UNIT

13

Structural Organisation of Animals

1. Animalia is divided into two groups, Invertebrates and Chordates.
2. Scientific name of Indian cattle leech is ***Hirudinaria granulosa*** which belongs to Phylum Annelida.

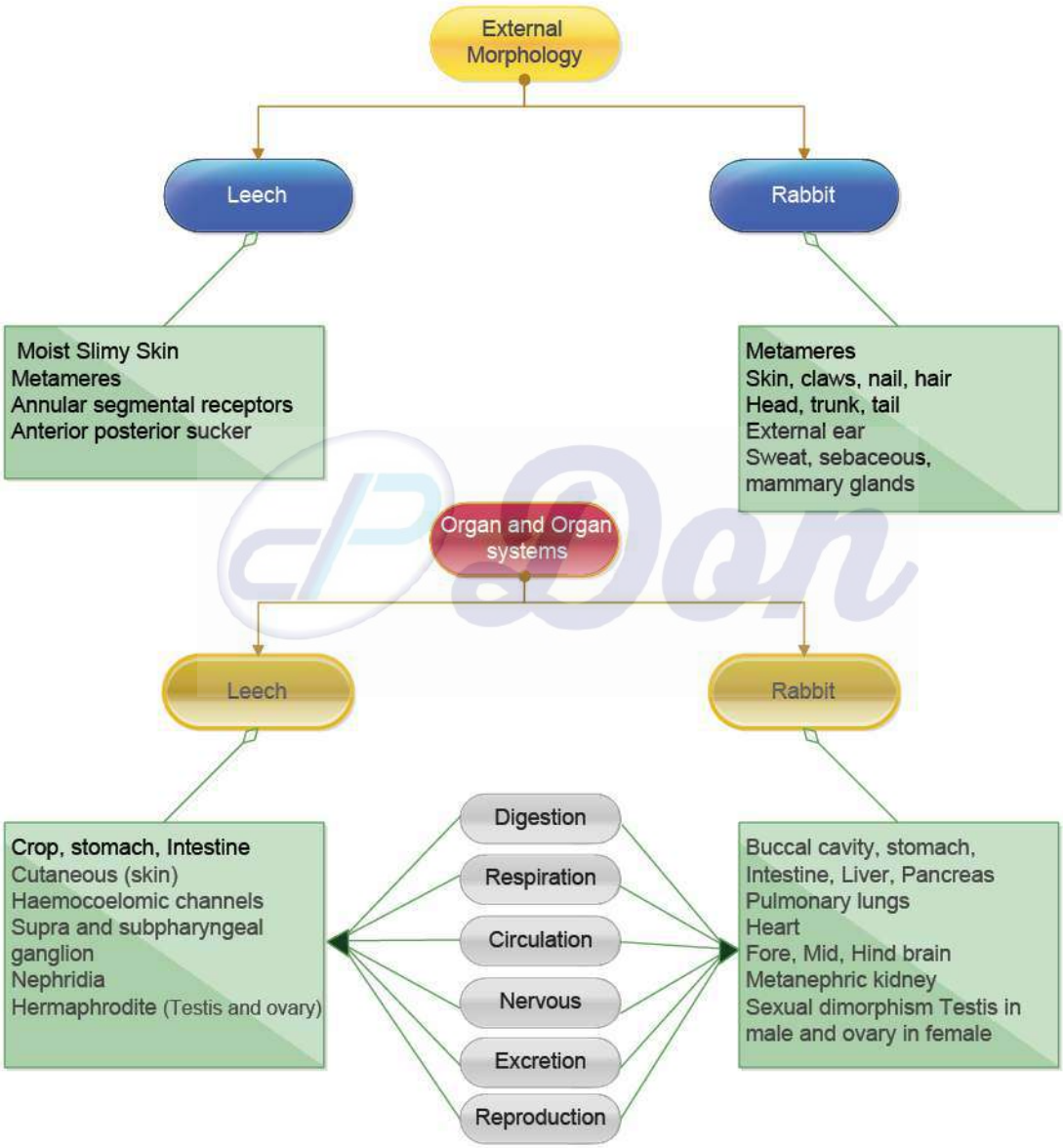
Taxonomic position

Phylum	Annelida
Class	Hirudinea
Order	Gnathobdellida
Genus	*Hirudinaria*
Species	*Granulosa*

