

CHAPTER 5: LIFE PROCESSES

What is Life?

To decide whether something is alive, we often observe:

- Movement (e.g., running dog, growing plant)
- Breathing (e.g., chest movement)
- Growth (plants growing taller, wounds healing)

But movements are not always visible. Even when we sleep, our cells are constantly doing invisible movements — like transporting molecules and repairing cells. These continuous internal activities are necessary to stay alive.

Life Processes – Definition:

Life processes are the basic functions performed by living organisms to maintain life, such as:

- Nutrition
- Respiration
- Transportation
- Excretion

These processes provide energy, build body material, remove waste, and help the organism survive.

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◆ 5.2 NUTRITION

Nutrition – Definition:

Nutrition is the process by which an organism takes in food, converts it into energy and nutrients, and uses it for body functions like growth, repair, and maintenance.

There are two main types of nutrition:

1. **Autotrophic Nutrition**

Organisms make their own food using simple substances (like CO₂ and water).

Example: Green plants (photosynthesis)

2. **Heterotrophic Nutrition**

Organisms depend on other plants or animals for food.

Examples: Humans, cows, lions

Autotrophic Nutrition (in Plants)

Photosynthesis – Definition:

The process by which green plants use sunlight, carbon dioxide, and water to make food (glucose), storing energy in the form of carbohydrates.

Equation:



☀ Steps in Photosynthesis:

1. Chlorophyll absorbs sunlight.
2. Water splits into hydrogen and oxygen.
3. CO_2 is converted into carbohydrates using hydrogen.

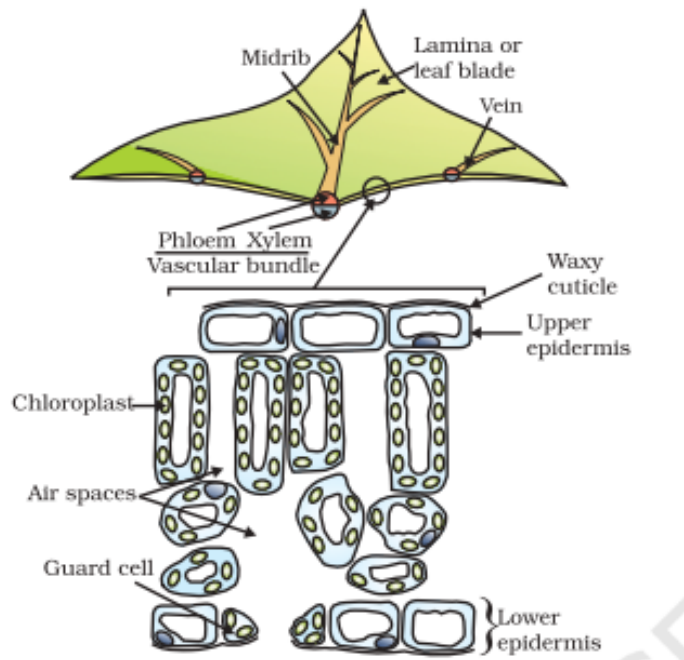


Fig. 5.1 – Structure of a leaf (showing chloroplasts)



Fig. 5.2 – Starch test in variegated leaf

🧪 Activity 5.1 – Starch Test in Leaf

- Keep a variegated leaf plant in dark for 3 days.
- Expose it to sunlight for 6 hours.
- Boil the leaf in alcohol → add iodine → only green parts turn blue-black.
 - ✅ Proves: Only green (chlorophyll) areas photosynthesised and stored starch.

🧪 Activity 5.2 – CO_2 is necessary for photosynthesis

- Place two plants in sunlight, one with KOH (absorbs CO_2) under a bell jar.

- Do starch test.
- ✓ Only plant without KOH shows starch → Proves CO₂ is required.

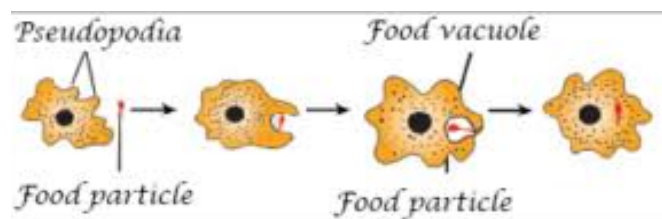
📖 **Stomata** – Tiny pores on leaves used for gaseous exchange and transpiration.

