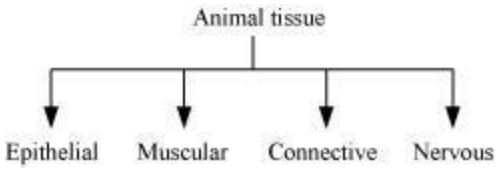
Structural Organisation in Animals

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 5^{th} – 9^{th} segments contain four pairs of spermathecal apertures.
- Segments 14^{th}, 15^{th}, and 16^{th} are thick and glandular. This region is known as clitellum.
- S–shaped setae are embedded in each body segment except for 1^{st}, 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 18^{th} segment while a single female genital pore is on 14^{th} 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 4^{th}, 5^{th}, and 6^{th} segments while a pair of large ovaries is extended from 2^{nd} – 6^{th} abdominal segments.
- Digestive, circulatory, respiratory, nervous, excretory, and reproductive systems are well-developed.
- Frog respires on land by lungs. It is known as pulmonary respiration. It respires 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 $\rightarrow$Tadpole $\rightarrow$Adult frog