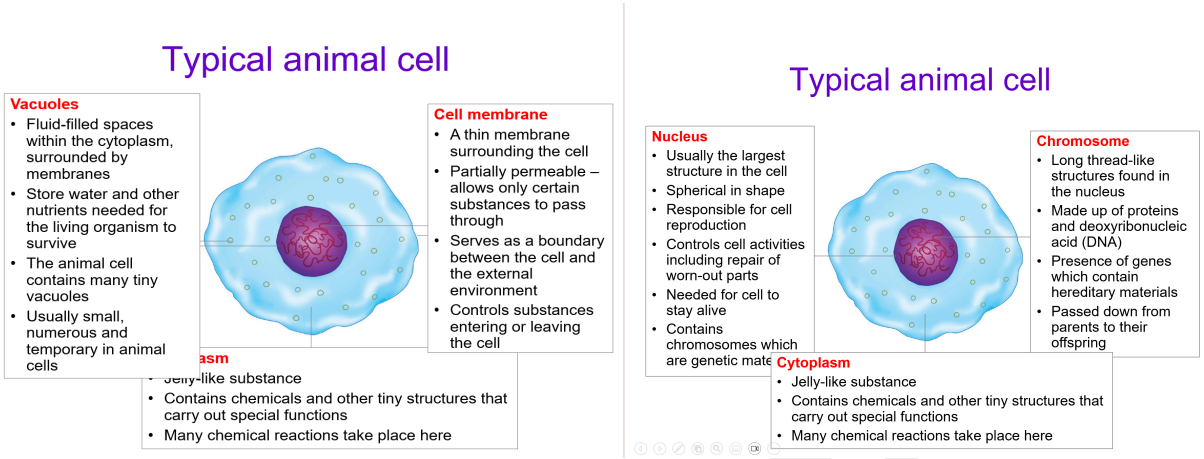
- A cell is made up of a tiny mass of living matter called **protoplasm**.
- Protoplasm is made up of a nucleus, cytoplasm and cell membrane.
- Other cell parts: cell wall, vacuole, mitochondrion, chloroplast



Electron micrograph of an animal cell

The above picture is magnified **400,000x**. (Good Microscope)
Anglo Chinese School (Independent)'s microscope and only magnifies up to **400x.** (Hopeless)

Parts of a Typical Animal Cell



Vacuoles

- Fluid-filled spaces within the cytoplasm, surrounded by membranes
- Store water and other nutrients needed for the living organism to survive
- The animal cell contains many tiny vacuoles
- Usually small, numerous, and temporary in animal cells

Cell Membrane

- A thin membrane surrounding the cell
- Partially permeable – allows only certain substances to pass through
- Serves as a boundary between the cell and the external environment
- Controls substances entering or leaving the cell

Cytoplasm

- Jelly-like substance
- Contains chemicals and other tiny structures that carry out special functions
- Many chemical reactions take place here

Nucleus

- Usually the largest structure in the cell
- Spherical in shape
- Responsible for cell reproduction
- Controls cell activities, including repair of worn-out parts
- Needed for the cell to stay alive
- Contains chromosomes which are genetic material

Chromosome

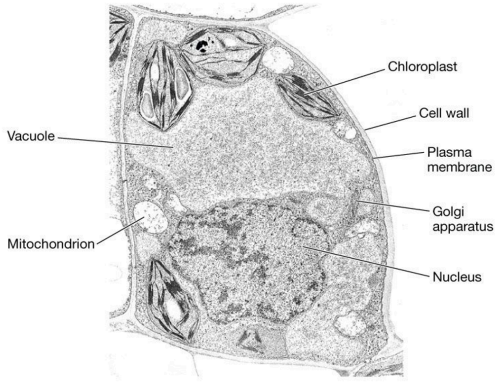
- Long thread-like structures found in the nucleus

- Made up of proteins and deoxyribonucleic acid (DNA)
- Presence of genes which contain hereditary materials
- Passed down from parents to their offspring

Mitchondrion

- Aerobic respiration occurs
- Uses glucose to release energy

Parts of A Typical Plant Cell



Electron micrograph of a plant cell

Cell Wall

- A thick layer surrounding the cell membrane
- Made up of cellulose
- Supports the cell and gives it a regular shape

Chromosome

- Similar to that of animal cells

Nucleus

- Spherical in shape
- Responsible for cell reproduction
- Controls most cell activities including repair of worn-out parts
- Needed for cell to stay alive
- Contains chromosomes which are genetic material

Cell Membrane

- A thin membrane surrounding the cell
- Partially permeable – allows only certain substances to pass through
- Serves as a boundary between the cell and the external environment
- Controls substances entering or leaving the cell

Cytoplasm

TakeYouToTask

- Jelly-like substance
- Contains chemicals and other tiny structures that carry out special functions
- Many chemical reactions take place here