📖 **Heterotrophic Nutrition – Types:**

1. Saprophytic (e.g., fungi like bread mold)
2. Holozoic (e.g., humans, Amoeba – ingest, digest, absorb)
3. Parasitic (e.g., lice, leeches, cuscuta)

🧬 **Nutrition in Amoeba (Unicellular organism)**

- Pseudopodia (finger-like extensions) help in capturing food.
- Food is digested in food vacuoles.



📷 Fig. 5.5 – Amoeba nutrition diagram

🧬 **Nutrition in Humans**

The human digestive system includes:

Mouth → Oesophagus → Stomach → Small Intestine → Large Intestine → Anus

📖 **Digestion** – The process of breaking down large food molecules into smaller absorbable ones.

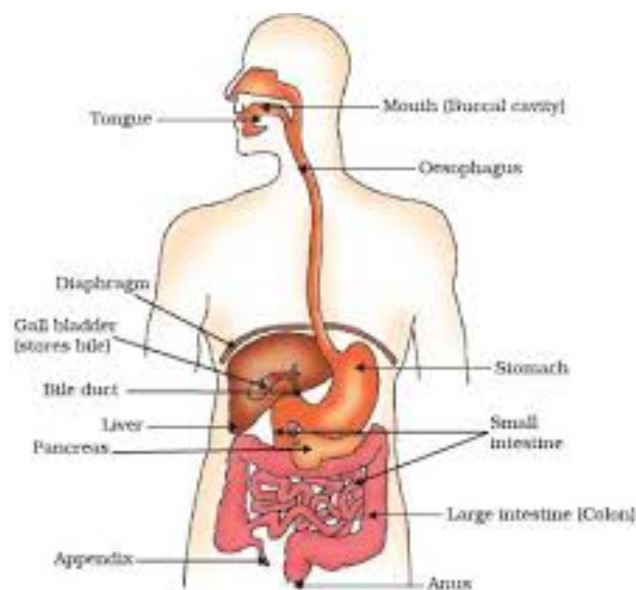


Figure 6.6 Human alimentary canal


Important Parts & Functions:

- **Mouth:** Chews food and mixes with saliva.

- **Saliva:** Contains enzyme salivary amylase to digest starch.

Activity 5.3 – Action of Saliva

- Add starch solution to two tubes; add saliva to one.
- Add iodine to both.
 - ✓ Only one with saliva doesn't turn blue-black → starch was broken down.
- **Stomach:** Contains gastric glands that release:
 - HCl (makes medium acidic)
 - Pepsin (digests protein)
 - Mucus (protects stomach walls)
- **Small Intestine:**
 - Liver → bile (digests fats)
 - Pancreas → enzymes (trypsin, lipase)
 - Intestinal glands → final digestion
 - Villi: Finger-like projections that absorb food
- **Large Intestine:** Absorbs water
- **Anus:** Removes undigested waste

 Did you know?

Dental caries (tooth decay) are caused by bacteria acting on sugars, forming acid that damages teeth.

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◆ **5.3 RESPIRATION**

Respiration – Definition:

The process of breaking down food (mainly glucose) to release energy.

Types of Respiration:

1. **Aerobic Respiration (uses oxygen)**
 - Glucose → $\text{CO}_2 + \text{H}_2\text{O} + \text{Energy}$
 - Happens in most plants and animals
2. **Anaerobic Respiration (without oxygen)**
 - Glucose → Alcohol + CO_2 (in yeast)
 - Glucose → Lactic acid (in muscles)

 **ATP – Adenosine Triphosphate:** The energy currency of the cell.

Activity 5.4 – Exhaled Air Contains CO_2

- Blow air into lime water → it turns milky → CO_2 is present

Activity 5.5 – Fermentation by Yeast

- Add yeast to sugar solution → gas formed turns lime water milky → CO_2 released

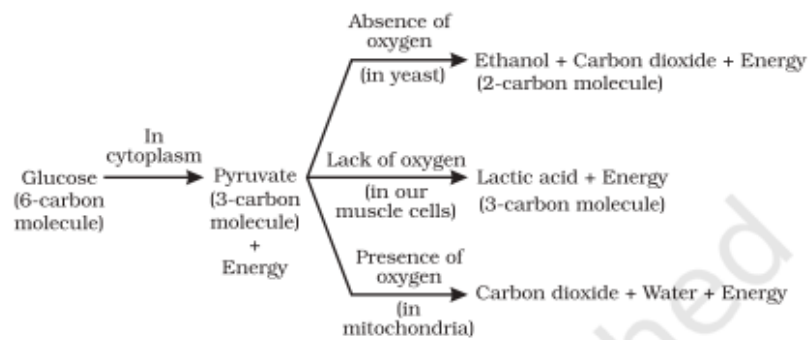


Figure 5.8 Break-down of glucose by various pathways

- 🧠 Muscular cramps occur due to formation of lactic acid during anaerobic respiration.

