

Structural Organization in Animals

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- In the animal kingdom, organisms range from **unicellular** to **multicellular** forms.

Unicellular Organisms

- In unicellular organisms, all vital functions such as digestion, respiration, and reproduction are performed by a **single cell**.

Multicellular Organisms

- In multicellular animals, basic life functions (digestion, respiration, reproduction, etc.) are performed by different groups of specialized cells in an organized way.
- Examples:
 - In **Hydra**:
 - The body is made up of different types of cells.
 - Each type may consist of thousands of cells.
 - In **humans**:
 - The body is composed of billions of cells.
 - These cells are organized into tissues, organs, and organ systems.
 - Each group performs specific functions to maintain the body's overall functioning.

Tissues: The Basic Functional Units

- In multicellular animals, a group of similar cells along with intercellular substances performs a specific function.
- This organized group is known as a **tissue**.
- All complex animals are built from just **four** basic types of tissues.

Four Basic Types of Tissues

- All complex animals consist of only **four** basic types of tissues
- Which are organized in specific proportions and patterns to form **organs**.

From Tissues to Organ Systems

- **Organs** (like the stomach, lungs, heart, kidneys) are made up of different types of tissues working together.
- When two or more organs work together to perform a common function through physical and/or chemical interaction, they form an organ system (e.g., digestive system, respiratory system).

Division of Labour

- The structural hierarchy—**cells** → **tissues** → **organs** → **organ systems**—creates a division of labour.

Division of Labour in Biological Systems



- Each level performs specific functions and contributes to the overall survival and efficiency of the organism.

Organ and Organ System

- In multicellular organisms, basic tissues organize to form **organs**, which then associate to form **organ systems**.
- This hierarchical organization ensures efficient and well-coordinated functioning of the millions of cells that make up an organism.

Organs and Tissues

- Each organ in the body is composed of one or more types of tissues.
- For example, the human heart is made up of **all four** basic tissue types:
 - Epithelial tissue
 - Connective tissue
 - Muscular tissue
 - Neural tissue



**Epithelial
Tissue**



**Connective
Tissue**



**Muscular
Tissue**



Neural Tissue

Evolutionary Trend

- The complexity of organs and organ systems in organisms shows a clear **evolutionary trend**.
- This trend reflects a gradual increase in specialization and organization from simpler organisms to more complex ones.
- This trend will be studied in more detail in Class XII.

Morphology and Anatomy of Frog

- This chapter introduces you to the morphology and anatomy of frog, a representative vertebrate.

Definitions:

Morphology:

- Refers to the external form or structure of an organism
- In plants and microbes, it specifically denotes external structure.
- In **animals**, it includes the external appearance of organs and body parts.

Anatomy:

- Refers to the study of the internal structure of organs and systems, particularly in animals

Frogs

- Frogs are amphibians belonging to Class Amphibia of Phylum Chordata.
- They are capable of living both on land and in freshwater.
- The most common species of frog found in India is **Rana tigrina** (now called *Hoplobatrachus tigerinus*).

Body Temperature

- Frogs are cold-blooded animals (**poikilotherms**), meaning their body temperature changes with the temperature of the environment.

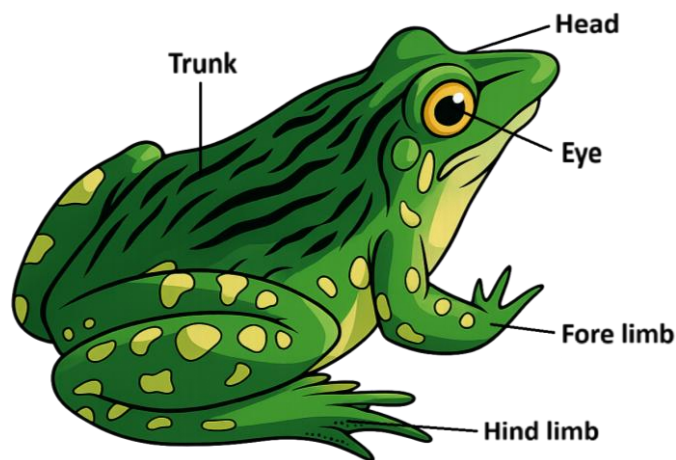
Camouflage and Mimicry

- Frogs can change their body color depending on their surroundings, such as green in grasses and brown on dry land.
- This helps them hide from predators, a protective mechanism known as **camouflage**.
- This form of protective coloration is referred to as mimicry.

Adaptation to Climate Extremes

- Frogs are **not active** during extreme weather conditions:
 - In peak summer, they undergo aestivation (summer sleep).
 - In peak winter, they undergo hibernation (winter sleep).
- During these periods, they take shelter in deep burrows to escape extreme heat and cold.

Morphology of Frog



External features of frog

Skin Characteristics

- The skin is smooth, slippery, and moist due to the presence of **mucus**.

- It plays a role in respiration and water absorption.
- Frogs do not drink water; instead, they absorb it through their skin.

Skin Coloration

- **Dorsal (upper) side:** Olive green with dark, irregular spots – provides camouflage.
- **Ventral (lower) side:** Uniformly pale yellow.

Body Division

- The frog's body is divided into **two** parts:
 - Head
 - Trunk
- Neck and tail are absent.

Head Features

- A pair of nostrils is present above the mouth.
- **Eyes** are:
 - Large and bulging – provide a wide field of vision.
 - Covered by a **nictitating membrane** for protection and moisture, especially underwater.
- On either side of the eyes is a tympanum (a membrane functioning as an ear) that receives sound signals.

Limbs

- Frogs have **two** pairs of limbs: forelimbs and hind limbs.

A. Forelimbs:

- Shorter than hind limbs.
- End in **four digits**.
- Aid in walking and balancing.

B. Hind limbs:

- Longer and more muscular.
- End in **five** webbed digits.
- Adapted for leaping, swimming, and burrowing.

Sexual Dimorphism

- Male frogs can be distinguished by:
 - **Vocal sacs:** Used for producing croaking sounds.
 - **Copulatory pad:** Present on the first digit of the forelimbs; absent in females.

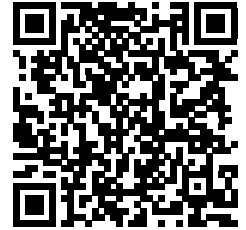


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