

* Structural Organisation in Animals *

- * Tissue - group of similar cells along with intercellular substances performing a specific function ex - Hydra has diff. types of cells.
- All organs are formed of 4 basic types of tissues organised in special proportion.
- * Epithelial Tissue
- Epithelium has free surface either body fluid or outside environment ; Provide covering or lining.
- They are compactly packed with little intercellular matrix.
- There are two types of Epithelial Tissue
 - 1) Simple epithelium 2) Compound epithelium
- 1) Simple epithelium
 - composed of single layer of cells
 - provides lining for body cavities, ducts, tubes
 - Based on structural modification there are three types of simple epithelial tissues - i) squamous ii) cuboidal iii) columnar
 - i) Squamous epithelium - Found in blood vessels and air sacs of lungs ; made of a single thin layer of flattened cells
 - Make diffusion boundary.
 - ii) Cuboidal epithelium - cube like cells ; works in absorption and secretion ; Found in ducts of glands, tubular parts of nephron ; Epithelium of PCT has microvilli
 - iii) Columnar epithelium - have tall and slender cells with basal nuclei
 - Free surface may have microvilli ;

→ Found in lining of Stomach & intestine Functions as absorption & secretion

→ If cuboidal or columnar epithelium has cilia it is called ciliated epithelium present in bronchioles & Fallopian tube

* Glandular Epithelium - modified cuboidal or columnar tissue for absorption

- single cell → ex Goblet cell
- Multicellular → Salivary Gland

→ On the basis of mode of pouring secretion

Exocrine → Secrete mucus, saliva, ear wax, oil, milk, digestive enzymes these products are released through ducts or tubes

Endocrine - ductless glands

2) Compound Epithelium

(multilayer) protection against chemical and mechanical stress

→ they cover dry surface of skin, moist surface of buccal cavity, pharynx, inner lining of ducts of salivary glands and pancreatic duct

* Cell junctions - provides structural & functional links between individual cells

1) Tight junction - Stop substance leakage

2) Adhering junction - Cementing ; keep neighbouring cells together

3) Gap junction - helps cells communicating with each other by joining their cytoplasm ; can transfer ions, small molecules & even big molecules

* Neural Tissue-

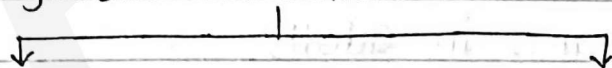
- Possess greatest control over body ; neurons are excitable cells
- Neuroglial cells (makes more than 50% vol of neural tissue)
- protects and support neuron.
- Nerve impulse can be generated & conducted → excitatory or inhibitory

* Connective tissue

- Most abundant and widely distributed
- function is to link & support other tissues / organs
- in all connective tissues except blood, cells secrete fibres of structural proteins called collagen & elastin.
- These cells also secrete modified polysaccharides, which accumulate betⁿ cells & fibres and act as matrix

* Types of Connective tissue

1) Loose connective tissue - cells and fibres loosely arranged in semifluid ground substance



Axialar tissue

Adipose tissue

- | | |
|--|------------------------------------|
| → beneath the skin | → Mainly beneath skin |
| → Serve as support framework for epithelium | → specialised to store fat |
| → contains fibroblast, macrophage, mast cell | → Excess nutrient converted to fat |

2) Dense connective tissue

Fibres and Fibroblast packed compactly

Types

i) Dense regular tissue

→ collagen fibres present in rows between many parallel bundles of fibres.

ex - Tendon (attach bone to muscle), Ligament (attach bone to bone)

ii) Dense irregular tissue

→ Fibroblast and many fibres (collagen) orientation differently; present in skin

3) Specialised connective tissue

Cartilage - intercellular material is solid & pliable & resist compression; chondrocytes enclosed in small cavities within matrix secreted by them; most cartilages in vertebrate embryos are replaced by bones in adult

→ Present in tip of nose, outer ear joints, between adjacent bones of vertebral column, limbs and hands in adults.

