Lesson - 03

Structural organisation In Animals

- Tissues are the group of similar cells that can fun perform specific function.

Animal Tissue :-

1 **Epithelial Tissue :-**

- It is found on the free surface which phases either body fluid or outside body surface
- Its main function is protection.
- It is classified into two types

i Simple Epithelial

ii Compound Epithelial

i Simple Epithelial :-

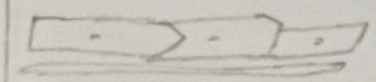
- It is classified into 5 types

~~i Squamous~~

- Simple Epithelial is composed of single layer of cells and functions as a lining ~~for~~, for body cavities, ducts and tubes.
- Ducts are tube like inside a small fibre like tubes which have been passed.

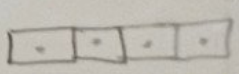
i Squamous :-

- It is also known as pavement epithilial.
- It is made of single thin layer of flattened cell with irregular boundries.



- This have been found on blood vessels, air sacs of lungs

ii Cuboidal :-

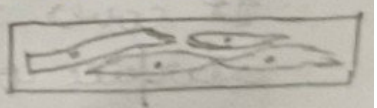
- It seems like cuboidal shape 
- It is composed of single layered made of cube like cells

- Commonly found in ducts of glands, Tubular parts of nephron in kidneys.
- Helps in secretion and absorption.
- It is found on PCT in nephrons of kidneys

iii Columnar:
- It is composed of single layer of tall and slender cells. Their nuclei are located at the base.
- These are found in lining of stomach and intestine
- main function is secretion and absorption

iv Ciliated:-
- These are columnar or cuboidal cells which bear cilia on their free surface
- Functions to move particles or mucus in a specific direction over the epithilia
- Found in hollow surfaces mainly on bronchiole and fallopian tube.

v Pseudo Stratified:-
- These are simple epithilia which appears 2 or more layer due to the presence of cells of different size which lies over the basement membrane.
- These may be ciliated or non ciliated found in inner nasal cavity trachea, brochi, etc.



- Cuboidal and columnar are again classified into 2 types & they are together called glandular Epithilial

- Granular Ephithilial are classified into

i Unicellular :-

- These are isolated granular cell they are called as goblet cells
- mucus secretion is its main function.

ii multicellular :-

- These are cluster of cells found in salivary gland.
- There are two categories endocrine and exocrine.

1 Exocrine :-

- These secreate mucus, saliva, ear wax, oil, milk.

2 Endocrine :-

- These are released through ducts or tubes

2 Endocrine :-

- These produces the products called hormones and secreated directly into the fluid bathing the gland.
- These do not have ducts.

ii Compound Ephithilial :-

- It is made up of multilayer of cells and thus has limited role in secretion and absorption
- Provide protection against chemical and mechanical stresses.
- It cover the dry surface of the skin, moist surface of buccal cavity, pharynx and pancreatic ducts.
- They are classified in 3 types of junctions.

i Tight junction

ii Adherent junctions

iii Gap junctions

i Tight

- Help to stop substances from leaking across a tissue.

ii Adherent

- Perform cementing to keep neighboring cells together.

iii Gap

- Facilitate the cells to communicate with each other by connecting the cytoplasm of adjoing cells.
- They are also called desosomes.

2 Connective tissue :-

- These are the specialized type which helps in linking and supporting other tissues or organs.
- Collagean is important protein which is seen in connective tissue.
- These provide strength, elasticity and flexibility to the cells.
- These are classified into 3 types :-

i Loose connective

ii Dense connective

iii Specialised connective

i Loose connective :-

- It has cells and fibres which are loosely arranged in a semi fluid ground substance.
- It helps for protection and support.
- It contains fibroblast, macrophages and mastcells with collagean fibres

- Which provide fibre are fibroblast
- These are WBC's that kills microbes and remover dead cells are macrophages
- Those which provide immune tolerance is mastcells.

