Class 10 Science: Life Processes Notes

Introduction

Life processes are essential activities performed by living organisms to maintain life. These include nutrition, respiration, transportation, and excretion.

1 Nutrition

Nutrition is the process by which organisms obtain and utilize food for energy and growth.

1.1 Types of Nutrition

- **Autotrophic Nutrition**: Organisms (e.g., green plants) prepare their own food through photosynthesis.
  - **Photosynthesis**:
    - *Equation*: $6CO_2 + 6H_2O \xrightarrow{\text{sunlight, chlorophyll}} C_6H_{12}O_6 + 6O_2$
    - Occurs in chloroplasts containing chlorophyll.
    - *Raw materials*: Carbon dioxide (via stomata) and water (via roots).
    - *Conditions*: Sunlight, chlorophyll, CO_2, water.
    - *By-product*: Oxygen.
  - *Diagram*: Cross-section of a leaf showing stomata, guard cells, and chloroplasts.
- **Heterotrophic Nutrition**: Organisms depend on others for food.
  - *Holozoic*: Ingesting and digesting food (e.g., humans, animals).
  - *Saprophytic*: Feeding on dead organic matter (e.g., fungi).
  - *Parasitic*: Deriving nutrients from a living host (e.g., tapeworm).

1.2 Nutrition in Amoeba

- *Process*: Holozoic nutrition via phagocytosis.
- Amoeba engulfs food using pseudopodia, forms a food vacuole, digests it, and expels waste via diffusion.
- *Diagram*: Amoeba showing pseudopodia and food vacuole.

1.3 Nutrition in Humans

- **Human Digestive System**:
  - *Organs*: Mouth, esophagus, stomach, small intestine, large intestine, rectum, anus.
  - *Accessory Organs*: Salivary glands, liver, pancreas, gallbladder.
  - *Process*:
    - *Ingestion*: Food intake via mouth.
    - *Digestion*: Breakdown of complex food into simpler molecules.
      - *Mouth*: Saliva (amylase) breaks down starch into maltose.
      - *Stomach*: Gastric juices (HCl, pepsin) digest proteins into peptides.
      - *Small Intestine*: Bile emulsifies fats; pancreatic juices digest carbohydrates, proteins, and fats. Villi absorb nutrients.
      - *Large Intestine*: Absorbs water; forms and stores feces.
    - *Absorption*: Nutrients absorbed in the small intestine via villi.
    - *Assimilation*: Nutrients used by cells for energy and growth.
    - *Egestion*: Removal of undigested waste via anus.
  - *Diagram*: Human digestive system with labeled parts.

2 Respiration

Respiration is the process of breaking down glucose to release energy for cellular activities.

2.1 Types of Respiration

- **Aerobic Respiration**:
  - Occurs in the presence of oxygen, in mitochondria.
  - *Equation*: $C_6H_{12}O_6 + 6O_2 \rightarrow 6CO_2 + 6H_2O + 38$ ATP.
  - Common in humans and animals.
- **Anaerobic Respiration**:
  - Occurs without oxygen, produces less energy.
  - *Examples*:
    - Yeast: $C_6H_{12}O_6 \rightarrow 2C_2H_5OH + 2CO_2 + 2$ ATP (fermentation).
    - Muscle cells: $C_6H_{12}O_6 \rightarrow 2$ Lactic acid $+ 2$ ATP.

2.2 Respiration in Humans

- **Respiratory System**:
  - *Organs*: Nostrils, nasal cavity, pharynx, larynx, trachea, bronchi, bronchioles, alveoli, lungs.
  - *Process*:
    - *Inhalation*: Diaphragm and intercostal muscles contract, drawing air into lungs.
    - *Exhalation*: Muscles relax, expelling air.
    - *Gas Exchange*: In alveoli, oxygen diffuses into blood, CO_2 is exhaled.
  - *Diagram*: Human respiratory system showing alveoli and lungs.
- **Transport of Gases**:
  - Oxygen binds to hemoglobin in RBCs.
  - CO_2 is transported as bicarbonate ions.

3 Transportation

Transportation moves nutrients, gases, and wastes within an organism.

3.1 Transportation in Humans

- **Circulatory System**:
  - *Components*: Heart, blood, blood vessels (arteries, veins, capillaries).
  - *Blood Components*:
    - *Plasma*: Carries nutrients, hormones, wastes.
    - *RBCs*: Carry oxygen via hemoglobin.
    - *WBCs*: Fight infections.
    - *Platelets*: Aid in clotting.
  - *Heart*: Four chambers (two atria, two ventricles); double circulation (pulmonary and systemic).
  - *Diagram*: Human heart showing chambers, valves, and blood flow.
- **Blood Vessels**:
  - *Arteries*: Carry oxygenated blood (except pulmonary artery).
  - *Veins*: Carry deoxygenated blood (except pulmonary vein).
  - *Capillaries*: Site of nutrient and gas exchange.

3.2 Transportation in Plants

- **Xylem**: Transports water and minerals from roots to leaves via transpiration pull.
- **Phloem**: Transports food (glucose) from leaves via translocation.
- *Diagram*: Cross-section of a plant stem showing xylem and phloem.

4 Excretion

Excretion is the removal of metabolic wastes to maintain homeostasis.

4.1 Excretion in Humans

- **Excretory System**:
  - *Organs*: Kidneys, ureters, urinary bladder, urethra.
  - *Kidneys*:
    - Functional unit: Nephron.
    - *Process*: Filtration, reabsorption, secretion, urine formation.
  - *Urine*: Contains water, urea, wastes; stored in bladder, expelled via urethra.
  - *Other Organs*: Lungs (excrete CO_2), skin (sweat), liver (converts ammonia to urea).
  - *Diagram*: Human excretory system and nephron.

4.2 Excretion in Plants

- Via stomata (O_2, water vapor), lenticels (CO_2), shedding leaves, or resins/gums.

5 Key Diagrams

- Photosynthesis: Leaf cross-section (stomata, chloroplasts).
- Amoeba: Phagocytosis process.
- Human Digestive System: Mouth to anus with accessory organs.
- Human Respiratory System: Alveoli and lungs.
- Human Heart: Double circulation and blood flow.
- Plant Transport: Xylem and phloem in stem.
- Human Excretory System: Kidneys and nephron.

6 Exam Tips

- **Definitions**: Define life processes, types of nutrition, respiration, etc.
- **Equations**: Memorize photosynthesis and respiration equations.

- **Diagrams**: Practice labeling diagrams accurately.
- **Functions**: Understand roles of organs/systems.
- **Differences**: Compare aerobic vs. anaerobic respiration, xylem vs. phloem.
- **Examples**: Relate processes to real-life (e.g., fermentation in yeast).