Complete Notes of Chapter 6 – Life Processes (Class 10 Science)

1. Life Processes

Living organisms need to perform certain essential functions to stay alive. These activities are called life processes.

Major life processes:

1. Nutrition
2. Respiration
3. Transportation
4. Excretion

Food provides energy for all life processes.

2. MODES OF NUTRITION

Nutrition is the process of obtaining food and using it for growth, energy, and repair.

Two major modes:

(1) Autotrophic Nutrition

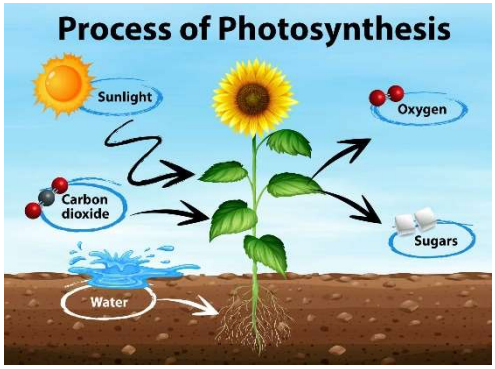
(2) Heterotrophic Nutrition

3. AUTOTROPHIC NUTRITION

Autotrophs (green plants, algae) prepare their own food from carbon dioxide and water using sunlight. This process is called photosynthesis.

Raw Materials for Photosynthesis

1. Carbon dioxide – enters through stomata
2. Water – absorbed by roots
3. Sunlight – source of energy
4. Chlorophyll – green pigment that absorbs light



Site of Photosynthesis

Photosynthesis occurs in chloroplasts present in leaf cells.

Main Events of Photosynthesis

1. Absorption of sunlight by chlorophyll
2. Conversion of light energy into chemical energy
3. Splitting of water into hydrogen and oxygen
4. Reduction of carbon dioxide to form glucose

Equation of Photosynthesis

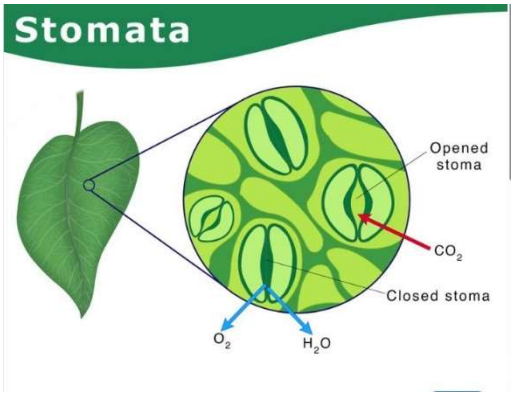
Carbon dioxide + Water + Sunlight ---> Glucose + Oxygen

Written as: $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$

4. STOMATA

Stomata are small pores on the leaf surface controlled by guard cells.

Functions of stomata:



1. Exchange of gases (CO_2, O_2)
2. Transpiration (loss of water vapour)
3. Regulation of opening and closing of stomata

5. HETEROTROPHIC NUTRITION

Heterotrophs cannot make their own food and depend on other organisms.

Types of heterotrophic nutrition:

1. Holozoic nutrition – humans, dogs
2. Saprophytic nutrition – fungi, mushrooms
3. Parasitic nutrition – tapeworm, lice, Cuscuta

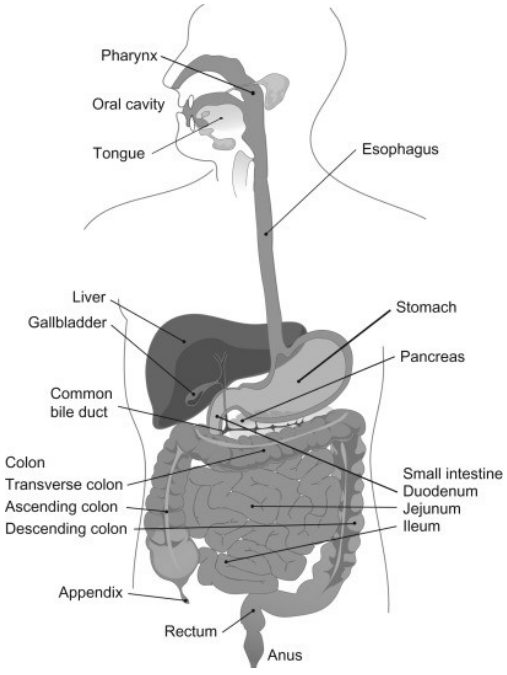
6. NUTRITION IN HUMAN BEINGS

Humans follow holozoic mode of nutrition.