ii Dense Connective :-

- These are compactively packed
- There are 2 types

1 Dense regular

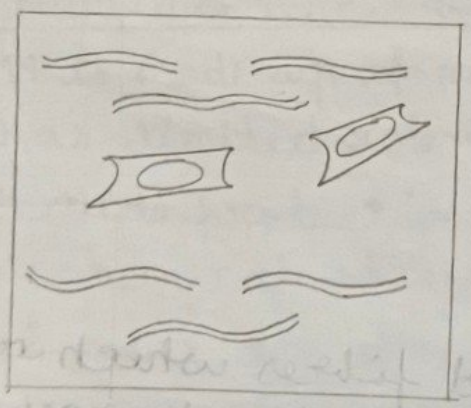
2 Dense Irregular

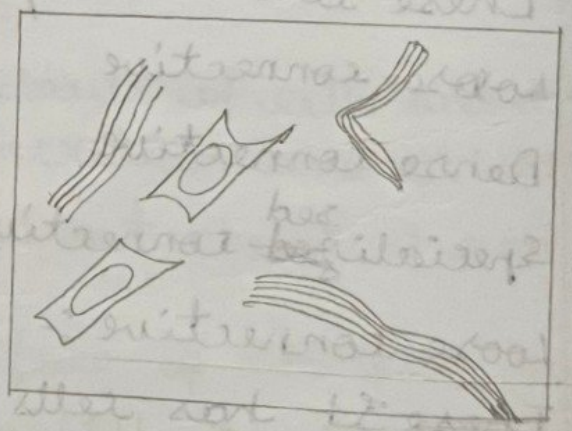
1 Dense regular :-

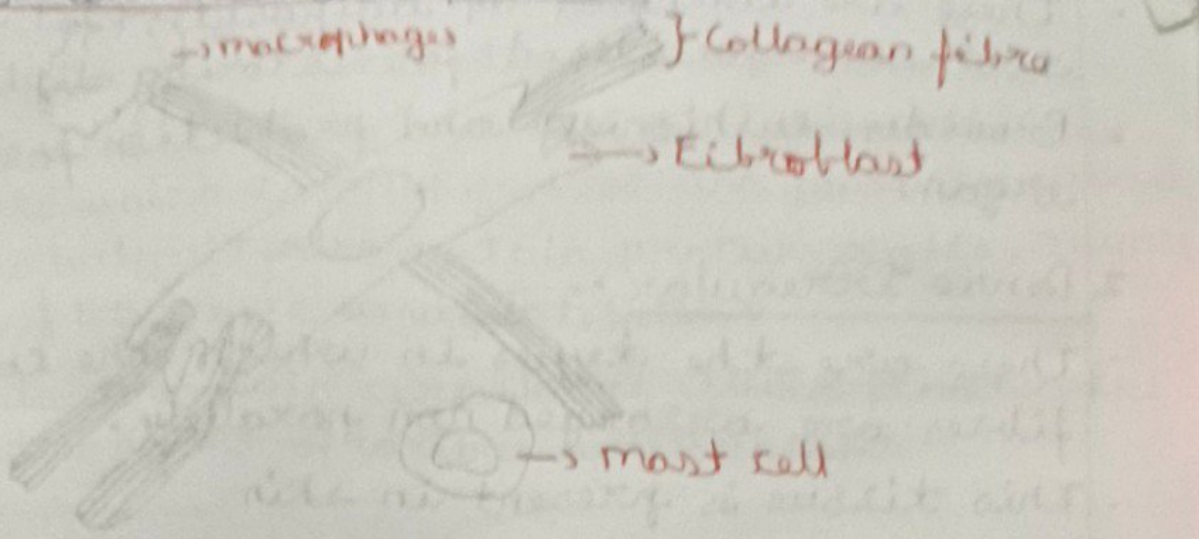
- The collagean fibres are present in rows between many parallel bundles of fibres.
- Tendons which attach skeletal muscle to bounce.
- Ligaments which attach one bone to another
- Connection between muscle to bone is tendons
- Connection between bone to bone is Ligament

2 Dense Irregular :-

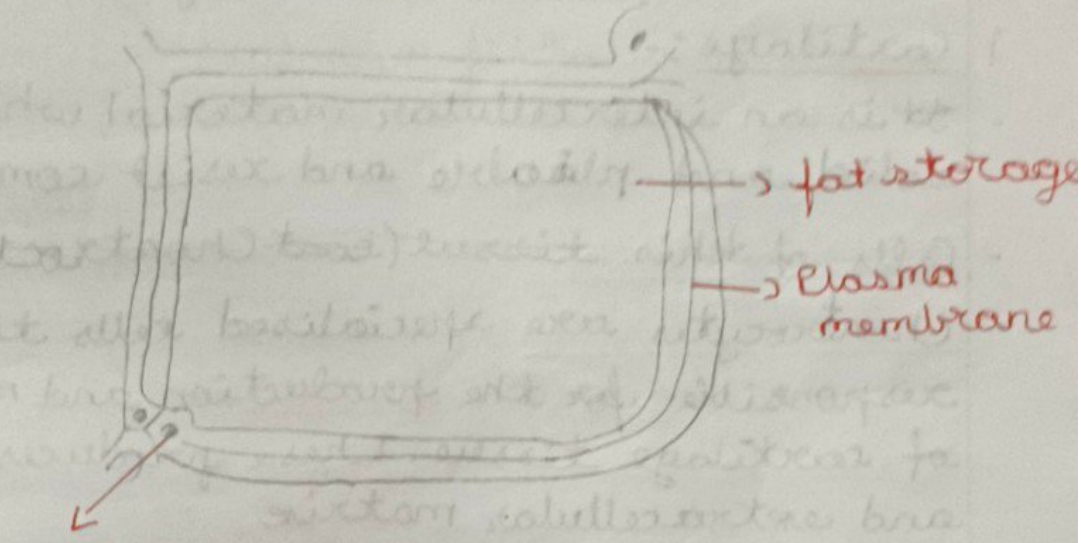
- These has fibroblast and collagean.







Areolar Tissue



Adipose Tissue

i Areolar Tissue :-

- It is a type of LCT found throughout the body.
- It provides structural support and elasticity
- It forms air filling spaces between organs and tissues. These consist cells like macrophages, mastcells, fibroblast, collagean fibre embedded in a gel like extracellular matrix.
- These also helps to form a cushion appearance and supports the organs

ii Adipose Tissue :-

- It is known as body fat which helps in storing energy in the form of fat.

- These are composed of adipocytes (fat cells) that are specialised for storing lipids.
- Provides cushioning and protection for the organ.

