

Organisms



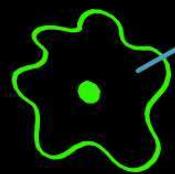
on the basis of no. of cells in organism's body

Unicellular

one

- Body consists of single cell

e.g., Bacteria, BGA, protozoan, yeast amoeba etc.

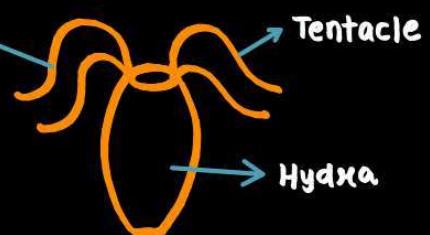


All functions like reproduction, digestion, respiration, excretion occur in same cell

Multicellular

>1 cells

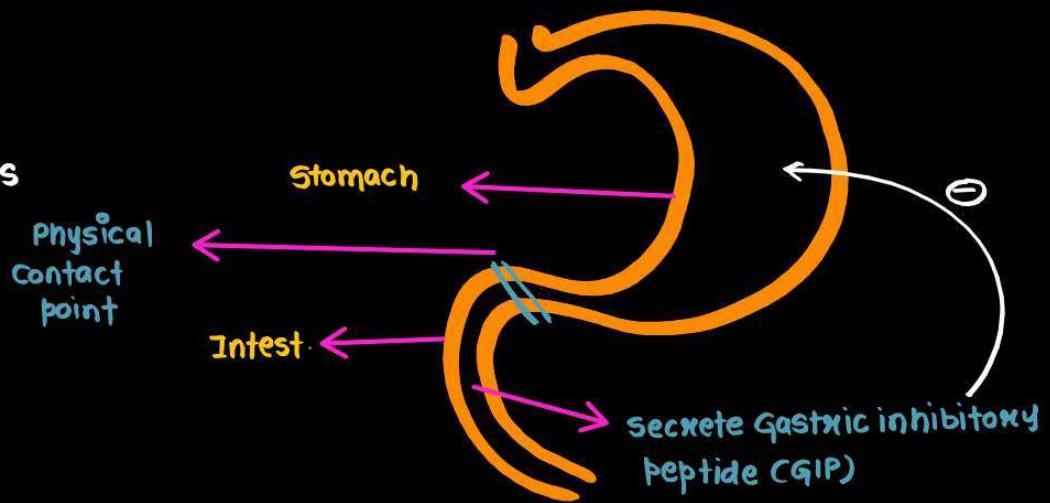
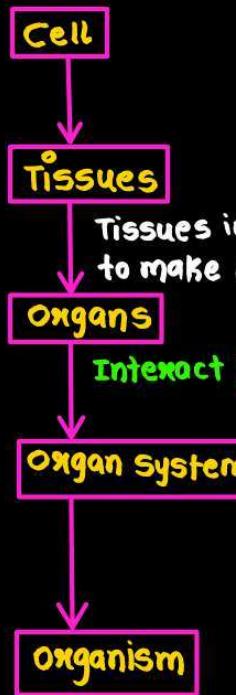
e.g., most fungi, plants, animals



Human brain = Billions of cells

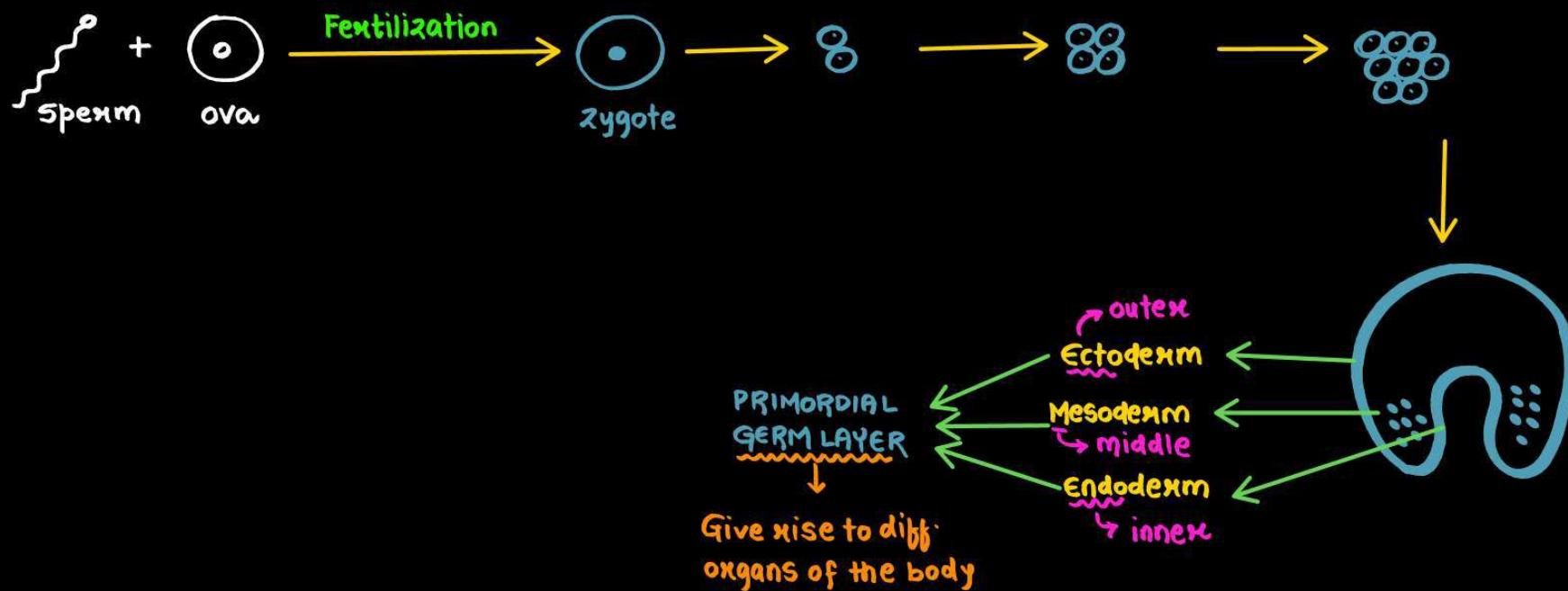


Hierarchy in Living Systems





Germ Layers





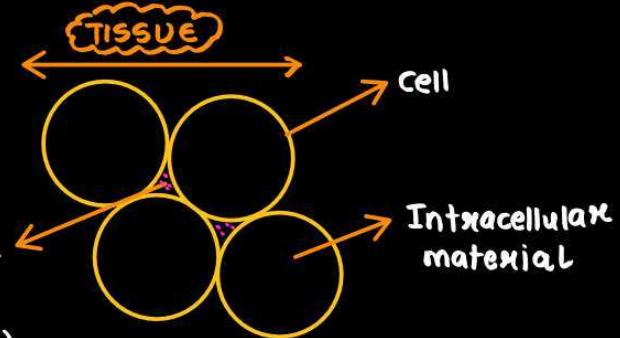
Definition of Tissue

- Group of cells ; similar in S, O, F
- ↓ ↓ ↓
Structure Origin Function

Structure & Funct. can be diff.
origin is always same

e.g., Blood → Mesodermal in origin

Cells → RBC → Biconcave disc like → Transportation of gases
WBC → Amoeboid → defence
Platelet → Plate like → Clotting



Decides the quality of tissue

soft: Blood Hard: Bone

Glycoprotein, mucopolysaccharides



Types of Tissues

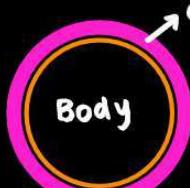
- The structure of the cells vary according to their function. Therefore, the tissues are different and are broadly classified into four types:

| Type of Tissue/ Features | Epithelial Tissue | Connective Tissue | Muscular Tissue | Nervous Tissue |
|---------------------------------|-----------------------------|--|---|-------------------------------------|
| Origin | All: Ecto, Meso, Endo | • Mesoderm | Mesoderm | Ectodermal |
| Functions and special points | • Covering • lining | • <u>Support</u> , link & connect other tissues • Most abundant tissue | • <u>Locomotion</u> (change in <u>location</u>) • Movement | • Nervous control & coordination |



Epithelial Tissue

- Meaning: Epithelial upon rest → Rests on connective tissue

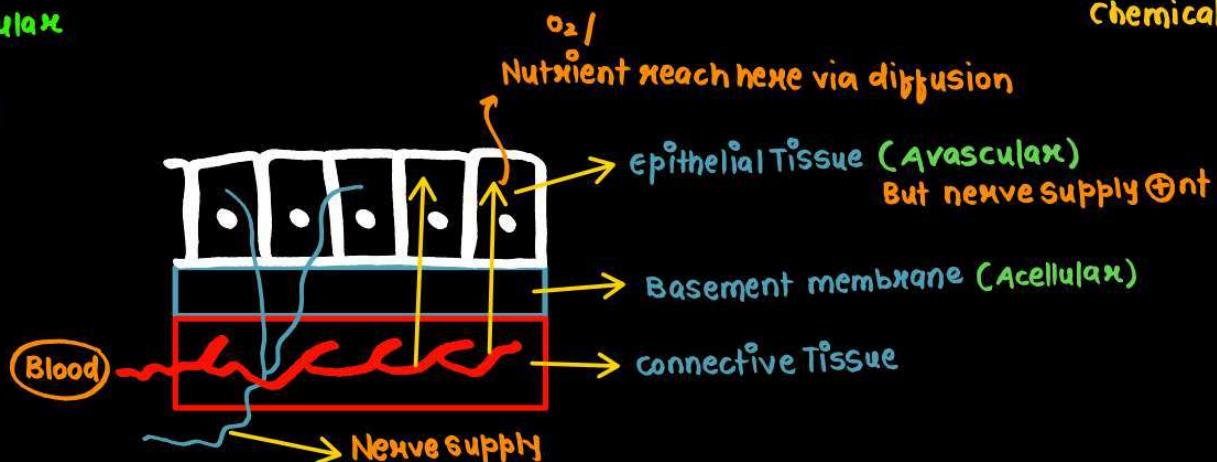
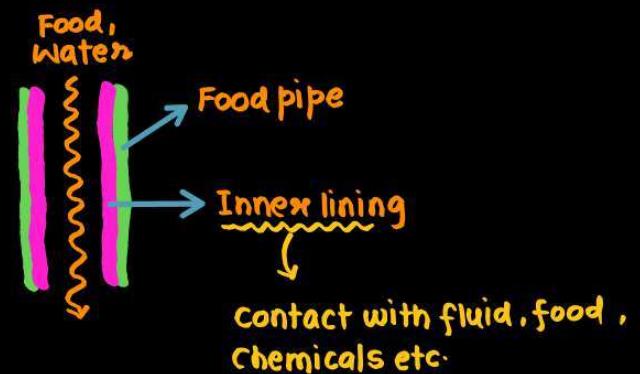


- Have free surface:

cover: contact with environment

- Packing: Tightly packed with little intercellular space

- Basement membrane:





Types of Epithelial Tissues

Depending on no. of layers
of cells

Simple

Unlayered

- Secretion, diffusion, filtration, absorption

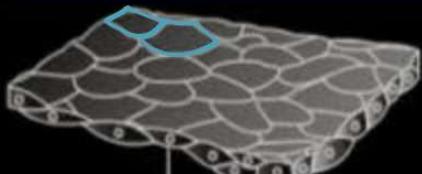
Compound

Many layers of cells

- Protection↑

Simple Squamous

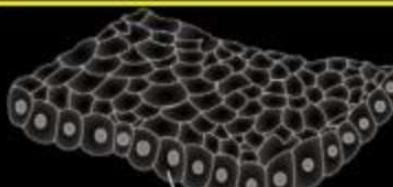
Tilelike



Flattened cell

Simple Cuboidal

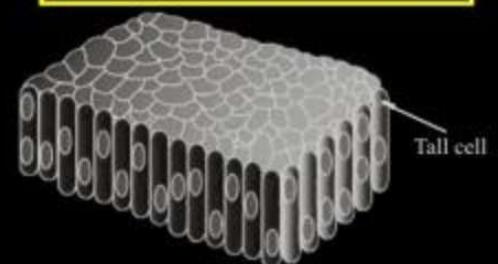
Cube like cell



Cube-like cell

Simple Columnar

Long, slender
Column like

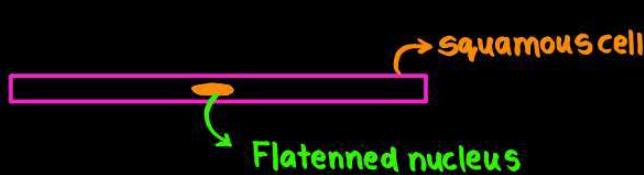


Tall cell



Simple Squamous Epithelium

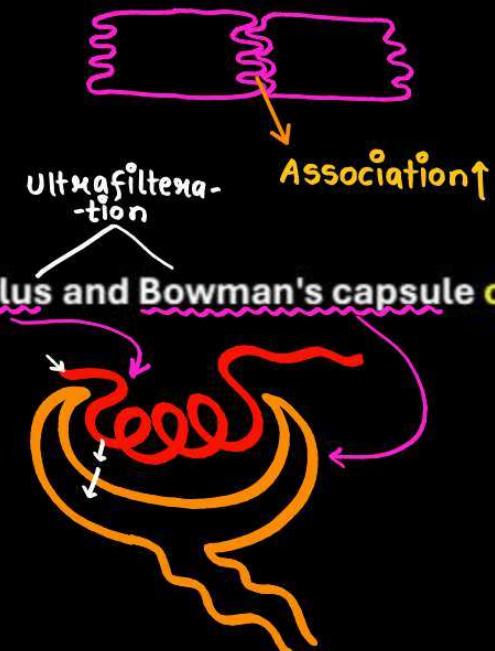
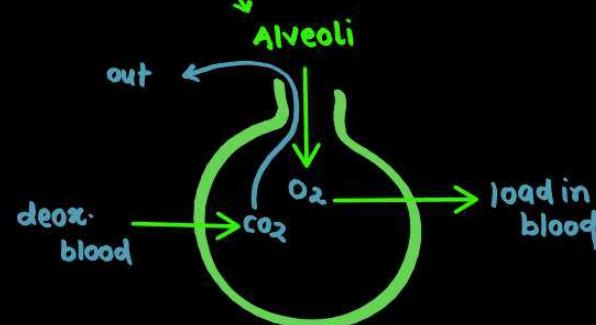
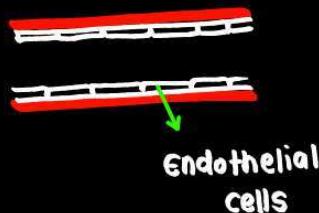
- The squamous epithelium is made of a single thin layer of flattened cells with irregular boundaries.



(Tile like)
Pavement
Epithelium

Tesselated epithelium
Association ↑

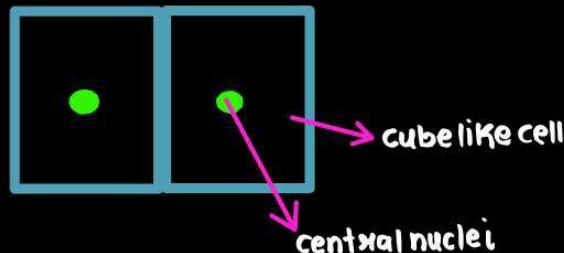
- They are found in the walls of blood vessels, air sacs of lungs and glomerulus and Bowman's capsule of nephron and are involved in functions like forming a diffusion boundary.



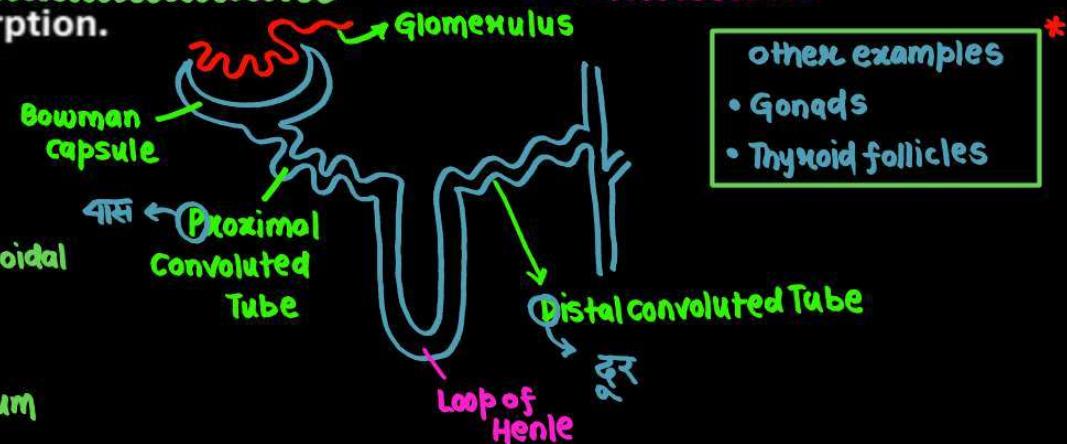
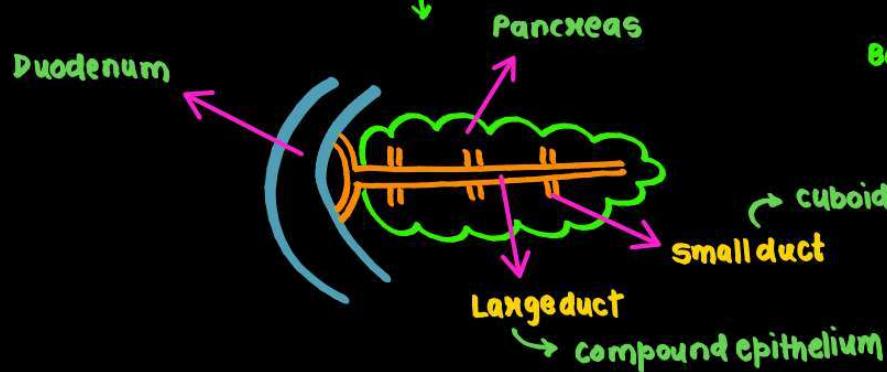


Simple Cuboidal Epithelium

- The cuboidal epithelium is composed of a single layer of cube-like cells.



- This is commonly found in ducts of glands and tubular parts of nephrons in kidneys (brush bordered in PCT) and its main functions are secretion and absorption.



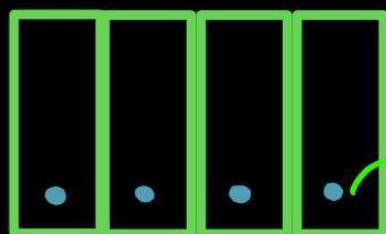
Surface area ↑
↓ Absorption ↑

Cells of PCT



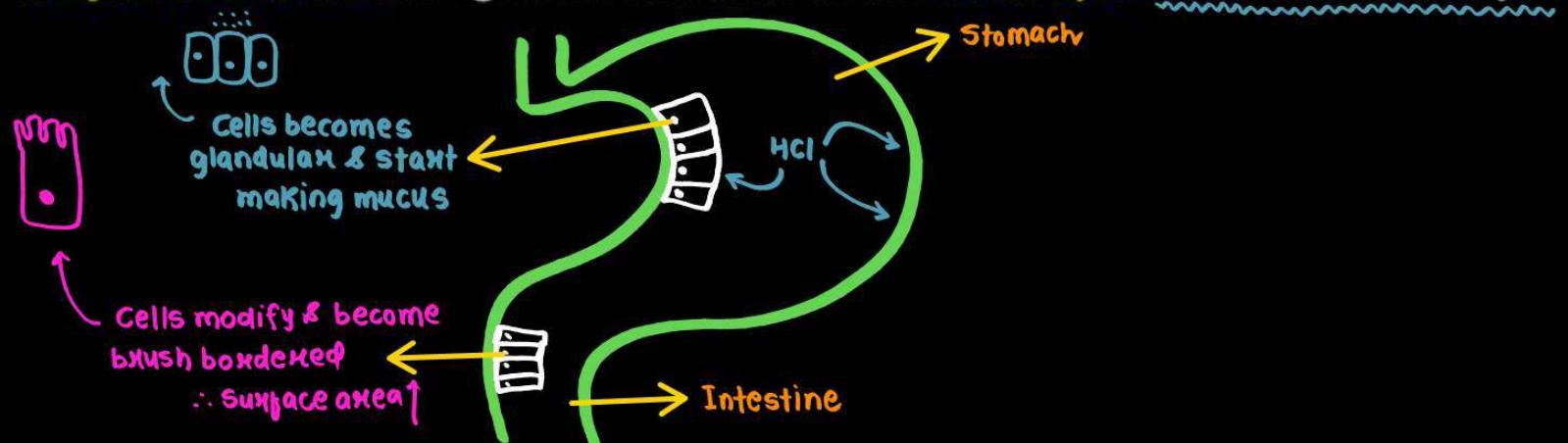
Simple Columnar Epithelium

- The columnar epithelium is composed of a single layer of tall and slender cells.