POINTS TO REMEMBER

- Annelids are metamerically segmented worms with well developed organ systems.
- Leech is an ectoparasite and feeds on the blood of fishes, frogs, cattles and humans.
- Leech is sanguivorous (blood sucking) in nature.
- Metamerism is the segmentation of the body.
- Its body is divided into 33 segments.
- Each segment is further divided into annulus.
- Clitellum is formed in the segments 9-11, which is meant for producing cocoon.
- There are five pairs of eyes on the dorsal side of the first five segments.
- Annular receptors and segmental receptors are the two types of sensory receptors.
- Annular receptors are located in each annulus and segmental receptors are located on the first annulus of each segment.
- Leech has two suckers. Anterior or oral sucker and posterior sucker.

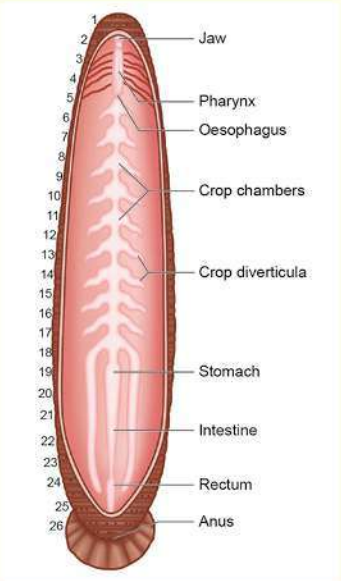
MIND MAP



- Anterior sucker occupies the five segments. Posterior sucker is formed by the fusion of last seven segments.
- Both the suckers help in attachment to the host and locomotion. Anterior sucker helps in feeding also.
- Mouth is situated in the middle of the anterior sucker.
- Anus is present in the 26th segment.
- There are 17 pairs of nephridiopores which lie ventrally on the last annulus of each segment from 6 to 22.
- There is a male genital pore between the 2nd and 3rd annuli of the 10th segment.
- There is a female genital pore between the second and third annuli of the 11th segment.
- Body of leech is divided into six regions.

Region	Segments
Cephhalic	1st – 5th
Preclitellar	6th, 7th and 8th
Clitellar	9th, 10th and 11th
Middle	12th – 22nd
Caudal	23rd – 26th
Posterior	27th – 33rd

- Body wall is divided into five layers. (i) cuticle (ii) epidermis (iii) dermis (iv) muscular layer (v) botryoidal tissue.
- Movement in leech takes place by (i) looping or crawling movement (ii) swimming movement.
- The buccal cavity has three jaws with single row of minute teeth.
- The jaws contain papillae which bear the openings of salivary glands.
- Muscular pharynx is surrounded by salivary glands. Saliva contains a protein called hirudin which prevents the blood clotting.
- Crop is the largest portion of the alimentary canal. It is divided into 10 chambers.
- The chambers of the crop has a pair of outgrowth known as caeca or diverticula.
- Crop and diverticula stores a large amount of blood which is slowly digested. Mouth → buccal cavity → pharynx → oesophagus → crop → stomach → intestine → rectum → anus.
- Digestive system of Leech



Digestive system of Leech

- Segmentation of leech

External and Internal features	Segments in which the structures are present
Body segments	33
Anterior Sucker, Mouth, Eyes	1^{st} - 5^{th}
Posterior sucker	27^{th} - 33^{rd}
Pharynx	5^{th} - 8^{th}
Crop	9^{th} - 18^{th}
Stomach	19^{th}
Intestine	10^{th} - 22^{nd}
Rectum	23^{rd} - 26^{th}
Anus	26^{th}
Nephridiopores	6^{th} - 22^{nd}
Male genital aperture	10^{th}
Female genital aperture	11^{th}

- Respiration takes place through the skin in leech.
- Respiration takes place by a process called diffusion.
- Oxygen dissolved in water diffuses through the skin into the haemocoelic fluid while carbondioxide diffuses out.
- The skin is kept moist and shiny due to the secretion of mucus.
- There are **no true blood vessels.**
- Blood vessels are replaced by haemocoelic channels. These channels are filled with coelomic fluid which contains haemoglobin.

