

Class 10 Biology: Complete Chapter-wise Notes

Based on the Latest Syllabus and Exam Pattern

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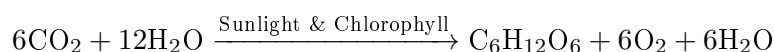
1 Life Processes

Life processes are the basic functions performed by living organisms to maintain their life on Earth. The four major life processes are Nutrition, Respiration, Transportation, and Excretion.

1.1 Nutrition

Nutrition is the process of taking in food and utilizing it for growth, metabolism, and repair.

- **Autotrophic Nutrition:** Organisms synthesize their own food from simple inorganic substances (e.g., green plants).
- **Photosynthesis:** The process by which green plants make their own food using sunlight, chlorophyll, carbon dioxide, and water.



- **Heterotrophic Nutrition:** Organisms depend on others for food. It includes:
 - *Holozoic*: Solid food is ingested and digested internally (e.g., Humans, Amoeba).
 - *Saprophytic*: Organisms feed on dead and decaying matter (e.g., Fungi).
 - *Parasitic*: Organisms obtain nutrients from a living host without killing it immediately (e.g., Cuscuta, Ticks).

1.2 Respiration

Respiration is the biochemical process of breaking down glucose to release energy.

- **Aerobic Respiration:** Occurs in the presence of oxygen. Produces a large amount of energy, carbon dioxide, and water. Occurs in mitochondria.
- **Anaerobic Respiration:** Occurs in the absence of oxygen. Produces less energy. In yeast, it produces ethanol and CO_2 . In human muscle cells (during heavy exercise), it produces lactic acid.

1.3 Transportation

- **In Humans:** The circulatory system consists of the heart, blood vessels, and blood. The human heart has four chambers to prevent the mixing of oxygenated and deoxygenated blood. Double circulation ensures efficient oxygen supply.
- **In Plants:**
 - *Xylem*: Transports water and minerals from roots to the rest of the plant (unidirectional).
 - *Phloem*: Transports food (sucrose) from leaves to other parts (bidirectional). This process is called translocation.

1.4 Excretion

- **Human Excretory System:** Comprises a pair of kidneys, a pair of ureters, a urinary bladder, and a urethra. The basic filtration unit in the kidney is the **nephron**.
- **Plant Excretion:** Plants excrete oxygen (a byproduct of photosynthesis), excess water (via transpiration), and store waste in cellular vacuoles, old xylem (as resins and gums), or shed leaves.

2 Control and Coordination

Living organisms respond and react to changes in their environment (stimuli). In animals, this is achieved by the nervous and endocrine systems. In plants, it is done via hormones.

2.1 Nervous System in Animals

- **Neuron:** The structural and functional unit of the nervous system. Impulses travel from the dendrite → cell body → axon → nerve ending → synapse.
- **Reflex Action:** A sudden, involuntary response to a stimulus (e.g., pulling your hand away from a hot object). The pathway taken by nerve impulses in a reflex action is called a **reflex arc**.

- **Human Brain:**

- *Forebrain*: Main thinking part (Cerebrum). Controls voluntary actions, memory, and sensory reception.
- *Midbrain*: Controls involuntary actions like pupil size changes.
- *Hindbrain*: Pons (respiration), Medulla (involuntary actions like blood pressure, vomiting), Cerebellum (precision of voluntary actions, posture, and balance).

2.2 Coordination in Plants

Plants do not have a nervous system but respond to stimuli via growth movements (Tropic movements).

- **Phototropism**: Movement towards light.
- **Geotropism**: Movement towards gravity.
- **Plant Hormones (Phytohormones)**:
 - *Auxins*: Promote cell elongation (synthesized at shoot tips).
 - *Gibberellins*: Help in the growth of the stem.
 - *Cytokinins*: Promote cell division.
 - *Abscisic Acid (ABA)*: Inhibits growth, causes wilting of leaves (stress hormone).

2.3 Endocrine System in Humans

Hormones are chemical messengers secreted directly into the blood by ductless glands.

- **Thyroid Gland**: Secretes Thyroxine (regulates carbohydrate, protein, and fat metabolism). Iodine is essential for its synthesis.
- **Pancreas**: Secretes Insulin (regulates blood sugar levels).
- **Adrenal Gland**: Secretes Adrenaline (prepares the body for emergency situations - "fight or flight").
- **Pituitary Gland**: The master gland. Secretes Growth Hormone.

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3 How Do Organisms Reproduce?

Reproduction is the process by which living organisms produce new individuals similar to themselves. It ensures the continuity of species.

3.1 Asexual Reproduction

Involves a single parent and no gamete formation. Offspring are genetically identical clones.

