Class 10 Biology Study Notes

Comprehensive Chapter-wise Revision Material

Chapter 1: Life Processes

Life processes are the basic functions performed by living organisms to maintain their life on Earth. The major life processes include nutrition, respiration, transportation, and excretion.

1. Nutrition

Nutrition is the process of intake of nutrients (like carbohydrates, fats, proteins, minerals, vitamins, and water) by an organism as well as the utilization of these nutrients by the organism.

- **Autotrophic Nutrition:** Organisms synthesize their own food using simple inorganic substances (like CO_2 and H_2O) in the presence of sunlight. E.g., Green plants.
  - **Photosynthesis Equation:**

$$6CO_2 + 12H_2O \xrightarrow[\text{Chlorophyll}]{\text{Sunlight}} C_6H_{12}O_6 + 6O_2 + 6H_2O$$

  - **Events in Photosynthesis:** Absorption of light energy by chlorophyll → Conversion of light energy to chemical energy and splitting of water molecules → Reduction of carbon dioxide to carbohydrates.
- **Heterotrophic Nutrition:** Organisms depend on others for food. Types include:
  - *Holozoic:* Solid food is ingested and digested inside the body (e.g., Humans, Amoeba).
  - *Saprophytic:* Organisms feed on dead and decaying matter (e.g., Fungi).
  - *Parasitic:* Organisms obtain food from a host without killing it (e.g., Cuscuta, Ticks).

2. Human Digestive System

The alimentary canal is a long tube extending from the mouth to the anus.

- **Mouth:** Digestion begins here. Salivary amylase breaks down starch into simple sugars.
- **Stomach:** Gastric glands release HCl, pepsin (protein digestion), and mucus.
- **Small Intestine:** Site of complete digestion. Receives bile from the liver (emulsifies fats) and pancreatic juice from the pancreas (trypsin for proteins, lipase for fats). Villi increase the surface area for absorption.
- **Large Intestine:** Absorbs excess water; solid waste is excreted through the anus.

3. Respiration

The process of releasing energy from food.

- **Aerobic Respiration:** Occurs in the presence of oxygen. Produces more energy (38 ATP). End products are CO_2 and H_2O. Occurs in mitochondria.
- **Anaerobic Respiration:** Occurs in the absence of oxygen. In yeast, it produces ethanol and CO_2. In human muscle cells (during vigorous exercise), it produces lactic acid, causing cramps.

4. Transportation & Excretion

- **Human Heart:** Four-chambered structure ensuring double circulation (pulmonary and systemic). Arteries carry oxygenated blood away from the heart; veins carry deoxygenated blood to the heart.
- **Plants: Xylem** transports water and minerals from roots to leaves. **Phloem** transports food from leaves to other parts (Translocation).
- **Human Excretory System:** Kidneys, ureters, urinary bladder, and urethra. The basic filtration unit is the **Nephron**.

Chapter 2: Control and Coordination

1. Nervous System

The nervous system coordinates activities through electrical impulses.

- **Neuron:** The structural and functional unit. Consists of Dendrite (receives signals), Cell body, Axon (transmits signals), and Synapse (gap between two neurons where chemical transmission occurs).
- **Reflex Action:** Sudden, involuntary reaction to a stimulus (e.g., pulling hand away from a hot object). The pathway taken by nerve impulses is the **Reflex Arc** (Receptor → Sensory Neuron → Spinal Cord → Motor Neuron → Effector).
- **Human Brain:**
  - *Forebrain:* Main thinking part (Cerebrum). Controls voluntary actions, memory, and senses.
  - *Midbrain:* Controls involuntary actions like pupil size changes.
  - *Hindbrain:* Pons, Medulla (controls involuntary actions like blood pressure, vomiting), and Cerebellum (maintains posture and balance).

2. Hormones in Animals and Plants

- **Plant Hormones (Phytohormones):**
  - *Auxin:* Promotes cell elongation, helps in phototropism (bending towards light).
  - *Gibberellins:* Promotes stem growth.
  - *Cytokinins:* Promotes cell division.
  - *Abscisic Acid:* Inhibits growth, causes wilting of leaves (stress hormone).
- **Animal Endocrine Glands:**
  - *Thyroid:* Secretes Thyroxine (regulates carbohydrate, protein, and fat metabolism). Iodine is essential for its synthesis.
  - *Pancreas:* Secretes Insulin (regulates blood sugar levels).
  - *Adrenal:* Secretes Adrenaline (prepares the body for emergency situations - fight or flight).
  - *Pituitary:* Master gland, secretes Growth Hormone.