- There are four longitudinal channels surrounding the alimentary canal. The two lateral channels serve as heart and has valves.
- The central nervous system consists of a nerve ring and a paired ventral nerve cord.
- Nerve ring is formed of **suprapharyngeal ganglion, circumpharyngeal connective** and **subpharyngeal ganglion.**
- In leech, excretion takes place through nephridia.
- There are 17 pairs of nephridia which open out by nephridiopores from 6th to 22nd segments.
- Leech is a **hermaphrodite** (Both the male and female sex organs are present in the same animal).
- Male reproductive system consists of 11 pairs of testes. One pair of testes in each segment from 12th to 22nd segments.
- From the testes arises a short duct called **vas efferens** and joins with **vasdeferens.**
- Vas deferens becomes convoluted to form epididymis or sperm vesicle. It stores **spermatozoa.**
- The epididymis leads to the **ejaculatory duct.**
- **Female reproductive system consists of ovaries,** oviducts and vagina.
- Single pair of ovary is present in the 11th segment. Each ovary is ribbon shaped. **Ova** is produced from the ovary.
- Ovary leads to the oviduct which further opens into the vagina.
- **Internal fertilization** takes place in leech.
- Cocoon is formed around 9th, 10th and 11th segment.
- Development is **direct.**
- Scientific name of common rabbit is ***Oryctolagus cuniculus*** which belongs to phylum chordate and class **Mammalia**. Rabbits are warm blooded vertebrates

Taxonomic position	
Phylum	Chordata
Sub-Phylum	Vertebrata
Class	Mammalia
Order	Lagomorpha
Genus	*Oryctolagus*
Species	*Cuniculus*

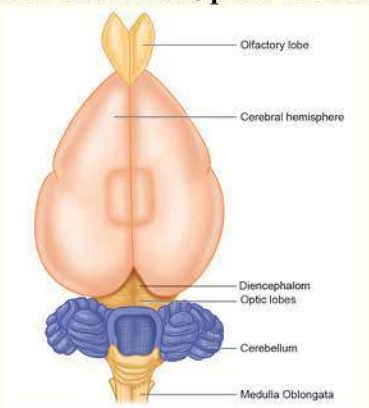
- Body of rabbit is divided into head, neck, trunk and tail. Nostrils are present.
- Whiskers called as **Vibrissae** are present on the sides of the upper lip.
- Trunk is divisible into an anterior thorax and posterior abdomen.
- In female four to five **teats** or **nipples** are present on the ventral surface.

- The trunk bears two pairs of **pentadactyl limbs.** All the digits bears claws.
- In males, penis is present and in females, a slit like vulva is present. Males have a pair of testes enclosed by **scrotal sacs.**
- Hairs, claws, nails and glands like sweat glands, sebaceous glands and mammary glands are derived from the integument (skin).
- The body of rabbit is divisible into thoracic cavity and abdominal cavity separated by diaphragm.
- **Diaphragm** is the characteristic feature of mammals. Breathing movements are brought by the movement of diaphragm.

Thoracic cavity	-	Lungs and Heart
Abdominal cavity	-	Digestive and Urinogenital system