Basal nuclei

- They are found in the lining of stomach and intestine and help in secretion and absorption.

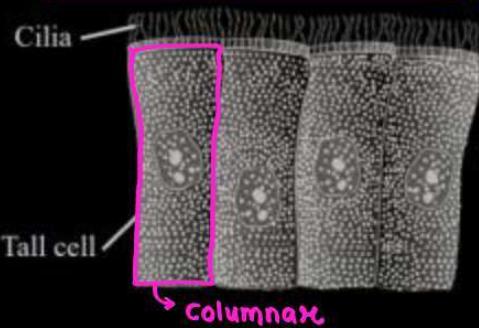




Modification of Cuboidal and Columnar Epithelium

No modification in squamous

Ciliated



- Help in movement of particles in a specific direction

- Bronchiole & Fallopian Tube
 - small (cuboidal)
 - large (columnar)

Glandular

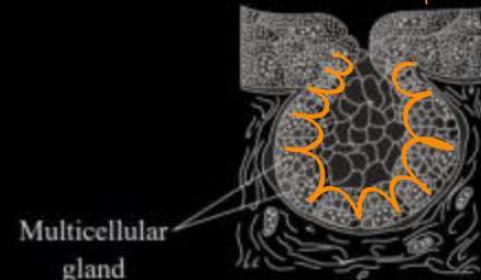
- Secrete various substances
 - on the basis of no. of cells in glands

Unicellular



Multicellular

- Pancreas, salivary gland



Glands

P
W

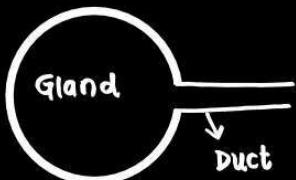
- Depending upon the mode of pouring secretion

Exocrine



They have ducts

- Secretion: sweat, mucus, tears, oil, enzymes, milk, ...



Endocrine

Hormones

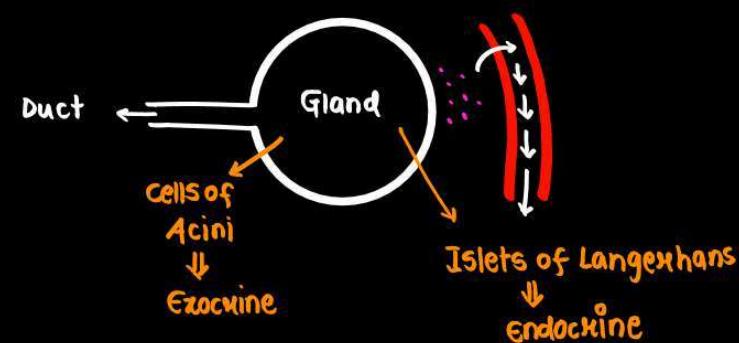
(directly released in Blood)



Heterocrine/
Composite

also k/a Mixed gland

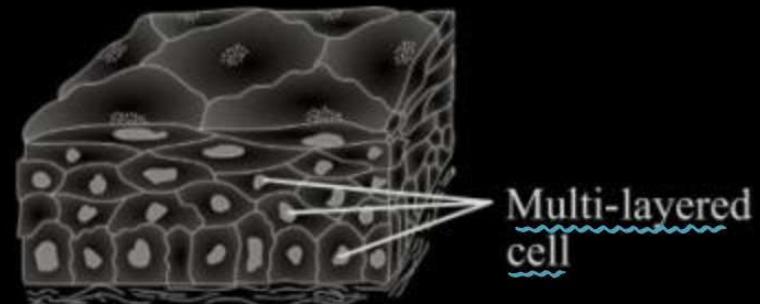
(Exo + Endo) e.g., Pancreas





Compound Epithelium

- Limited role in: secretion & absorption
- Main role: Protection ↑↑
- Found in:
 - skin → Keratinised
 - Large ducts of glands → Pancreas
 - salivary gland
 - Moist surface of buccal cavity
 - Pharynx
 - Transition epithelium: urinary bladder
(stretchable)





Cell-Cell Junctions

- Nearly ALL animal tissues have specialised junctions that provide structural and functional links between cells.

| Tight Junction | Adhering Junction | Gap Junctions |
|---|--|--|
| <ul style="list-style-type: none">Prevent leakage across the tissue | <ul style="list-style-type: none">cementing cells together (योगकारी) | <p>cytoplasms connected</p>  <ul style="list-style-type: none">movement of ions, small molecules & sometimes large molecules |



Connective Tissues



* blast: forming
clast: eating

- Abundance: most abundant & widely distributed
- Main function: To link, support & connect other tissues

- Cells of connective tissue forms **fibers** (structural proteins):

Except Blood & lymph

S: strength

E: Elasticity

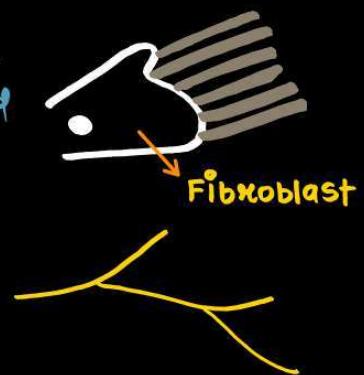
F: Flexibility

Collagen: white fiber

- Unbranched
- Bundled

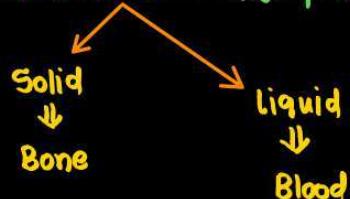
Elastin: yellow fiber

- Branched
- Single



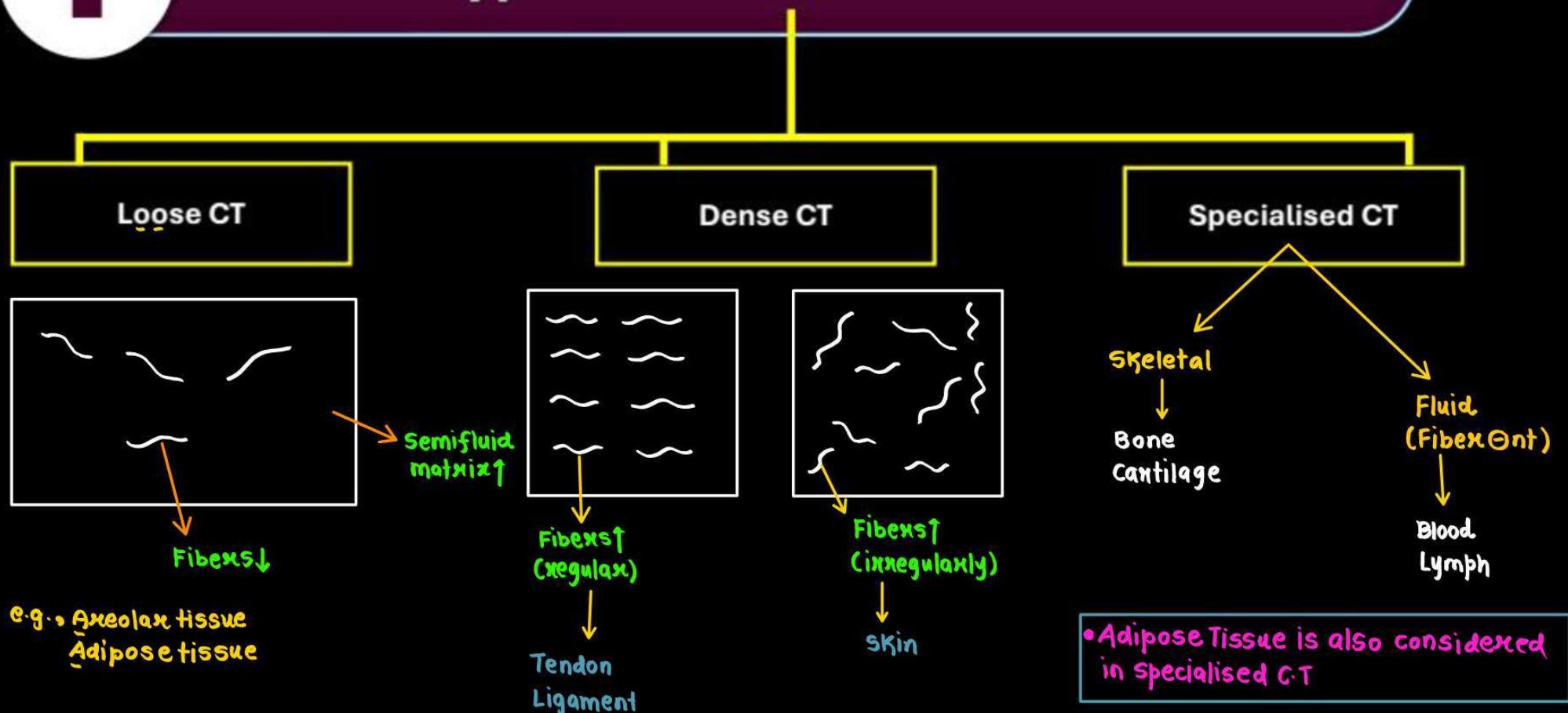
- Cells of connective tissue secretes modified polysaccharides also:

which is called matrix: Glycoproteins + Mucopolysaccharides





Types of Connective Tissues

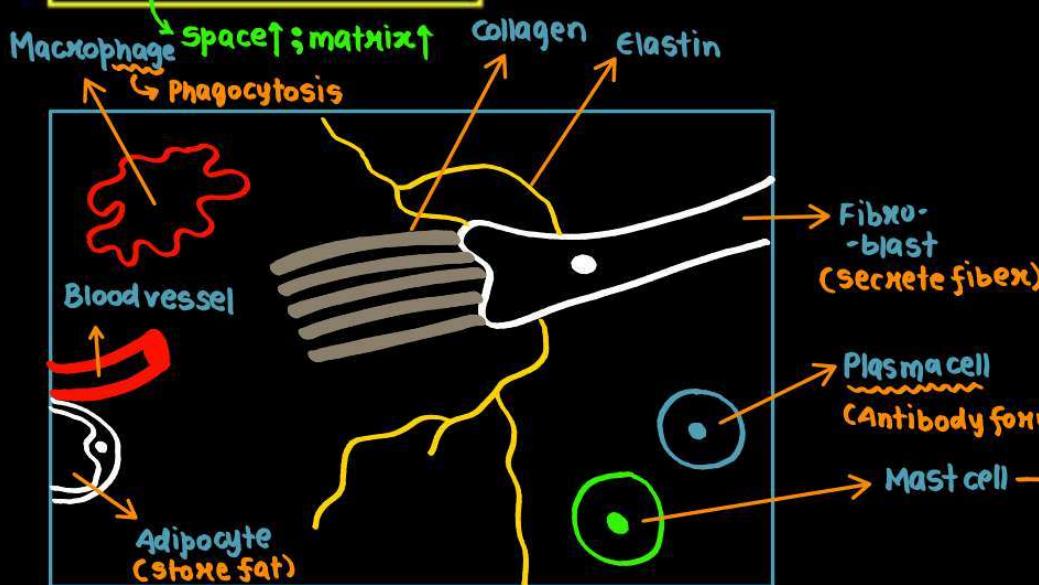




Loose Connective Tissue

Areolar Tissue

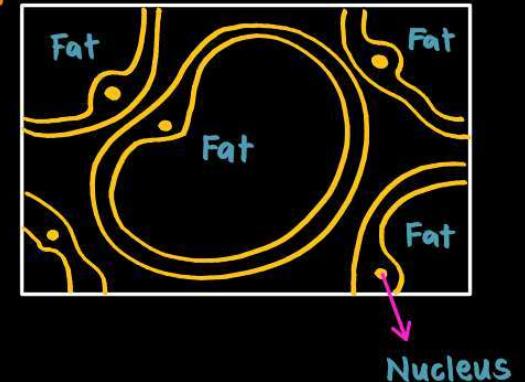
- e.g., Beneath the skin
- Supporting framework for epithelium



Beneath the
Skin

- ↓
Store excessive nutrient
in form of fat
• Insulation layer

Adipose Tissue





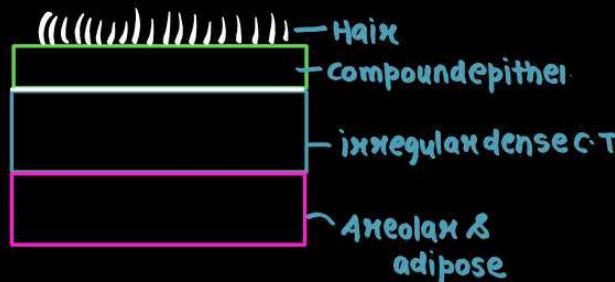
Dense Connective Tissue

Regular

Tendon
↓
Bone with muscle

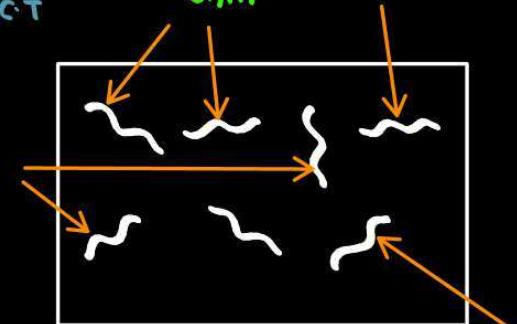


Ligament
(BaBLi)
Bone to Bone



Irregular

skin





Specialised Connective Tissue

Cartilage

- Chondroblast: Forming cells
- Chondroblast: eating cells
- Chondrocyte: cells
- Matrix: chondroitin SO_4^{2-}
Hyaluronic acid (animal cement)
- Solid & pliable
- Most of the cartilage gets converted in bones in adults
e.g., Nose tip & external ear joints
B/w vertebrae
in limbs

Bone

- Osteoblast: Forming cell
osteoclast: eating cell
osteocyte: Bone cell
- Solid & non-pliable
 \downarrow
Ca salts $\leftrightarrow \text{PO}_4^{3-}$
 $\leftrightarrow \text{CaCO}_3$
- Funct: weight bearing funct: leg bones
Provide frame
Makes blood cells in Bone marrow



Specialised Connective Tissue



Cartilage

Lacunae (space)

Fiber

Chondrocyte
(1-4)

Lacunae

Bone

Lacunae (space)
Lamellae (layens)

osteocyte

Lacunae

Lamellae





Blood (Specialised Connective Tissue)

- Do not contain fibers
- Fluid connective tissue

Plasma

Mainly contain H₂O

Formed elements

RBC

WBC

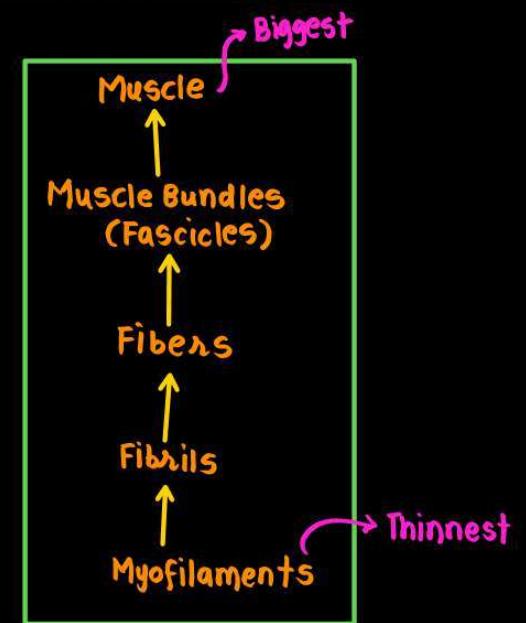
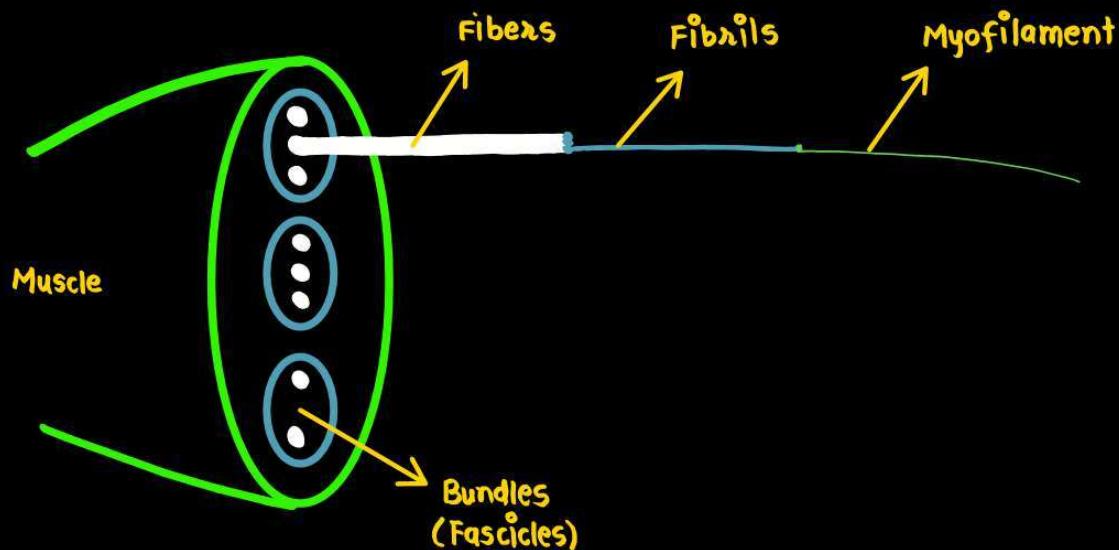
Platelet



Muscular Tissue

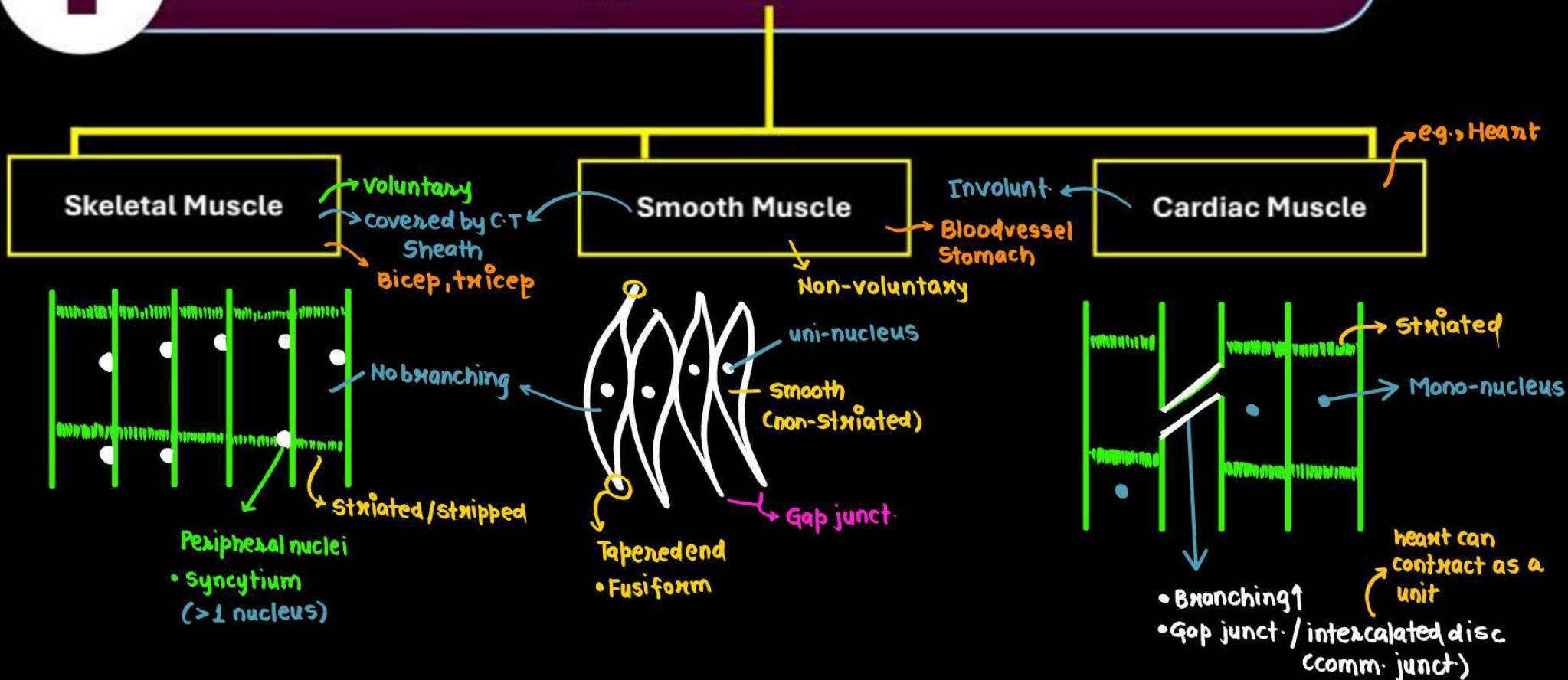


- Functions: Locomotion & movement; change in body posture
- Structure of a typical muscle (skeletal):



