

## Chapter - 7 Structural Organisation In Animals

### Points to Remember

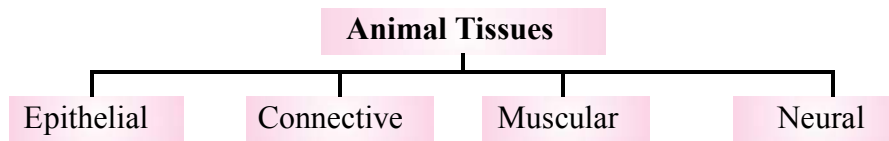
**Cell junctions**—In nearly all animal tissues, specialised junction provide structural and functional links between its individual cells.

#### Three Types of Cell junctions—

- 1. Tight junctions :** Plasma membranes of adjacent cells are fused at intervals. They help to stop substances from leaking across a tissue.
- 2. Adhering junctions :** Perform cementing function to keep neighbouring cells together.
- 3. 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 soometimes big molecules.

#### Types of Fundamental Animal Tissues

S.No.	Type	Location	Functions
1.	Epithelial Tissues	Free Surfaces	Protection, Secretion, Excretion, absorption, Sensory and reproduction
2.	Connective Tissues	Inside body, its organs other tissues and below skin	Holding or binding, support, transport and circulation, protection and storage.
3.	Muscular Tissues	Inside movable parts	Movements and locomotion
4.	Nervous Tissues	Central Peripheral and every organ	Communication and control



## Epithelia Tissue

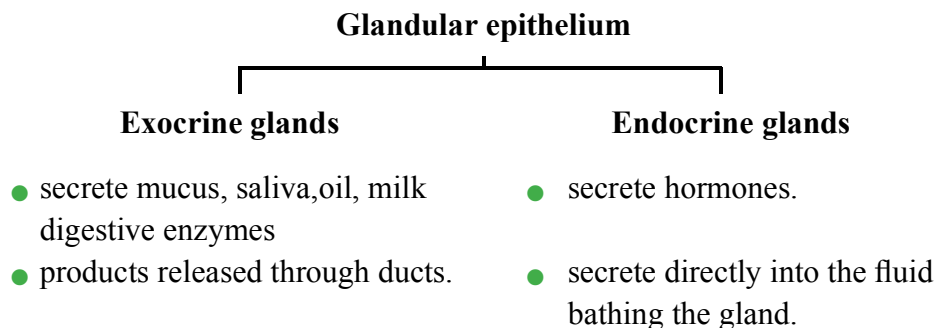
**Simple :** ● Composed of single layer of cells.

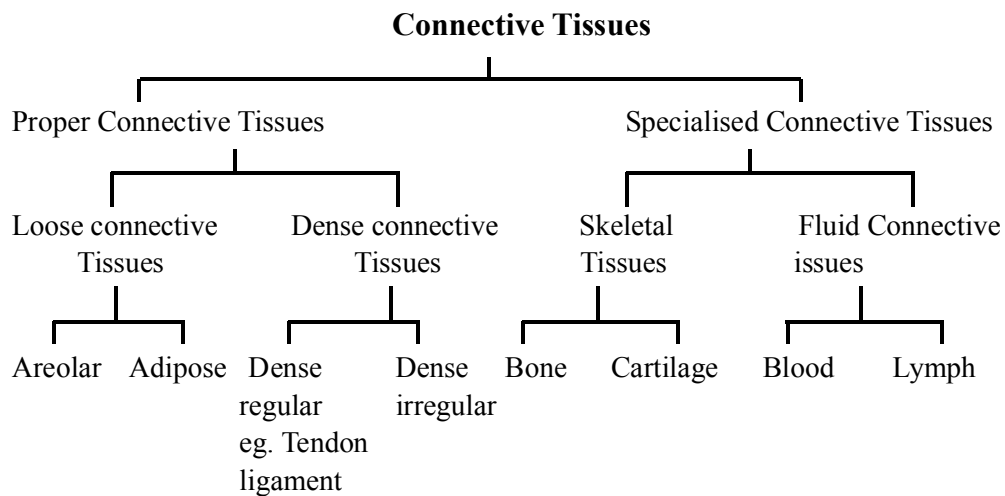
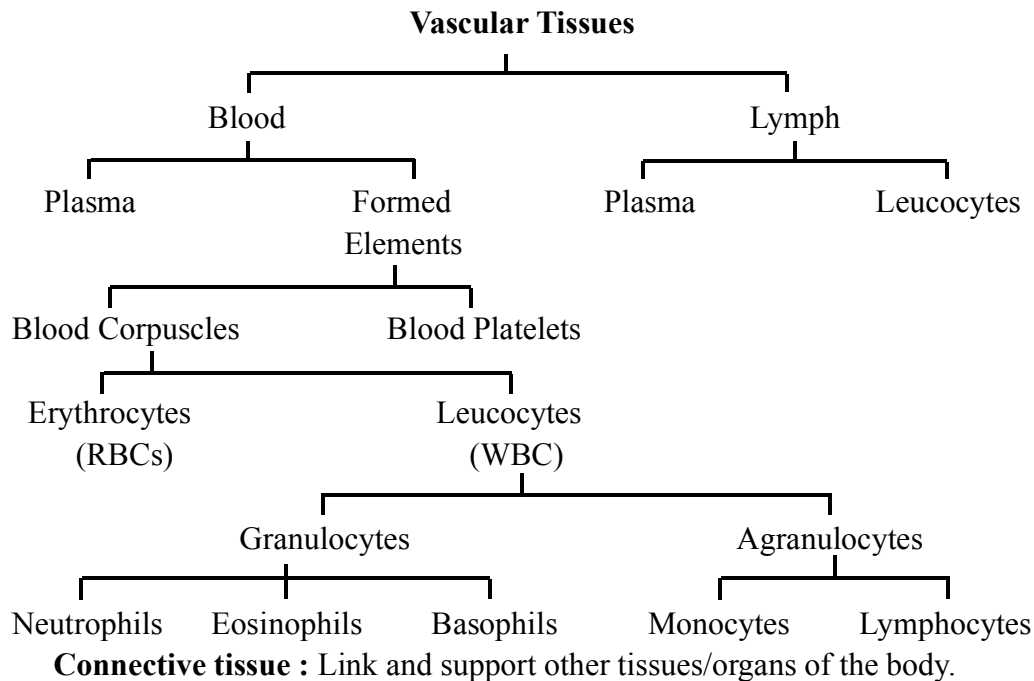
● Functions as lining for body cavities, ducts and tubes.