- The digestive system of rabbit includes alimentary canal and associated digestive glands.
- Mouth → buccal cavity → Pharynx → Oesophagus → stomach → Small intestine → Large Intestine → Anus
- Large Intestine has Colon and Rectum.
- The digestive glands are salivary glands, gastric glands, liver, pancreas and intestinal glands.
- Rabbit has two sets of teeth, milk teeth and permanent teeth. Hence, called as **diphyodont** dentition.
- There are different types of teeth, hence called as the heterdont.
- The four kinds of teeth in mammals are **incisors**(I), **canines** (C), **premolars**(PM), and **molars**(M).
- Dental formula is $\left(I\frac{2}{1}, C\frac{0}{0}, PM.\frac{3}{2}, M\frac{3}{3}\right)$ in rabbit which is written as $\frac{2033}{1023}$.
- In rabbit, **canines are absent**. The gap between the incisors and premolars is called **diastema**.
- Respiration takes place by a pair of **lungs**, enclosed in the thoracic cavity. On the lower side is the diaphragm.
- Lung is enclosed by a double membranous pleura.
- External nostril → nasal passage → pharynx → glottis → Trachae.
- Larynx or voice box is present in the anterior part of the wind pipe. Vocal cord lies inside the larynx. Vibrations of vocal cord produce the sound.
- The **epiglottis** prevents the entry of food into the trachea.
- Trachea divides into branches called **bronchi**. This further divides into branches called **bronchioles**. This ends in **alveoli**.
- Heart is enclosed by a double layered membrane called **pericardium**.

- It lies inside the thoracic cavity in between the lungs.
- Heart has four chambers. Right and left auricle is separated by **interauricular septum**. Right and the left ventricle is separated by **interventricular septum.**
- Right auricle opens into the right ventricle by right auriculoventricular aperture guarded by **tricuspid valve**. Left auricle opens into the left ventricle by left auriculoventricular aperture guarded by **bicuspid valve** or mitral valve.
- The opening of the pulmonary artery and aorta are guarded by three **semilunar valves.**
- The right auricle receives deoxygenated blood through two **precaval** and one **postcaval** vein from all parts of the body.
- The left auricle receives oxygenated blood from the pulmonary veins from the lungs.
- From the right ventricle arises pulmonary trunk which carries deoxygenated blood to the lungs. Systemic aorta arises from the left ventricle and carries oxygenated blood to all parts of the body.
- Nervous system in rabbit is formed of the **central nervous system**(CNS), **peripheral nervous system**(PNS) and **autonomic nervous system**(ANS).
- CNS consists of brain and spinal cord.
- PNS is formed of 12 pairs of cranial nerves and 37 pairs of spinal nerves.
- ANS comprises **sympathetic** and **parasympathetic** nerves.
- Brain is covered by the outer duramater, inner piamater and middle arachnoid membrane.
- The brain is divided into fore brain, mid brain and hind brain.
- **Fore brain** consists of a (i) a pair of olfactory lobes, cerebral hemispheres and **diencephalon.**
- The right and the left cerebral hemispheres are connected by a nerve tissue called **corpus callosum.**
- The mid brain consists of **optic nerves.**
- Hind brain consists of the **cerebellum**, **pons varolii** and **medulla oblongata.**



Brain of Rabbit

- Kidneys are made of **nephrons**. Excretion is in the form of Urea.

- **Ureters** arise from the kidney and opens into the **urinary bladder** which leads into a thick walled muscular duct called **urethra**.
- **Sexual dimorphism** is exhibited.
- Male reproductive system consists of a pair of testes. Each testes consists of fine tubules called **seminiferous tubules**.
- These seminiferous tubules lead into a coiled tubule called epididymis, which leads into the **sperm duct** called **vas deferens**.
- There are 3 accessory glands in the male reproductive system called **prostrate gland, cowpea's gland** and **perineal gland.**
- Female reproductive system consists of a pair of ovaries. A pair of oviducts opens into the body cavity.
- The anterior part of the oviduct is the **fallopian tube**. It leads into a wider tube called the uterus.
- **Uterus** opens into the vagina.
- Union of urinary bladder and the vagina is called **urinogenital canal or vestibule**.
- Accessory glands of the female reproductive system are a pair of cowper's gland and perineal gland.

