

NCERT NOTES

CHAPTER-7 (STRUCTURAL ORGANISATION IN ANIMALS)

(FROG)

INTRODUCTION :

Systematic Position:

Kingdom-Animalia

Phylum- chordata

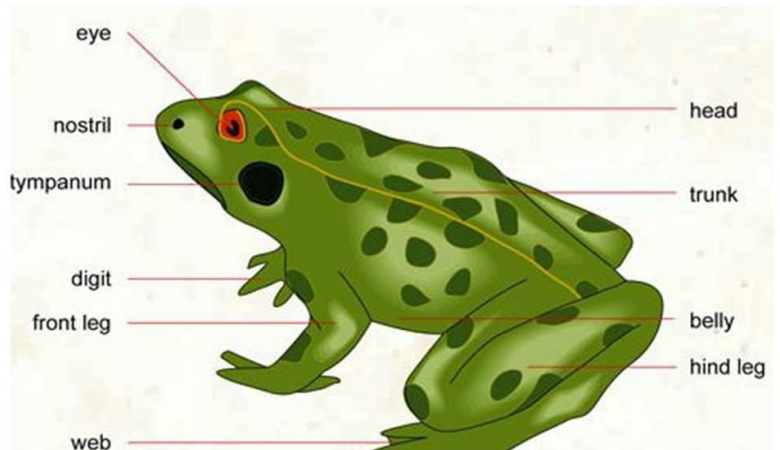
Subphylum-Vertebrata

Class- Amphibia

Order- Anura

Genus-*Rana*

Species-*tigrina* (indian species)



Habitat :-

- Frogs can live both on land and in freshwater. They do not have constant body temperature i.e., their body temperature varies with the temperature of the environment. Such animals are called **cold blooded or poikilotherms**.
- 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)** respectively.

Defence/Adaptation :- They have the ability to change the colour to hide them from their enemies (**camouflage**). This protective coloration is called **mimicry**.

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. On the ventral side the skin is uniformly pale yellow.
- **The frog never drinks water** but absorb it through the skin.
- Body of a frog is divisible into **head** and **trunk**. A 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 eyes a **membranous tympanum (ear)** receives sound signals.
- **The forelimbs** and **hind limbs** help in swimming, walking, leaping and burrowing. The hind limbs end in five digits and they are larger and muscular than fore limbs that end in four digits. Feet have webbed digits that help in swimming.
- Frogs exhibit **sexual dimorphism (male and female individuals of the same species are differentiated externally)**.

- **Male frogs** can be distinguished by the presence of sound producing **vocal sacs** and also a **copulatory pad** on the first digit of the fore limbs which are absent in female frogs.

ANATOMY:

The body cavity of frogs accommodate different organ systems such as

- digestive,
- circulatory,
- respiratory,
- nervous and
- reproductive systems with well developed structures and functions.

DIGESTIVE SYSTEM

- The digestive system consists of **alimentary canal** and **digestive glands**.
- **The alimentary canal** is short because frogs are carnivores and hence the length of intestine is reduced. The mouth opens into the buccal cavity that leads to the oesophagus through pharynx. Oesophagus is a short tube that opens into the stomach which in turn continues as the intestine, rectum and finally opens outside by the **cloaca**.
- **Liver** secretes bile that is stored in the gall bladder.
- **Pancreas**, a digestive gland produces pancreatic juice containing digestive enzymes.
- Food is captured by the bilobed tongue.
- **Digestion of food** takes place by the action of HCl and gastric juices secreted from the walls of the stomach. Partially digested food called **chyme** is passed from stomach to the first part of the small intestine, the duodenum. The duodenum receives bile from gall bladder and pancreatic juices from the pancreas through a common bile duct. Bile emulsifies fat and pancreatic juices digest carbohydrates and proteins.
- **Final digestion takes place in the intestine**. 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.