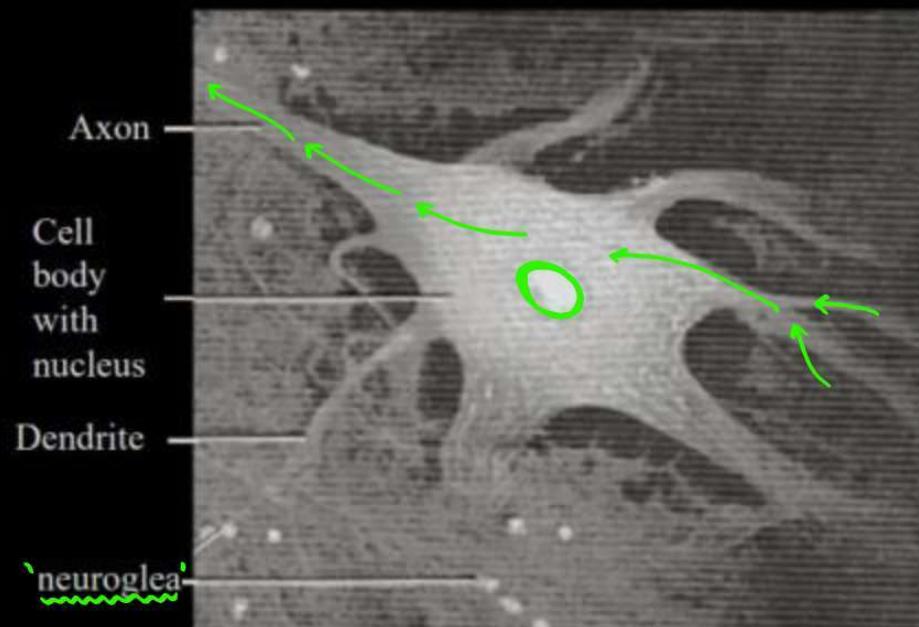


Types of Muscles

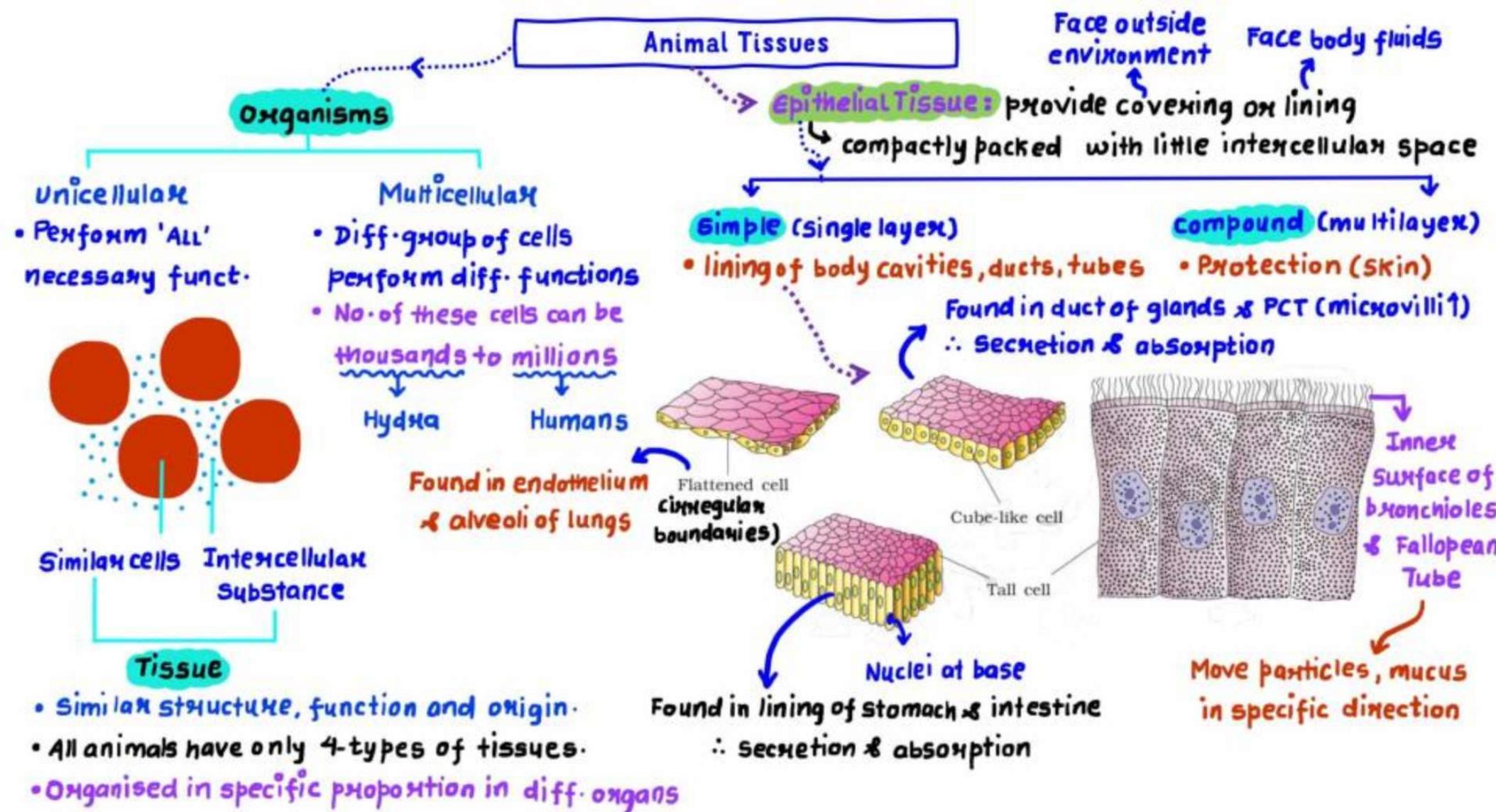




Neural Tissue

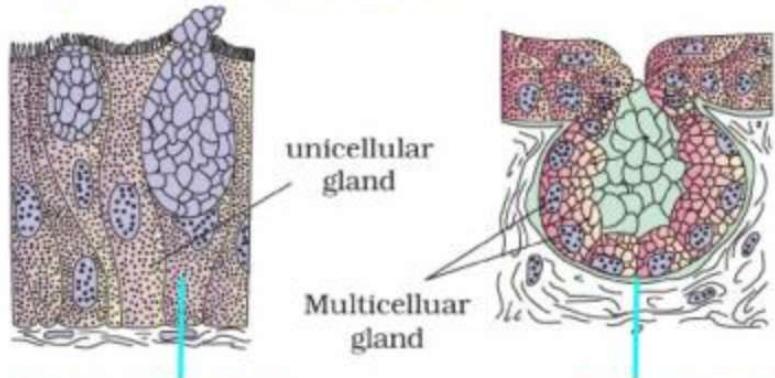


- Greatest control over body
- Neurons are special cells: excitable
 - ↳ D: Detect signal
 - ↳ R: Receive signal
 - ↳ T: Transmit signal
- Neuroglial Cells: consists $>50\%$ part of neural tissue
 - protect, nourish neurons
 - Support neurons
- Neuron can transmit various signals: promotional, inhibitory



Modifications of Epithelial Tissues

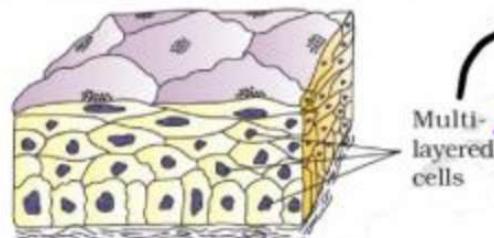
- Some cuboidal & columnar cells are specialised for SECRETION



Goblet cells → Mucus

- Endocrine (ductless): secrete hormones
- Exocrine (have duct): Mucus, saliva, enzymes, oil, milk, enzymes etc.

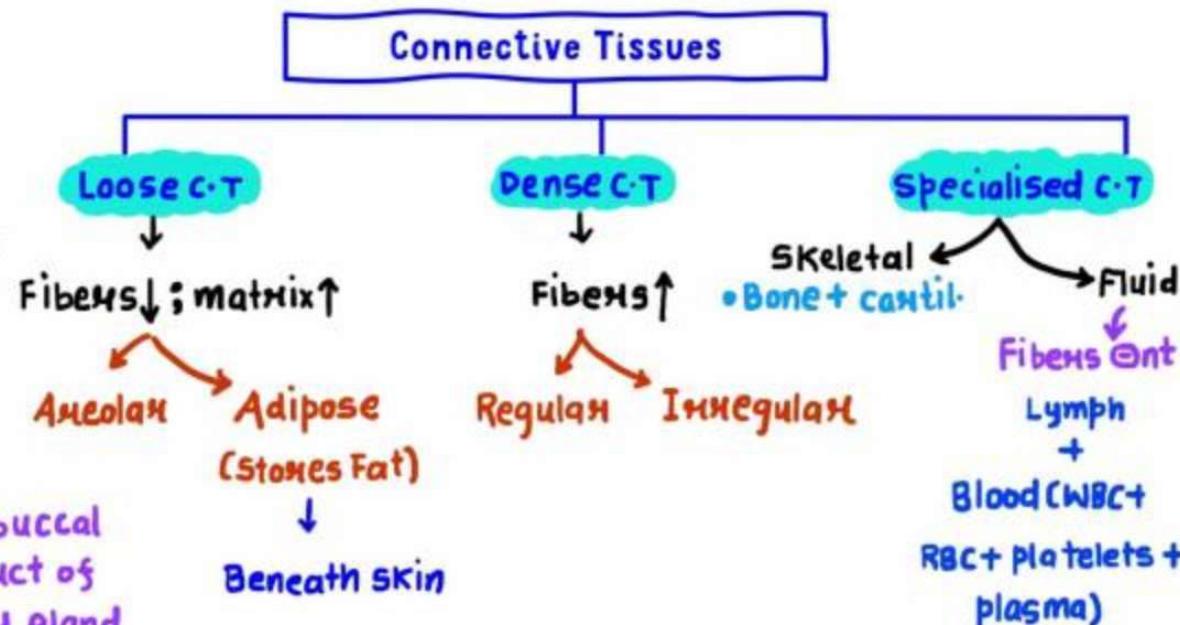
Compound Epithelium: protection



- Secretion & absorption ↓
- Moist surface of buccal cavity, pharynx, duct of pancreas & salivary gland

■ **CELL JUNCTIONS** → Provide structural links b/w individual cells
↳ Present in all types of tissues

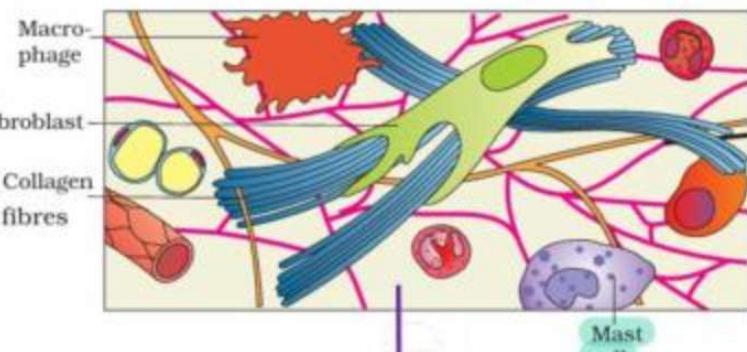
| Cell Junction | Features |
|-------------------|---|
| Tight Junction | Stop substances from leaking across the tissue |
| Adhering Junction | Perform cementing and keep neighbouring cells together |
| Gap Junction | Cytoplasm of neighbouring cells connected for communication (rapid transfer of ions, small molecules and sometimes big molecules) |



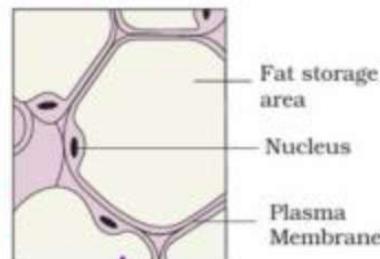
CONNECTIVE TISSUE: most abundant tissue;

Support & link other tissues/organs

- They secrete fibers of str. proteins named elastin & collagen → provides strength + elasticity + flexibility

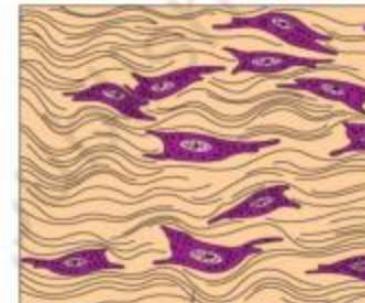


Areolar tissue (support epithelium)
Beneath skin

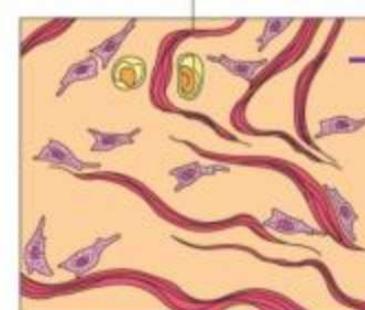


Adipose tissue
Beneath skin

Dense connective tissue:



- Tendon: Bone to muscle
- Ligament: Bone to Bone



Specialised C-T (skeletal)

Cartilage

Solid and Pliable

Cells: Chondrocytes

Most cartilages in vertebrate embryos are replaced by bones in adults (tip of nose, outer ear joints, adjacent bones of vertebral column, limbs and hands in adults)

Lacunae present; lamellae absent

Bone

Solid and Non-Pliable (rich in calcium salts and collagen)

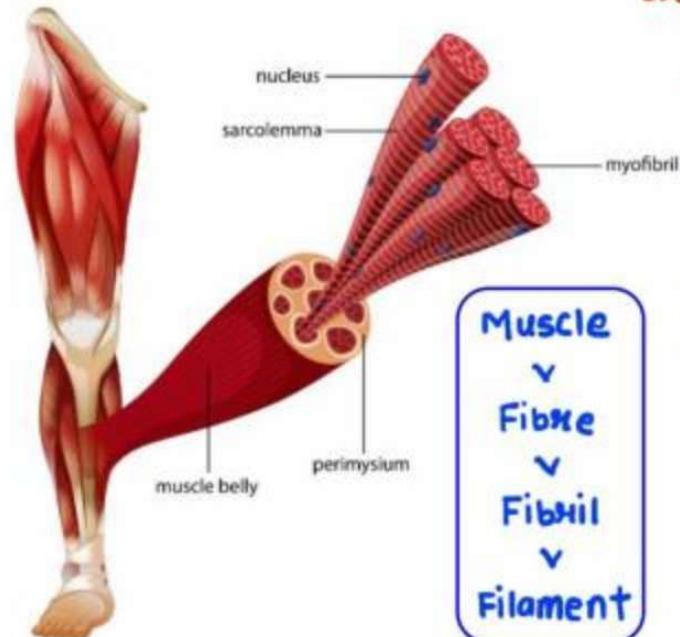
Cells: Osteocytes

Give frame to body; protect softer tissues and organs; locomotion and movement; produce blood cells (in long bones)

Both present

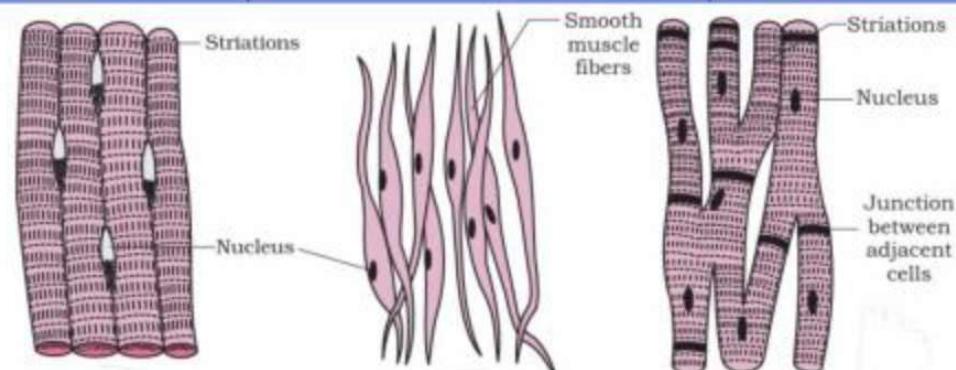
Muscular Tissues

→ Shorten & lengthen to bring about movement



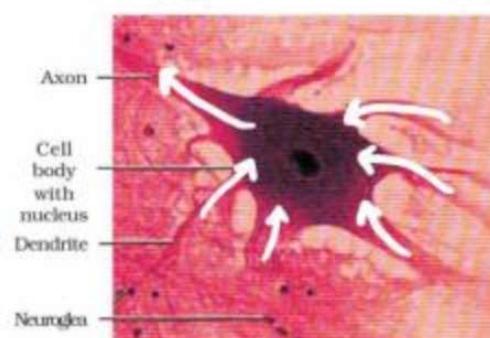
Types of Muscular Tissues

| Skeletal | Smooth | Cardiac |
|--|---|--|
| Closely attached to skeletal bones (bicep, tricep) | Internal walls of blood vessels, stomach, intestine | In heart (communication junctions or intercalated discs present) |
| Striated | Non-striated, fusiform | Striated |
| Voluntary | Involuntary | Involuntary |



Neural Tissues

- Greatest control over body
- struc. & funct. unit: Neurons (excitable)
- Neuroglial cells: support & protect neurons
↳ makes >50% part of nervous tissue





QUESTION (NEET PYQ EXAM 2024)

Which of the following statements is correct about the type of junction and their role in our body?

- (1) Adhering junctions facilitate the cells to communicate with each other. X
- (2) Tight junctions help to stop substances from leaking across a tissue. ✓
- (3) Tight junctions help to perform cementing to keep neighbouring cells together. X
- (4) Gap junctions help to create gap between the cells and tissues. X

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2024)

In which of the following connective tissues, the cells secrete fibres of collagen or elastin?

