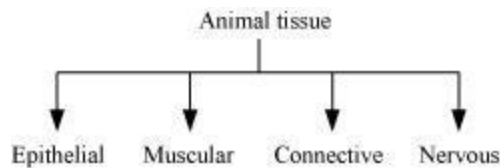


Structural Organisation in Animals

Animal tissues

- Based on the function they perform, animal tissues are classified into four types.



- Epithelial tissue**
 - It forms the outer covering of the external surfaces, internal cavities, and organs of the animal body.
 - There are two types of epithelial tissues: simple epithelium and compound epithelium.
 - Simple epithelium** – It is composed of single layer of cells.
 - Squamous epithelium** – found in the inner lining of mouth, oesophagus, blood vessels, lung alveoli
 - Cuboidal epithelium** – found in the lining of kidney tubules and ducts of salivary gland
 - Columnar epithelium** – found in the inner lining of intestine and stomach
 - Ciliated epithelium** – found in the inner lining of bronchioles and fallopian tubes
 - Some columnar or cuboidal epithelium gets specialised for secretion and are called glandular epithelium.
 - They may be unicellular as in goblet cells or multicellular as in salivary glands.
 - Glands are of two types – exocrine with duct and endocrine without duct.
 - Compound epithelium** – It is composed of several layers of cells. It provides protection against chemical and mechanical injuries.

Connective tissue

- It is specialised to connect various body organs.
- It is classified into three types:
 - Loose connective tissue**
 - Areolar tissue** – It forms a framework for epithelium.



- **Adipose tissue** – It acts as a storage site of fat.
- **Dense connective tissue** – Based on the orientation of fibres, dense connective tissue is divided into two types: dense regular tissue and dense irregular tissue. Dense regular tissue includes tendons and ligaments.
- **Tendons** are strong, non-elastic structures that connect muscles to bones.
- **Ligaments** are elastic structures that connect two bones together.
- **Specialised connective tissue** – It includes cartilage, bone, and blood.
- **Cartilage** provides support and flexibility to various body parts. It is found in tip of nose, outer ear joints, etc. Cells of this tissue are called chondrocytes.
- **Bones** provide shape and support to body. Cells of this tissue are called osteocytes.
- **Blood** is a fluid connective tissue containing plasma, RBC, WBC, and platelets.

Morphology of Earthworm

- **Earthworm (*Pheretima posthuma*)**
- Animal is cylindrical in shape with more than hundred short segments.
- The first body segment is called peristomium, which contains mouth.
- Oesophagus runs from 5-7 segments and muscular gizzard runs from 8-9 segments.
- The 5th – 9th segments contain four pairs of spermathecal apertures.
- Segments 14th, 15th, and 16th are thick and glandular. This region is known as clitellum.
- S-shaped setae are embedded in each body segment except for 1st, last, and clitellar segments. It helps in locomotion.
- Typhlosole is located between 26-35 segments and is a characteristic feature of intestine. It increases the absorption area in intestine.
- A pair of male genital pores is located on 18th segment while a single female genital pore is on 14th segment.
- Earthworms are hermaphrodite (bisexual). Earthworm is protandrous i.e., male organs develop earlier than female organs.
- Circulatory system is closed containing blood vessels, capillaries, and heart.



- Excretory organs are called nephridia and these are of three types-
- **Septal nephridia** – present from segment 15 to last segment
- **Integumentary nephridia** - present from segment 3 to last segment
- **Pharyngeal nephridia** - present in segment 4, 5, and 6
- Earthworms are used in the process of vermicomposting.

Cockroach (*Periplaneta americana*)

- Body is covered by chitinous exoskeleton.
- Body is divided into head, thorax (contains three segments), and abdomen (contains 10 segments).
- Cockroach has biting and chewing type of mouth parts. It consists of
 - labrum, which forms upper lip
 - a pair of mandibles
 - a pair of maxillae
 - labium, which forms lower lip
- The digestive system of cockroach includes hepatic caeca, which is located at the junction of foregut and midgut, that secretes digestive juices.
- Malpighian tubules are located at the junction of midgut and hindgut. They act as excretory organs.
- Respiration occurs by tracheae, which open towards exterior through spiracles.
- Circulatory system is open.
- Cockroach is uricotelic. They excrete nitrogenous waste in the form of uric acid.
- Cockroach has mosaic type of vision with less resolution and more sensitivity.
- Cockroaches are dioecious. A pair of testes lies in 4th, 5th, and 6th segments while a pair of large ovaries is extended from 2nd – 6th abdominal segments.
- Digestive, circulatory, respiratory, nervous, excretory, and reproductive systems are well-developed.
- Frog respire on land by lungs. It is known as pulmonary respiration. It respire in water through skin. It is known as cutaneous respiration.
- The main excretory organ is kidney.



- Frog is ureotelic animal. It excretes nitrogenous waste in the form of urea.
- Frog shows sexual dimorphism. The male reproductive organ is a pair of testes and female reproductive organ is a pair of ovaries.
- The fertilization is external and development is indirect in frog.
- They undergo the phenomenon of metamorphosis.
Egg → Tadpole → Adult frog