The human digestive system includes:

Mouth, Oesophagus, Stomach, Small intestine, large intestine, Rectum, Anus and digestive glands like Liver, Pancreas, Salivary glands.

FUNCTION OF EACH ORGAN



1. Mouth / Buccal Cavity

- Teeth chew food
- Tongue mixes food and helps in swallowing
- Saliva contains an enzyme called salivary amylase

  Salivary amylase converts starch into sugar (maltose)

2. Oesophagus

- No digestion
- Food moves by peristaltic movement

3. Stomach

- J-shaped organ
- Secretes gastric juice

  Gastric juice contains:
  - Hydrochloric acid (HCl) – kills germs
  - Pepsin – digests proteins
  - Mucus – protects stomach lining

  Food becomes semi-liquid called chyme.

4. Small Intestine

Main site of digestion and absorption.

Secretions received by small intestine:

(A) Bile juice (from liver) – breaks fats into small droplets (emulsification)

(B) Pancreatic juice (from pancreas)

Pancreatic juice contains:

- Trypsin – digests proteins
- Amylase – digests starch
- Lipase – digests fats

(C) Intestinal juice – completes digestion of food

Absorption of Digested Food

- Inner surface has finger-like projections called villi
- Villi increase surface area
- Nutrients enter blood through villi

5. Large Intestine

- Absorbs excess water
- Forms semi-solid waste

6. Rectum and Anus

- Rectum stores waste
- Anus removes waste from the body (egestion)

⭐ 1. RESPIRATION IN HUMAN BEINGS

Respiration is a vital life process through which living organisms obtain energy by breaking down glucose.

This process occurs in all cells of the body.

Respiration involves two main steps:

1. **Breathing** – physical process of taking in oxygen and releasing carbon dioxide.
2. **Cellular respiration** – chemical process where glucose is oxidised to release energy.

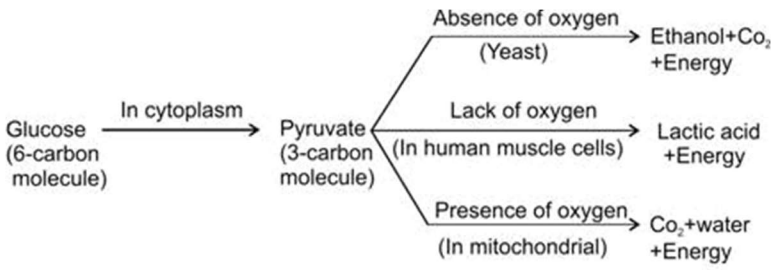
Respiration helps in:

- Growth
- Movement
- Repair of cells
- Maintaining body temperature
- All metabolic activities

⭐ BREAKDOWN OF GLUCOSE BY VARIOUS PATHWAYS

Glucose is broken down in different ways depending on oxygen availability.

There are **three pathways**:



1. Aerobic Respiration (In presence of oxygen)

(Break down of glucose by various pathways)

This occurs inside mitochondria.

Steps:

- Glucose is completely broken down.
- Produces carbon dioxide and water.
- Releases a large amount of energy.

Word-friendly equation:

Glucose + Oxygen ---> Carbon dioxide + Water + Energy (large amount)

This is the most efficient form of respiration.

2. Anaerobic Respiration (In absence of oxygen)

Occurs in organisms like yeast and also in human muscles during exercise.

(a) In yeast (fermentation):

Glucose ---> Alcohol + Carbon dioxide + Energy (small amount)

(b) In human muscles:

Glucose ---> Lactic acid + Energy (small amount)

Lactic acid causes muscle cramps.