Chloroplast

- Contains the green pigment chlorophyll
- Chlorophyll is needed for the plant to absorb energy from the Sun
- Used to make food through photosynthesis

Vacuole

- Usually a single large space surrounded by a membrane
- Contains a liquid called cell sap
- Cell sap is made up of water and dissolved materials such as sugars and mineral salts
- Helps maintain the turgidity of the cell

Mitchondrion

- Aerobic respiration occurs
- Uses glucose to release energy

Similarities & Differences between Animal Cell and Plant Cell

ANIMAL CELL	**Similarities**	PLANT CELL
☐ Both have a nucleus, cytoplasm, plasma membrane, Golgi apparatus, mitochondria, endoplasmic reticulum and ribosomes		
ANIMAL CELL	**Differences**	PLANT CELL
Do not have fixed shape	Shape	Have fixed shape
Do not have cell wall	Cell wall	Have cell wall
Do not have vacuoles (or small)	Vacuoles	Large vacuoles
Do not have chloroplast	Chloroplasts	Have chloroplasts
Glycogen	Food storage	Starch
Have centrioles	Centrioles	Do not have centrioles

What are centrioles?

- A centriole is a small, tube-like structure found in animal cells.

Function:

- Helps the cell divide properly
- Plays an important role during cell division by helping to separate chromosomes

Location:

- Found near the nucleus

What is Glycogen?

- Glycogen is a form of stored sugar (energy) in animals.

Function:

- It stores glucose for energy
- When the body needs energy, glycogen is broken down into glucose

Location:

- Stored mainly in the liver and muscles

Division of Labour in Cells

What is division of labour in cells?

- Division of labour in cells means that different parts of a cell have different jobs, and each part does its own special function.
- This helps the cell work more efficiently.

Example by Prof. MR Tan:
Person #1: Class Chairman
Person #2: Vice-Chairman
Person #3: VIA Head
Person #4: Flower Pot

- Within each cell, there are many special structures or organelles.
- Each organelle is specially designed to carry out a specific job.

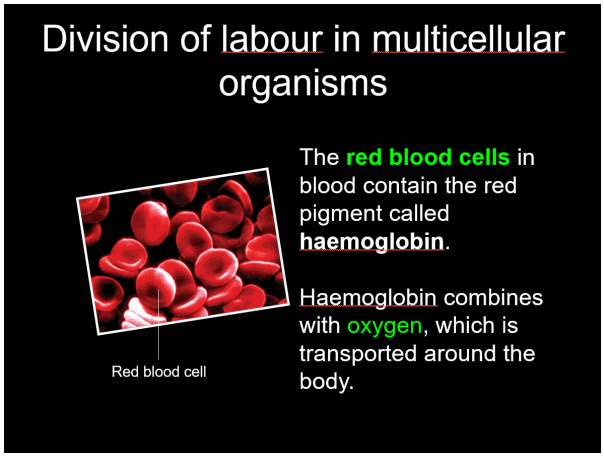
Examples of Organelles:

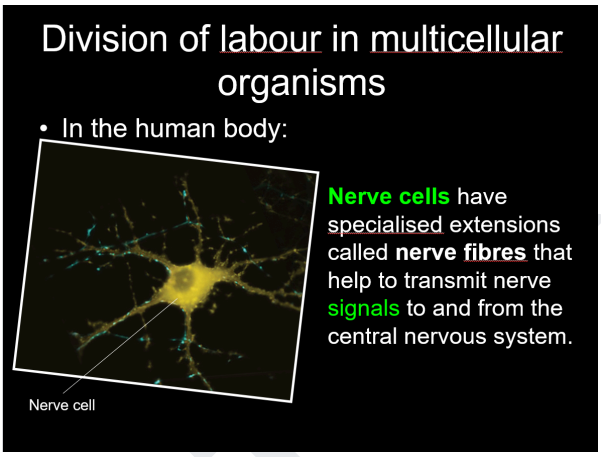
Organelle	Function
Nucleus	Controls the cell
Mitochondria	Produces energy
Ribosomes	Make proteins
Vacuole	Stores water and nutrients
Chloroplast*	Makes food (plants only)

* Chloroplast is only found in plant cells.

StudyOutToTask

- Multicellular organisms are made up of different types of cells performing different functions.
- The cells have different shapes, sizes and structures, designed to perform **specific** tasks. This allows the organism to function **efficiently** as a whole.





Explanation of the Slide: *Division of Labour in Multicellular Organisms*

This slide shows how **different cells in the body do different jobs**, which is called **division of labour**.

1 Red Blood Cells Have a Special Job

In our body, **red blood cells** are specialised cells.
Their main job is to **transport oxygen**.

They contain a red pigment called **haemoglobin**.

2 Role of Haemoglobin

Haemoglobin is a protein inside red blood cells.

