

Chapter-7

STRUCTURAL ORGANISATION IN ANIMALS

POINTS TO REMEMBER

Tissue : A group of similar cells along with intercellular substances which perform a specific function.

Simple epithelium : is composed of a single layer of cells resting on a basement membrane.

Compound epithelium : consists of two or more cell layers and has protective function.

Areolar tissue : is a type of loose connective tissue present beneath the skin.

Adipose tissue : is a type of loose connective tissue which has cells specialised to store fats.

Neuroglia : A delicate connective tissue which supports and binds together the nerve tissue in the Central Nervous Tissue.

Malpighian tubules : Yellow coloured thin, filamentous tubules present at the junction of midgut and hindgut in cockroach; helps in excretion.

Uricotelic : Animals which excrete nitrogenous waste in the form of uric acid.

Tight junctions : Plasma membranes of adjacent cells are fused at intervals. They help to stop substances from leaking across a tissue.

Adhering junctions : Perform cementing function to keep neighbouring cells together.

Gap junction : Facilitate the cells to communicate with each other by connecting the cytoplasm of adjoining cells for rapid transfer of ions, small molecules and sometimes big molecules.

Epithelial Connective Muscular Neural

Epithelial Tissue

Simple : • Composed of single layer of cells.

• Functions as lining for body cavities, ducts and tubes.

1. Squamous • single thin layer of flattened cells.
• found in walls of blood vessels, air sacs of lungs.
2. Cuboidal • single layer of cube like cells.
• found in ducts of glands and tubular parts of nephron.
3. Columnar • single layer of tall and slender cells.
• free surface may have microvilli.
• found in living of stomach and intestine.
4. Ciliated • columnar or cuboidal cells with cilia.
• move particles or mucus in specific direction, in bronchioles, fallopian tubes.

Compound

- Made of more than one layer of cells.
- Provide protection against chemical and mechanical stresses.
- Cover dry surface of skin, moist cavity, pharynx, inner lining of ducts of salivary glands and pancreatic ducts.

Glandular epithelium

Exocrine glands

- secrete mucus, saliva, oil, milk, digestive enzymes.
- products released through ducts.

Endocrine glands

- secrete hormones.
- secrete directly into the fluid bathing the gland.

Connective tissue : Link and support other tissues / organs of the body.

Loose Connective Tissue

(has cells and fibres loosely arranged in semi-fluid ground substance)

(i) Areolar Tissue :

- present beneath the skin.
- contains fibroblasts, macrophages and mast cells.
- serves as a support framework for epithelium.

(ii) Adipose Tissue :

- located beneath the skin.
- cells are specialised to store fats.

Dense Connective Tissue

Fibres and fibroblasts are compactly packed.

(i) Dense Regular

- Collagen fibres present in rows.
- Tendons attach skeletal muscle to bone.
- Ligaments attach bone to bone.

(ii) Dense Irregular

- Has collagen fibres and fibroblasts oriented differently.
- This tissue is present in the skin.

Specialised Connective Tissue

- | | |
|---------------|--|
| (i) Cartilage | made up of chondrocytes and collagen fibres. |
| (ii) Bones | Ground substance is rich in calcium salts and collagen fibres. Osteocytes are present in lacunae |
| (iii) Blood | Fluid connective tissue, consists of plasma and blood cells |

Muscle Tissue

Consists of long, highly contractile cells called fibres; bring about movement and locomotion.

(i) Skeletal Muscle

- Consists of long cylindrical, multinucleated fibres.
- Closely attached to skeletal bones.
- Striated.

(ii) Smooth Muscles

- Consists of spindle like, uninucleated fibres.
- Do not show striations.
- Wall of internal organs such as blood vessels, stomach and intestine.

(iii) Cardiac Muscles

- Short, cylindrical, uninucleated fibres.
- Occur in the heart wall.
- Intercalated discs for communication.

Neural Tissue

- Neurons are the functional unit and are excitable cells.
- Neuroglia cells make up more than half the volume of neural tissue.

They protect and support neurons.

Cockroach – *Periplaneta americana*

Cockroach is a terrestrial, nocturnal, omnivorous, unisexual, oviparous insect. Body covered by a chitinous, hard exoskeleton of hard plates called sclerites.

Head : Triangular, formed by fusion of 6 segments. Bears a pair of antennae, compound eyes. Mouth parts consists of labrum (upper lip), a pair of mandibles, a pair of maxillae, labium (lower lip), hypopharynx (acts as tongue).