3. Partial Breakdown of Glucose (Glycolysis)

Inside cells, glucose first breaks into pyruvate.

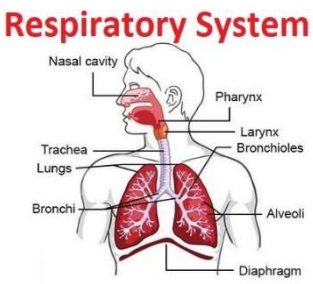
After that, depending on oxygen availability, pyruvate enters aerobic or anaerobic pathway.

⭐ TYPES OF RESPIRATION

1. **Aerobic respiration** – uses oxygen, gives more energy
2. **Anaerobic respiration** – no oxygen, produces less energy

⭐ HUMAN RESPIRATORY SYSTEM

The human respiratory system is designed to take in oxygen and remove carbon dioxide efficiently.



Main parts:

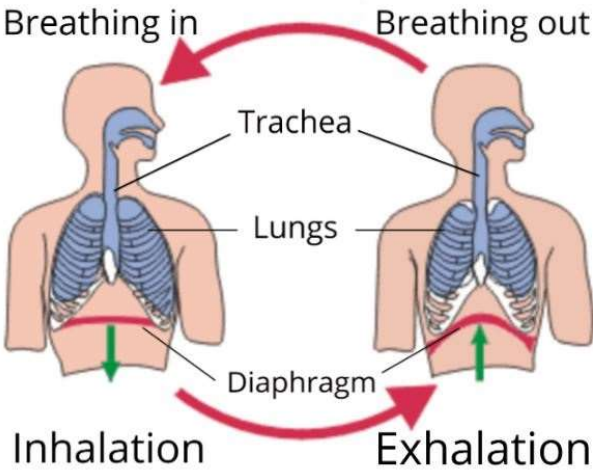
1. **Nostrils** – openings for air
2. **Nasal cavity** – filters, warms, and moistens air
3. **Pharynx** – passage connecting nose and windpipe
4. **Larynx** – voice box
5. **Trachea** – windpipe with C-shaped rings of cartilage to keep it open
6. **Bronchi** – two tubes leading to lungs
7. **Bronchioles** – further branches inside lungs
8. **Lungs** – spongy organs
9. **Alveoli** – tiny air sacs where gas exchange occurs

Alveoli provide a large surface area and have thin walls and rich blood supply.

⭐ MECHANISM OF BREATHING

Breathing involves **inhalation** and **exhalation**.

1. **Inhalation (Breathing in)**



- Ribs move upward and outward
- Diaphragm contracts and moves downward
- Chest cavity becomes larger
- Lungs expand
- Air is drawn into the lungs

2. Exhalation (Breathing out)

- Ribs move downward and inward
- Diaphragm relaxes and moves upward
- Chest cavity becomes smaller
- Lungs contract
- Air is pushed out of the lungs

Breathing rate in a normal healthy adult is about 12 to 18 times per minute.

⭐ RESPIRATION IN PLANTS

Plants also need oxygen to release energy from food.

Plants do not have a respiratory system. They exchange gases through:

1. **Stomata** – present in leaves
2. **Lenticels** – present in woody stems
3. **Root hairs** – absorb oxygen from soil

Respiration in plants is slower compared to animals.

During nighttime, plants only respire (take oxygen, release carbon dioxide).

During daytime, photosynthesis and respiration occur simultaneously.

⭐ 2. TRANSPORTATION IN HUMAN BEINGS

Transportation is the system that carries materials like food, oxygen, hormones, and wastes to different parts of the body.

In humans, transportation is carried out by:

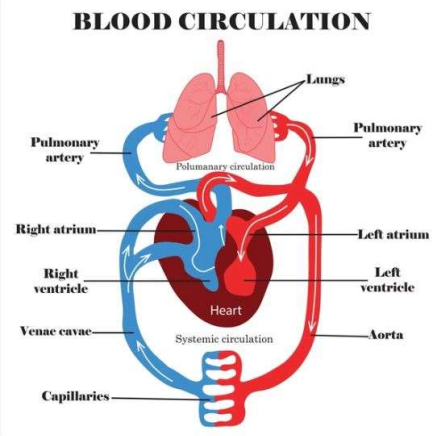
1. **Blood**
2. **Heart**
3. **Blood vessels**
4. **Lymph**

⭐ CIRCULATORY SYSTEM IN HUMAN BEINGS

The circulatory system transports oxygen, nutrients, hormones, and waste materials.