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 lining 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.





## 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**

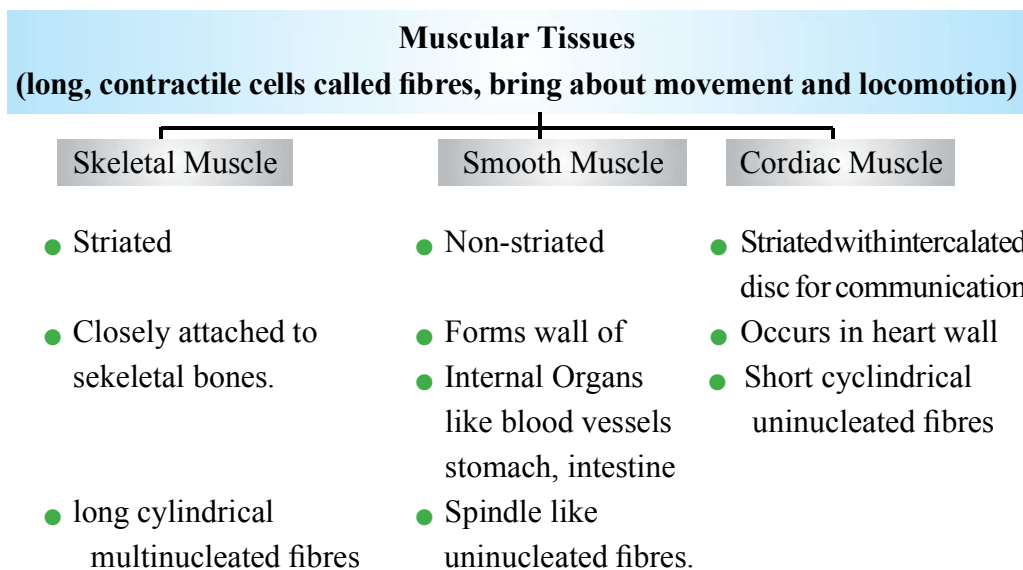
- Has collagen fibres and fibroblasts oriented differently.
- This tissue is present in the skin.

**Specialised Connective Tissues**

**(i) Cartilage :** made up of chondrocytes and collagen fibres; inter cellular material is solid and resists compression. Present in tip of nose outer ear joints, etc.

**(ii) Bones :** Ground substance is rich in calcium salts and collagen fibres Osteocytes are present in lacunae. Bones support and protect softer tissues and organs. They interact with skeletal muscles to bring about movements. Bone marrow in some bones is the site of blood cell formation.

**(iii) Blood :** Fluid connective tissue, consists of plasma and blood cells.



## Neural Tissues

- 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* (Phylum-Arthropoda, Class-Insecta)

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 7th segment is boat shaped.