📘 Respiration in Humans:

- Air enters through nostrils → trachea → lungs → alveoli
- Alveoli exchange oxygen & CO₂ with blood
- Haemoglobin in blood binds oxygen
- Carbon dioxide is transported mostly dissolved in plasma

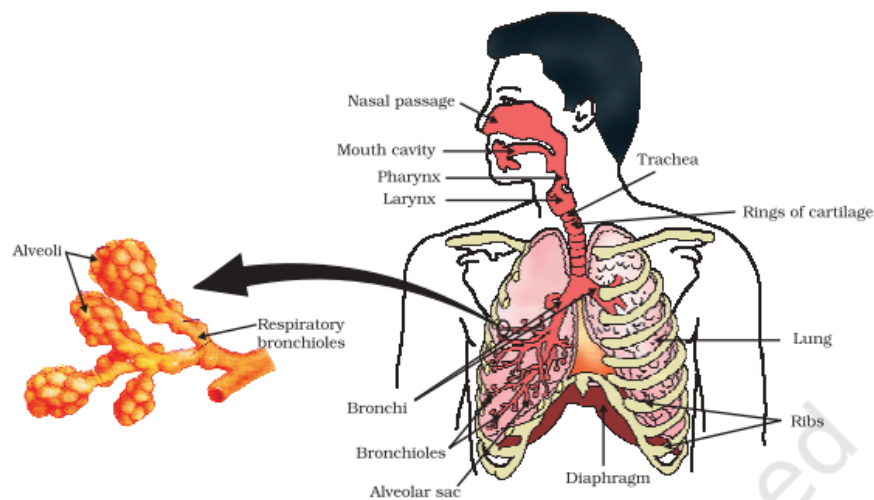


Figure 5.9 Human respiratory system

📷 Fig. 5.9 – Human respiratory system

🐟 Activity 5.6 – Fish Breathe Faster

- **Observe fish** → gills move fast → they need more oxygen because oxygen in water is less

💎 5.4 TRANSPORT

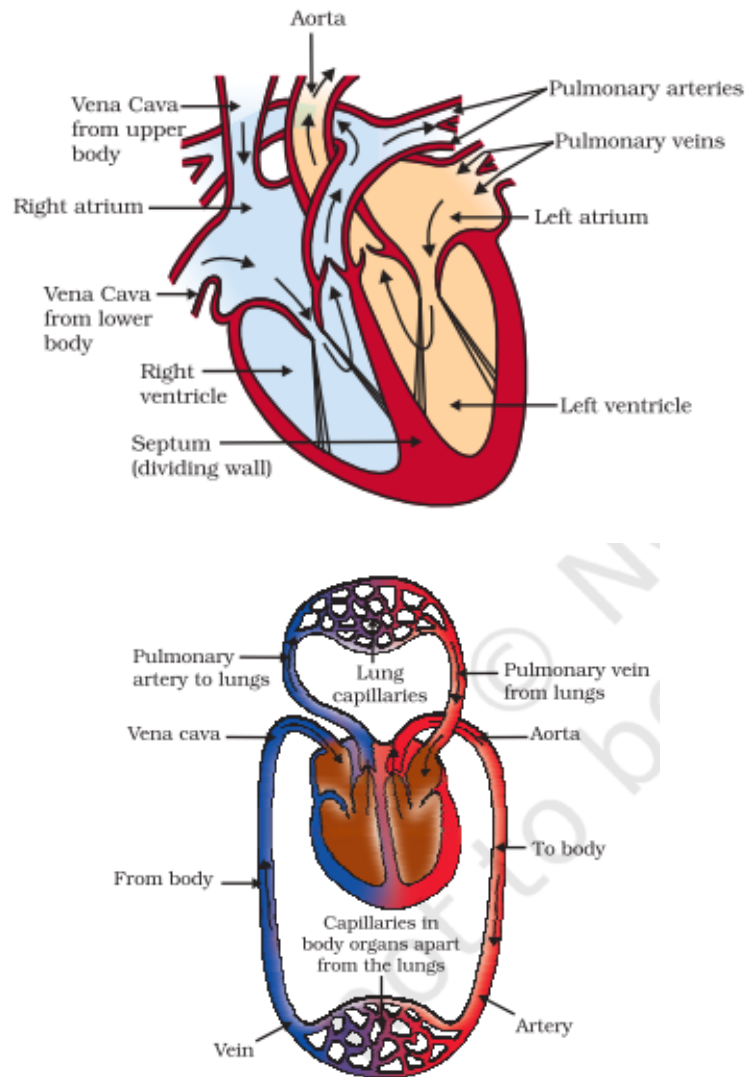
📘 Transportation in Humans

Transport system includes:

- Heart ❤️
- Blood (RBCs, WBCs, Platelets, Plasma)

- Blood vessels (Arteries, Veins, Capillaries)

📖 **Heart** – Pumps oxygenated and deoxygenated blood separately



🖼️ Fig. 5.10 & 5.11 – Heart structure & circulation

🧠 **Double Circulation** – Blood passes through heart twice in one cycle (lungs → heart → body)

📖 **Blood Pressure:**

- **Systolic (120 mm Hg):** when heart contracts
- **Diastolic (80 mm Hg):** when heart relaxes

📖 **Lymph** – A tissue fluid that helps transport and filter substances

📖 **Transportation in Plants**

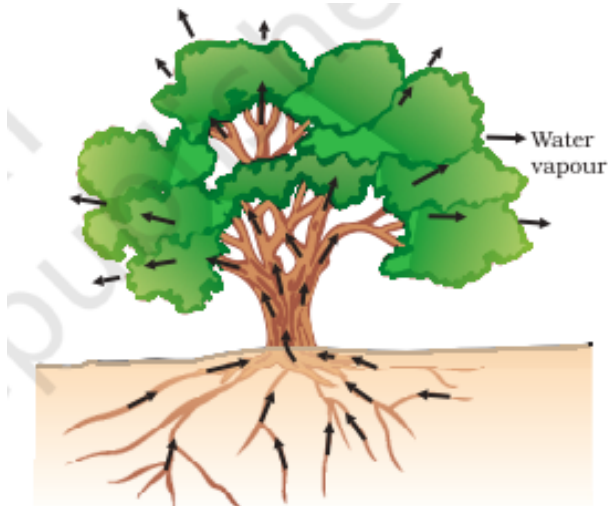
Plants use two tissues:


- **Xylem** → transports water and minerals (only upward)
- **Phloem** → transports food (both directions)

📖 **Transpiration** – Loss of water through stomata; creates suction force for xylem transport

Activity 5.8 – Transpiration

- Place a covered plant in sunlight → water droplets form inside → transpiration



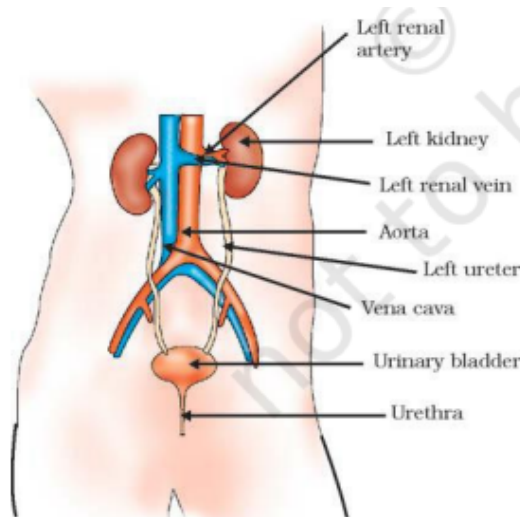
 Fig. 5.12 – Water movement in plants


◆ 5.5 EXCRETION


 **Excretion** – The biological process of removing harmful metabolic waste from the body.

In Humans:

- **Organs:** Kidneys, Ureters, Urinary bladder, Urethra
- **Unit of kidney: Nephron** – filters blood to produce urine



 Fig. 5.13 – Human excretory system & nephron

 **Hemodialysis** – Artificial kidney used when kidneys fail

In Plants:

- Excrete via falling leaves, resins, gums
- Oxygen is a waste during photosynthesis

- Excess water is lost via transpiration

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✅ Summary Points:

- **Life processes:** Nutrition, Respiration, Transportation, Excretion
- **Autotrophs make food;** heterotrophs depend on others
- **Respiration releases energy (ATP)** – aerobic & anaerobic
- Circulatory system transports nutrients & gases
- Plants use xylem & phloem
- Excretion removes harmful substances