RESPIRATORY SYSTEM

- Frogs respire **on land** and **in the water** by **two different methods**.
- **In water**, skin acts as aquatic respiratory organ (**cutaneous respiration- or cutaneous gas exchange or skin breathing, is a form of respiration in which gas exchange occurs across the skin or outer integument of an organism rather than gills or lungs.**) . Dissolved oxygen in the water is exchanged through the skin by diffusion.
- **On land**, the buccal cavity, skin and lungs act as the respiratory organs.
- The respiration by **lungs** is called **pulmonary respiration**. The lungs are a pair of elongated, pink coloured sac-like structures present in the upper part of the trunk region (thorax). Air enters through the nostrils into the buccal cavity and then to lungs.

- **During aestivation and hibernation** gaseous exchange takes place through **skin**.

CIRCULATORY SYSTEM

- The vascular system of frog is well-developed **closed type** (the blood is enclosed in the vessels and the heart while circulating). Frogs have a lymphatic system also. The blood vascular system involves **heart, blood vessels and blood**. The lymphatic system consists of **lymph, lymph channels and lymph nodes**.
- **Heart** is a muscular structure situated in the upper part of the body cavity.
- It has **three chambers, two atria and one ventricle** and is covered by a membrane called **pericardium**.
- A triangular structure called **sinus venosus** joins the right atrium. It receives blood through the major veins called vena cava.
- The ventricle opens into a saclike **conus arteriosus** on the ventral side of the heart. 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** and the latter is called **renal portal system**.
- **The blood** is composed of plasma and cells. The blood cells are RBC (red blood cells) or erythrocytes, WBC (white blood cells) or leucocytes and platelets. RBC's are nucleated and contain red coloured pigment namely haemoglobin. The lymph is different from blood. It lacks few proteins and RBCs.
- The blood carries nutrients, gases and water to the respective sites during the circulation. The circulation of blood is achieved by the pumping action of the muscular heart.

NERVOUS 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 secreted by the endocrine glands. The prominent endocrine glands found in frog are pituitary, thyroid, parathyroid, thymus, pineal body, pancreatic islets, adrenals and gonads.
- **The nervous system** is organised into **a central nervous system** (brain and spinal cord), **a peripheral nervous system** (cranial and spinal nerves) and **an autonomic nervous system** (sympathetic and parasympathetic).
- There are **ten pairs of cranial nerves** arising from the brain.
- **Brain** is enclosed in a bony structure called brain box (cranium). The brain is divided into **fore-brain, mid-brain and hind-brain**.
- **Forebrain** includes olfactory lobes, paired cerebral hemispheres and unpaired diencephalon. **The midbrain** is characterised by a pair of optic lobes. **Hind-brain** consists of cerebellum and medulla oblongata. The medulla oblongata passes out

through the foramen magnum and continues into spinal cord, which is enclosed in the vertebral column.

SENSE ORGANS :