- A. Cartilage
- B. Bone
- C. Adipose tissue
- D. Blood X
- E. Areolar tissue

Choose the **most appropriate** answer from the options given below :

- (1) D, C, D and E only X
- (2) A, B, C and E only ✓
- (3) B, C and D only X
- (4) A, C and D only X

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2024)

Match List I with List II :

| | List - I | | List – II |
|----|----------------------|------|---|
| A. | Squamous Epithelium | I. | Goblet cells of alimentary canal |
| B. | Ciliated Epithelium | II. | Inner lining of pancreatic ducts (change) |
| C. | Glandular Epithelium | III. | Walls of blood vessels |
| D. | Compound Epithelium | IV. | Inner surface of Fallopian tubes |

Choose the correct answer from the options given below

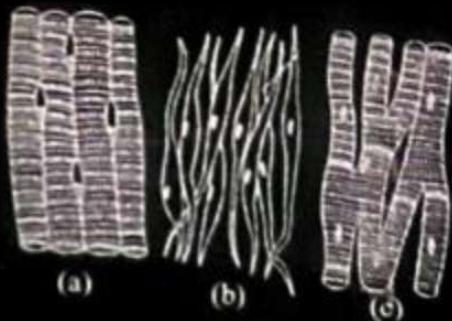
- (A-II, B-III, C-I, D-IV
(A-III, B-I, C-II, D-IV

- (A-II, B-IV, C-III, D-I
(A-III, B-IV, C-I, D-II

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2024)

Three types of muscles are given as a, b and c. Identify the correct matching pair along with their location in Name of muscle/location human body:



- (1) Smooth - Toes
 Skeletal – Legs
 Cardiac – Heart
- (2) (a) Skeletal - Triceps
 Smooth – Stomach
 Cardiac – Heart
- (3) (a) Skeletal - Biceps
 Involuntary – Intestine
 Smooth – Heart
- (4) Involuntary – Nose tip
 Skeletal – Bone
 Cardiac – Heart

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2024)

Match List I with List II:

| | List I | | List II |
|----|------------------------------------|------|---------------------------------------|
| A. | Unicellular glandular epithelium | I. | Salivary glands |
| B. | Compound epithelium | II. | Pancreas |
| C. | Multicellular glandular epithelium | III. | Goblet cells of alimentary canal |
| D. | Endocrine glandular epithelium | IV. | Moist surface of <u>buccal</u> cavity |

Choose the correct answer from the options given below:

(X) A-II, B-I, C-III, D-IV

(X) A-IV, B-III, C-I, D-II

(✓) A-III, B-IV, C-I, D-II

(X) A-II, B-I, C-IV, D-III

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2023)

Given below are two statements. (Manipur, 2023)

Statement-I: Goblet cells are unicellular glands. ✓

Statement-II: Earwax is the secretion of exocrine gland. ✓

In the light of the above statements, choose the **correct** answer from the options given below;

- (1) **Statement-I** is true but **Statement-II** is false.
- (2) **Statement-I** is false but **Statement-II** is true.
- (3) Both **Statement-I** and **Statement-II** are true. ✓
- (4) Both **Statement-I** and **Statement-II** are false.

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2023)

Match List-I with List-II.

(Manipur, 2023)

| List-I | | List-II | |
|--------|---------------------|---------|---------------------------------------|
| A. | Columnar epithelium | P. | Ducts of glands |
| B. | Ciliated epithelium | Q. | Inner lining of stomach and intestine |
| C. | Squamous epithelium | R. | Inner lining of bronchioles |
| D. | Cuboidal epithelium | S. | Endothelium |

Choose the **correct** answer from the options given below.

- (1) A-(R); B-(Q); C-(P); D-(S)
- (2) A-(R); B-(Q); C-(S); D-(P)
- (3) A-(Q); B-(R); C-(P); D-(S)
- (4) A-(Q); B-(R); C-(S); D-(P)

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2023)Match **List-I** with **List-II**.

(2023)

| List-I | | List-II | |
|--------|-----------------------------|---------|-------------------------------|
| A. | Mast cells | P. | Ciliated epithelium |
| B. | Inner surface of bronchiole | Q. | Areolar connective tissue |
| C. | Blood | R. | Cuboidal epithelium |
| D. | Tubular parts of nephron | S. | Specialised connective tissue |

Choose the **correct** answer from the options give below.

- (1) A-(Q); B-(R); C-(P); D-(S)
 (2) A-(Q); B-(P); C-(S); D-(R)
(3) A-(R); B-(S); C-(Q); D-(P)
(4) A-(P); B-(Q); C-(S); D-(R)

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2023)

Given below are two statements.

(2023)

Statement-I: Ligaments are dense irregular tissue.

Statement-II: Cartilage is dense regular tissue.

In the light of the above statements, choose the **correct** answer from the options given below.

- (1) Both **Statement-I** and **Statement-II** are false.
- (2) **Statement-I** is true but **Statement-II** is false.
- (3) **Statement-I** is false but **Statement-II** is true.
- (4) Both **Statement-I** and **Statement-II** are true.

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2022)

Which of the following types of epithelium is present in the bronchioles and fallopian tubes? (2022 II)

- (1) Stratified squamous epithelium
- (2) Simple squamous epithelium
- (3) Simple columnar epithelium
- (4) Ciliated epithelium ✓

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2022)

Choose the **correct** statement about a muscular tissue.

- (1) Smooth muscles are multinucleated and involuntary.
- (2) Skeletal muscle fibres are uninucleated and found in parallel bundles.
- (3) Intercalated discs allow the cardiac muscle cells to contract as a unit. ✓
- (4) The walls of blood vessels are made up of columnar epithelium. ✗

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2022)

Choose the **correct** statements.

(2022 II)

- (a) Bones support and protect softer tissues and organs. ✓
- (b) Weight bearing function is served by limb bones. ✓
- (c) Ligament is the site of production of blood. ✗
- (d) Adipose tissue is specialised to store fats. ✓
- (e) Tendons attach one bone to another. ✗

Choose the most appropriate answer from the options given below.

- (1) (a), (b) and (e) only
- (2) (a), (b) and (d) only
- (3) (b), (c) and (e) only
- (4) (a), (c) and (d) only

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2022)

Which of the following is present between the adjacent bones
of the vertebral column? (2022)

- (1) Smooth muscle
- (2) Intercalated discs
- (3) Cartilage
- (4) Areolar tissue

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2022)

Which of the following is **not** a connective tissue?

- (1) Neuroglia
- (2) Blood
- (3) Adipose tissue
- (4) Cartilage

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2022)

Match **List-I** with **List-II**. (2022)

| List-I | | List-II | |
|--------|----------------|---------|---------------------------------|
| A. | Bronchioles | P. | Dense regular connective tissue |
| B. | Goblet cell | Q. | Loose connective tissue |
| C. | Tendons | R. | Glandular tissue |
| D. | Adipose tissue | S. | Ciliated epithelium |

Choose the **correct** answer from the options given below.

- (1) A-(Q); B-(P); C-(S); D-(R)
- (2) A-(R); B-(S); C-(Q); D-(P)
- (3) A-(S); B-(R); C-(P); D-(Q)
- (4) A-(P); B-(Q); C-(R); D-(S)

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2021)

Identify the types of cell junctions that help to stop the leakage of the substances across a tissue and facilitation of communication with neighbouring cells via rapid transfer of ions and molecules; (2021)

- (1) Tight junctions and gap junctions, respectively
- (2) Adhering junctions and tight junctions, respectively
- (3) Adhering junctions and gap junctions, respectively
- (4) Gap junctions and adhering junctions, respectively

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2021)

Which of the following statement **wrongly** represents the nature of smooth muscle? (2021)

- (1) They are involuntary muscles. ✓
- (2) Communication among the cells is performed by intercalated discs. ✗
- (3) These muscles are present in the wall of blood vessels. ✓
- (4) These muscle have no striations. ✓

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2020)

Cuboidal epithelium with brush border of microvilli is found in; (2020)

- (1) ducts of salivary glands.
- (2) proximal convoluted tubule of nephron.
- (3) eustachian tube.
- (4) lining of intestine.

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2020)

Goblet cells of alimentary canal are modified from; (2020)

- (1) Columnar epithelial cells ✓
- (2) Chondrocytes ✗
- (3) Compound epithelial cells ✗
- (4) Squamous epithelial cells ✗

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2020)

Select the incorrectly matched pair from following;
(2020 Covid)

- (1) Neurons-Nerve cells ✓
- (2) Fibroblast-Areolar tissue ✓
- (3) Osteocytes-Bone cells ✓
- (4) Chondrocytes-Smooth muscle cells ✗

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2020)

Which one of the following is the most abundant protein in the animals? (2020)

- (1) Haemoglobin
- (2) Collagen
- (3) Lectin
- (4) Insulin

FOR NOTES & DPP CHECK DESCRIPTION



Frog



- Kingdom: **Animalia** → Multicellular, Eukaryotic, Heterotrophic, Holozoic mode of nutrition

- Phylum: **Chordata** → Notochord \oplus nt

- Subphylum: **Vertebrata** → Vertebral column \oplus nt

- Division: **Gnathostomata** → Jaw → Mouth

- Superclass: **Tetrapoda** (4) → limb

- Class: **Amphibia** → dual ← Water ← Terrestrial

- Order: **Anura**

- Family: **Ranidae** → Tail-less

- Genus: **Rana**

- Species: **tigrina** → Indian Bullfrog

2-Forelimbs → thin ;
2-Hindlimbs

Swimming
Leaping (jump)
Burrowing
Walking

Body: Head + Trunk
(neck & tail \ominus nt)



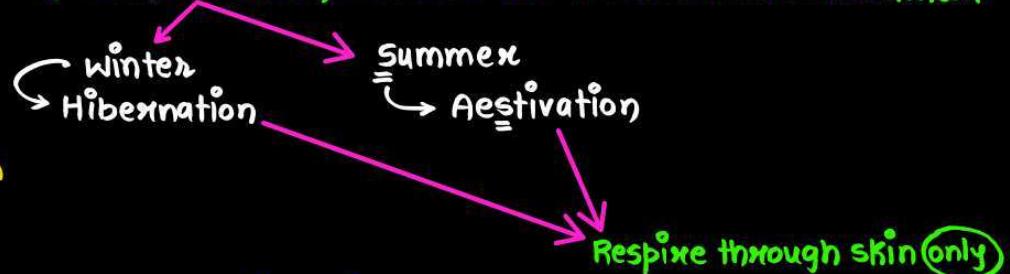
Consumed as a protein source





Features of Frog

- Poikilotherms: cold blooded: their body temperature fluctuates acc. to external environment



- Camouflage: protective colouration
→ Mimicry

- Frog doesn't drink water: as it gets H₂O through moist skin

- Body is divisible into: Head + Trunk (neck & Tail Ont)

- Sexual dimorphism: ♂

- vocal sacs development
- Nuptial pad/copulatory pad

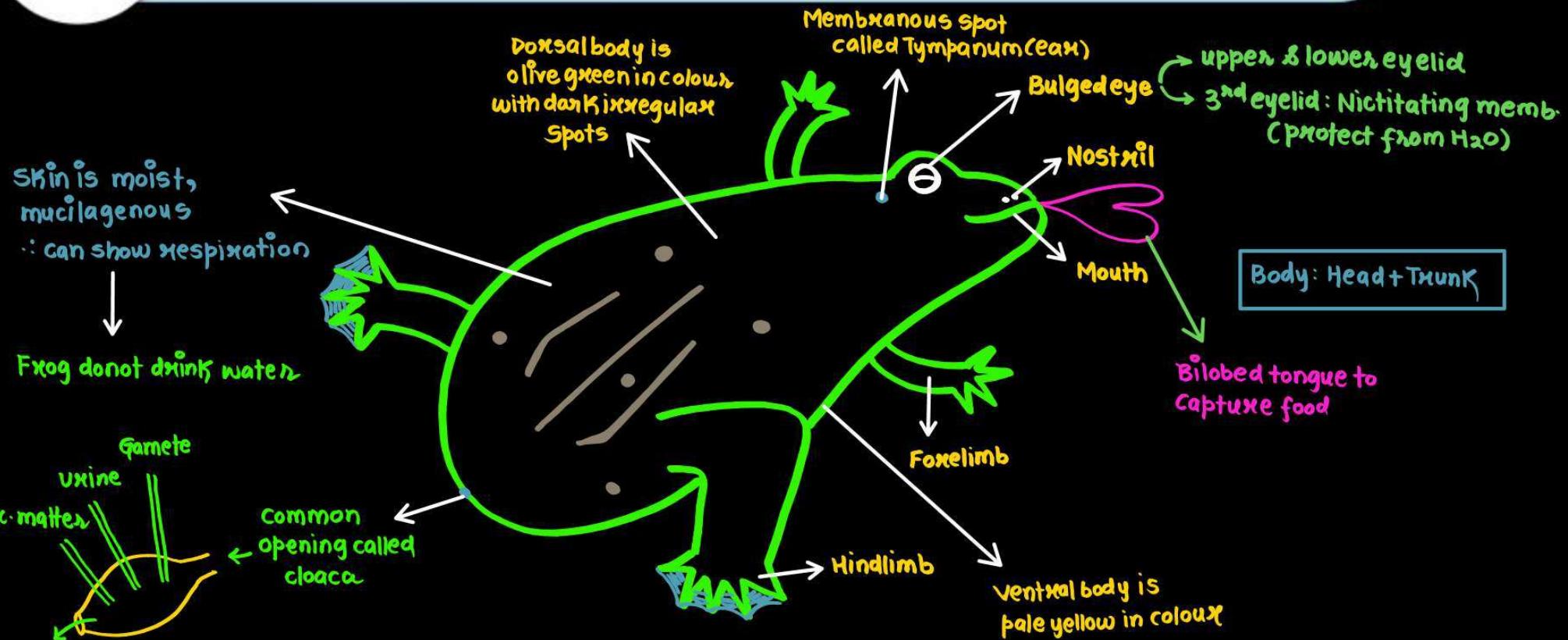


- Economic Importance:

- Carnivore :: protects crops
- A vital part of food chain



Morphology





Digestive System

- Includes: Alimentary canal + Digestive glands

Small
Frog is carnivore
Mouth to cloaca

Stomach → gastric juice
Liver → make Bile
Gall Bladder → store Bile juice
Pancreas → makes pancreatic juice

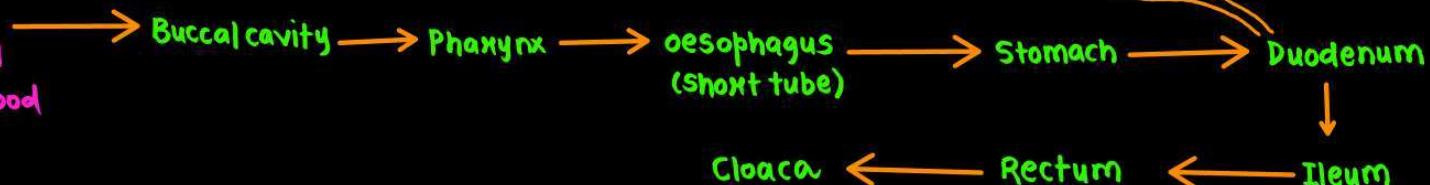
- Alimentary canal is small:

frog is carnivore → it eats insects & their larva

- Starts at: Stomach → digests proteins

- Ends at: Small intestine

- Path of Food: Bilobed Tongue will capture food





Digestive System

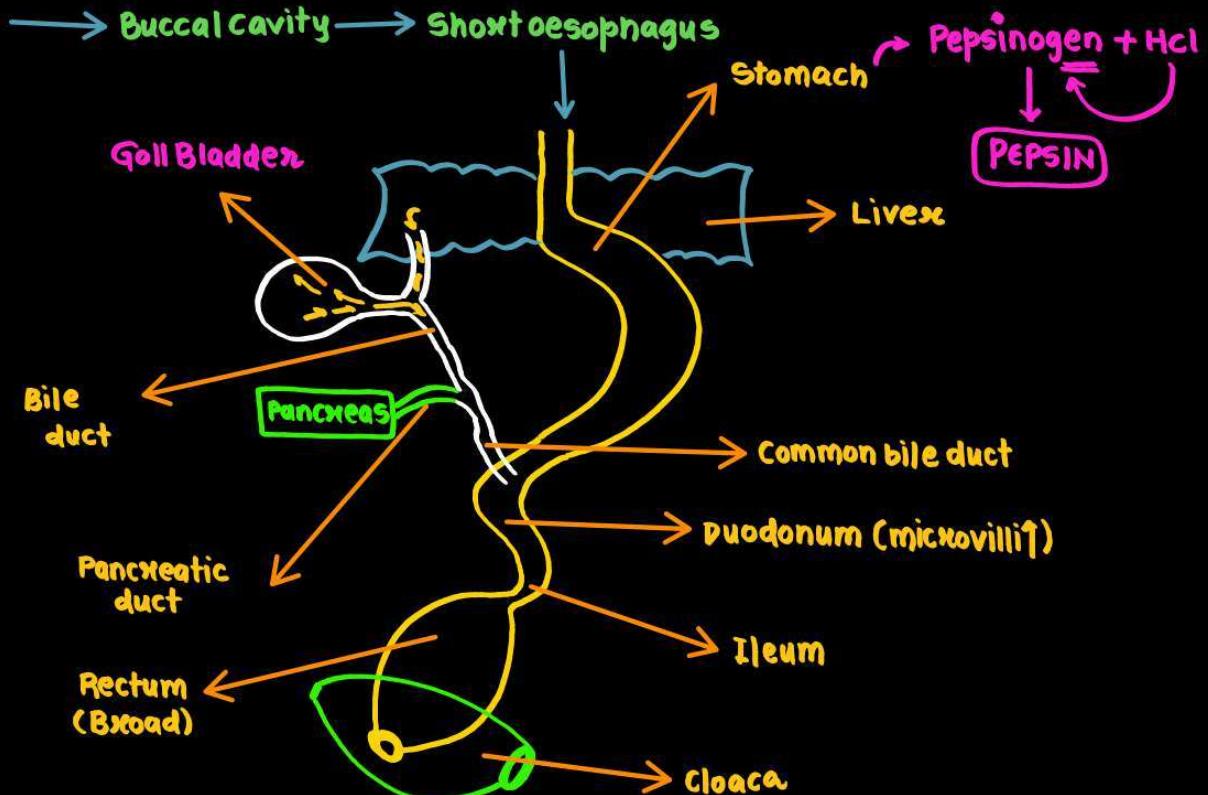


Food captured by
Bilobed Tongue

Mouth → Buccal cavity → Short oesophagus

Stomach → Pepsinogen + HCl

PEPSIN





Respiration

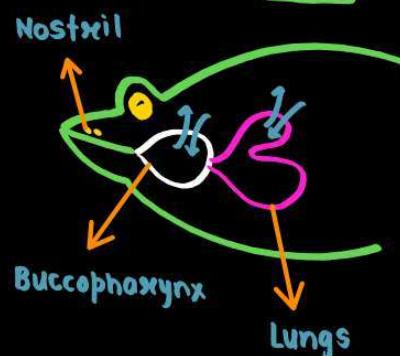
Cutaneous



- Hibernation
- Aestivation
- Aquatic

Bucco-pharyngeal

Least



Pulmonary

Most

- via Lungs

on land: all 3 respiration can work

Circulatory System



• Well developed / closed

Blood Vascular System

- 1. Heart
 - 2. Blood vessels
 - 3. **Blood**
 - RBC
 - WBC
 - Platelet
- Nuclear**
- 3-chambered = 2 Atria / auricle
1 ventricle
- + 2 additional chambers
1. sinus venosus dorsal
2. conus arteriosus ventral

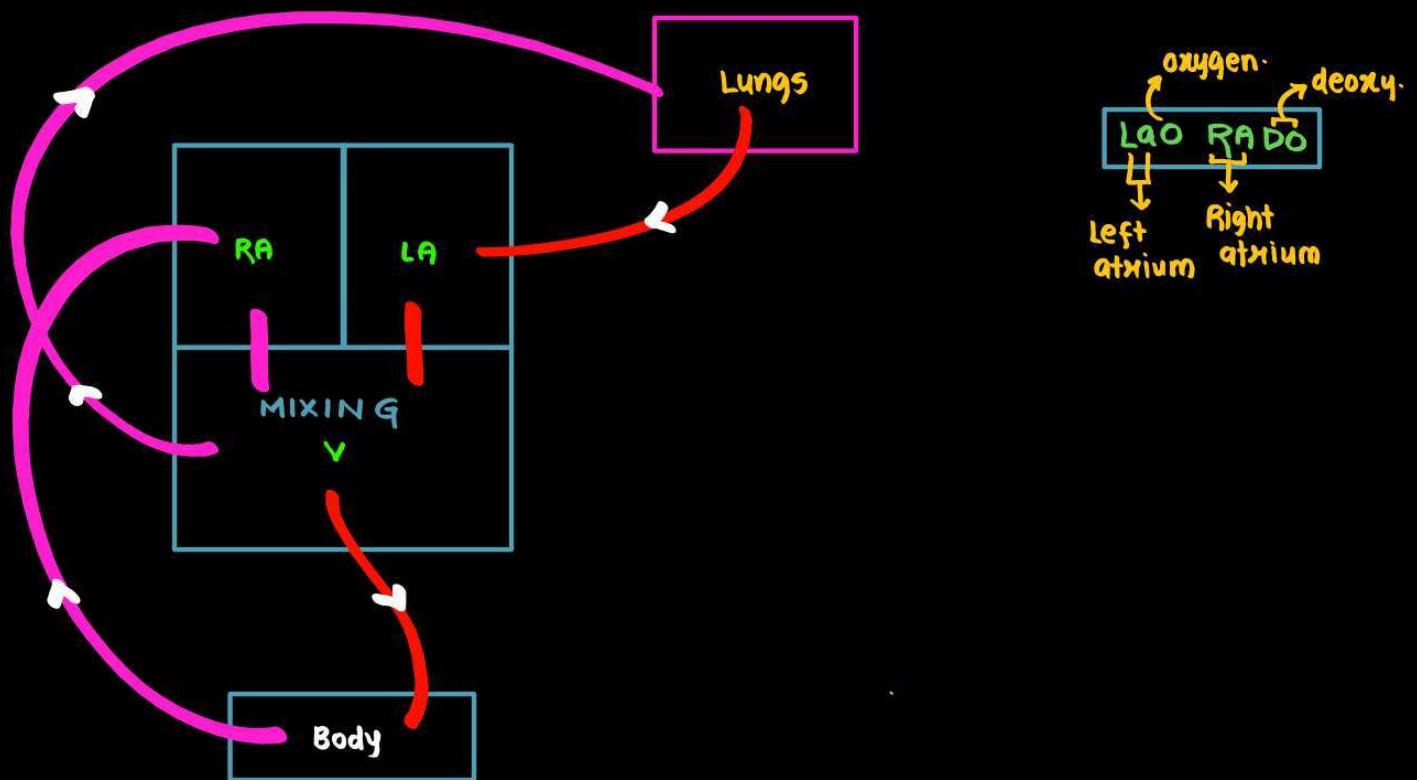


Lymphatic System

- 1. Lymph
 - 2. Lymph channels
 - 3. **Lymph nodes**
- Blood minus RBCs & large proteins**