2 Dense Irregular :-

- These are the types in which the collagean fibres are arranged non paralley.
- This tissue is present in skin

3 Specialized Connective tissue :-

- There are divided into 3 types:-

i Cartilage :-

- It is an intercellular material which are solid and pliable and resist compression.
- ~~Cells of this tissue (Cont~~ Chontrocytes)
- Chontrocytes are specialised cells that are responsible for the production and maintanence of cartilage tissue. These produces collagean and extracellular matrix
- Cells of this tissue (Chontrocytes) are enclosed within the matrix secreted by them
- They are present in tip of nose, outer ear joints, limbs and hands between adjacent bones of the vertebral column.

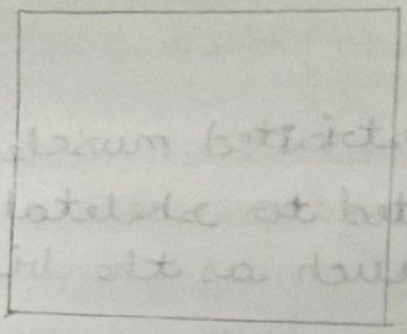
ii Bones :-

- These are hard and non pliable ground substance rich in Calcium salts and collagean fibre which give the strength.
- The main tissue that provides structural frame to the body. It support and protect softer tissues.
- They also interact with skeletal muscles attached to them to bring movements.

iii Blood :-

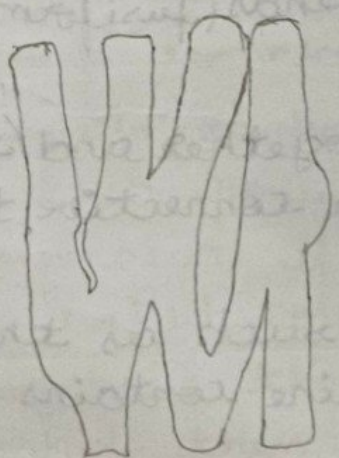
- It is a fluid connective tissue containing plasma (it is light yellow or straw coloured fluid which carries RBC, WBC and platelates around the body, it also contain proteins, salts, sugars etc) RBC, WBC and platelates.
- It is the main circulating fluid that helps in transport of various substances.

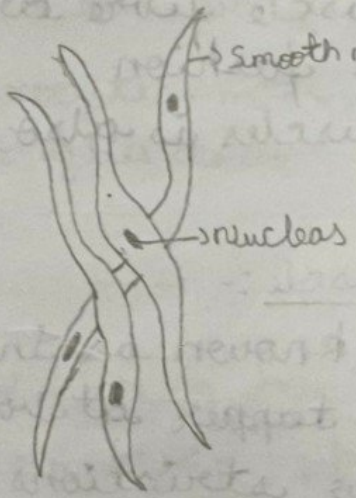
Cartilage



Bones

3 Muscle Tissue :-





8 Muscle Tissue :-

- muscle is made of many long cylindrical fibres arranged in parallel form. These fibres are composed of numerous fine fibrils called myofibrils
- Fibrils are thread like structure.
- muscle fibres contract (shorten) in response to stimulation, then relax (lengthen) and return to their uncontracted state their action moves body to edge adjust to changes in the environment and to maintain the positions of various parts of the body.
- muscle play an active role in all the movements of the body.
- There are 3 types of muscles :-

i ~~Skeletal Tissue~~ :-

i Skeletal Muscles :-

- It is also known as striated muscle.
- Tissue is ~~to~~ closely attacted to skeletal bones.
- In a typical muscle such as the bisepts, striated (striped)
- Skeletal muscle fibre are bundle together in a parallel fashion
- Skeletal muscles is also known as volunteer muscle.

ii Smooth muscle :-

- It is also known as Involunteer form muscle
- The fibres tapper at both ends (fusiform) and do not show striations.
- Cell junctions hold ~~fast~~ them together and they are bundled together in a connective tissue sheath.
- The wall of internal organs such as the blood vessels, stomach and intestine contains this type of muscle tissue

- Smooth muscles are involuntary as their functioning cannot be directly controlled

iii Cardiac Muscle Tissue :-

- It is an involuntary in function, It is a contractile tissue present only in the heart.
- Cell junctions fuse the plasma membranes of cardiac muscle cells and make them stick together.
- Cardiac muscle tissue appeared as a branched form

4 Neural Tissue :-

- Neural Tissue which act as greatest control over the body's responsiveness to changing conditions.
- Neurons are the unit of neural system. The neuroglial cells (these are known neuronal cells which supports the nervous system by providing nutrition, protection etc) constitute the rest of the neural system to protect and support neurons.
- Neuroglia make a more than ~~half~~ 1; ½ the volume of neural tissue in our body.
- Schwann, Oligodendrocytes, microglial, ependymal, Astrocytes are the glia cells

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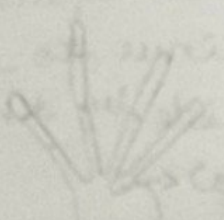
I Frog :-

- Rana, tigrina
- It live both on land and in fresh water
- Belongs to class amphibia, phyllum chordata
- They do not have constant body temperature ie, their body temperature varries with the temperature of the environment. Such animals are called cold blooded or poikilotherms.
- They have the ability to change the colour to hide them from their enemies (camouflage).