Blood → Fluid conn. tissue containing plasma + RBC + WBC + platelet; helps in transport

Bones → Hard and non-pliable ground substance rich in Ca^{2+} and collagen; provide structural frame to body; support & protect softer tissues & organs; osteocytes present in spaces called lacunae; interact with muscles to bring about movement; Bone marrow in some bones is site of blood cell prodn

* Muscular tissue.

- Each muscle is formed of muscle fibres in fact made of myofibrils; muscles can contract and lengthen;
- Help in movement generation.

i) Skeletal - striated, voluntary, fibres arranged parallelly.

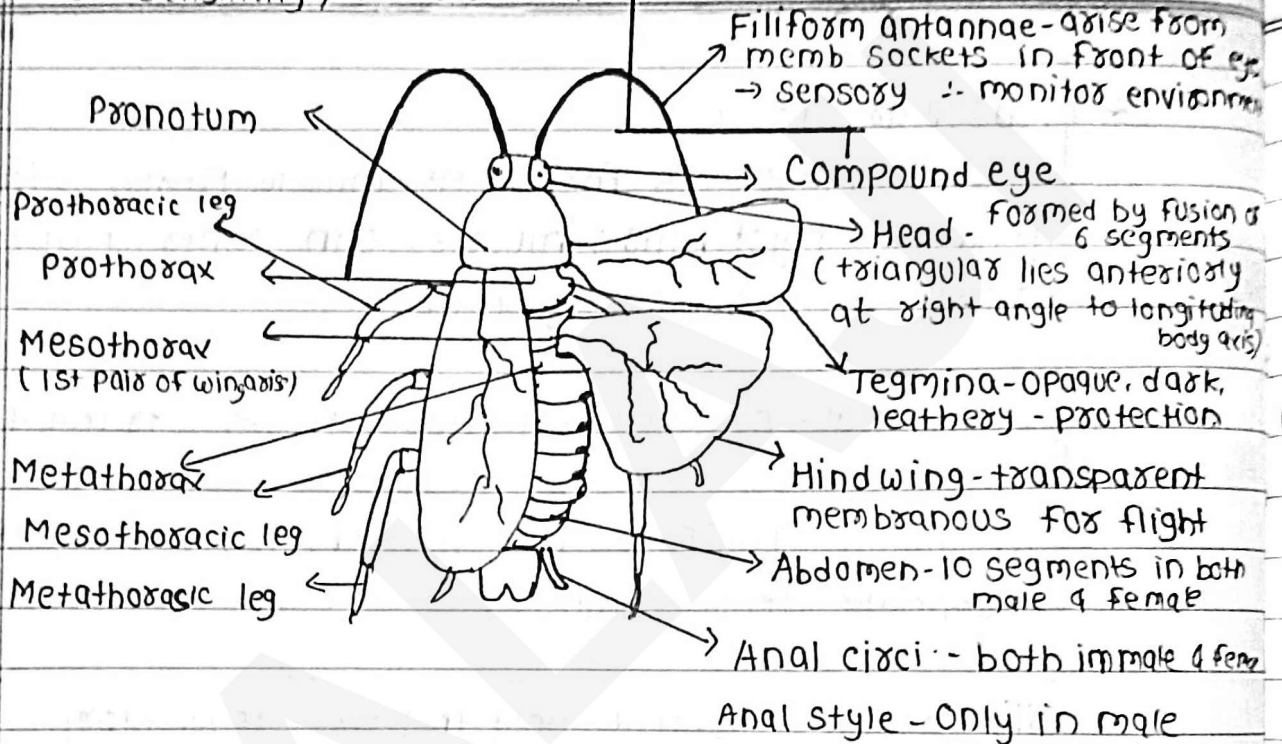
ii) Smooth - Fusiform, non-striated, involuntary, bundle connective tissue sheath

iii) Cardiac - Striated, only in heart, involuntary

* Morphology of cockroach.