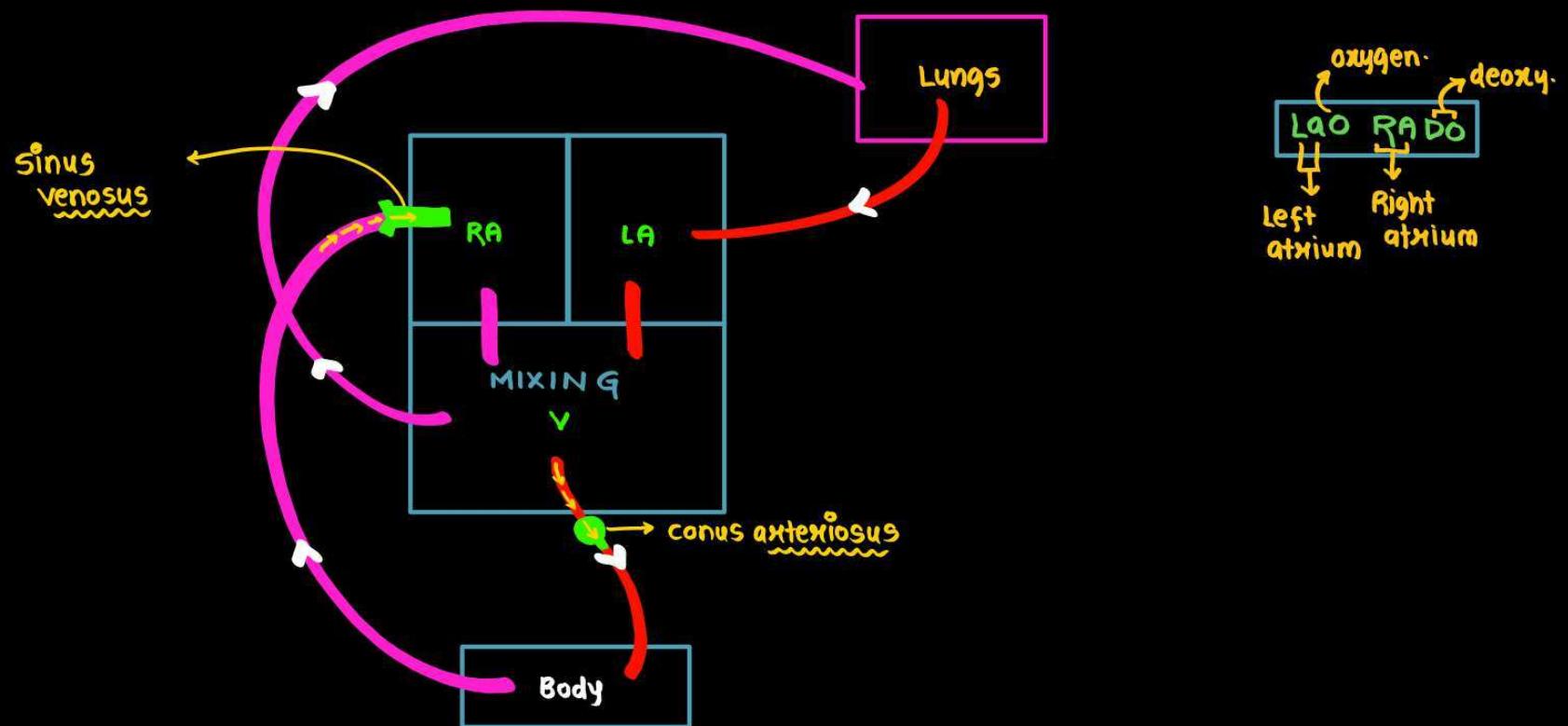


Circulatory System





Circulatory System



Portal Systems



Hepatic Portal System

Liver & intestine के बीच
Venous connection



Renal Portal System

Kidney

For purification

Lower body parts



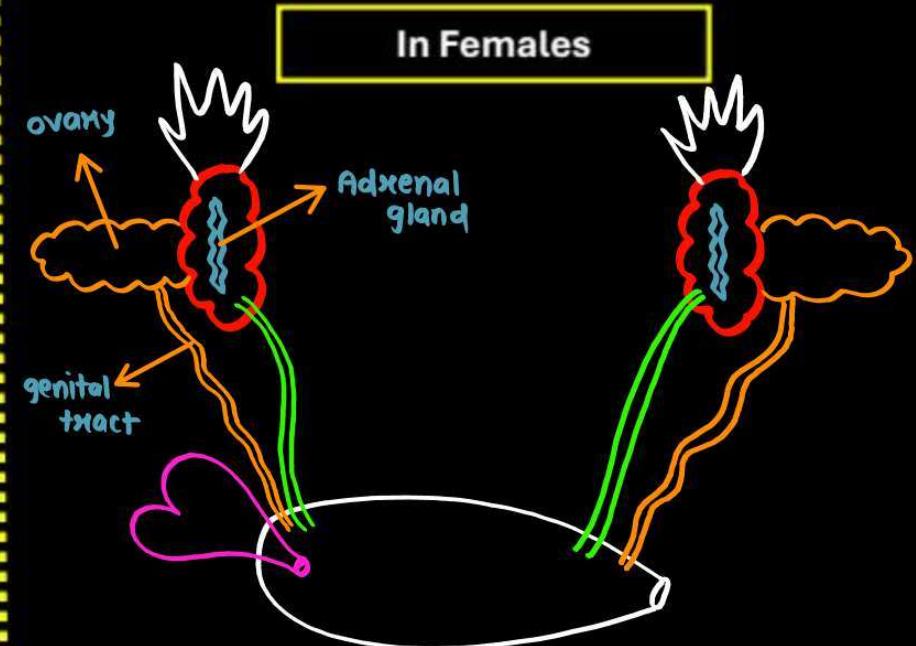
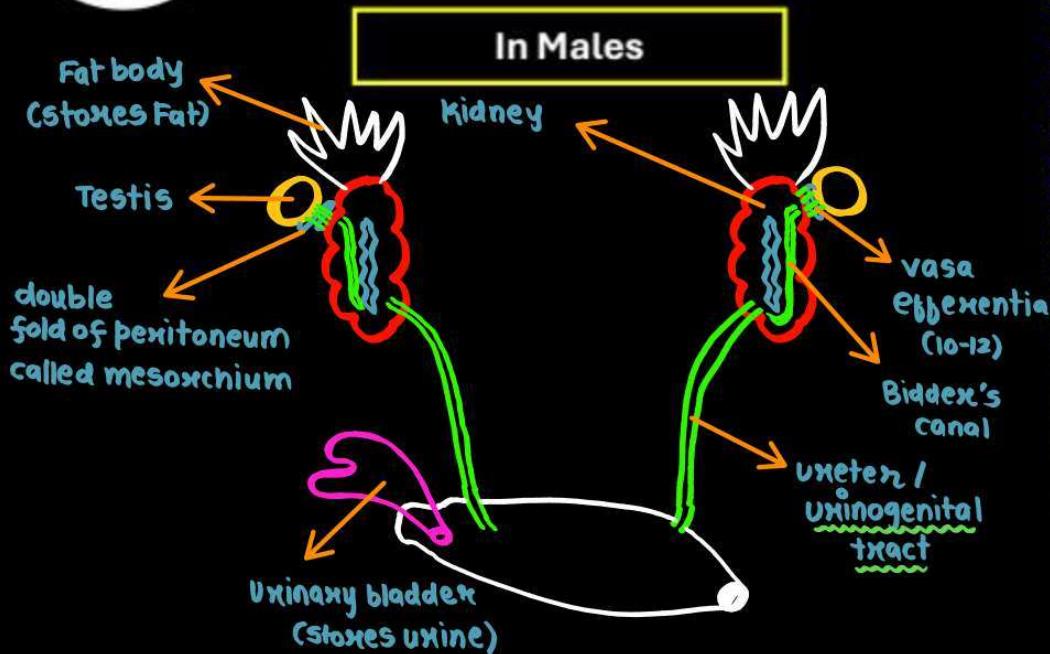


Excretory System

- Nitrogenous waste: Urea \leftarrow Ureotelic
- Includes: Kidneys, ureters, urinary bladder & cloaca
- Structural and Functional Unit is: Nephron / uriniferous Tubule



Excretory System





Control and Coordination

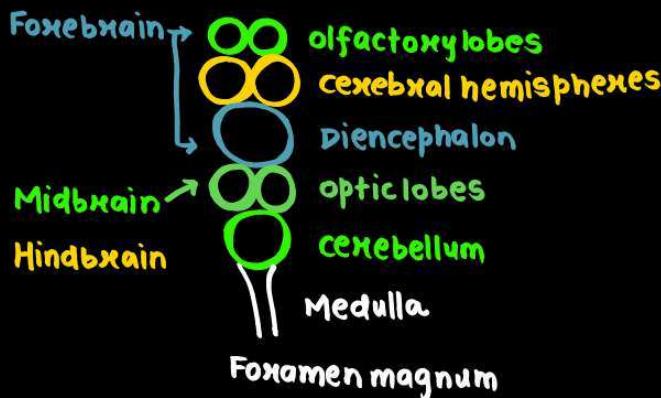
Endocrine control

- Pituitary gland
- Thyroid gland
- Adrenal gland
- Pancreas
- Testes
- ovary

Neural control

central Nervous System (CNS)

Brain + spinal cord



Peripheral nervous System (PNS)

cranial nerve 10 pairs

spinal nerve 10 pairs



Sense Organs

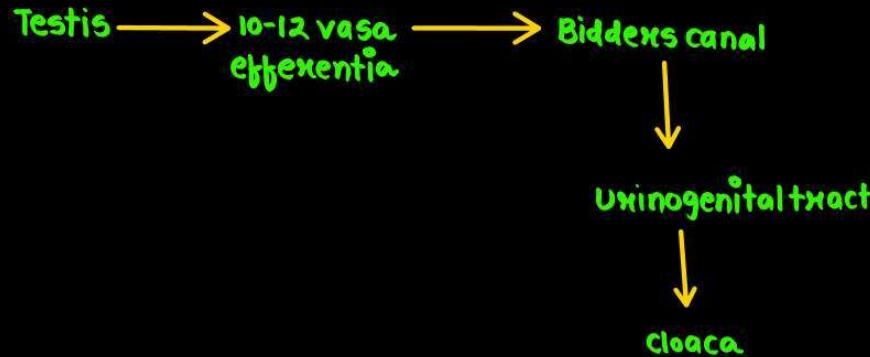
- **Sensory papillae:** for touch
others are cellular aggregations around nerve endings
- **Taste Buds:** for Taste
- **Nasal epithelium:** for Smell
- **Eyes:** for Vision
- **Tympanum and Inner Ear:** for Hearing and Balance (equilibrium)
Most well developed



Reproductive Systems

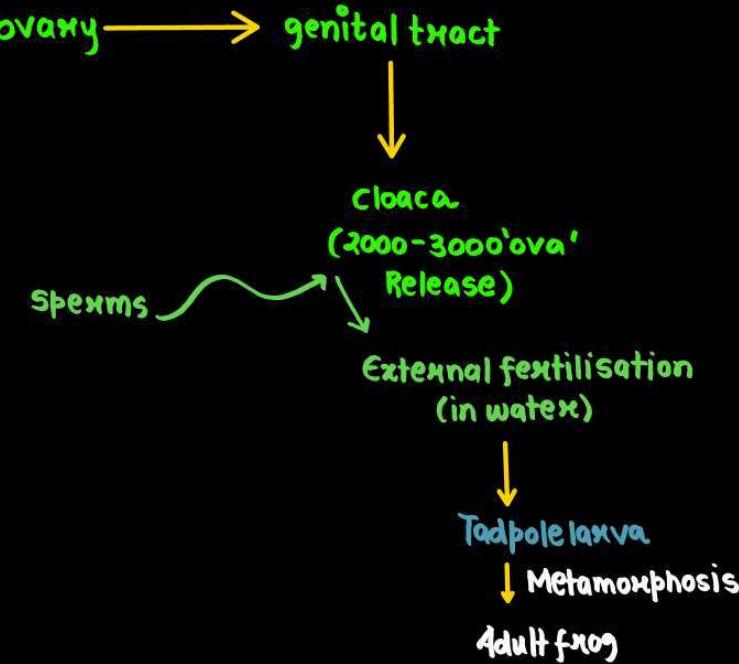
In Males

Sperm path



In Females

Ova path:



- Can live on Land + Fresh H₂O; Chondate; Most common - Rana
- Poikilotherms; do camouflage; Show aestivation & hibernation

Мембранные тимпаны (еар) to receive sound signals

Forelimbs: thin, have 4-digits
(In ♂: copulatory nuptial pads on first digits)

Ventral side is pale yellow (uniform)

Respiration in Frog

- In H₂O: skin (cutaneous) - by diffusion
- During aestivation & hibernation: skin
- At land: skin + lungs + buccal cavity
 - ↳ buccopharyngeal
 - ↳ pink coloured sacs in upper thorax



Circulation in Frog

- Heart = 3 chambered (2A+1V) - surrounded by pericardium
 - ↳ Dorsal side has triangular sinus venosus conn. to RA
∴ deox. blood → vena cava → sinus venosus → RA
 - Ventral side has sac like conus arteriosus conn. to ventricle
∴ ox. blood → ventricle → conus arteriosus → Body

Circulation in Frog

LAO RADO



- Portal system: special venous system
 - ↳ Hepatic portal: b/w intestine & liver
 - Renal portal: b/w lower body parts & kidney
- Blood contains RBC + WBC + Platelets
 - ↳ nucleated
- Lymph: Blood minus RBC & some large proteins

Digestion in Frog

- Alimentary canal short :: сънчивък
 - Digestive system = Al. canal + glands
 - Bilobed tongue captures food
- ↓
- Buccal cavity ← Mouth
- ↓
- Pharynx
- ↓
- Short oesophagus
- ↓
- Stomach
- make HCl & gastric juice
- ↓
- Pancreas
- ↓
- Common bile duct
- ↓
- Small intestine
- ↓
- Rectum
- Digestion complete;
has microvilli
- ↓
- Cloaca → send out fecal matter,
urine & gametes

Excretion in Frog

- Ureotelic: excretes urea
 - System: Kidneys(2) + мочекък + уриний bladder + cloaca
 - Kidney: compact dark red, bean shaped; situated post. to body cavity on both sides of vent. column
 - Unit: Nephrons / уринiferous tubules
 - Умерен етаже from each kidney
- in ♂
- in ♀
- сънчо иинет +
Spermatozoa: уриногенитал иине
- Уриний bladder (thin) is present ventral to rectum that opens through cloaca

Control in Frog

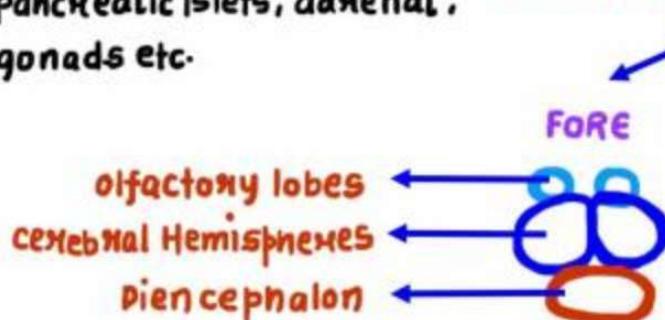
- chemical (endocrine)
- Pituitary, thyroid, para-thyroid, thymus, pineal body, pancreatic islets, adrenal, gonads etc.

Neural

Autonomic nervous system: Sympathetic and Parasympathetic
(Fight, Flight) (Eat, sleep)

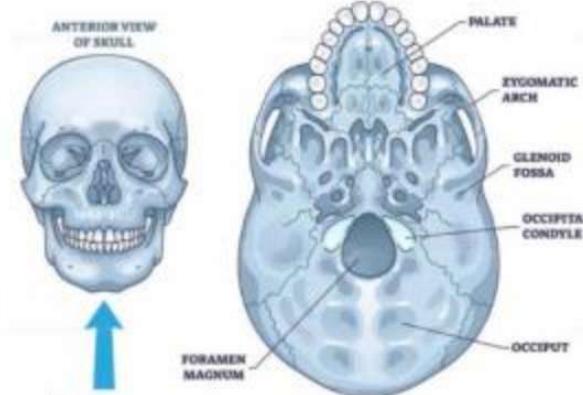
Peripherical nervous system: Cranial nerves + Spinal nerves
(12 pairs) (31 pairs)

Central N.S.: Brain + spinal cord
enclosed in cranium



enclosed in vertebral column

Cerebellum
Medulla oblongata
Pass through foramen magnum to continue into spinal cord



Sense Organs in Frog

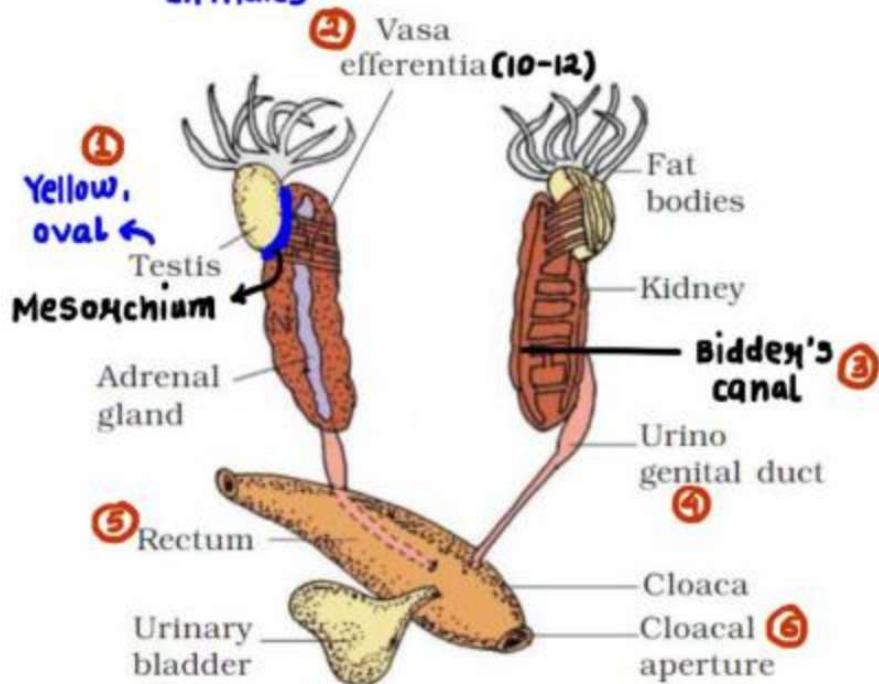
- For touch: sensory papilla
- For taste: Taste buds → cellular aggregation around nerve endings
- For smell: olfactory epithelium
- For hearing & balance: tympanum with internal ear (ext. ear absent)
- For vision: simple eyes (present in orbit) → well developed