- This protective coloration is called mimicry.
- Frogs are not seen during peak summer and winter.
- During this period they take shelter in deep burrows to protect them from extreme heat and cold. This is known as summer sleep (Aestivation) and winter sleep (hibernation)

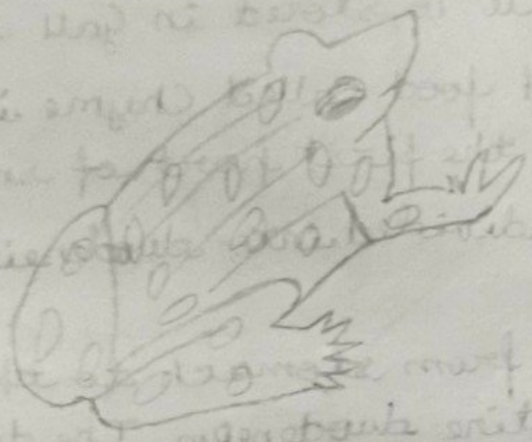
1 Morphology :-

- The skin is smooth and slippery due to the presence of mucus.
- The skin is always maintained in a moist condition. The colour of dorsal side of body is generally olive green with dark irregular spots
- The ventral side of the skin is uniformly pale yellow.
- Frog never drinks water but absorb it through the skin.
- Body of the frog is divisible into head and trunk. Neck and tail are absent
- Above the mouth a pair of nostrils is present.
- Eyes are bulged and covered by a nictitating membrane that protects them while in water
- On either side of the eyes a membranous tympanum receives sound signals.
- The forelimbs and hindlimbs help in swimming walking, leaping and burrowing.
- The hind limb end in 5 digits and they are longer and muscular whereas forelimbs that ends in 4 digits
- Feet have web digits that help in swimming.
- Frogs exhibit sexual dimorphism.
- Male frogs can be distinguished by the presence of sound producing vocal sacs and also a copulatory pad.



Forelimb of Frog

- copulatory pad help the male frog to hold femal frog tightly underneath its body during copulatory.
- on the first digit of the forelimbs which are absent in female frogs.



Frog

2 Anatomy:-

- The body cavity of frogs accomodate different organ system such as digestive, circulatory, respiratory, nervous, excretory and reproductive systems with well developed structures and functions.

1 Digestive System:-

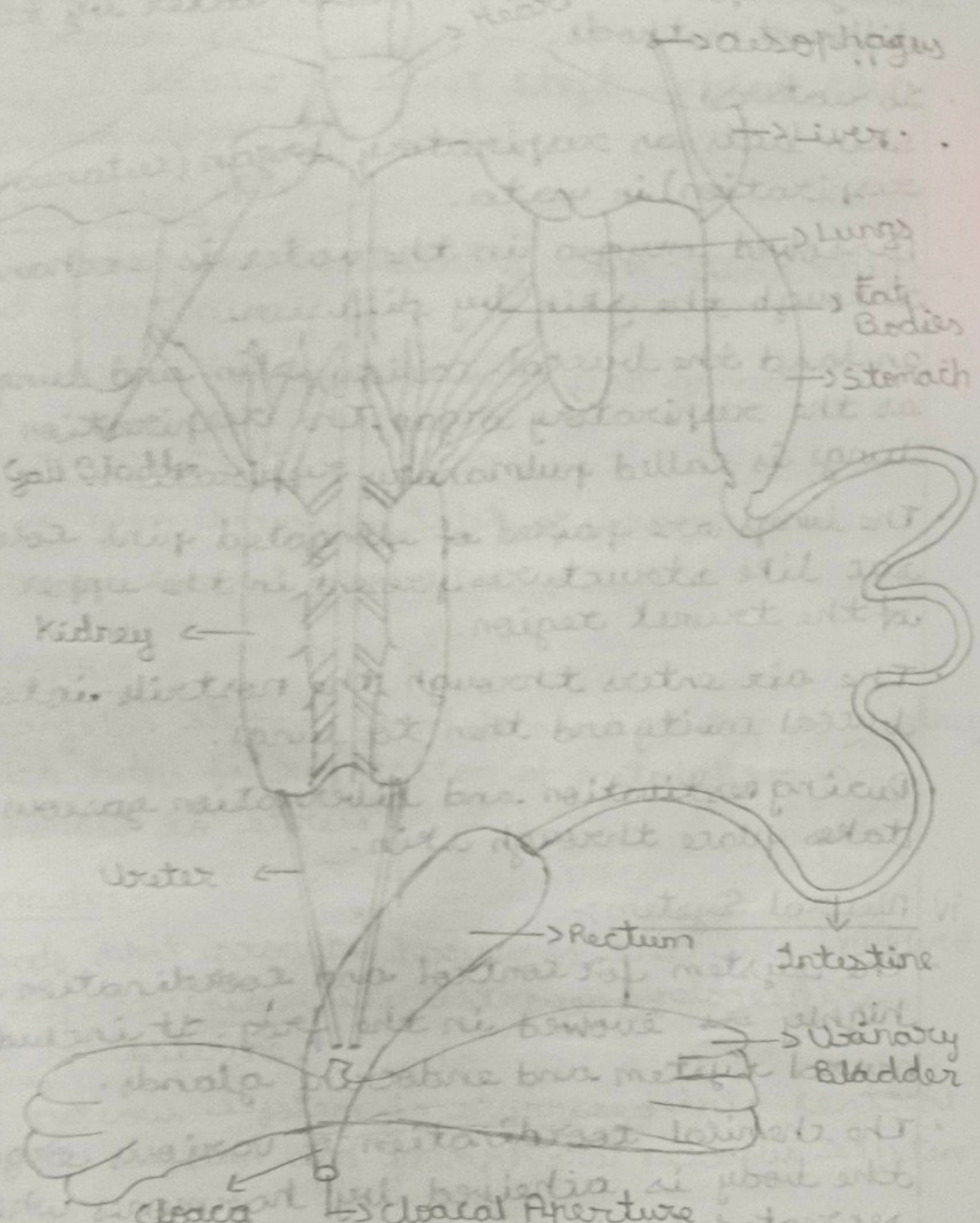
- The digestive system consists of alimentary canal and digestive glands.
- The alimentary canal is short because frogs are carnivorous and hence length of instestine is reduced.
- The mouth opens into buccal cavity that leads to oesophagus through pharynx.