- It **combines with oxygen** in the lungs
- Then carries oxygen to all parts of the body
- Cells use this oxygen to release energy

3 How This Shows Division of Labour

Not all cells do the same thing:

- Red blood cells → carry oxygen
- Muscle cells → help us move
- Nerve cells → send messages

TakeYouTo

Forming a Multicellular Organism

•A human body is made up of different **organs** such as the heart, liver and stomach.

•Each organ has several sets of **tissues** working together to allow it to function.

•These organs work together and make the five main **organ systems** in your body – the **digestive system**, the **circulatory system**, the **respiratory system**, the **skeletal system** and the **muscular system**.

Difference Between Tissue and Organ (Sec 1 Life Science)

Feature	Tissue	Organ
Meaning	A group of **similar cells** working together	A group of **different tissues** working together
Function	Performs **one main function**	Performs **several related functions**
Made of	Similar cells	Different tissues
Example	Muscle tissue, blood tissue	Heart, lungs, stomach

•A human body:

Different types of **cells** have **specialised functions**

•A human body:

Cells of the same kind that perform the same job are grouped together to form a tissue. Some tissues have more than one type of cells. These are called **complex tissues**.

•A human body:

An **organ** is formed by **several tissues working together to perform a specialised function**.

•A human body:

oThe different organ systems work together to make up the entire **body** of an organism.

•Like the human body, **plants** have organ systems too.

•The main organ systems in a plant are the **shoot system** and the **root system**.

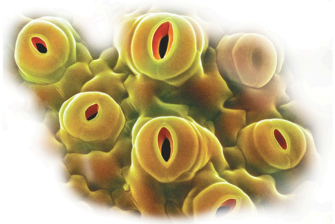
•The shoot system consists of the part of the plant above the ground.

•The organs which make up the shoot system are the leaves, stems, buds and flowers (of flowering plants).

•The root system consists of the parts of the plant below the ground such as the main roots and branched roots.

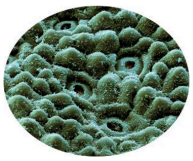
Forming a Multicellular Organism

- A plant
  - o **Guard cells:** The guard cells allow gaseous exchange to take place.



Forming a Multicellular Organism

- A plant
  - o **Epidermal tissue (Epidermis):** The epidermal tissue is made up of many closely packed cells including the guard cells. This tissue helps to reduce water loss. It also enables gaseous exchange.

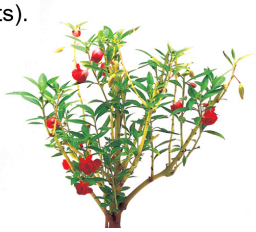


Forming a Multicellular Organism

- A plant
  - o **Leaf:** The leaf is an organ where food substances are formed. Epidermal tissue forms the outermost layer of the leaf. Vascular tissues (xylem & phloem) make up the transport system in the plant.

Forming a Multicellular Organism

- A plant
  - o **Shoot system:** The shoot system includes the organs – leaves, stems, buds and flowers (of flowering plants).



Mitochondria

- Cellular (Aerobic) respiration occurs
- Uses oxygen to release energy from glucose (both plants & animals)

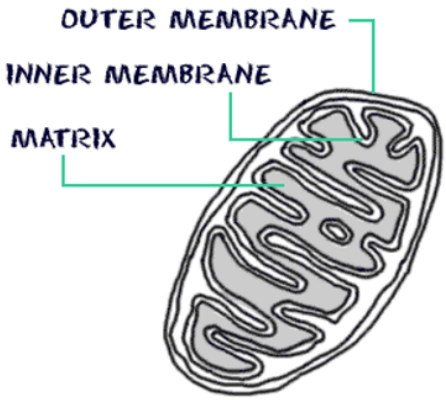
General shape: Oblong ranging from 1 to 10 micrometers in length.

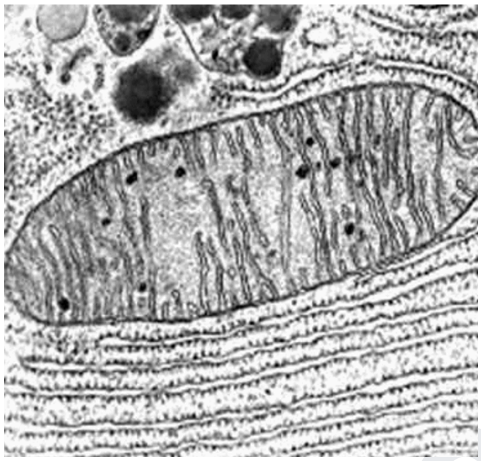
More Mitochondria will be found in a cell which requires more energy, e.g. muscle cell