Economic Importance

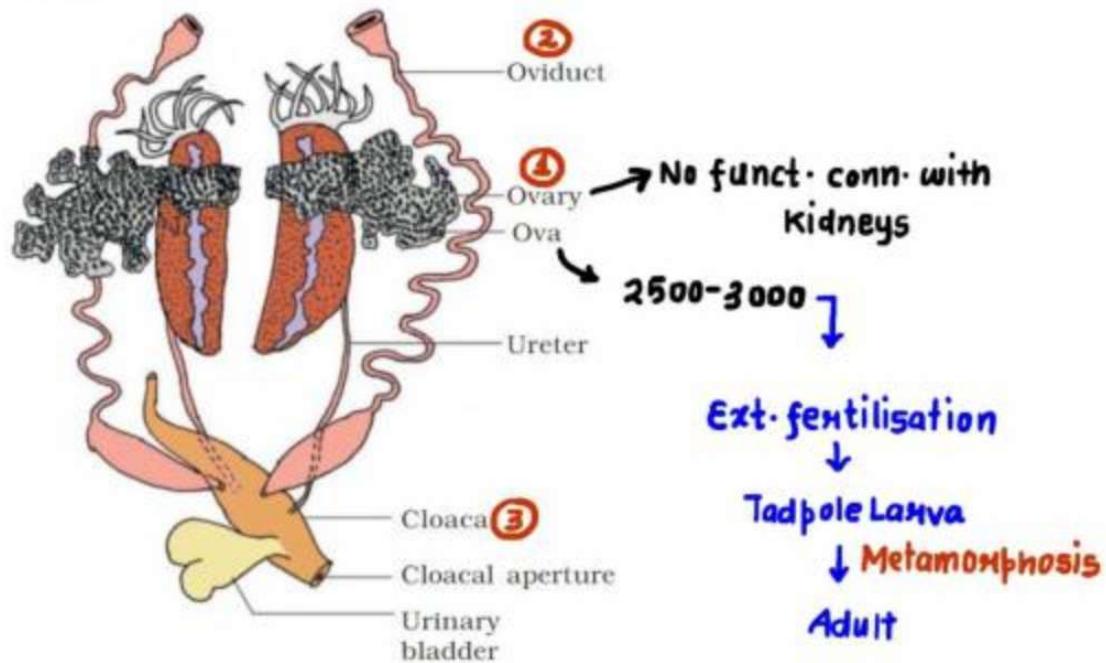
- Eat insects & protect crops
- Part of food cycle
- Muscular legs can be eaten ∴ Food

Reproduction in Frog

In males



In females



QUESTION (NEET PYQ EXAM 2017)

Select the **correct** route for the passage of sperms in male frogs;
(2017-Delhi)

- (1) Testes → Bidder's canal → Kidney → Vasa efferentia → Urinogenital duct → Cloaca
- (2) Testes → Vasa efferentia → Kidney → Seminal Vesicle → Urinogenital duct → Cloaca
- (3) Testes → Vasa efferentia → Bidder's canal → Uter → Cloaca
- (4) Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2017)

Frog's heart when taken out of the body continues to beat for sometime. (2017)

Select the **best** option from the following statements.

- (a) Frog is a poikilotherm. X
 - (b) Frog does not have any coronary circulation. X
 - (c) Heart is "myogenic" in nature: ✓
 - (d) Heart is autoexcitable. ✓
- (1) (a) and (b) ✓ (2) (c) and (d)
 - (3) Only (c) ✓ (4) Only (d)

FOR NOTES & DPP CHECK DESCRIPTION

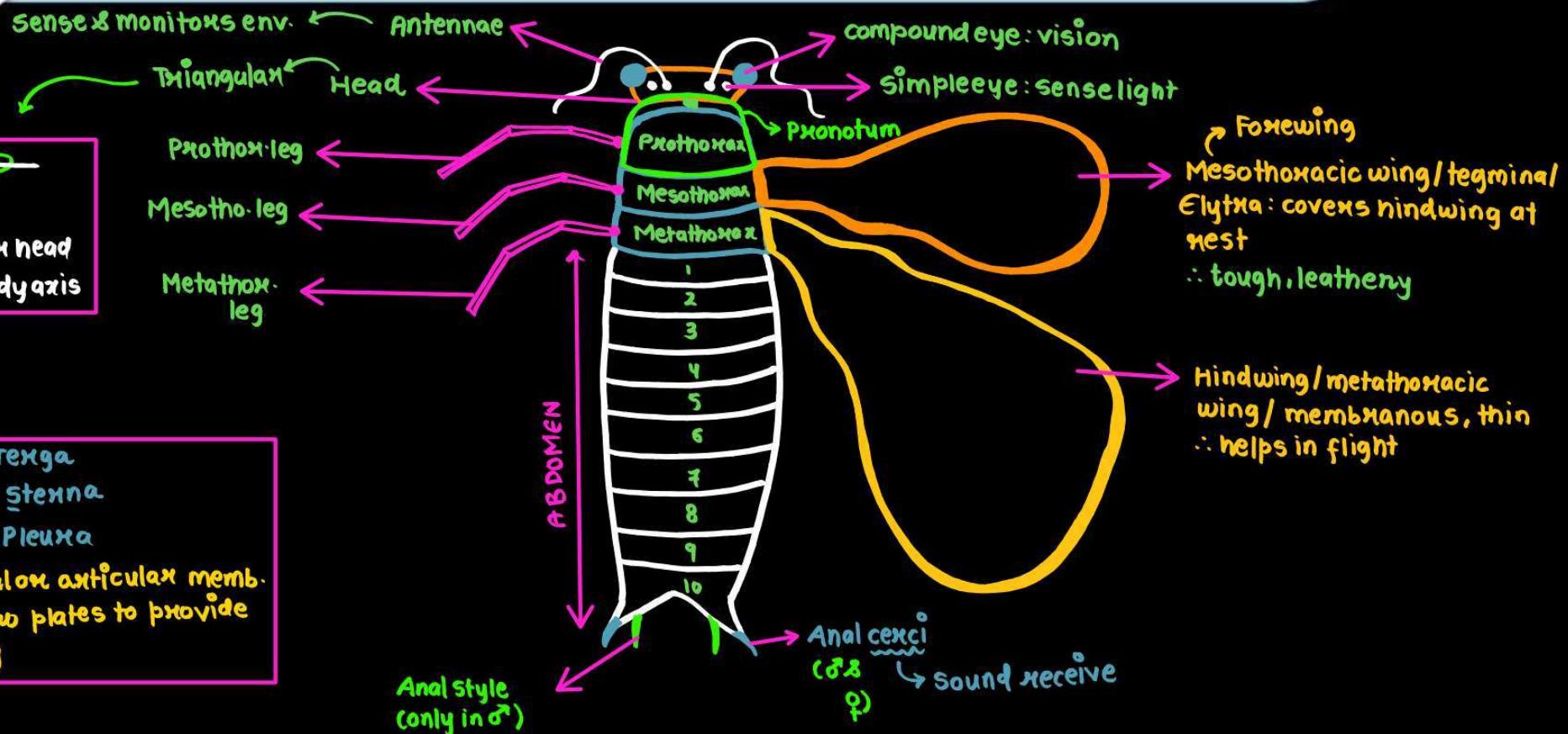


Cockroach

- Kingdom: Animalia
- Phylum: Arthropoda
 - Joint
 - appendages
 - Biggest phylum
- Class: Insecta
 - (Biggest class)
 - 3-pair of legs
 - Chitinous exoskeletal
- Genus: *Periplanata*
- Species: *americana*
- Usual colour: dark brown to black
- Other colours: yellow, green & red
- Usual size: 1/4-3" or 0.6-7.6cm
- Size of Adult Periplanata: 34mm to 53mm
- Found in regions: Tropical
 - night
 - Fast runner
- Usual features: Omnivore, nocturnal, cursorial
 - Herbit/carni
- Economic importance: no importance



Morphology





Morphology

- Head shape: Triangular & it is at perpendicular to body axis



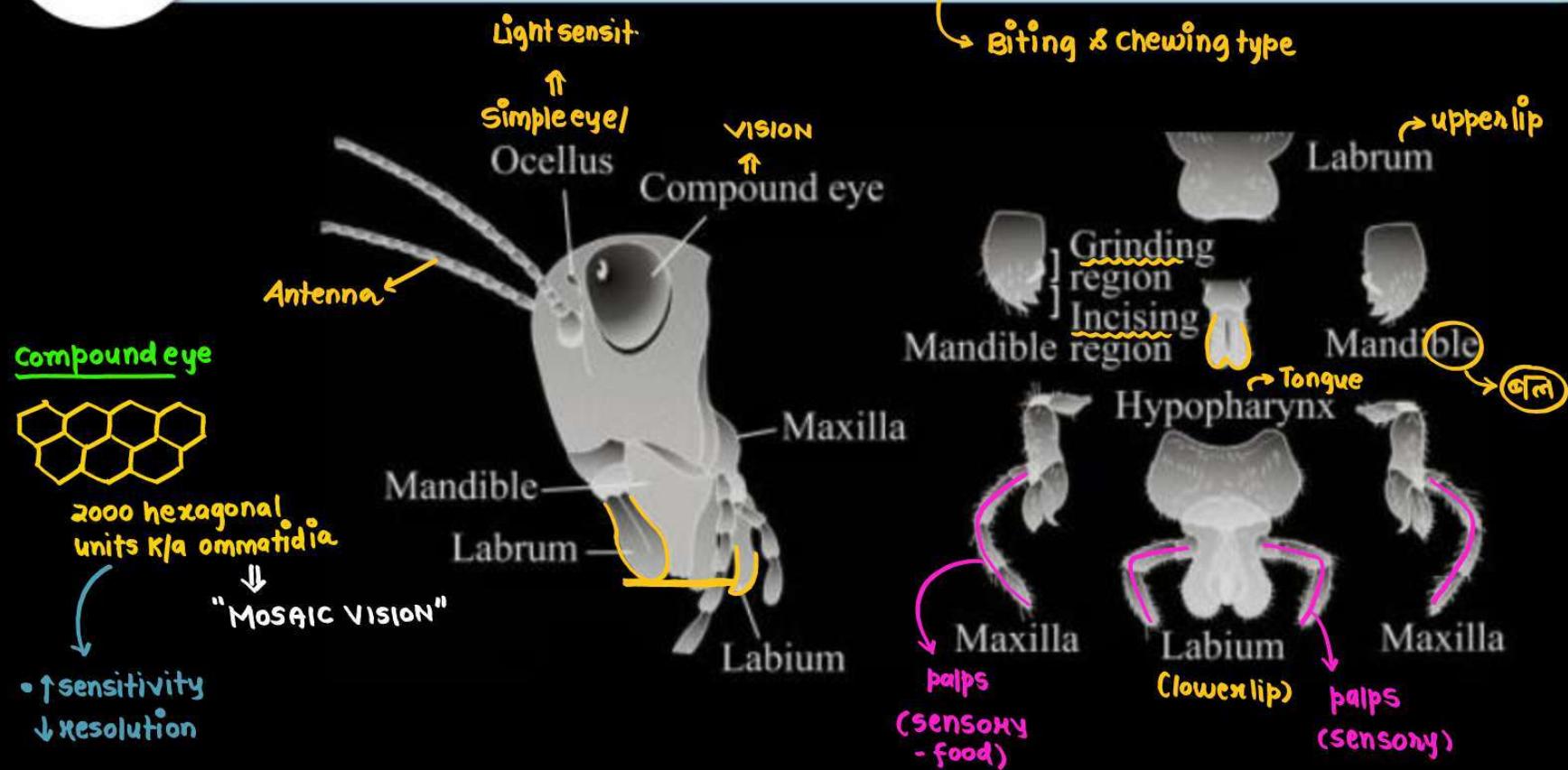
- Segmentation: Head + thorax + abdomen

| Segment number in Embryonic Stage | Head | Thorax | Abdomen |
|-----------------------------------|------|--------|---------|
| 20 | 6 | 3 | 11 |
| In Adults | 1 | 3 | 10 |

Annotations: A red arrow points from the number 20 to the first row. A red bracket below the table spans from the second row to the third row, with the number 14 written next to it.



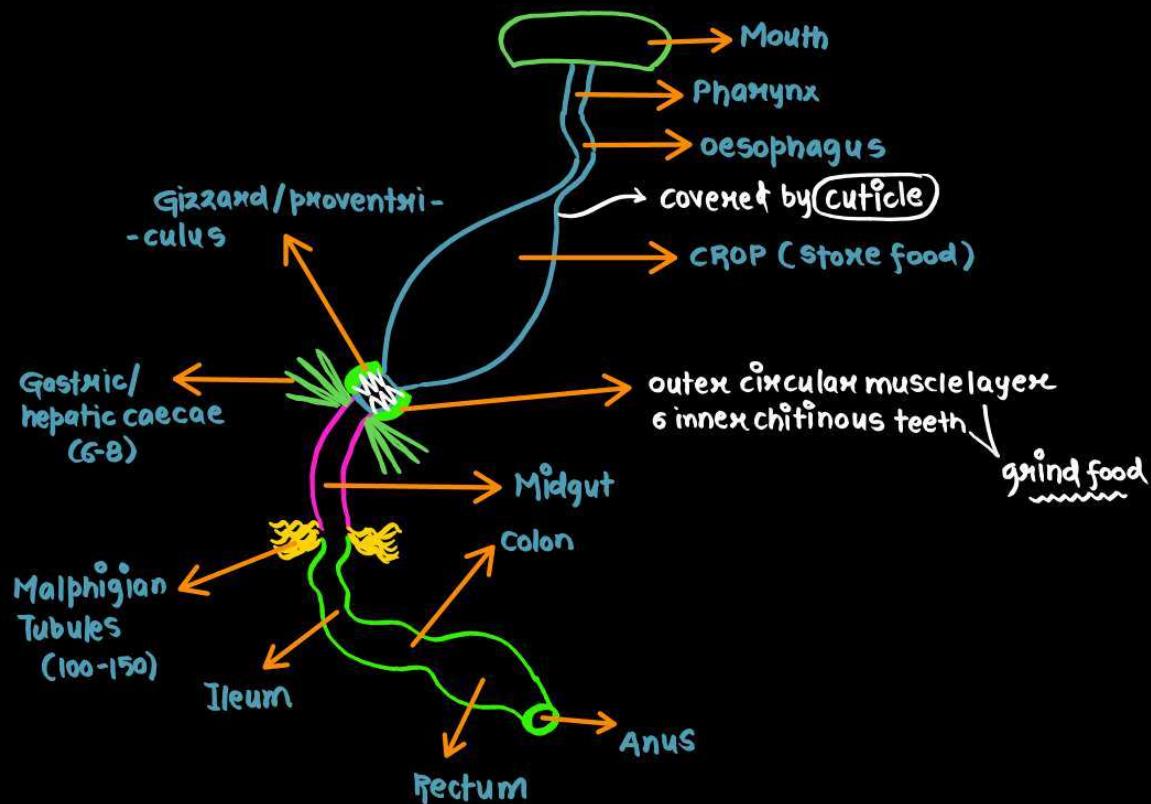
Mouth Parts





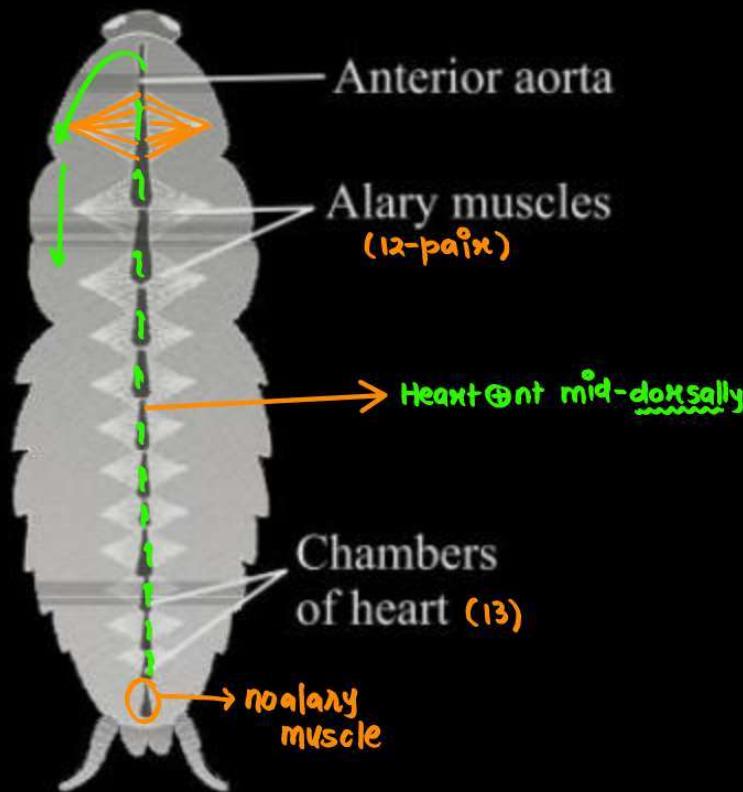
Digestive System

The alimentary canal present in the body cavity is divided into three regions: **foregut**, **midgut** and **hindgut** (Figure 7.16). The mouth opens into a short tubular **pharynx**, leading to a narrow tubular passage called **oesophagus**. This in turn opens into a **sac like structure** called **crop** used for storing of food. The crop is followed by **gizzard** or **proventriculus**. It has an outer layer of thick circular muscles and thick inner cuticle forming six highly chitinous plate called **teeth**. Gizzard helps in **grinding** the food particles. The entire foregut is lined by **cuticle**. A ring of **6-8** blind tubules called **hepatic or gastric caeca** is present at the junction of foregut and midgut, which secrete digestive juice. At the junction of midgut and hindgut is present another ring of **100-150** yellow coloured thin filamentous **Malpighian tubules**. They help in removal of excretory products from haemolymph. The hindgut is broader than midgut and is differentiated into **ileum**, **colon** and **rectum**. The rectum opens out through **anus**.





Circulatory System



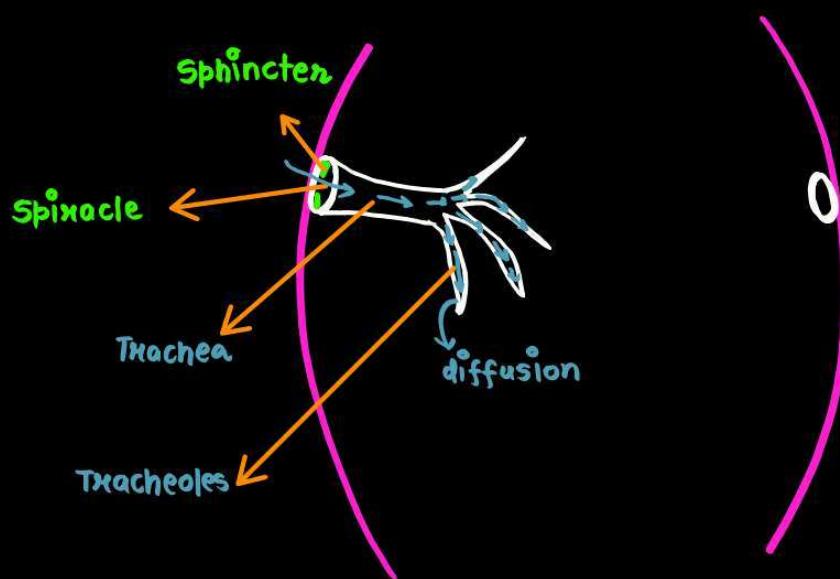
- Heart
 - blood / Haemolymph
(colourless)
- ↓
- 13-chambered
- Flows in haemocoel
(open circulation)



Respiratory System



10 pairs of spiracles + Trachea + Tracheoles





Excretory System

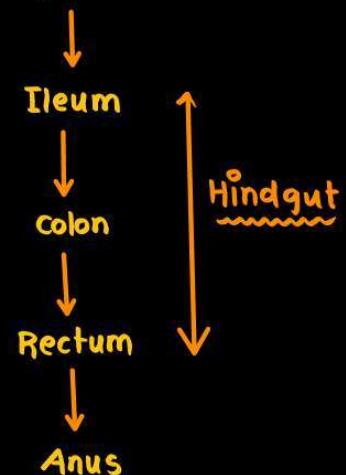
Excretion is performed by Malpighian tubules. Each tubule is lined by glandular and ciliated cells. They absorb nitrogenous waste products and convert them into uric acid which is excreted out through the hindgut. Therefore, this insect is called uricotelic. In addition, the fat body, nephrocytes and urecose glands also help in excretion.

