

Senior 1: Term 1 Study Notes

Theme: Diversity of Living Things

TOPIC 1.1: INTRODUCTION TO BIOLOGY

Competency: The learner understands biology as a study of life and that all living organisms experience common life processes.

1.1.1 What is Biology?

- **Definition: Biology** (from Greek *bios* = life, *logia* = study of) is the natural science that studies **life** and **living organisms**.
- It covers the structure, function, growth, evolution, distribution, and taxonomy of all living things.

1.1.2 Branches of Biology

Branch	Area of Study	Analogy/Aid
Botany	The study of plants .	<i>Botany</i> sounds like "garden," where plants grow.
Zoology	The study of animals .	Zoo is a place for animals.
Physiology	The study of the functions of living organisms and their parts.	<i>Phy</i> (think <i>physical</i>) is how things work.
Anatomy	The study of the structure of living organisms and their parts.	<i>Ana</i> (think <i>analysis</i>) is breaking down the body to look at the structure.
Genetics	The study of heredity (how traits are passed down) and variation.	Gen (think generation/genesis) is the study of human evolution

Ecology	The study of how organisms interact with their environment.	<i>Eco</i> (think <i>economy/system</i>) is about how things fit together.
Taxonomy	The science of naming, describing, and classifying organisms.	<i>Tax</i> (think <i>taxi</i>) is a system for organizing things.

1.1.3 Biology in Everyday Life (Application)

Biology is a practical science applied in fields like:

- **Medicine:** Understanding disease, developing treatments, and producing vaccines (Physiology, Microbiology).
- **Agriculture:** Improving crop yields, animal breeding, and pest control (Botany, Genetics).
- **Conservation:** Managing ecosystems and protecting endangered species (Ecology).

1.1.4 Characteristics of Living Things (Life Processes)

All living organisms exhibit common life processes.

- **Mnemonic: MR NIGER D** (The seven characteristics, plus Death)

Characteristic	Explanation	Plant vs. Animal Manifestation
Movement	Change in position or place.	Plants: Internal or growth movements only. Animals: Locomotion (moving the whole body).
Respiration	Breakdown of food (glucose) to release energy (ATP).	Both: Occurs in all living cells, continuously.
Nutrition	The process of obtaining and using food.	Plants: Autotrophic (make their own food). Animals: Heterotrophic (ingest pre-formed food).
Irritability/Sensitivity	The ability to detect and respond to internal or external changes (stimuli).	Both: Respond to stimuli like light, temperature, and touch.

Growth	A permanent and irreversible increase in size and dry mass.	Plants: Continuous throughout life. Animals: Stops once maturity is reached.
Excretion	Removal of toxic metabolic waste products.	Both: Remove waste, but animals remove it via urine/sweat, plants mostly store or shed it.
Reproduction	The process of creating new individuals of the same species.	Both: Sexual or Asexual reproduction.
Death	The final, irreversible loss of life functions.	(Added for completeness)

Summary: Biology is the study of life, with branches like Botany and Zoology. All living things are defined by seven processes, summarized by **MR NIGER D**: **M**ovement, **R**espiration, **N**utrition, **I**rritability, **G**rowth, **E**xcretion, and **R**eproduction.

TOPIC 1.2: CELLS

Competency: The learner appreciates the cell as the basic unit of living organisms including how the structures of different specialized cells are related to their functions.

1.2.1 The Cell: Basic Unit of Life

- **Definition:** The **cell** is the fundamental, structural, and functional unit of all known living organisms.
- **Organelles:** The specialized structures within a cell that carry out specific functions.

1.2.2 Structure and Function of Plant and Animal Cells

Structure (Organelle)	Description	Function	Plant or Animal?
Cell Membrane	Thin, selectively permeable barrier.	Controls which substances enter and leave the cell.	Both
Cytoplasm	Jelly-like substance filling the cell.	Site of most chemical reactions (metabolism).	Both
Nucleus	Contains DNA.	Controls all cell activities (the 'control center').	Both
Mitochondria	Oval-shaped organelle.	Site of aerobic respiration (releasing energy).	Both
Cell Wall	Rigid outer layer made of cellulose .	Provides fixed shape and support.	Plant only
Chloroplasts	Contains chlorophyll (green pigment).	Site of photosynthesis (food production).	Plant only

Vacuole	Large, central sac filled with cell sap.	Stores water/nutrients; maintains cell turgor (pressure).	Plant (Large, permanent)
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1.2.3 Specialized Cells and Function

The structure of a specialized cell is related to its specific function in the organism.