Textbook Evaluation

I. Choose the most suitable answer from the given four alternatives and write the option code and corresponding answer:

1. In leech locomotion is performed by

a) Anterior sucker b) Posterior sucker
c) Setae d) None of the above

2. The segments of leech are known as

a) Metameres (somites) b) Proglottids
c) Strobila d) All of the above

3. Pharyngeal ganglion in leech is a part of ★ ★

a) Excretory system b) Nervous system
c) Reproductive system d) Respiratory system

4. The brain of leech lies above the

a) Mouth b) Buccal cavity
c) Pharynx d) Crop

5. The body of the leech has ★ ★

a) 23 segments b) 33 segments c) 38 segments d) 30 segments

6. Mammals are _____ animals.

a) Cold blodded b) Warm blodded
c) Poikilothermic d) All the above

7. The animals which give birth to young ones are

a) Oviparous b) Viviparous c) Ovoviviparous d) All the above.

Ans:

1.	d)	None of the above	5.	b)	33 segments
2.	a)	Metameres (somites)	6.	b)	Warm blodded
3.	b)	Nervous system	7.	b)	Viviparous
4.	c)	Pharynx			

II. Fill in the blanks:

1. The posterior sucker is formed by the fusion of the _____ segments.
2. The existence of two sets of teeth in the life of an animal is called _____ dentition. ★★
3. The anterior end of leech has a lobe like structure called _____.
4. The blood sucking habit of leech is known as _____.
5. _____ separates nitrogenous waste from the blood in rabbit. ★★
6. _____ spinal nerves are present in rabbit. ★★

Ans:

1.	Seven	4.	Sanguivorous
2.	Diphyodont	5.	Nephrons
3.	Prostomium	6.	37 pairs

III. Identify whether the statements are True or False. Correct the false statement.

1. An anticoagulant present in saliva of leech is called heparin. **False**
   An anticoagulant present in saliva of leech is called hirudin.
2. The vas deferens serves to transport the ovum. **False**
   The vas deferens serves to transport the sperm.
3. The rabbit has a third eyelid called tympanic membrane which is movable. **False**
   The rabbit has a third eyelid called nictitating membrane which is movable.
4. Diastema is a gap between premolar and molar teeth is rabbit. **False**
   Diastema is a gap between incisors and premolar teeth is rabbit.
5. The cerebral hemispheres of rabbit are connected by band of nerve tissue called corpora quadrigemina. **False**
   The cerebral hemispheres of rabbit are connected by band of nerve tissue called corpus callosum.

IV. Match the columns I, II and III correctly

1.

Organs	Membranous Covering	Location
Brain	pleura	Abdominal cavity
Kidney	Capsule	Mediastinum
Heart	Meninges	Enclosed in thoracic cavity
Lungs	Pericardium	Cranial cavity

Answer:

Organs	Membranous covering	Location
Brain	Meninges	Cranial cavity
Kidney	Capsule	Abdominal cavity
Heart	Pericardium	Enclosed in thoracic cavity
Lungs	Pleura	Mediastinum

V. Answer in a sentence

1. Give the common name for *Hirudinaria granulosa*. ★ ★ ★

The Indian cattle leech.

2. How does leech respire?

Respiration takes place through **skin.**

3. Write the dental formula of rabbit. ★ ★

Dental formula is $\left(I\frac{2}{1}, C\frac{0}{0}, PM.\frac{3}{2}, M\frac{3}{3}\right)$ in rabbit which is written as $\frac{2033}{1023}$.

4. How many pairs of testes are present in leech?

There are **eleven** pairs of testes in leech.

5. How is diastema formed in rabbit? ★

Diastema is a **gap** between **incisors** and **premolar** formed due to **absence** of **canine**.

6. What organs are attached to the two bronchi?

Lungs are attached to the two bronchi.

7. Which organ acts as suction pump in leech?

Blood is sucked by muscular pharynx, which act as a suction pump.

8. What does CNS stand for?

Central Nervous System.

9. Why is the teeth of rabbit called heterodont?

There are **different** types of teeth in rabbit. Hence, called as heterodont dentition.

10. How does leech suck blood from the host? ★ ★

The leech makes a **triradiate** or 'Y' shaped incision in the skin of the host by the jaws protruded through the mouth and sucks the blood by **muscular pharynx.**

VI Short answer questions

1. Why are the rings of cartilages found in trachea of rabbit? ★

Rings of cartilages are found in the tracheal walls of rabbit to help in the free **passage of air.**

2. List out the parasitic adaptations in leech.

Leech is a parasite and sucks the blood of vertebrates and show adaptations.