↙
nephron

↙
only in ♂

↗ main

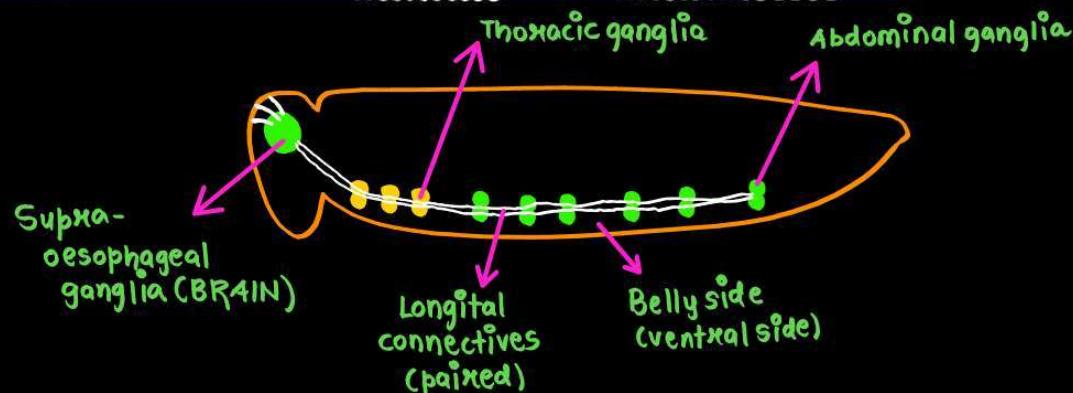
Malpighian Tubule





Nervous System

The nervous system of cockroach consists of a series of fused, segmentally arranged ganglia joined by paired longitudinal connectives on the ventral side. Three ganglia lie in the thorax, and six in the abdomen. The nervous system of cockroach is spread throughout the body. The head holds a bit of a nervous system while the rest is situated along the ventral (belly-side) part of its body. So, now you understand that if the head of a cockroach is cut off, it will still live for as long as one week. In the head region, the brain is represented by supra-oesophageal ganglion which supplies nerves to antennae and compound eyes.





Sense Organs



- Simple eyes: light
- Compound eyes: vision
- Antennae: monitor environment
- Labial and Maxillary palps: food intake
- Anal Styles: touch
(♂)
- Anal Cerci: sound

Reproductive System

→ well developed!

- Sexual Dimorphism:

| Male | Female |
|------|--------|
|------|--------|

- Anal styles/caudal Styles ♂nt
- Absent

- Wings extends beyond the tip of abdomen



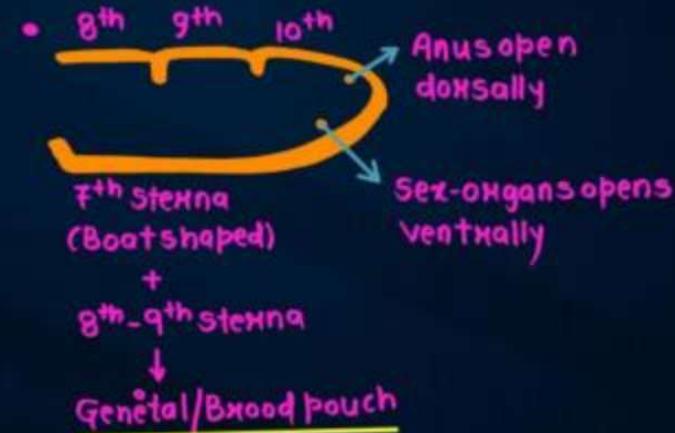
- Phallic gland
- Phallomere (♂ gonopophysis)

Left phallomere → Ventral phall.

Right phall.

Assymetric chitinous str.

- Wings are small

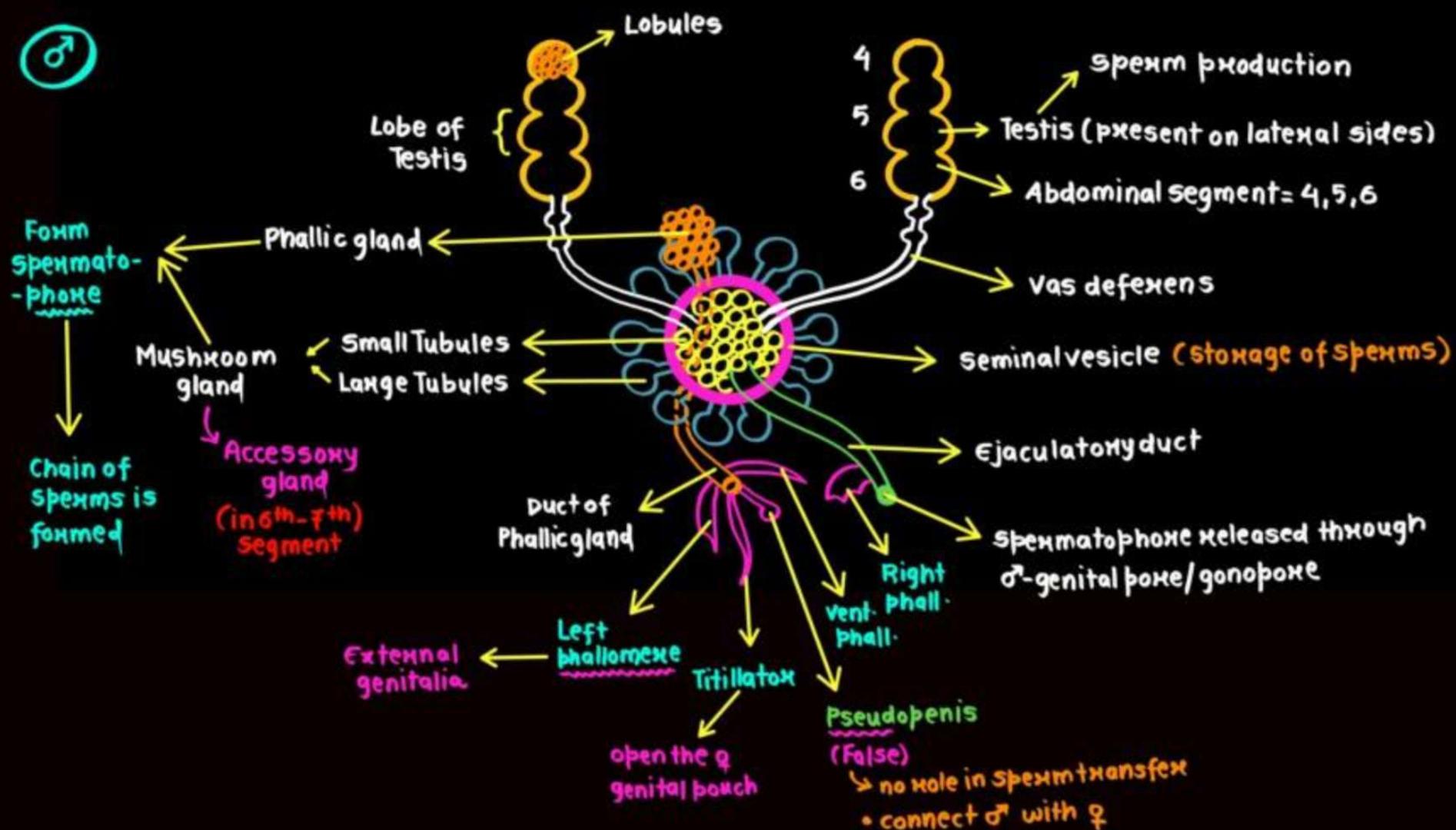


Female

Fecol - Thick
Collateral glands

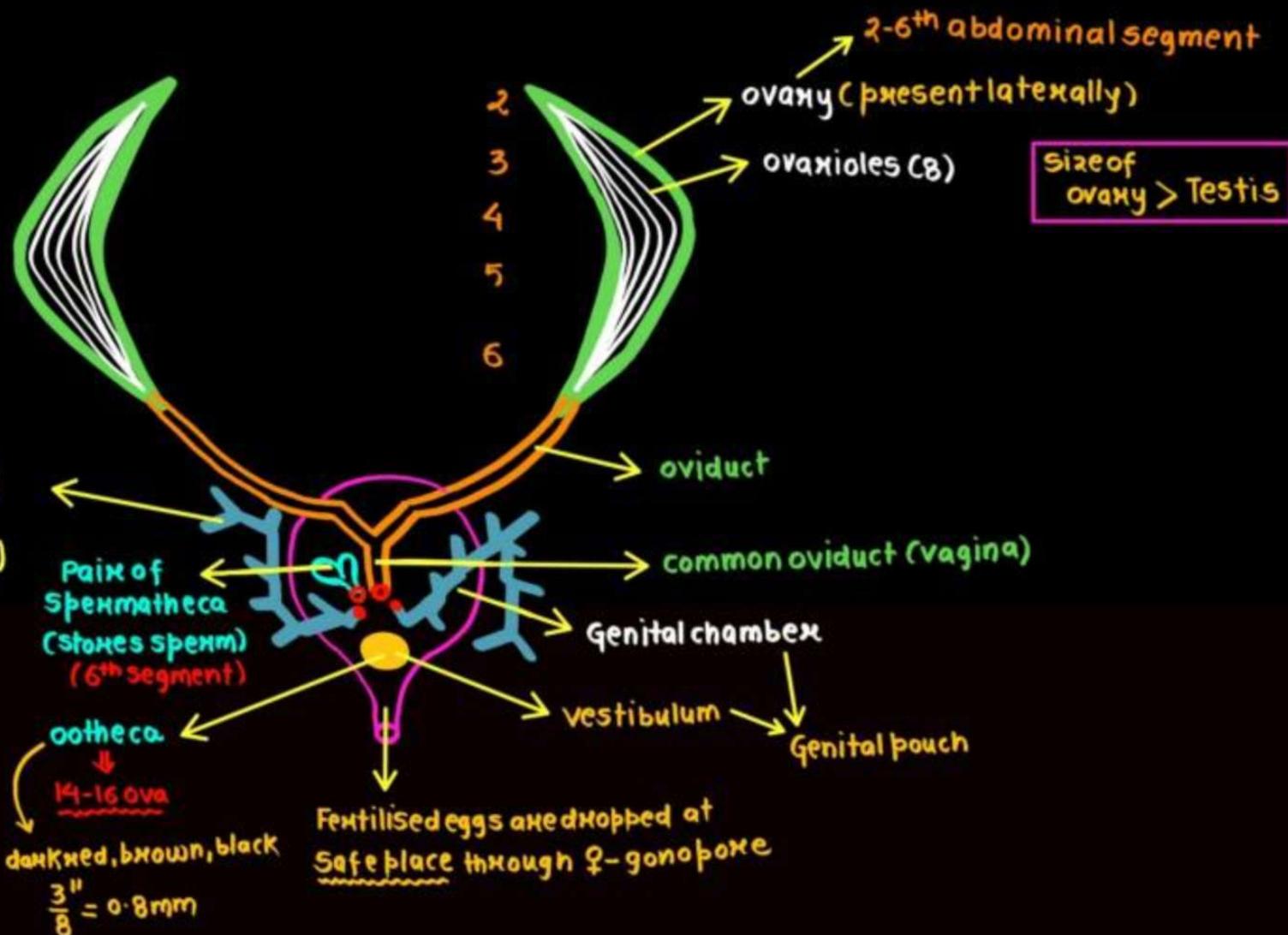
Theca

Sperma-theca
(stokes sperms)
oothecca



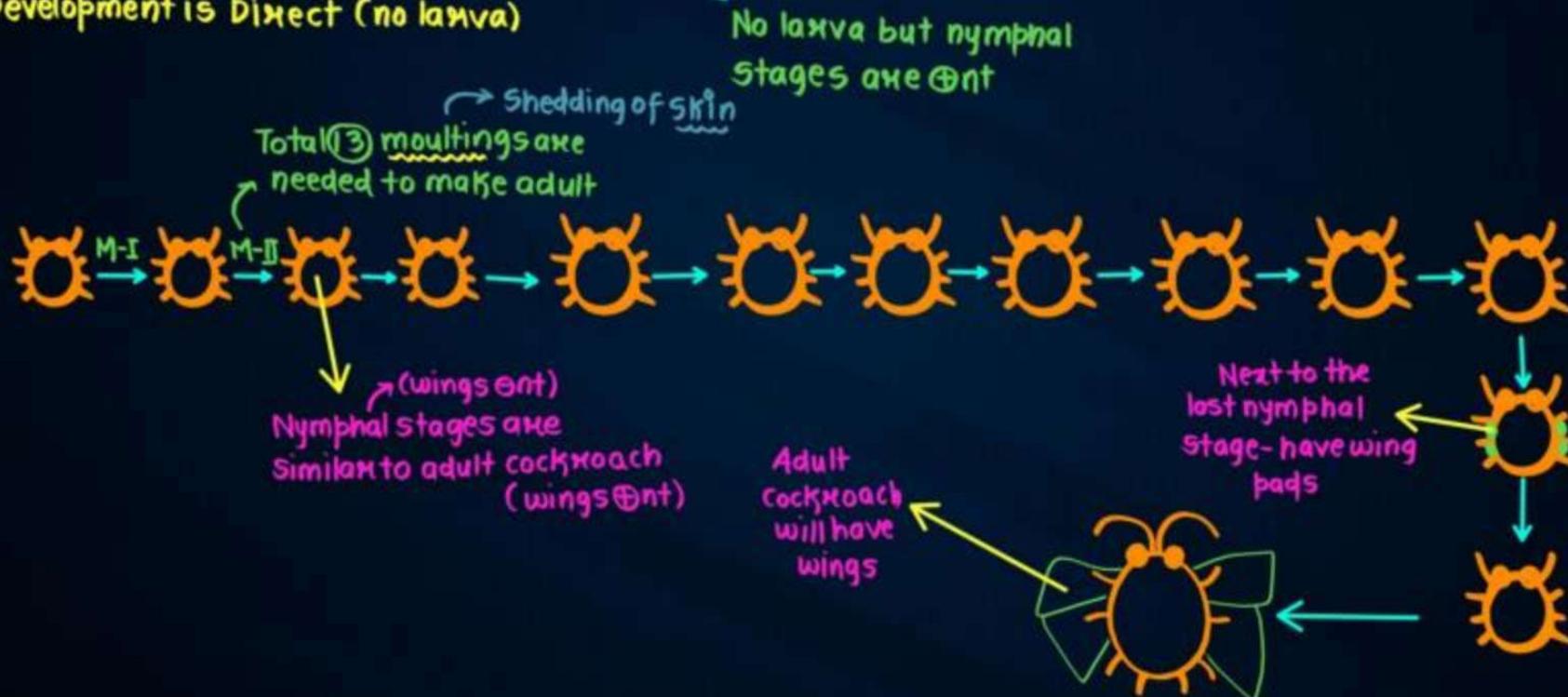
♀

- Helps in formation of ootheca
- 14-16 ova in one ootheca
- 9-10 ootheca produced by ♀ in lifetime
- Total eggs in lifetime of ♀ **126-160 ova**



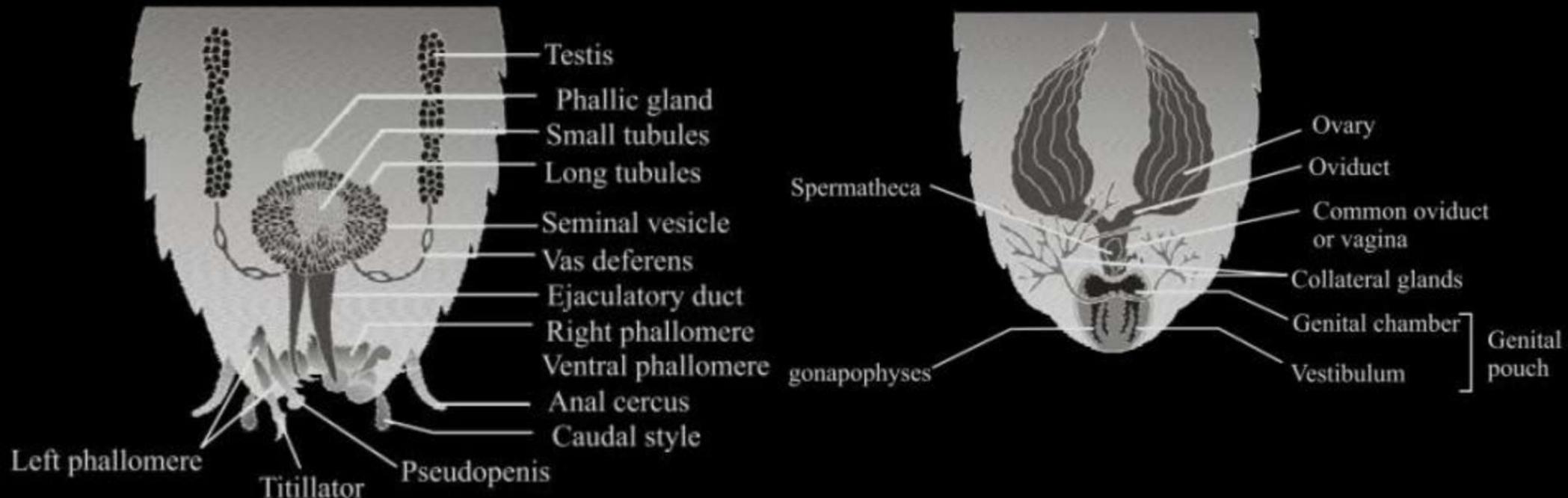
Reproductive System

- Development in cockroach: **Paenometabolous**
- Fertilisation is internal
- Development is Direct (no larva)





Reproductive System



• *Periplaneta americana*

↳ usually brown to black

Typical regions: yellow, red, green

• Size: 1/4-3" or 0.6-7.6 cm

• Adult Periplaneta: 34-53mm

• They are nocturnal omnivores

Sensory: monochromic

Filiform antennae

vision

∴ sensory

↓
situated
dorsally

↓
contain 2000
ommatidia

∴ mosaic image formed

↑ sensitivity; ↓ resolution

In ♂; wings extend
beyond the tip of abdomen

Cockroach (Arthropod)

• Show great mobility
due to flexible neck

• Neck is extension of prothorax

Sensory: monochromic

Filiform antennae

vision

∴ sensory

↓
situated
dorsally

↓
contain 2000
ommatidia

∴ mosaic image formed

↑ sensitivity; ↓ resolution

In ♂; wings extend
beyond the tip of abdomen

Cockroach (Arthropod)

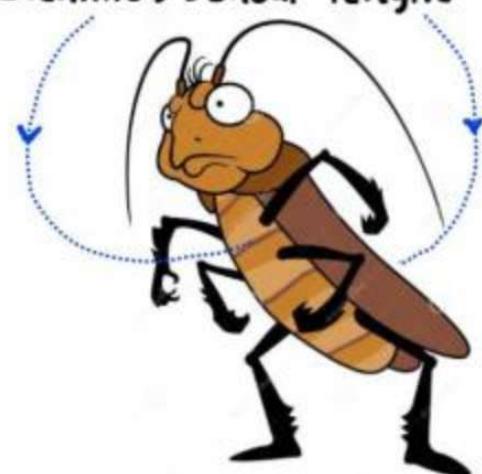
• Chitinous exoskeletal present

• Body = Head + Thorax + Abdomen

(Solo) (3-segm.) (10 segm.)