Thorax : 3 segments; prothorax, mesothorax and metathorax. Bears 2 pairs of wings :

Forewings : tegmina (mesothoracic).

Hindwings : transparent, membranous (metathoracic)

3 pairs of legs in thoracic segments. (one pair in each thoracic segment.)

Abdomen : 10 segments. Bears a pair of long, segmented **anal cerci** in both sexes and a pair of short, unjoined **anal styles** in males only.

Also has anus and genital aperture at the hind end. Genital aperture surrounded by external genitalia called **gonapophysis or phallomere**.

Male Cockroach

1. Abdomen long and narrow
2. All nine sterna visible

Female Cockroach

1. Abdomen short and broad
2. Seven sterna visible. (7th sternum fused with 8th and 9th sterna)

3. Anal style present

3. Anal style absent

Anatomy - Study of the morphology of internal organs.

Alimentary canal : Divided into foregut, midgut and hindgut.

Mouth → Pharynx → Oesophagus → Crop (stores food) → Gizzard (grinding of food) → Hepatic caecae (at junction of fore and midgut; secretes digestive juice) → Hindgut (ileum, colon, rectum) → Anus.

Blood vascular system : Open type, visceral organs bathed in haemolymph (colourless plasma and haemocytes).

Heart consists of elongated muscular tube and differentiated into funnel-shaped chambers with ostia on either side. Blood from sinuses enters heart through ostia and is pumped anteriorly to sinuses again. Blood is colourless (haemolymph).

Respiratory system : Network of trachea which open through 10 spiracles. Spiracles regulated by sphincters. Oxygen delivered directly to cells.

Excretion and osmoregulation : by malpighian tubules; uricotelic (Uric acid as excretory product).

Nervous system : Consists of series of fused segmentally arranged ganglia joined by paired longitudinally connectives on the ventral side. three ganglia in thorax, six in abdomen. Brain represented by supra-oesophageal ganglion.

Reproductive system :

Male reproductive system : Pair of testes (4th-6th segments) → vas deferens → ejaculatory duct → male gonophore.

Glands – Seminal vesicle (stores sperms), mushroom shaped gland (6th-7th segment).

Female reproductive system :

A pair of ovaries (with 8 ovarian tubules) → Oviduct → Genital chamber.

Sperms transferred through spermatophores. Fertilised eggs encased in capsules called oothecae; development of *P. americana* paurometabolous (incomplete metamorphosis). Nymph grows by moulting 13 times to reach adult form.

Interaction with man

- Pests as destroy food and contaminate it.
- Can transmit a variety of bacterial diseases (Vector).

QUESTIONS**Very Short Answer Questions (1 mark each)**

1. Name the tissue which contains Haversian canals.
2. Mention two special properties of nervous tissues.
3. Name the large cells present in adipose tissue.
4. Name the cells responsible for clotting of blood.
5. What are exocrine glands ?
6. Differentiate between tendon and ligament.
7. Where are RBC's formed?

Short Answer Questions-II (2 marks each)

8. What is the function of ciliated epithelium ? Where do we find this epithelium?
9. What are the two types of fibres of connective tissues ? Distinguish between the two.
10. To which tissue do the following belong to :
 - (a) Osteocytes
 - (b) Chondrocytes
 - (c) Neuroglia
 - (d) Intercalated discs
11. Give the location of hepatic caecae in cockroach ? What is their function ?
12. Name the locomotory appendages of cockroach on the basis of external morphology.

Short Answer Questions-I (3 marks each)

13. Differentiate between skeletal and smooth muscles.
14. Differentiate between male and female cockroach on the basis of external morphology.
15. (a) What is open circulatory system ?
(b) Explain the respiratory system of cockroach.
16. (a) Give the common name of *Periplaneta americana*.
(b) How many spermathecae found in cockroach ?
(c) What is the position of ovaries in cockroach ?
(d) How many segments are present in the abdomen of cockroach ?
(e) Where do you find malpighian tubules ?
(f) What is mosaic vision ?

16. (a) American Cockroach.
(b) One pair, present in 6th segment.
(c) Between 2nd and 6th abdominal terga.
(d) 10 segments.
(e) At the beginning of ileum in cockroach.
(f) Vision where several images of an object are formed by compound eye. Helps to detect movement of objects very efficiently.

Long Answers (5 marks each)

17. Refer 'Points to Remember'.

18. Refer Fig 7.16 NCERT Text Book of Biology class-XI