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
3. Anal style present

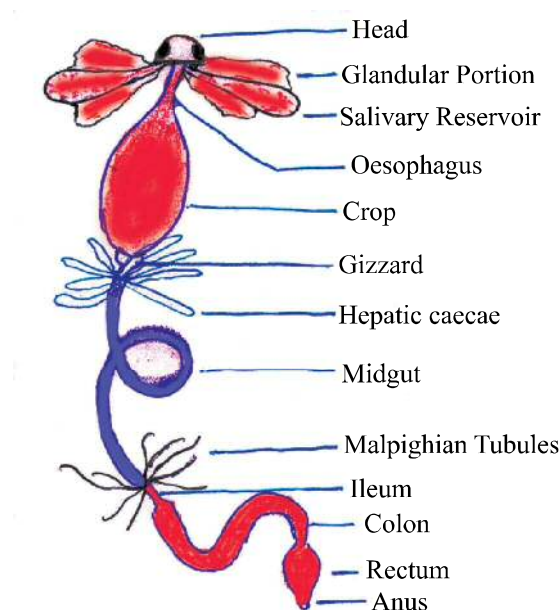
### Female Cockroach

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



### Alimentary Canal of Cockroach

**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 pairs of 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 supraoesophageal ganglion. Each eye consists of 200 hexagonal ommatidia.

### 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 female produces 9–10 Ootheca. Fertilised eggs encased in capsules called oothecae (contains 14-16 eggs on an average) development of *P. americana* paurometabolous incompleated 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 ?
8. A muscular fiber having no striations and tapers at both ends. Name it.
9. Mention the site, where sclerite is present in cockroach.
10. Name the mouth part of cockroach which is comparable to our tongue.
11. "Sexual dimorphism is found in cockroach". Explain the statement.

### Short Answer Questions-I

(2 marks each)

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

### Short Answer Questions–II

(3 marks each)

16. Differentiate between skeletal and smooth muscles.
17. Differentiate between male and female cockroach on the basis of external morphology.
18. (a) What is open circulatory system ?  
(b) Explain the respiratory system of cockroach.
19. (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 ?
20. Name the different cell junctions found in tissues.
21. Mention the special features of eye in cockroach.
22. Write the appropriate type of tissue in column B accounting to the functions mentioned in column A.

#### Column A

#### Column B

- |                                      |       |
|--------------------------------------|-------|
| a. Linking and supporting frame work | ..... |
| b. Protective covering               | ..... |
| c. Secretion and absorption          | ..... |

### Long Answer Questions

(5 marks each)

23. (a) What is compound epithelium ? What are their main function ?  
(b) Where do we find areolar tissue ?  
(c) How is adhering junction different from gap junction ?
24. Make a neat and well labelled diagram showing alimentary canal of cockroach.

## Answers

### Very Short Answers

(1 mark each)

1. Mammalian bone.
2. Excitability and conductivity.
3. Adipocytes.
4. Blood platelets.
5. Glands which discharge their secretions into ducts.



**6. Tendon**

Attach skeletal muscles to bones

**Ligament**

Attach bone to bone

7. Bone narrow

8. Smooth or non striated muscle fibre.

9. In the exoskeleton all over the body.

10. Hypopharynx = lingua

11. Male and female cockroaches show morphological differences.

**Short Answers-I**

**(2 marks each)**

11. Refer 'Points to Remember'.

12. White and yellow fibres. White fibres are thin, wavy, unbranched, inelastic, occur in bundles and formed of protein collagen. Yellow fibres are thick, straight, elastic, branched, occurring singly, formed of protein elastin.

13. (a) Bone tissue

(b) Cartilage

(c) Neural tissue

(d) Cardiac muscle

14. Refer 'Points to Remember'.

15. Three pairs of legs and two pairs of wings.

**Short Answers-II**

**(3 marks each)**

16. Refer 'Points to Remember'.

17. Refer 'Points to Remember'.

18. Refer 'Points to Remember'.

19. (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.

20. (i) Gap junctions

(ii) Tight junctions

(iii) Adhering junctions

21. See text in NCERT at page No. 114.
- (i) Situated at dorsal surface of head.
  - (ii) Each eye consists of about 2000 hexagon ommatidia.
  - (iii) It can receive several images of an object.
  - (iv) This kind of vision is known as mosaic vision.
  - (v) It is more sensitivity but less resolution.
22. (a) Connective tissues
- (b) Stratified epithelium
  - (c) Columnar epithelium

### **Long Answers**

**(5 marks each)**

23. Refer 'Points to Remember'.
24. Refer Fig. 7. 16 NCERT Text Book of Biology class-XI.