↳ formed by fusion of 6-embryonic
segments; triangular, lie
perpendicular to longitudinal body

• Exoskeletal has hard plates called sclerites
ventral - sternite; Dorsal - tergite



• These plates are conn. to each other
by thin, flexible articular/arthrodial membrane

Sensory: monochromic

Filiform antennae

vision

∴ sensory

↓
situated
dorsally

↓
contain 2000
ommatidia

∴ mosaic image formed

↑ sensitivity; ↓ resolution

In ♂; wings extend
beyond the tip of abdomen

Cockroach (Arthropod)

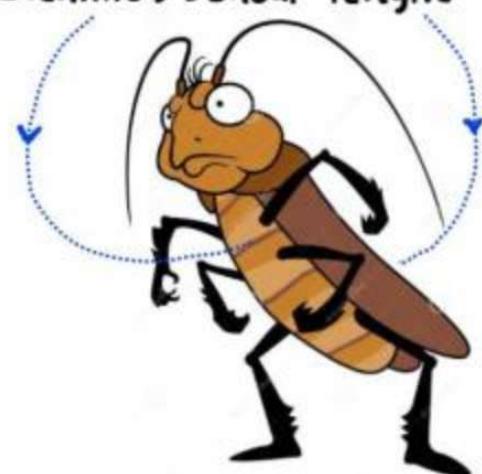
• Chitinous exoskeletal present

• Body = Head + Thorax + Abdomen

(Solo) (3-segm.) (10 segm.)

↳ formed by fusion of 6-embryonic
segments; triangular, lie
perpendicular to longitudinal body

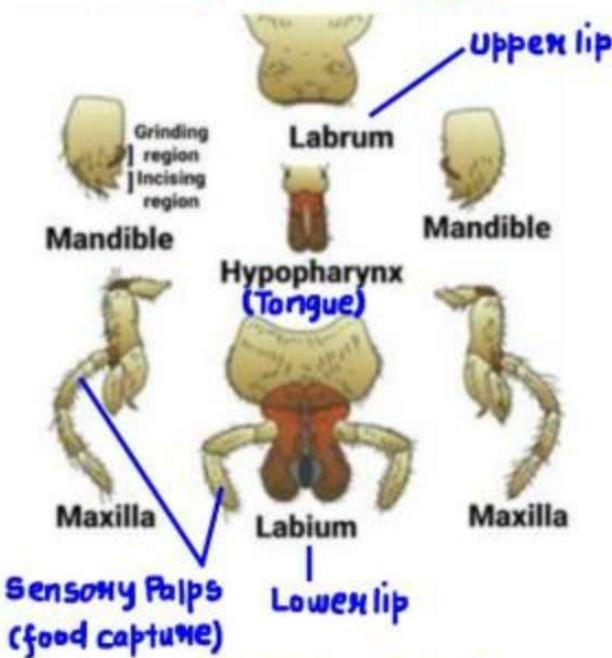
• Exoskeletal has hard plates called sclerites
ventral - sternite; Dorsal - tergite



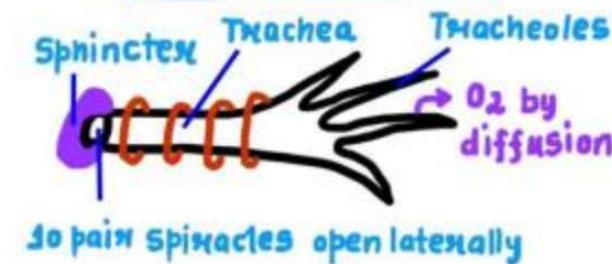
• These plates are conn. to each other
by thin, flexible articular/arthrodial membrane

Mouth Parts

- Biting & chewing type

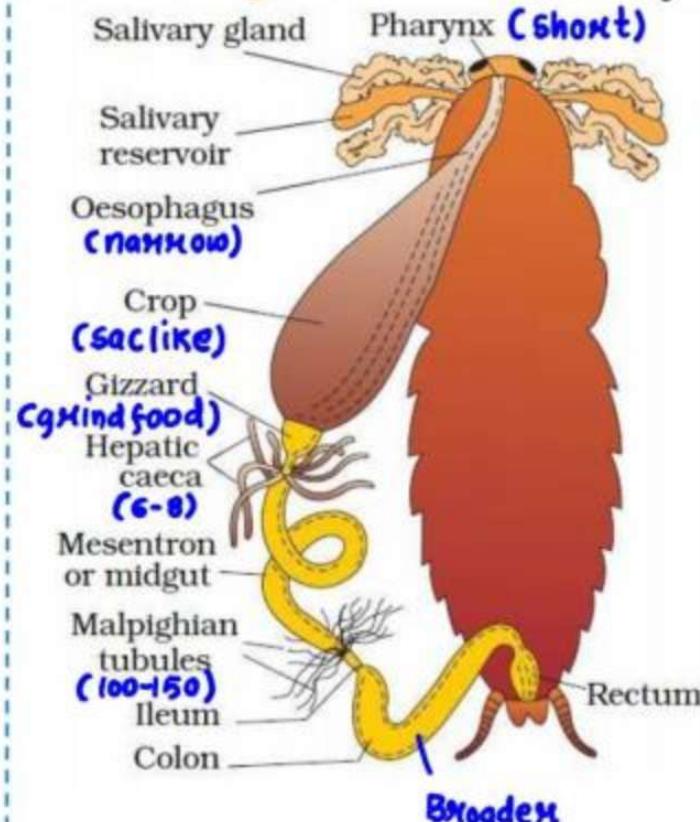


Respiration



Digestive System

- Alimentary canal: Fore, mid, Hindgut

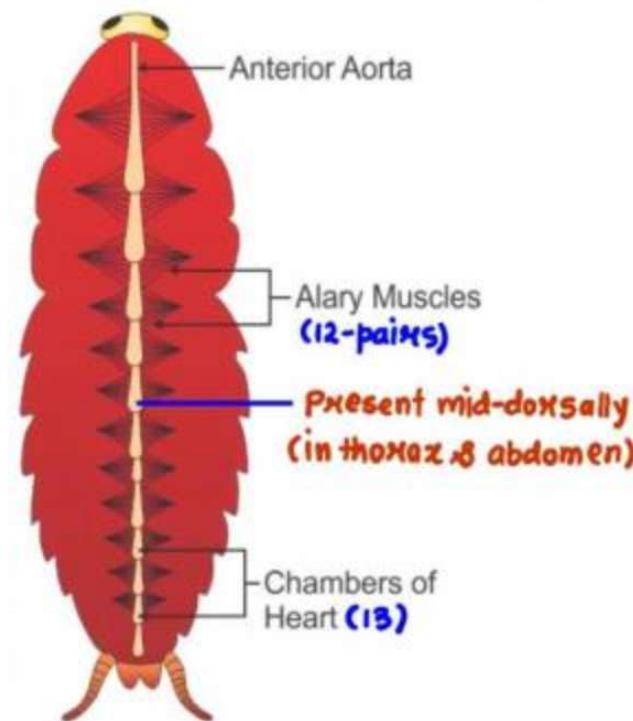


Snop: stores food; Gizzard/proventriculus has outer thick circular muscle layer and 6 inner chitinous teeth for grinding of food

Circulatory System

- open type; haemolymph flow openly in haemocoel

Plasma + haemocytes (colourless)

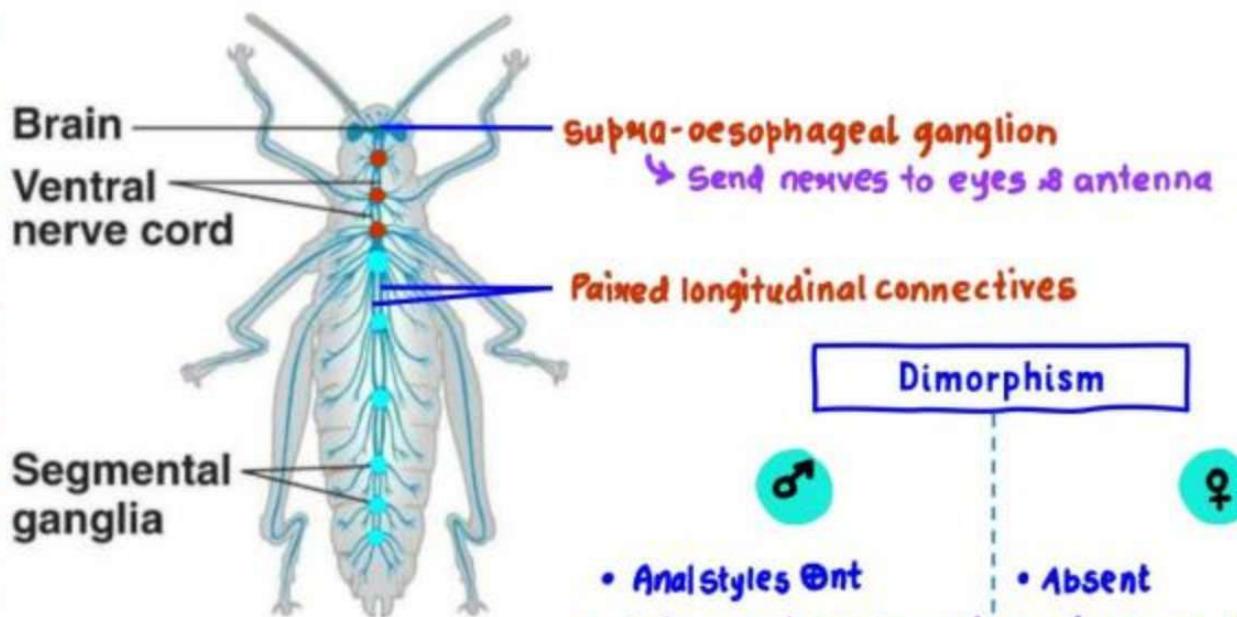


Excretion

- Mainly by Malpighian Tubules
- They are lined by ciliated & glandular cells that convert N-waste to uric acid & send it to hindgut
- ∴ Uricotelic
- Other excretory structures
 1. Fat bodies
 2. Nephrocytes
 3. Mushroom (urecose glands) - in ♂

Nervous System

- Consists of series of fused, segmentally arranged ganglia joined by paired longitudinal connectives on ventral side.
- ∴ Double, solid, ventral nerve cord
- Spread throughout body = 3 in thorax and 6 in abdomen



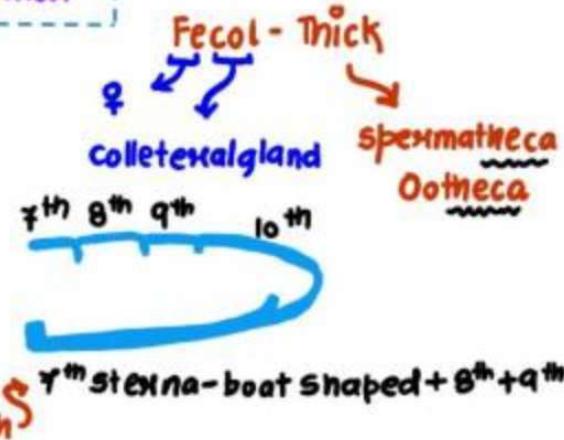
Dimorphism



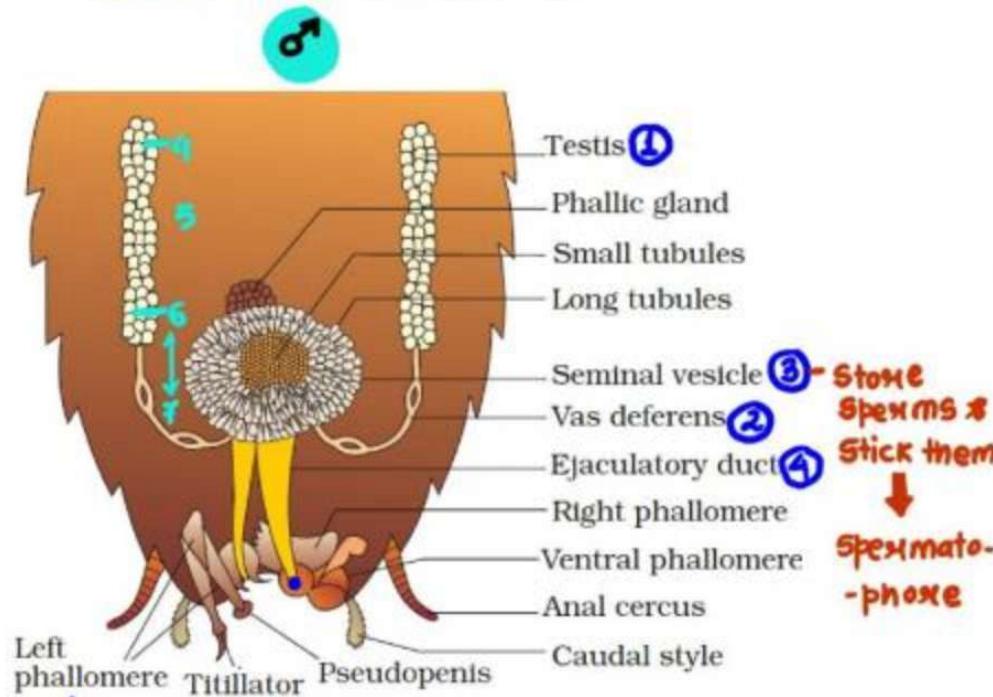
- Anal styles present
- Wings extend beyond the tip of abdomen



- Absent
- wings small



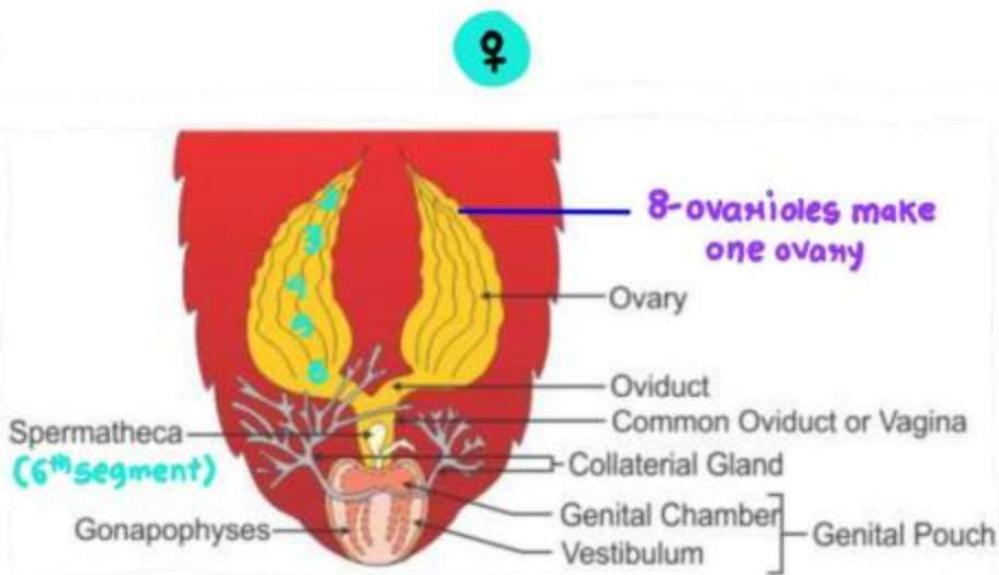
Reproductive System - dioecious/ well developed



Chitinous structures surrounding ♂-genopore

Economical Importance

- No ecological importance
- Contaminate food: spread disease



ootheca: dark reddish to black brown capsule
↳ 3/8" or 8mm → laid at regular place & contain 14-16 eggs

- Development is **Paulinometabolous**: i.e., through nymphal stages
- 13-moultings to be done
- 2nd last nymph has wing pads but only adults have wings.



QUESTION (NEET PYQ EXAM 2024)

In both sexes of cockroach, a pair of jointed filamentous structures called anal cerci are present on

- (1) 5th segment
- (2) 10th segment ✓
- (3) 8th and 9th segment
- (4) 11th segment

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2024)

Match List I with List II related to digestive system of cockroach.

| | List I | | List II |
|----|---|------|--------------------|
| A. | The structures used for storing of food | I. | Gizzard |
| B. | Ring of 6-8 blind tubules at junction of foregut and midgut. | II. | Gastric Caeca |
| C. | Ring of 100-150 yellow coloured thin filaments at junction of midgut and hindgut. | III. | Malpighian tubules |
| D. | The structures used for grinding the food. | IV. | Crop |

Choose the correct answer from the options given below:

- (1) A-IV, B-II, C-III, D-I
- (2) A-I, B-II, C-III, D-IV X
- (3) A-IV, B-III, C-II, D-I
- (4) A-III, B-II, C-IV, D-I

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2023)

Given below are two statements.

(Manipur 2023)

Statement-I: In cockroach, the forewings are transparent  and prothoracic in origin.

Statement-II: In cockroach, the hind wings are opaque, leathery and mesothoracic in origin. 

In the light of the above statements, choose the **correct** answer from the options given below;

- (1) Statement-I is correct but Statement-II is incorrect.
- (2) Statement-I is incorrect but Statement-II is correct.
- (3) Both Statement-I and Statement-II are correct.
- (4) Both Statement-I and Statement-II are incorrect. 

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2023)

The Cockroach is; (Manipur 2023)

- (1) Ammonotelic only (2) Uricotelic only
- (3) Ureotelic only (4) Ureotelic and Uricotelic

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2023)

Which of the following is characteristic feature of cockroach regarding sexual dimorphism? (2023)

- (1) Presence of anal cerci
- (2) Dark brown body colour and anal cerci
- (3) Presence of anal styles
- (4) Presence of sclerites

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2023)

In cockroach, excretion is brought about by; (2023)

- A. Phallic gland X
- B. Urecose gland
- C. Nephrocytes
- D. Fat body
- E. Collateral glands X

Choose the **correct** answer from the options given below.

- (1) B and D only
- (2) A and E only
- (3) A, B and E only
- (4) B, C and D only

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2022)

Excretion in cockroach is performed by all, except;

(2022 II)

- () Hepatic caeca
- (2) Urecose glands
- (3) Malpighian tubules
- (4) Fat body

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2022)

Tegmina in cockroach, arises from; (2022)

- (1) Prothorax and mesothorax
- (2) Prothorax
- (3) Mesothorax
- (4) Metathorax

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2021)

Which of the following characteristics is incorrect with respect to cockroach? (2021)

- (1) Hypopharynx lies within the cavity enclosed by the mouth parts.
- (2) In females, 7th-9th sterna together form a genital pouch.
- (3) 10th abdominal segment in both sexes, bears a pair of anal cerci.
- (4) A ring of gastric caeca is present at the junction of midgut and hind gut.



FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2020)

If the head of cockroach is removed, it may live for few days because;

(2020)

- (1) The cockroach does not have nervous system.
- (2) The head holds a small proportion of a nervous system while the rest is situated along the ventral part of its body.
- (3) The head holds a 1/3rd of a nervous system while the rest is situated along the dorsal part of its body.
- (4) The supra-oesophageal ganglia of the cockroach are situated in ventral part of abdomen.

FOR NOTES & DPP CHECK DESCRIPTION



QUESTION (NEET PYQ EXAM 2020)

In cockroach, identify the parts of the foregut in **correct sequence**; **(2020 Covid)**

- (1) Mouth → Crop → Pharynx → Oesophagus → Gizzard
- (2) Mouth → Gizzard → Crop → Pharynx → Oesophagus
- (3) Mouth → Pharynx → Oesophagus → Crop → Gizzard ✓
- (4) Mouth → Oesophagus → Pharynx → Crop → Gizzard

FOR NOTES & DPP CHECK DESCRIPTION

QUESTION (NEET PYQ EXAM 2020)

Match the following list with reference to cockroach and select the **correct** option.
(2020 Covid)

| List-I | | List-II | |
|--------|--------------------------------|---------|--------------------------|
| A. | Grinding of the food particles | P. | Hepatic caecae |
| B. | Secrete gastric juice | Q. | 10 th segment |
| C. | 10 pairs | R. | Proventriculus |
| D. | Anal cerci | S. | Spiracles |

- | | A | B | C | D |
|------------|------------|------------|------------|------------|
| (1) | (S) | (R) | (P) | (Q) |
| (2) | (P) | (S) | (R) | (Q) |
| (3) | (Q) | (R) | (P) | (S) |
| (4) | (R) | (P) | (S) | (Q) |

FOR NOTES & DPP CHECK DESCRIPTION



Homework



- Revise this Chapter from NCERT or [Mindmap](#)
- Participate in [DPP Battleground](#)
- Write [Tarakara or Tunik Tunik](#) in comment section once done!!!!!!
- You can give feedbacks in comments and discuss doubts too!

FOR NOTES & DPP CHECK DESCRIPTION

VIPIN SIR

JOIN MY OFFICIAL TELEGRAM CHANNEL