Chapter 3: How do Organisms Reproduce?

1. Asexual Reproduction

Involves a single parent and does not require the fusion of gametes.

- **Fission:** Splitting of a cell into two or more cells. *Binary fission* in Amoeba; *Multiple fission* in Plasmodium.
- **Fragmentation:** Body breaks into smaller pieces, each growing into a new individual (e.g., Spirogyra).
- **Regeneration:** Ability to give rise to new individuals from body parts (e.g., Planaria, Hydra).
- **Budding:** A bud develops as an outgrowth due to repeated cell division (e.g., Hydra, Yeast).
- **Vegetative Propagation:** New plants are obtained from the parts of old plants like stems, roots, and leaves without the help of reproductive organs.

2. Sexual Reproduction in Plants

- **Flower Structure:** Male part is the Stamen (Anther, Filament); Female part is the Carpel/Pistil (Stigma, Style, Ovary).
- **Pollination:** Transfer of pollen grains from anther to stigma. Can be self-pollination or cross-pollination.
- **Fertilization:** Fusion of male and female gametes to form a zygote. After fertilization, the ovule develops into a seed and the ovary into a fruit.

3. Human Reproduction

- **Male Reproductive System:** Testes (produce sperm and testosterone), Vas deferens, Prostate gland, Urethra, Penis.
- **Female Reproductive System:** Ovaries (produce eggs/ova, estrogen, and progesterone), Fallopian tubes (site of fertilization), Uterus (embryo development), Vagina.
- **Menstruation:** If the egg is not fertilized, the thick and spongy lining of the uterus sheds along with blood and mucus.
- **Reproductive Health:** Methods of contraception include Barrier methods (condoms), Chemical methods (oral pills), IUDs (Copper-T), and Surgical methods (Vasectomy in males, Tubectomy in females).

Chapter 4: Heredity and Evolution

1. Heredity

The transmission of characters/traits from parents to their offspring.

- **Mendel's Contributions:** Gregor Mendel used pea plants (*Pisum sativum*) to study inheritance.
- **Monohybrid Cross:** Cross between two plants differing in one character (e.g., Tall vs. Dwarf). The phenotypic ratio in the F_2 generation is 3:1.
- **Dihybrid Cross:** Cross involving two pairs of contrasting characters (e.g., Round/Yellow seeds vs. Wrinkled/Green seeds). The phenotypic ratio in the F_2 generation is 9:3:3:1.
- **Dominant and Recessive Traits:** A dominant trait expresses itself in both homozygous and heterozygous conditions, whereas a recessive trait expresses itself only in a homozygous condition.

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**.
- A child inheriting an X chromosome from the father will be a girl (XX), and a child inheriting a Y chromosome from the father will be a boy (XY). The father's sperm determines the sex of the child.

Chapter 5: Our Environment

1. Ecosystem

An ecosystem consists of biotic components (living organisms) and abiotic components (physical factors like temperature, rainfall, wind, soil, and minerals) interacting with each other.

- **Producers:** Organisms that can make their own food (Green plants, blue-green algae).
- **Consumers:** Organisms that depend on producers directly or indirectly (Herbivores, Carnivores, Omnivores).
- **Decomposers:** Microorganisms that break down dead remains and waste products (Bacteria, Fungi).

2. Food Chain and Food Web

- **Food Chain:** A series of organisms feeding on one another. Each step forms a trophic level.
- **10% Law:** Only 10% of the energy is transferred from one trophic level to the next. The rest is lost as heat to the environment. Hence, food chains generally consist of only 3 or 4 steps.
- **Biological Magnification:** The accumulation of harmful chemicals (like pesticides) in the bodies of organisms at higher trophic levels. The highest concentration occurs in top carnivores (including humans).

3. Ozone Layer and Waste Management

- **Ozone Layer:** A layer of O_3 molecules in the stratosphere that shields the Earth from harmful Ultraviolet (UV) radiation from the Sun. UV radiation can cause skin cancer.
- **Depletion:** Caused mainly by Chlorofluorocarbons (CFCs) used in refrigerants and fire extinguishers.
- **Waste Management:**
  - *Biodegradable Waste:* Can be broken down by biological processes (e.g., vegetable peels, paper).
  - *Non-biodegradable Waste:* Cannot be broken down naturally (e.g., plastics, glass, heavy metals).