Specialized Cell	Adaptation	Function
Red Blood Cell	Biconcave shape, no nucleus.	Increases surface area to transport maximum oxygen .
Nerve Cell (Neuron)	Long, thin axon.	Transmits rapid electrical impulses over long distances.
Root Hair Cell	Long, thin projection.	Increases surface area for maximum absorption of water and mineral salts.
Sperm Cell	Tail (flagellum).	Allows for locomotion towards the egg for fertilization.

1.2.4 Levels of Organization

Multicellular organisms are organized in a hierarchy from simple to complex.

- **Mnemonic: Cindy Took Our Sweat Off**
- 1. **Cell** (Basic unit) →
- 2. **Tissue** (Group of similar cells) →
- 3. **Organ** (Group of different tissues) →
- 4. **System** (Group of different organs, e.g., Digestive System) →
- 5. **Organism** (The complete living thing)

Summary: The **cell** is the unit of life. **Plant cells** are distinguished by having a **cell wall**, **chloroplasts**, and a large central **vacuole**. **Differentiation** leads to specialized cells with

unique structures for specific functions. The levels of organization move from **Cell** to a complete **Organism**.

TOPIC 1.3.1: CLASSIFICATION

Competency: The learner understands that classification is the sorting out of living things based on their similarities.

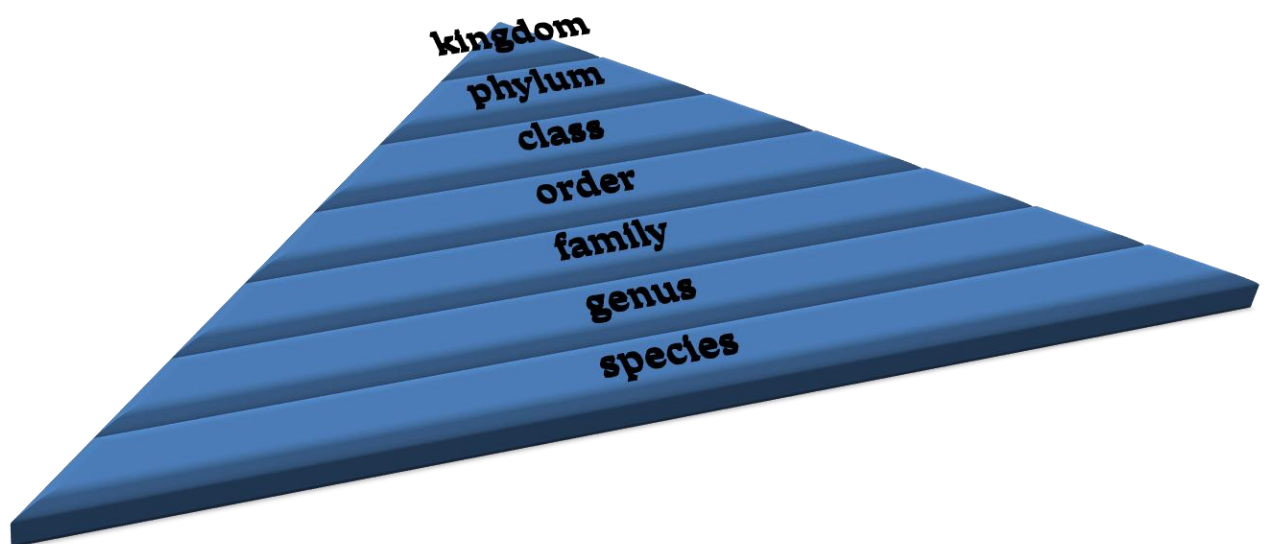
1.3.1.1 The Concept of Classification

- **Definition: Classification** is the systematic arrangement of organisms into groups based on their similarities and evolutionary relationships.
- **Benefit:** Provides a universal system for naming and studying the vast number of organisms, making biology easier to manage internationally.