- Oesophagus is a short tube ... into the stomach which in turn continue to the intestine rectum and finally open outside by the cloaca.

ii Digestive glands:-

- These are having ducts that pore pour secretion into digestive system. It includes salivary glands of digestive glands, gastric glands, pancreas, liver and intestinal glands.

- Pancreas :- A digestive gland that produces pancreatic juice containing digestive enzymes.
- Digestion of food takes place by the action of HCl and gastric juice secreated from wall of stomach
- Liver secreates bile i.e, stored in Gall bladder
- Partially digested food called Chyme is passed from stomach to the first part of small intestine
- Small intestine is divided into duodenum, jejunum and ileum.
- Chyme is passed from stomach to the first part of small intestine duodenum. The duodenum receives bile from the Gall bladder and pancreatic juices from the pancreas through a common bile duct.
- Bile emulsifies fat and pancreatic juices, digest carbohydrates and proteins.
- The final digestion takes place in the intestine where digested food is absorbed by the numerous finger like folds in the inner wall of intestine called villi and microvilli.
- The undigested solid waste moves into the rectum and passes out through cloaca



Internal Organs of Frog showing complete digestive system

iii Respiratory System :-

- Frogs respire in land and in water by two different methods.
- In water
- Skin acts as respiratory organ (cutaneous respiration) in water.
- Dissolved oxygen in the water is exchanged through the skin by diffusion.
- On land the buccal cavity, skin and lungs act as the respiratory organ. The respiration by lungs is called pulmonary respiration.
- The lungs are paired of elongated pink coloured sac like structures present in the upper part of the trunk region.
- The air enters through the nostrils into the buccal cavity and then to lungs.
- During aestivation and hibernation gaseous exchange takes place through skin.

iv Neural System :-

- The system for control and coordination is highly evolved in the frog. It includes both neural system and endocrine glands.
- The chemical coordination of various organs of the body is achieved by hormones which are secreated by the endocrine glands.
- The endocrine glands found in the frog are pituitary gland which is located below hypothalamus helps in metabolism, provides energy and growth.

i Parathyroid glands :-

- It produces parathyroid hormones which play key role in regulation of calcium ions which is located behind the

iii Thymus :-

- Responsible for the production and maturation of immune cells.
- This is located in upper chest behind the sternum above the heart.

iii Pineal body :-

- This helps in maintaining circadian rhythm and melatonin.
- Pancreatic islets, adrenals and gonads

iv Pancreatic Islets :-

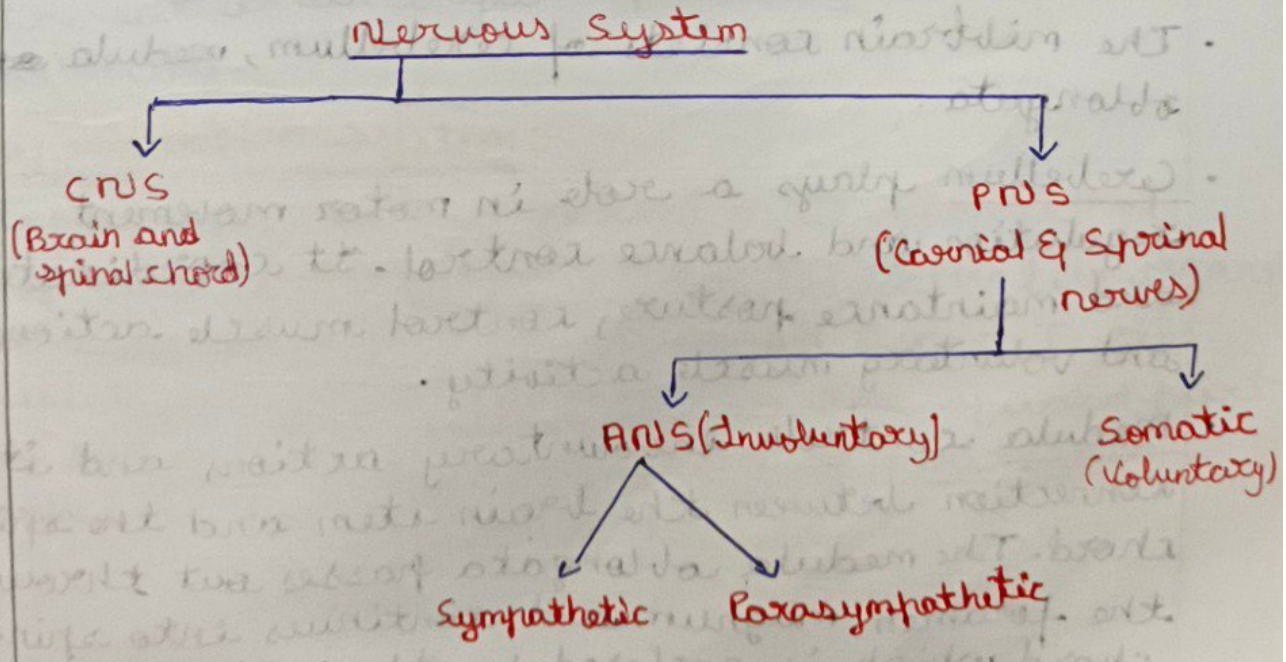
- It is also known as Islets of Langerhans.
- Helps in control blood glucose level