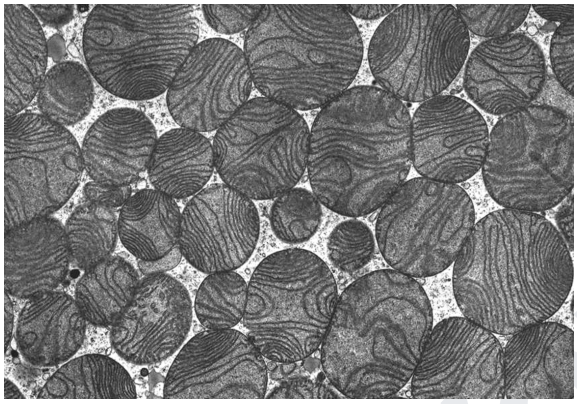
Site for Cellular Respiration

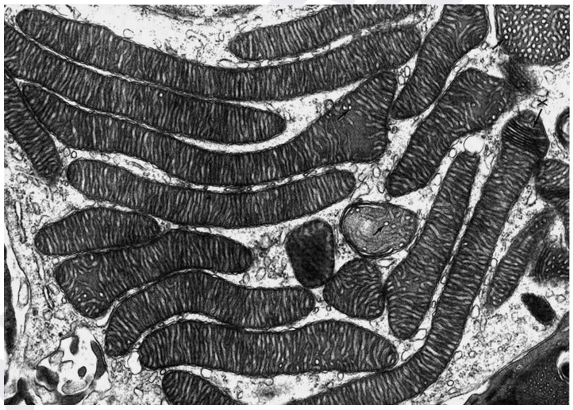
What is micrometer?

Micrometer (unit of length) – also called a micron, it is a unit of length equal to one millionth of a meter: 1micrometer (μm)=0.000001meters=10−6m





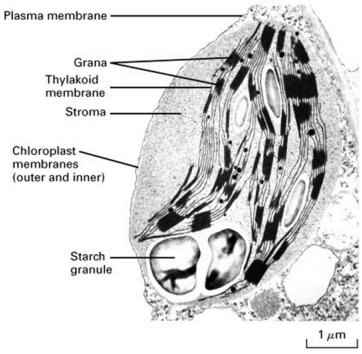


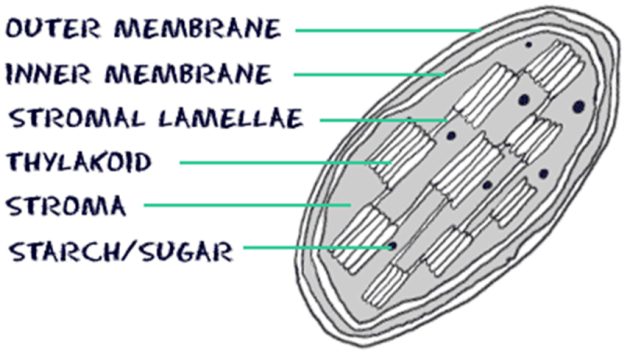


These are mitochondria……so are these.

Chloroplasts

•Small, Oblong, green (chlorophyll) organelles found only in green plants, a few algae (green algae) & protists (euglena)
• More Chloroplasts will be found in cells of green plants which requires more energy
• Site for Photosynthesis





Mitochondrion VS Chloroplasts

Similarities

- Both chloroplasts and mitochondria are **ORGANELLES**.
- Both chloroplasts and mitochondria have their **own DNA molecules**.

These organelles use their own DNA to code for proteins that are necessary for the organelles to perform their functions. They act as individual organisms within a cell.

- They can change in shape, move, and reproduce.

They reproduce by splitting as do most prokaryotic organisms such as bacteria.

- Both chloroplasts and mitochondria have **DOUBLE MEMBRANES**.
- Chloroplasts and mitochondria are similar in many ways because they both were once free-living bacteria.

Differences

Chloroplasts - Photosynthesis (harvesting energy) Explanation: 99% of energy on earth comes from the sun but the energy is not available to many organisms. For example, as animals, we cannot eat sunlight and survive.

However, plants can harvest the energy and convert it to an edible form so that other organisms like us can utilize the energy from the sun. This process is called photosynthesis and takes place in chloroplasts.

Using solar energy, chloroplasts produce glucose which is a highly energetic molecule because the energy from the sun is trapped in it. Glucose can now be used in the plant body, or it can be eaten by other organisms and used as a source of energy.

Mitochondria - Respiration (utilizing energy) Explanation: In order to extract the energy trapped inside of a glucose molecule, it must be broken down to small pieces again. This process is called respiration, and it is simply a reversal of photosynthesis. Respiration takes place in the mitochondria where glucose is broken down to carbon dioxide and water. The energy released through this process is responsible for the growth and survival of the organism.

Summary:

Chloroplasts are the site of **photosynthesis**.

On the other hand, mitochondria are the site of **respiration**.

TakeYouToTask

TakeYouToTask