- **Fission:** Splitting of a single cell into two or more cells. *Binary fission* in Amoeba; *Multiple fission* in Plasmodium.
- **Fragmentation:** Breaking of the body into pieces, each growing into a new organism (e.g., Spirogyra).
- **Regeneration:** Ability to give rise to new individual organisms from body parts (e.g., Planaria, Hydra).
- **Budding:** An outgrowth (bud) arises and detaches to form a new organism (e.g., Hydra, Yeast).
- **Vegetative Propagation:** New plants develop from roots, stems, or leaves (e.g., Bryophyllum, Potato).

3.2 Sexual Reproduction in Flowering Plants

- **Flower Parts:** Sepals, Petals, Stamens (male part: anther + filament), Carpel/Pistil (female part: stigma + style + ovary).
- **Pollination:** Transfer of pollen grains from the anther to the stigma. Can be self-pollination or cross-pollination.
- **Fertilization:** Fusion of male gamete with the female gamete (egg) inside the ovule, leading to zygote formation. The ovary develops into a fruit, and ovules develop into seeds.

3.3 Reproduction in Humans

- **Male Reproductive System:** Testes (produce sperm and testosterone), Vas deferens, Prostate gland, Seminal vesicles, Urethra, Penis.
- **Female Reproductive System:** Ovaries (produce eggs/ova, estrogen, progesterone), Fallopian tubes (site of fertilization), Uterus (site of embryo development), Vagina.
- **Menstruation:** If the egg is not fertilized, the thick, spongy lining of the uterus breaks down and is discharged along with blood and mucus.

4 Heredity

Heredity is the transmission of traits or characteristics from parents to their offspring.

4.1 Mendel's Contributions

Gregor Johann Mendel is known as the Father of Genetics. He conducted experiments on pea plants (*Pisum sativum*) because they have easily observable contrasting traits, a short life span, and can self-pollinate or cross-pollinate.

- **Monohybrid Cross:** Cross involving a single pair of contrasting characters (e.g., Tall vs. Dwarf plants).
 - F1 Generation: All plants are tall.

- F2 Generation: The phenotypic ratio is 3:1 (Tall:Dwarf). The genotypic ratio is 1:2:1 (TT:Tt:tt).
- **Dihybrid Cross:** Cross involving two pairs of contrasting characters (e.g., Round/Yellow seeds vs. Wrinkled/Green seeds). The F2 phenotypic ratio is 9:3:3:1.
- **Law of Dominance:** Out of a pair of contrasting alleles, only one expresses itself in the hybrid (dominant), while the other remains hidden (recessive).

4.2 Sex Determination in Humans

Humans have 23 pairs of chromosomes. 22 pairs are autosomes, and the 23rd pair are sex chromosomes.

- Females have a perfect pair of sex chromosomes: **XX**.
- Males have a mismatched pair: **XY**.
- If a sperm carrying an X chromosome fertilizes the egg, the child will be female (XX).
- If a sperm carrying a Y chromosome fertilizes the egg, the child will be male (XY). Thus, the father determines the sex of the child.

5 Our Environment

The environment includes our physical surroundings (abiotic components) and the living organisms (biotic components).

5.1 Ecosystem

A self-sustaining system where biotic and abiotic components interact.

- **Producers:** Organisms that make their own food (plants, blue-green algae).
- **Consumers:** Organisms that depend on producers (herbivores, carnivores, omnivores).
- **Decomposers:** Microorganisms that break down dead remains, returning nutrients to the soil (bacteria, fungi).

5.2 Food Chain and Food Web

- **Food Chain:** A linear sequence of organisms where nutrients and energy are transferred from one organism to another. (e.g., Grass → Grasshopper → Frog → Snake → Hawk).
- **10% Law of Energy Transfer:** Only 10% of the energy available at one trophic level is passed onto the next. The rest is lost as heat.
- **Biological Magnification:** The progressive increase in the concentration of harmful non-biodegradable chemicals (like DDT) at successive trophic levels. Top carnivores (like humans) accumulate the highest concentration.

5.3 Ozone Layer Depletion

- Ozone (O_3) forms a protective layer in the stratosphere that shields the Earth from harmful Ultraviolet (UV) radiation from the sun. UV radiation can cause skin cancer in humans.
- The depletion of the ozone layer is primarily caused by synthetic chemicals like **Chlorofluorocarbons (CFCs)**, which were widely used in refrigerants and fire extinguishers.

5.4 Waste Management

- **Biodegradable Waste:** Substances that can be broken down by biological processes (e.g., vegetable peels, paper).
 - **Non-biodegradable Waste:** Substances that cannot be broken down by biological processes and persist in the environment for a long time (e.g., plastics, glass).
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