v Adrenals :-

- Triangular shaped gland located on top of kidneys which helps is regulation of metabolism and responses to stress

vi Gonads :-

- Glands that produce hormones that are involved in reproduction like estrogen, progesterone and testosterone.
- The nervous system is organised into central nervous system and pheriphoral nervous system.



- There are 10 pairs of cranial nerves arising from the brain. Brain is enclosed in a bony structure called brain box (Cranium).
- The Brain is divided into forbrain, midbrain and Hindbrain.

ANS :- (Atonomous nervous system)

- It regulates involuntary physiological processes including heart rate, blood pressure, respiration, digestion and sexual arousal.
- Nerves that relaxes the body after the periods of stress or danger is para sympathetic.
- It carries signals related to fight or flight responces is sympathatetic.
- Forebrain includes olfactory lobes, paired cerebral hemisphere (Division occured by a deep logitudinal tear). and unpaired diencephalon.

  Forebrain :- Telencephalon

  midbrain :- Mesencephalon

  Hindbrain :- Myelencephalon

  Interbrain :- Diencephalon (tween brain)
- Diencphalon includes thalamus and hypothalamus.
- The midbrain is characterised by a pair of optic lobes.
- The mibbrain consists of cerebellum, medula ~~and~~ oblongata.
- Cerebellum plays a role in motor movement regulation and balance control. It coordinates and maintance posture, control muscle actions and voluntary muscle activity.
- Medula controls involuntary actions and it is connection between the brain stem and the spinal chord. The medula oblongata passes out through the foramen magnum and continues into spinal chord which is enclosed in the vertebral coloumn.

- Foramen magnum is large oval shaped or circular formed openings in the base of the skull.

Sense Organs :-

- Frogs have different type of sense organs namely organs of touch (Sensory papillae - Fine small cone shape structure found on the anterior surface of the tongue)
- organs of taste (taste buds), Organs of smell (nasal epithilium), Vision (Eyes), Earing (~~Eustachian~~ Tympharum with internal ears).
- It has 10 pair of cranial nerves in fishes and amphibians
- There are 12 pairs in mammales ~~in~~ and Aves.
- out of this eyes and internal ears are well organised structure and the rest are cellular agregation around nerve endings.
- Eyes in a frog are a pair of spherical structures situated in the orbit in skull. These are simple eyes ie, possesing only one unit.
- External ears is absent in frogs and only tympharum is seen externally.
- The ear is an organ of earing as well as balancing.

Reproductive system :-

- Frogs have well organised male and female reproductive systems. Male reproductive organs consists of a pair of yellowish ovaid Testes. which are found adherent to the upward part of kidneys by a double fould of peritoneum called as mesorchium.