- Blood is sucked by **pharynx**.
- Suckers are present in the **anterior** and **posterior** ends of the body, by which the animal attaches itself to the body of the host.
- The three jaws inside the mouth causes a triradiate or **Y shaped** wound in the skin of the host.
- Saliva contains a protein called **hirudin** which prevents the blood clotting. Thus **continuous supply** of blood is maintained.
- **Parapodia** and **setae** are completely absent.
- Blood is stored in the **crop**. It gives nourishment to the leech for several months. Hence, there is no digestive juices and enzyme.

VII. Long answer questions

1. How is the circulatory system designed in leech to compensate the heart structure?

- Circulation is brought about by **haemocoelic system.**
- There are **no true** blood vessels.
- The blood vessels are replaced by **haemocoelic channels** filled with blood like fluid. This fluid contains **haemoglobin**.
- There are **four** longitudinal channels. One lies above the alimentary canal, one below the alimentary canal and two on either side of the alimentary canal, which serve as the heart and has inner valves.

2. How does locomotion take place in leech? ★★

Locomotion takes place in leech by

- Looping or crawling movement
- Swimming movement.

Looping or crawling movement:

- This type of movement is brought about by the contraction and relaxation of muscles.
- The two suckers help in attachment during the movement.

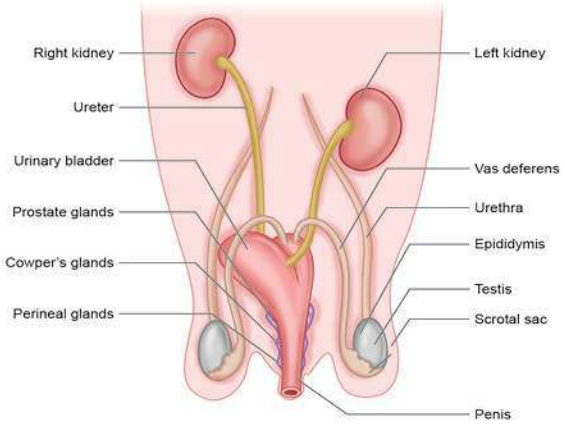
Swimming movement:

- Leeches swim very actively and perform undulating movements in water.

3. Explain the male reproductive system of rabbit with a labelled diagram. ★★★

- Male reproductive system consists of a **pair of testes,** which are **ovoid** in shape.
- Testes is enclosed by **scrotal sacs** in the abdominal cavity.
- Each testes consists of **numerous fine tubules** called seminiferous tubules.
- This network of tubules lead into the coiled tubule called epididymis which leads to the sperm duct called **vas deferens.**

- Below the urinary bladder is the **urethra**. Vas deferens **joins** the urethra.
- Urethra runs **backward** and passes into the **penis**.
- There are **three** accessory glands namely prostate gland, cowper's gland and perineal gland. Their **secretions** are involved in **reproduction**.



Male reproductive system of Rabbit

VIII. Higher Order Thinking skills (HOTS)

1. **Arjun is studying in tenth standard. He was down with fever and went to meet the doctor. As he went to the clinic he saw a patient undergoing treatment for severe leech bite. Being curious, Arjun asked the doctor why leech bite was not felt as soon as it attaches to the skin. What would have been the reply given by the doctor?**

The leech, while making incision on the skin it also injects an anaesthetic substance that prevents the host from feeling the bite.

2. **Shylesh has some pet animals at his home. He has few rabbits too, one day while feeding them he observed something different with the teeth. He asked his grandfather, why is it so? What would have been the explanation of his grandfather?**

- Canines are absent.
- Hence, a gap is seen between the incisors and premolars.
- This is called diastema.
- It helps in mastication and chewing of food in herbivorous animals.