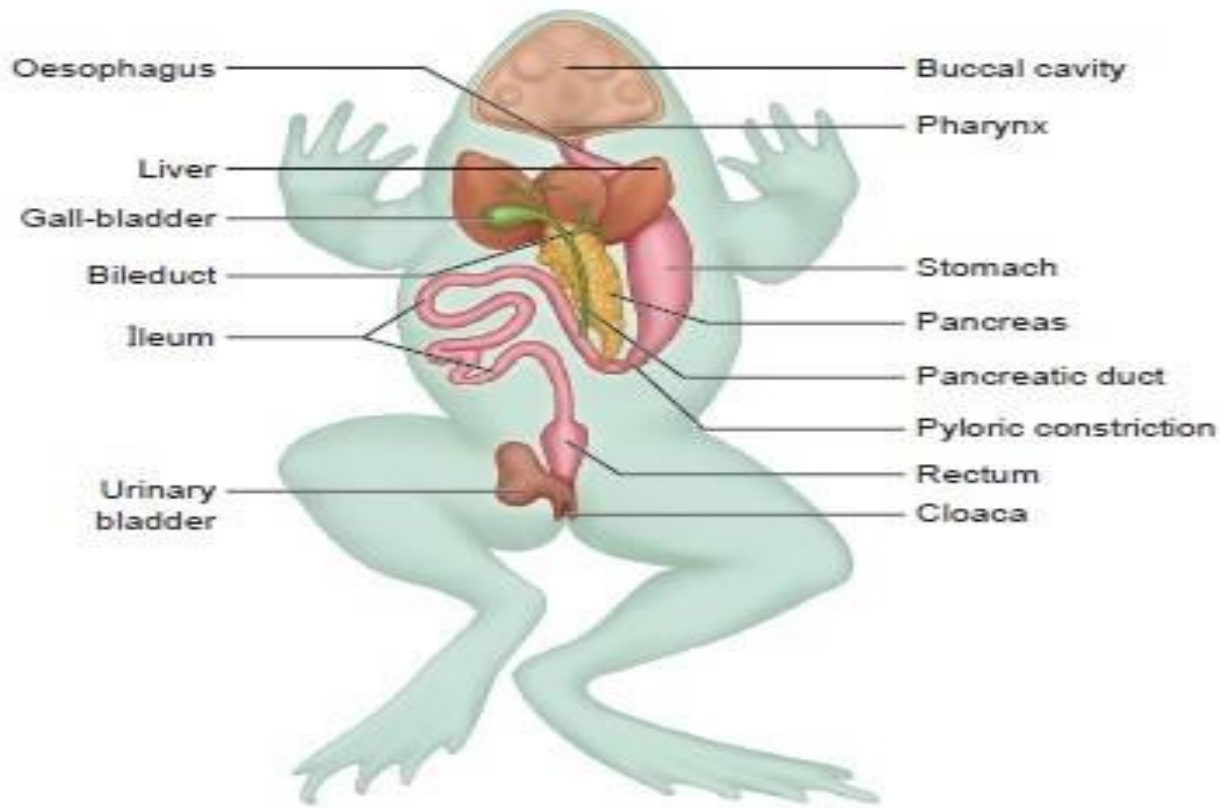
- Frog has different types of sense organs, namely **organs of touch** (sensory papillae), **taste** (taste buds), **smell** (nasal epithelium), **vision** (eyes) and **hearing** (tympanum with internal ears).
- Out of these, **eyes** and internal ears are well-organised structures and the rest are cellular aggregations around nerve endings. Eyes in a frog are a pair of spherical structures situated in the orbit in skull. These are **simple eyes** (possessing only one unit).
- **External ear** is absent in frogs and only tympanum can be seen externally. The ear is an organ of hearing as well as balancing (equilibrium).