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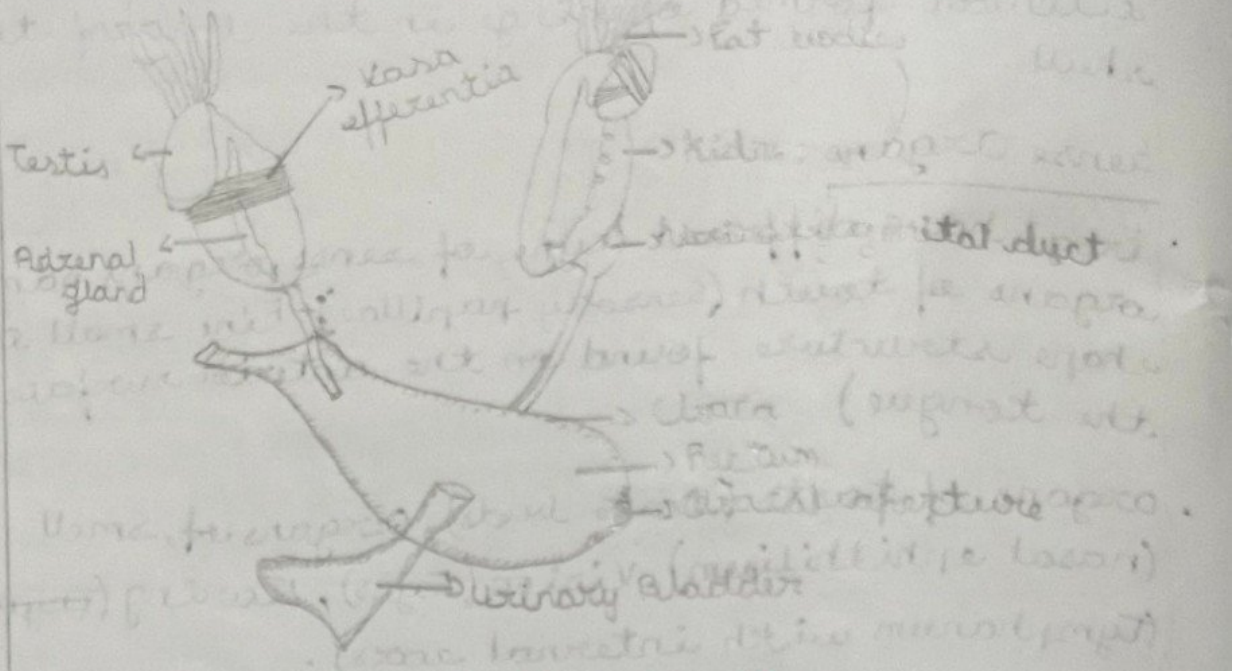
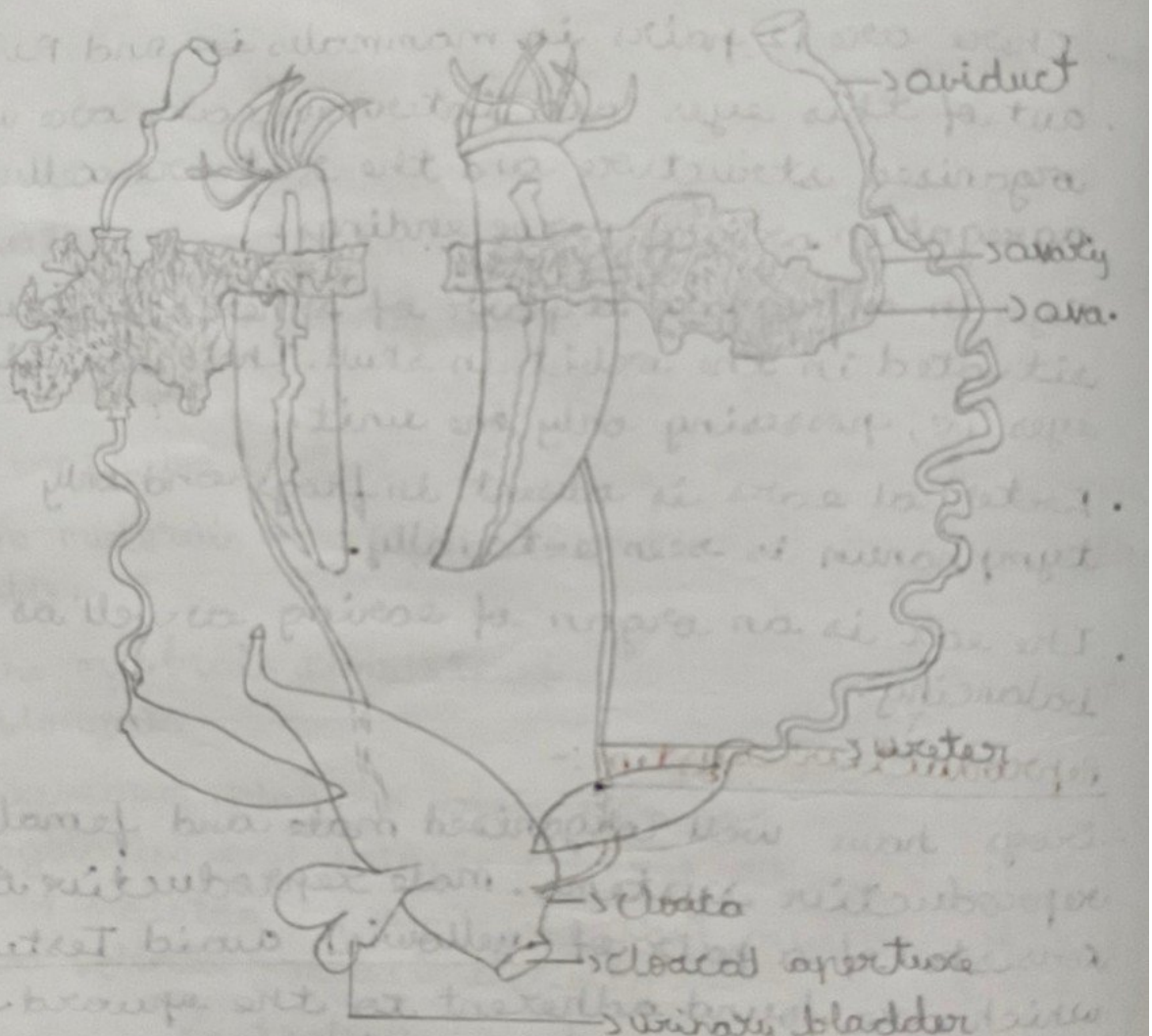