IX. Value based questions

1. **Leeches do not have an elaborate secretion of digestive juices and enzymes. Why?**

- Slime glands are present in the body wall. Their secretion keeps the body moist and slippery so that the host can't remove it easily while it sucks blood.
- The availability of the host to the leeches is not regular. Hence, a large amount of blood is stored in the crop whenever it gets food. Digestion is also very slow .
- It may take more than a year for the complete digestion after a full meal.
- In leech the ingested blood is stored in crop chambers. It may take more than a year for the complete digestion and absorption of a full meal. So there is no need for an elaborate secretion of digestion juices and enzymes.

2. How is the digestive system of rabbit suited for herbivorous mode of feeding?

- Herbivores have a more specialised digestive system than that of a carnivore because it is more difficult to digest vegetarian than meat.
- Plant material is difficult to digest, particularly plant cellulose.
- The herbivorous animals have a longer intestine than the carnivorous animals giving more time for digestion.
- The teeth is also designed to grind the grass and plant material rather than the sharp teeth of carnivores designed to tear flesh.

Additional Questions

I. Choose the most suitable answer from the given four alternatives and write the option code and corresponding answer:

1. There are five pairs of eyes on the dorsal side of the first five segments
a) Five pairs b) Six pairs c) Eight pairs d) Nine pairs

2. Leech has ____ suckers.
a) Three b) Two c) Four d) five

3. Anus is present in the _____ segment.
a) 42nd b) 32nd c) 26th d) 27th

4. There are _____ pairs of nephridiopores. ★
a) 23 b) 32 c) 17 d) 48

5. There is a female genital pore in the _____ segment.
a) 11th b) 13th c) 12th d) 15th

6. Body wall of leech is divided in to _____ layers.
a) Six b) Five c) Three d) Two

7. Crop is divided into _____ chambers. ★
a) 10 b) 12 c) 9 d) 8

8. Respiration in leech takes place through _____.
a) Lungs b) Skin c) Mouth d) Nostrils

9. There are _____ pairs of nephridia.
a) 16 b) 18 c) 17 d) 10

10. Male reproductive system consists of _____ pairs of testes.
a) 10 b) 11 c) 12 d) one of the above

11. Single pair of ovary is present in the _____ segment. ★
a) 10th b) 12th c) 11th d) 9th

12. Heart of rabbit has _____ chambers.
a) Four b) Three c) Two d) One

13. Excretion in rabbit is in the form of _____.
a) Ammonia b) Urea c) Uric acid d) Amino acid

14. **Annelids are**
    a) Radially symmetrical b) Externally segmented
    c) Triploblastic d) Pseudocoelomate

15. **Which is not a feature of Annelid?** ★
    a) Metameric segmentation b) Nephridia
    c) Pseudocoelom d) clitellum

16. **In rabbit _____ teeth are absent**
    a) molars b) premolars c) canines d) incisors.

17. **The shape of the wound in the skin of the host caused by leech is _____**
    a) V b) X c) U d) Y

Ans:

1.	a)	Five pairs	10.	b)	11
2.	b)	Two	11.	c)	11^{th}
3.	c)	26^{th}	12.	a)	Four
4.	c)	17	13.	b)	Urea
5.	a)	11^{th}	14.	a)	Radially symmetrical
6.	b)	Five	15.	c)	Pseudocoelom
7.	a)	10	16.	c)	canines
8.	b)	Skin	17.	d)	Y
9.	c)	17			

II. Fill in the blanks:

1. Scientific name of Indian cattle leech is _____.
2. _____ is formed in the segments 9-11, meant for producing cocoon.
3. _____ and _____ receptors are the two types of sensory receptors.
4. _____ and _____ stores a large amount of blood which is slowly digested. ★★
5. In leech, excretion takes place through _____.
6. _____ stores spermatozoa in rabbit.
7. Trunk of rabbit bears two pairs of _____ limbs.
8. Breathing movements are brought by _____ which is a characteristic feature of mammal.
9. There are two sets of teeth in rabbit, milk teeth and permanent teeth called as _____ dentition. ★
10. Lung is enclosed by a double membranous _____ .
11. Heart is enclosed by a double layered membrane called _____ .
12. _____ is present between the left auricle and left ventricle.
13. In a substratum the locomotion of leech is by _____ movement.