- generally brown or black bodied
- tropical cockroaches can even be of yellow, green & red colour
- size $1/4$ to 3 inch (0.6 to 7.6 cm); nocturnal
- omnivorous - found in damp places; serious pests;
- adults of *periplaneta americana* are about 34-53 mm with long wings extending beyond abdomen tip in male.
- body segmented into Head, thorax and abdomen
- whole body covered by hard brown, chitinous exoskeleton
- exoskeletal has hard plates called sclerite (tergites dorsally and sternites ventrally) which are joined to each other by arthrodial membrane
- biting and chewing mouth parts

dorsally present have 2000 ommatidia to make mosaic vision
more sensitivity; less resolution

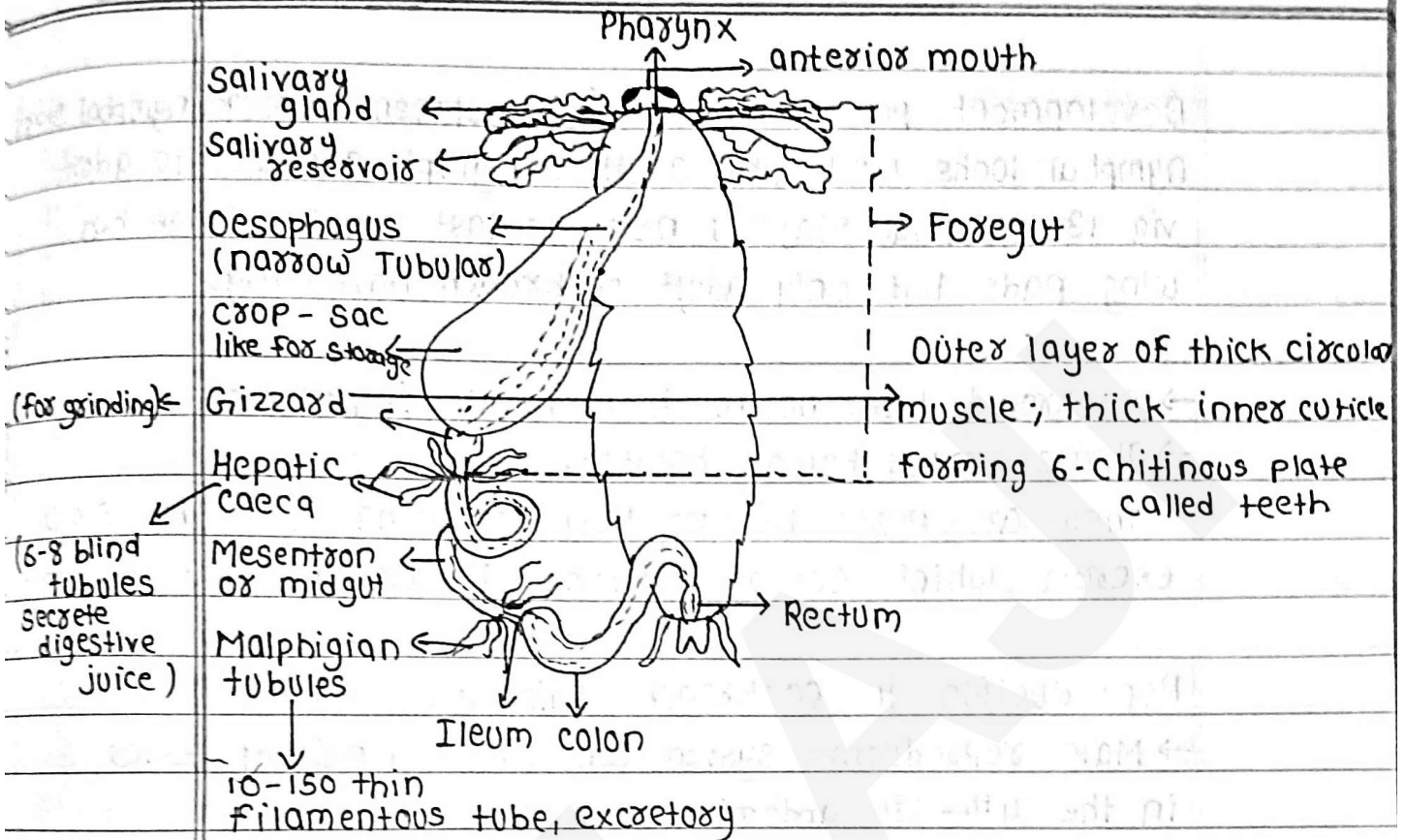


In male- genital pouch lies at hind end of abdomen bounded dorsally by 9th & 10th terga & ventrally by 9th sternum. It contains dorsal anus, ventral male genital pores & gonapophysis.