REPRODUCTIVE SYSTEM

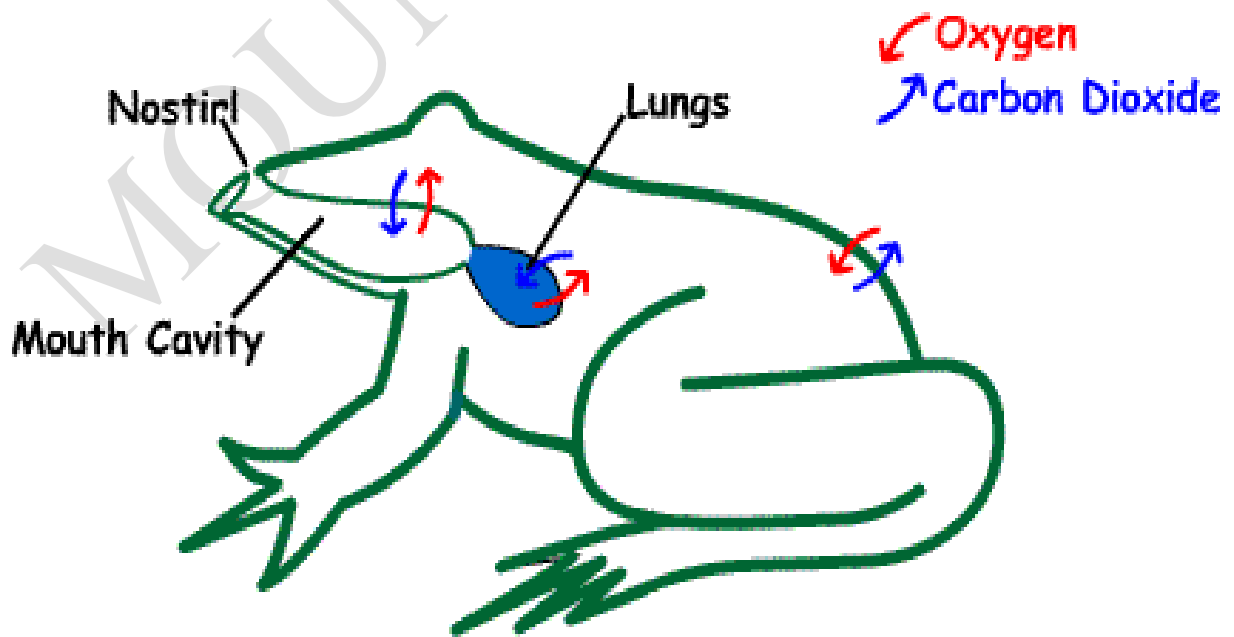
- Frogs have well organised **male and female reproductive systems**.
- **Male reproductive organs** consist of a pair of yellowish ovoid testes which are found adhered to the upper part of kidneys by a double fold of peritoneum called mesorchium. **Vasa efferentia** are 10-12 in number that arise from testes. They enter the kidneys on their side and open into **Bidder's canal**. Finally it communicates with the **urinogenital duct** that comes out of the kidneys and opens into the **cloaca**. The cloaca is a small, median chamber that is 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 kidneys and there is no functional connection with kidneys. A pair of oviduct arising from the ovaries opens into the cloaca separately. A mature female can lay 2500 to 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.

ECONOMIC IMPORTANCE

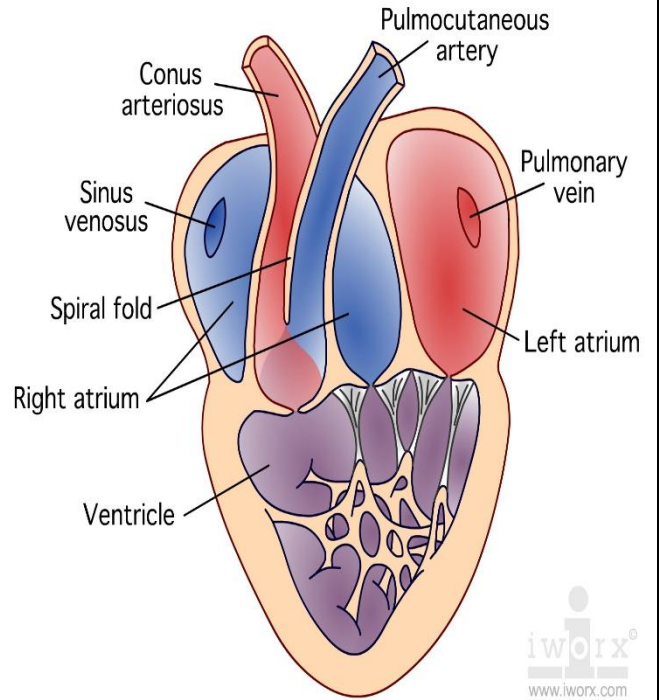
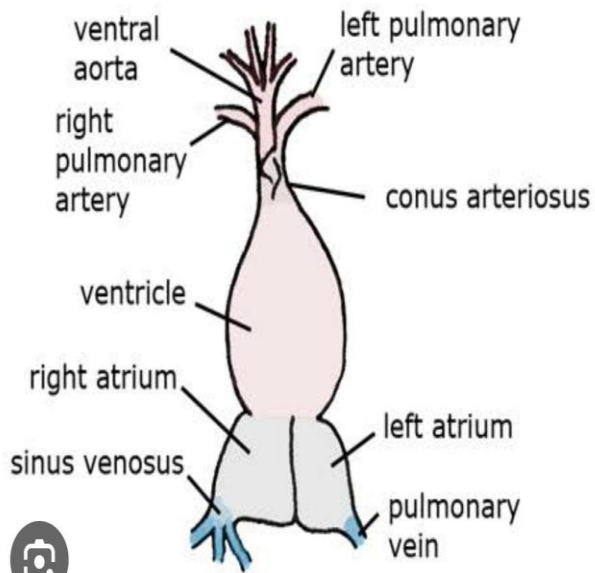
- Frogs are beneficial for mankind because they eat insects and protect the crop.
- Frogs maintain ecological balance because these serve as an important link of food chain and food web in the ecosystem.
- In some countries the muscular legs of frog are used as food by man.