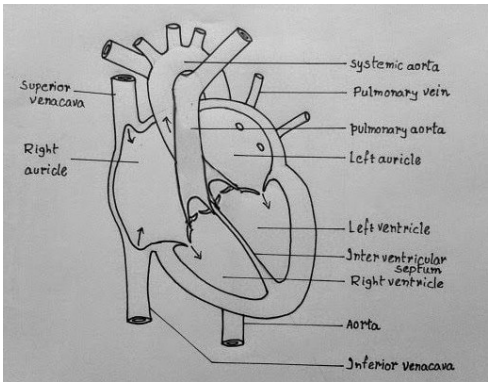
The human heart acts as a pump.

Heart structure:



- Four chambers
    1. Right atrium
    2. Right ventricle
    3. Left atrium
    4. Left ventricle

Left ventricle has the thickest wall because it pumps blood to the whole body.



⭐ BLOOD CIRCULATION IN THE HUMAN BODY

Circulation occurs in two loops:

1. **Pulmonary circulation** – between heart and lungs
2. **Systemic circulation** – between heart and body organs

⭐ DIRECTION OF BLOOD FLOW THROUGH HUMAN HEART

1. Deoxygenated blood from the body enters the right atrium through vena cava
2. Right atrium ---> Right ventricle
3. Right ventricle pumps deoxygenated blood to lungs through pulmonary artery
4. In lungs, blood gets oxygen
5. Oxygenated blood returns to left atrium through pulmonary veins
6. Left atrium ---> Left ventricle
7. Left ventricle pumps oxygenated blood to the whole body through the aorta
8. Body cells use oxygen and release carbon dioxide
9. Deoxygenated blood returns to heart through veins

⭐ 3. BLOOD

Blood is a red fluid that transports materials in the body.

Components of Blood:

1. **Plasma** – liquid portion, carries nutrients, hormones, waste
2. **Red Blood Cells (RBCs)** – carry oxygen using haemoglobin
3. **White Blood Cells (WBCs)** – fight infections
4. **Platelets** – help in blood clotting

⭐ LYMPH

Lymph is a clear, yellowish fluid.

Functions of lymph:

1. Helps in the transport of digested fats
2. Helps in immunity (contains WBCs)
3. Drains excess fluid from tissues

⭐ TYPES OF BLOOD VESSELS

1. **Arteries**
    - Carry blood away from the heart
    - Thick elastic walls
    - High pressure
2. **Veins**
    - Carry blood to the heart
    - Thin walls
    - Contain valves to prevent backflow

3. **Capillaries**
    - One-cell thick
    - Connect arteries and veins
    - Main site of exchange of materials

⭐ EXCHANGE OF GASES BETWEEN ALVEOLI, BLOOD AND TISSUES

Gas exchange occurs by simple diffusion.

At alveoli:

- Oxygen from alveoli enters blood
- Carbon dioxide from blood enters alveoli

At body tissues:

- Oxygen moves from blood to tissues
- Carbon dioxide moves from tissues to blood

⭐ 4. TRANSPORTATION IN PLANTS

Plants transport water and food through:

1. **Xylem** – conducts water and minerals from roots to leaves
2. **Phloem** – conducts food from leaves to other parts

Xylem transport is upward and physical;

Phloem transport is both upward and downward and requires energy.

⭐ TRANSPIRATION AND ITS FUNCTIONS

Transpiration is the loss of water vapour from leaves.