In female- 7th sternum is boat shaped, & together with 8th & 9th sternum forms broad pouch whose anterior part contains female gonopore, spermathecal pore & collateral glands.

* Anatomy of cockroach.

- Blood Vascular System - Open type; vessel open into space (haemocoel) $\therefore$ visceral organs bathed in haemolymph.
- haemolymph is having colourless plasma & hemocyte.
- Heart form of elongated muscular type lying in mid dorsal line of thorax and abdomen
- Heart is differentiated into funnel shaped chamber with ostia on either side.



→ Respiratory System - consist of network of tracheae
 → tracheae opens through 20 spiracles present laterally.
 → Tracheal tube subdivided into tracheoles carry oxygen from air to all parts.

→ opening of spiracles is regulated by sphincter
 → Exchange takes place at tracheoles by diffusion

Excretory system - by malpighian tubule (each tubule lined by glandular and ciliated cell; uricotelic; Fat body, Nephrocyte, uricose glands also help in excretion)

Nervous system - consist of series of fused segmentally arranged ganglia joined by paired longitudinal connectives on ventral side; 3 ganglia in thorax and 6 in abdomen (belly side); brain is represented by supraoesophageal ganglion which supply nerve to compound eye and antenna.



Development - paurometabolous (development through nymphal stage). Nymphal looks much like adults; nymph grows into adult via 13 nymphal stages; next to last nymphal stage has wing pads but only adult cockroach have wings.

- cockroach have no much economic importance
- Thrive around human habitat.
- they are pests because they contaminate food by smelly excreta which contain bacterial disease by contaminating food.

Reproduction in cockroach → dioecious

- Male reproductive system consists of a pair of testes in the 4th - 6th abdominal segments.
- From each testes arises a thin vas-deferens which opens into ejaculatory duct & ejaculatory duct opens into male gonopore.
- A characteristic mushroom shaped gland is present in the 6th - 7th abdominal segments which function as ^{accessory reproductive} ductive gland.
- The sperms are stored in the seminal vesicles and are glued together in the form of bundles called spermatophore which are discharged during copulation.
- The female reproductive system consists of two large ovaries lying laterally in the 2nd - 6th abdominal segments.
- A pair of spermatheca is present in the 6th segment.
- Sperms are transferred through spermatophores. Their fertilised eggs are encased in capsules called oothecae. Oothecae is dark reddish to blackish brown capsule, about 3/8" (8mm) long.
- On an average females produce 9-10 oothecae, each containing 14-16 eggs.

* Cell : The Unit of Life *



Robert Hooke - Discovered Cell (Dead cell)

Book micrographia

Anton von Leeuwenhoek - Discovered living cell

Robert Brown - Discovered nucleus

* Cell Theory

- Schleidan (1838) → plants made of cells.
- Schwann (1839) → Animals made of cells
- Virchow → Omnis cellula-e-cellula
New cells arise from pre-existing cell.

* All living organisms are made of cell and products of cells

* All cells arise from pre-existing cell

Prokaryotes

Both

Eukaryotes

- | | | |
|-----------------------------------|---------------|----------------|
| → Simple | → Ribosome | → More complex |
| → No nucleus memb.
(Nucleoid) | → cytoplasm | → Nucleus |
| | → plasma memb | → memb. bound |
| → No membrane bound
organelles | → DNA | organelles |
| | | → Linear DNA |
| → Circular DNA | | |

* Smallest cell :- Mycoplasmas (0.3 mm)

Largest cell :- Egg of ostrich

Longest cell :- Nerve cell

Bacteria - 3-5 μ m

RBC - 7.0 μ m micrometer