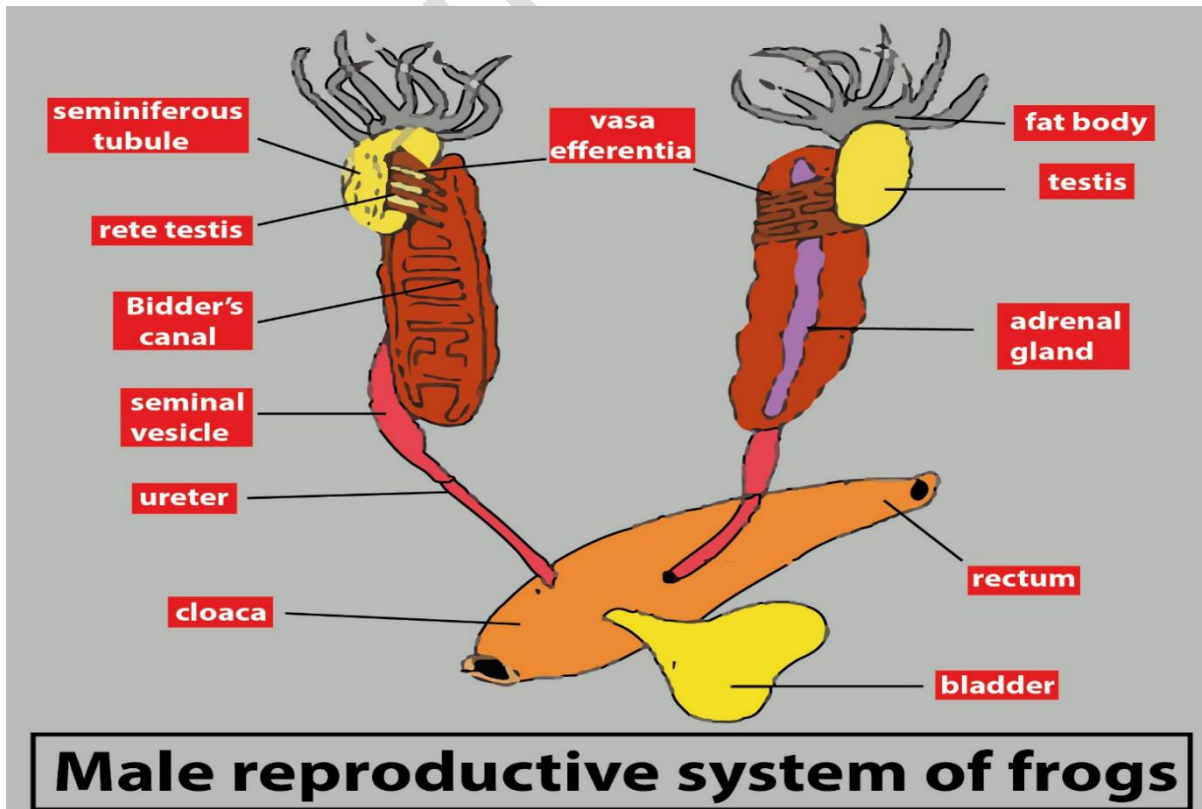
Digestive system of frog



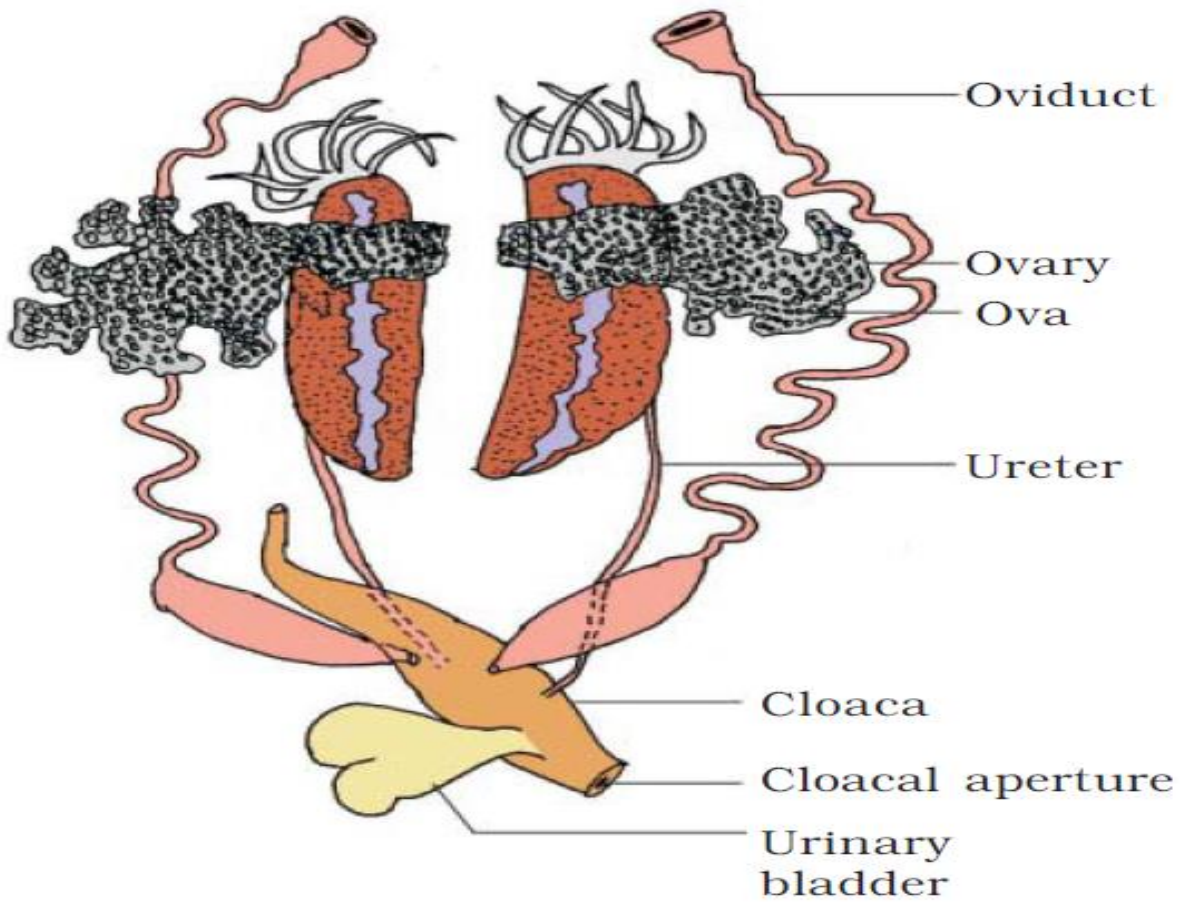
Diagrammatic view of frog heart



CIRCULATORY SYSTEM



Male reproductive system of frogs



FEMALE REPRODUCTIVE SYSTEM OF FROG