1.3.1.2 The Hierarchy of Classification (Taxonomic Ranks)

Classification uses a rigid hierarchy of seven main ranks (taxa).

- **Mnemonic: King Philip Came Over For Good Spaghetti**



1.3.1.3 Binomial Nomenclature

- **Definition:** The two-name (binomial) system of naming organisms, popularized by Carolus Linnaeus. It provides a **universal scientific name** to avoid confusion from regional common names.
- **Rules:** The scientific name is always in Latin and consists of two parts:
 1. **Genus** name (Capitalized).
 2. **Species** name (Lowercase).
- **Formatting:** The name must be written in *Italics* when typed (e.g., *Homo sapiens*) or **underlined** when handwritten (e.g., Homo sapiens)

Summary: Classification is the sorting of life, using the hierarchy from **Kingdom** down to **Species**. **Binomial Nomenclature** assigns a universal, two-part Latin name (**Genus** and **species**) to every organism.

Senior 1: Term 2 Study Notes

Theme: Diversity of Living Things

TOPIC 1.3.2: THE FIVE KINGDOMS OF LIVING ORGANISMS

Competency: The learner knows the key characteristics of the five kingdoms of living organisms and is able to identify examples of organisms from each kingdom.

Organisms are classified based on cell structure, organization, and mode of feeding.

Kingdom	Cell Structure	Cell Organization	Mode of Feeding	Examples
Monera	Prokaryotic (No membrane-bound nucleus).	Unicellular.	Autotrophic or Heterotrophic.	Bacteria, Cyanobacteria.
Protocista	Eukaryotic (True nucleus).	Mostly Unicellular.	Autotrophic (Algae) or Heterotrophic (Protozoa).	Amoeba, <i>Paramecium</i> , Algae.
Fungi	Eukaryotic. Cell walls of Chitin .	Unicellular (Yeast) or Multicellular (Mushrooms).	Heterotrophic (Saprotrophic/Parasitic).	Yeast, Mushrooms, Molds.
Plantae	Eukaryotic. Cell walls of Cellulose .	Multicellular.	Autotrophic (Photosynthesis).	Mosses, Ferns, Flowering Plants.
Animalia	Eukaryotic. No cell wall.	Multicellular, complex organ systems.	Heterotrophic (Ingestion).	Worms, Insects, Mammals.

Value of Microorganisms in Food-making: Bacteria (*Lactobacillus*) ferment milk to produce yogurt and cheese. Yeast (Fungi) ferments sugars to produce CO² (leavening bread) and alcohol (brewing).

1.3.2.1 Kingdom Plantae: Classification Categories (No Drawings Required)

- **Vascular** (Tracheophytes): Have xylem and phloem (e.g., Ferns, Angiosperms).
- **Non-Vascular** (Bryophytes): Lack transport tissue (e.g., Mosses).
- **Angiosperms:** Flowering plants; seeds are enclosed in a fruit.
- **Gymnosperms:** Non-flowering plants; produce **naked seeds** (e.g., Pines, Conifers).
- **Monocots:** One seed leaf; parallel leaf veins (e.g., Maize, Grass).
- **Dicots:** Two seed leaves; net-like leaf veins (e.g., Beans, Roses).

1.3.2.2 Kingdom Animalia: Examples of Phyla

Phylum	Characteristics	Example
Platyhelminthes	Flatworms; unsegmented, flattened body.	Tapeworms, Flukes.
Nematoda	Roundworms; unsegmented, cylindrical body.	<i>Ascaris</i> (common intestinal worm).
Annelida	Segmented worms; body divided into rings.	Earthworms, Leeches.
Arthropoda	Jointed limbs, segmented body, exoskeleton.	Insects, Spiders, Crustaceans.

Summary: The five kingdoms are **Monera**, **Protocista**, **Fungi**, **Plantae**, and **Animalia**. They are distinguished by their cell characteristics and feeding methods. Plantae are further grouped by transport tissue (Vascular/Non-Vascular) and seed structure (Angiosperm/Gymnosperm).

Term 3 Study Notes

Theme: Diversity of Living Things

TOPIC 1.4: INSECTS

Competency: The learner understands the characteristics of insects, relates structures to their functions in some common insects, and appreciates that insects have a direct or indirect effect on the well-being of other organisms.