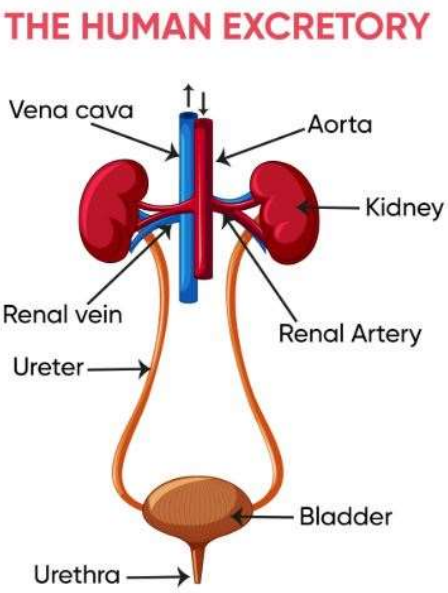
Functions:

1. Creates suction pull for upward water movement
2. Helps in cooling the plant
3. Helps in distribution of minerals
4. Maintains water balance inside the plant

⭐ 5. EXCRETION SYSTEM IN HUMAN BEINGS

Excretion is the removal of harmful waste products formed during metabolism.

The human excretory system includes:



- Kidneys
- Ureters
- Urinary bladder
- Urethra

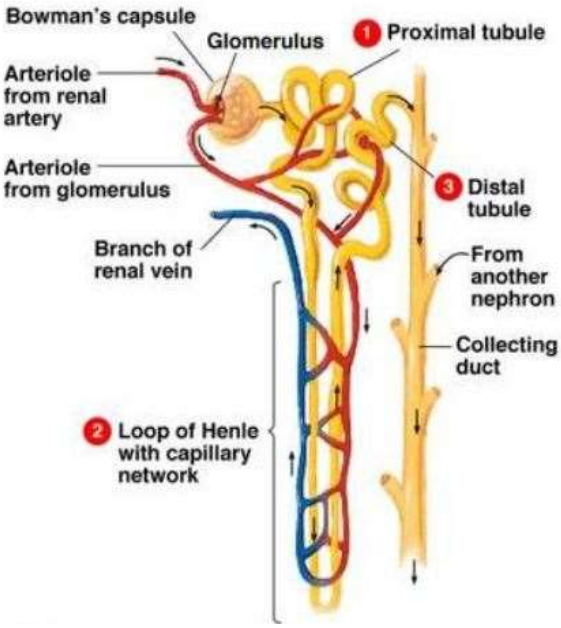
⭐ EXCRETORY WASTES

Main nitrogenous waste products:

- Urea
- Uric acid
- Creatinine

Other wastes: excess water, salts, toxins

⭐ THREE STEPS OF URINE FORMATION



1. **Ultrafiltration**
    - Takes place in glomerulus
    - Water and small molecules filter into Bowman's capsule
2. **Selective Reabsorption**
    - Useful substances like glucose, amino acids, water are reabsorbed into blood
3. **Tubular Secretion**
    - Harmful substances like urea, uric acid, excess ions are added into filtrate

⭐ FORMATION OF URINE IN HUMAN BEINGS

1. Blood enters kidney through renal artery
2. In glomerulus, filtrate forms
3. Filtrate enters Bowman's capsule
4. Selective reabsorption in proximal tubule
5. More reabsorption in loop of Henle
6. Final adjustments in distal tubule
7. Urine finally collected in collecting duct
8. Urine flows to bladder through ureters
9. Stored in bladder
10. Excreted through urethra

⭐ FUNCTIONS OF NEPHRON

1. Filtering blood
2. Removing nitrogenous wastes
3. Reabsorbing useful materials
4. Maintaining water and salt balance
5. Producing urine

⭐ ARTIFICIAL KIDNEY (DIALYSIS)

Dialysis is used when kidneys fail.

Functions:

1. Removes urea from blood
2. Removes excess salts and water
3. Maintains proper concentration of blood
4. Purifies blood using a dialysing machine

⭐ 6. EXCRETION IN PLANTS

Plants remove wastes through:

1. Storing wastes in leaves and shedding them

2. Excreting gases through stomata
3. Storing wastes in bark
4. Releasing gums, resins, latex
5. Removing excess water by transpiration