Male Reproductive System



Female Reproductive System

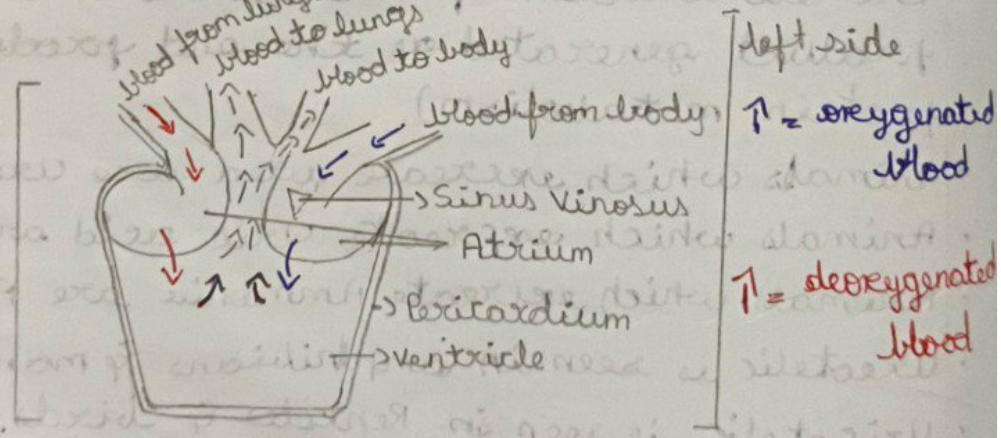
- Vasa efferentia is a convoluted tubule which helps in transport of sperms from the testis.
- Vasa efferentia are 10-12 in numbers that arises from testes. They enter the kidneys on their side and open into Bidder's Canal. Finally it communicates with urinogenital ducts that comes out of the kidneys and opens into the cloaca.
- The Cloaca is a small median chamber i.e, used to pass faecal matter, urine and sperms to the exterior.
- The female reproductive organs include a pair of ovaries. The ovaries are situated near the kidneys and there is no functional connection with kidneys.
- A pair of oviduct arising from the ovaries open into the cloaca seperately. A mature female lay 2500-3000 ova at a time. Fertilisation is external and takes place in water.
- Development involves a larval stage called tadpole. Tadpole undergoes metamorphosis to form the adult.

Excretory System:-

- The elimination of nitrogenous waste is (waste product generated as the end products of protein metabolism).
- Animals which excreate urea are Ureotelic
- Animals which excreate Uric acid are Uricotelic
- Animals which excreate Ammonia are Ammonotelic
- Ureotelic is seen in amphibians & mammals.
- Uricotelic is seen in Reptiles & birds.
- Ammonotelic is seen in fishes.
- The elimination of nitrogenous waste is carried out by a well developed excretory system.

- The excretory system consists of a pair of kidneys, ureters (filter blood and create urine as a waste product) helps to convey urine from the kidneys to the bladder), cloaca and urinary bladder. These
- There are compact dark red and bean like structure situated a little posteriorly in the body cavity on both sides of vertebral column. Each kidney is composed of several structural and functional units called Uriniferous tubules or nephrons.
- Two ureters emerge from the kidneys in the male frog. The ureters act as urinogenital duct which open & into the cloaca..
- In female ureter and oviduct open seperately to the cloaca.
- The thin walled urinary bladder is present ventral to the rectum which also opens to the cloaca.
- The frog excreates urea thus it is known as uricotelic animal
- Excretory base are carried by blood into the Kidney where it is seperated and excreted.

Circulatory System :-



Circulatory System of Frog

- The vascular system of frog is well developed.
- Frogs have a lymphatic system.
- The blood vascular system involves heart, blood vessels and blood.
- The lymphatic system consists of lymph, lymph channels and lymph nodes..
- Heart is a vascular structure situated in the upper part of the body cavity. It has 3 chambers 2 ateria and 1 ventricle and is covered by a membrane called pericardium (protective fluid filled sac that surrounds heart and help in functions).
- A triangular structure called sinus Vinosus which joins the right atrium. It receives blood through the major veins called vena cava.
- Vena cava carries deoxygenated blood
- Aorta carries oxygenated blood.
- The ventricals opens into a sac like Conus arteriosus on ventral side of the heart.
- Sinus Vinosus and conus arteriosus in the heart of the frog are present on the dorsal and ventral surface. Sinus vinosus receives blood from the body whereas conus arteriosus distribute blood to the body.
- The blood from the heart is carried to all parts of the body by the arteries (arterial system).
- The veins collect blood from different parts of body to the heart and form the venous system.
- Special venous connection between liver and intestine as well as the kidney and lower parts of the body are present in frogs.
- The former is called hepatic portal system (carries blood from the alimentary canal and its associated glands to the liver) and the latter is called renal portal system.
- The blood is composed of plasma and cells

- The blood cells are (erythrocytes) RBC, WBC (leucoplasts) and platelates
- RBC are nucleoid and contain red coloured pigment called haemoglobin
- The lymph is different from blood. It lacks few proteins and RBC's.
- The blood carries nutrients, gases and waste to the respective sites during the circulation.
- The circulation of blood is achieved by the pumping action of the muscular heart.