1.4.1 General Features and External Features

Insects belong to the Class Insecta (Phylum Arthropoda).

- **Body Divisions:** Three main parts: **Head**, **Thorax**, and **Abdomen**.
- **Appendages:** Three pairs of jointed legs (6 total) and usually one or two pairs of wings attached to the thorax.
- **Head Structures:** Contain one pair of **antennae** (for feeling/smelling) and usually compound eyes.

Insect	Key External Features (Observable)
Housefly	One pair of wings; the hind pair is modified into halteres (for balance).
Mosquito	Long, delicate legs; fringed wings; proboscis (piercing/sucking mouthpart).
Butterfly	Large, scale-covered wings; coiled proboscis (for sucking nectar).
Bee	Hairy body; two pairs of membranous wings; often brightly striped (yellow/black).

1.4.2 The Dichotomous Key

- **Definition:** A tool used for the systematic identification of organisms.
- **Construction:** It consists of a series of numbered couplets, each offering **two mutually exclusive choices** (e.g., "Wings present" vs. "Wings absent"). Following the appropriate choice leads to the next step or the organism's name.

1.4.3 Useful and Harmful Effects

Insect	Useful Effects	Harmful Effects
Bee/Butterfly	Pollination of crops, Honey and Wax production (Bee).	Stings (Bee); Larvae (Caterpillars) are crop pests (Butterfly).
Mosquito	Food for other animals (e.g., frogs).	Vector for diseases (Malaria, Yellow Fever, Dengue).
Housefly	Larvae (maggots) are decomposers.	Spreads diseases (Cholera, Typhoid) by contaminating food.
Termite	Decomposers, soil aeration.	Destroys wooden structures (buildings, furniture) and crops.

1.4.4 Control Methods for Harmful Stages

Control often targets the most susceptible life stage (e.g., larva or pupa).

- **Mosquito:** Eliminating **stagnant water** (breeding sites); use of mosquito nets/repellents; application of larvicides.
- **Housefly: Sanitation** (proper disposal of garbage/faeces); fly traps; insecticide spray.
- **Cockroach: Hygiene** (not leaving food/water uncovered); sealing cracks; poisoned bait.
- **Butterfly (Caterpillar stage):** Use of appropriate **pesticides** or biological control agents.

Summary: Insects have a three-part body and six legs. They are identified using a **dichotomous key**. Their impact is seen in **pollination** (useful) and **disease transmission** (harmful). Control involves environmental **sanitation** and targeted elimination of breeding sites.

TOPIC 1.5: FLOWERING PLANTS

Competency: The learner understands the structure and function of the parts of a flowering plant and their role in reproduction.

1.5.1 Structure and Function of a Flower

The flower is the reproductive organ of the plant.

- **Diagram (Representation):** The flower parts are held by the **Receptacle** on the **Pedice**l (stalk).

Part (Whorl)	Component Parts	Function
Sepal	Calyx (all sepals together).	Protects the flower bud before it opens.
Petal	Corolla (all petals together).	Often bright/scented to attract pollinators .
Stamen (Male)	Anther (produces pollen) and Filament (stalk).	Produces Pollen (contains male gametes).
Pistil/Carpel (Female)	Stigma (pollen receiver) , Style (stalk), Ovary (contains ovules).	Receives pollen; the Ovules contain the female gametes.

1.5.2 Pollination and Fertilization

- **Pollination:** The transfer of **pollen** from the **anther** to the **stigma**.
 - **Self-pollination:** Pollen transfer within the same plant.
 - **Cross-pollination:** Pollen transfer between different plants of the same species.
- **Fertilization:** After pollination, the pollen grain grows a **pollen tube** down the style. The male gamete fuses with the female gamete in the **ovule**.
- **Post-Fertilization:** The **Ovule** develops into the **Seed**. The **Ovary** develops into the **Fruit**.

Summary: The flower's parts are dedicated to reproduction. The **Stamen** is male, producing pollen, and the **Pistil** (Stigma, Style, Ovary) is female. **Pollination** is followed by **fertilization** in the ovule, which results in the formation of the **seed** and the surrounding **fruit**.