14. Leech can suck blood _____ times more than their body weight.
15. Leeches can sense vibrations through their _____.
16. _____ are used for preparation of pharmaceutical drugs that can treat hypertension.
17. _____ is a technique of bleeding in a patient to remove toxic impurities from the body. ★★
18. Thoracic cavity and abdominal cavity is separated by transverse partition called _____.
19. _____ are the mammary glands.

Ans:

1.	Hirudinaria granulosa	11.	Pericardium
2.	Clitellum	12.	Bicuspid valve or Mitral valve
3.	Annular, segmental	13.	Looping or crawling
4.	Crop and diverticula	14.	5
5.	Nephridia	15.	Skin
6.	Epididymis or sperm vesicle	16.	Saliva of leech
7.	Pentadactyl	17.	Blood letting
8.	Diaphragm	18.	diaphragm
9.	Diphyodont	19.	Modified glands of the skin.
10.	Pleura		

III. Identify whether the statements are True or False. Correct the false statement.

1. **There is a male genital pore in the 10th segment.** — **False**
   There is a male genital pore in the 11th segment.
2. **Body of leech is divided into eight regions.** — **False**
   Body of leech is divided into six regions.
3. **The buccal cavity has two jaws.** — **False**
   The buccal cavity has three jaws.
4. **Muscular pharynx is surrounded by salivary glands.** — **True**
5. **There are no true blood vessels.** — **True**
6. **Leech has an ear in the 8th segment.** — **False**
   Leech doesn't have ears.
7. **External fertilization takes place in leech.** — **False**
   Internal fertilization takes place in leech
8. **Pulmonary artery and aorta are guarded by two semilunar valves .** — **False**
   Pulmonary artery and aorta are guarded by three semilunar valves.
9. **The left auricle receives oxygenated blood from the pulmonary veins from the lungs.** — **True**

IV. Answer in a sentence

1. **Give the scientific name for the segmentation of the body in leech.**
   Metamerism is the segmentation of the body.
2. **Name the two types of movement in leech.**
   Looping or crawling movement and swimming movement
3. **Give the scientific name of common rabbit.** ★
   Scientific name of common rabbit is ***Oryctolagus cuniculus.***
4. **Name the organs present in the thoracic cavity.**
   Heart and Lungs.
5. **Name the organ system present in the abdominal cavity.** ★
   Digestive and Urinogenital system.
6. **Which is the largest portion of the alimentary canal?**
   Crop is the largest portion of the alimentary canal.
7. **What are the whiskers in rabbit called as?**
   Whiskers in rabbit is called as **vibrissae**.
8. **What are the four kinds of teeth in mammals?**
   The four kinds of teeth in mammals are **incisors(I), canines** (C), **premolars(PM)**, and **molars(M).**
9. **Which prevents the entry of food into trachea?** ★
   Epiglottis prevents the entry of food into trachea.
10. **Name the partition which separates the right and the left auricle.**
    Interauricular septum is the partition which separates the right and the left auricle.
11. **Name the partition which seperates the right and the left ventricle.**
    Interventricular septum is the partition which seperates the right and the left ventricle.
12. **Name the valve present between the right auricle and the right ventricle.**
    Tricuspid valve is present between the right auricle and the right ventricle
13. **Which blood vessel carries the oxygenated blood from the heart to different parts of the body?**
    Systemic aorta carries the oxygenated blood from the heart to different parts of the body.
14. **Which blood vessel carries the deoxygenated blood from the heart to the lungs?**
    Pulmonary trunk carries the deoxygenated blood from the heart to the lungs.
15. **How many cranial and spinal nerves from the peripheral nervous system .** ★
    Peripheral nervous system is formed of **12 pairs** of cranial nerves and **37 pairs** of spinal nerves.
16. **Name the 3 membranes which cover the brain.**
    Brain is covered by the outer duramater, inner piamater and middle arachnoid membrane.
17. **What is the functional unit of kidney in rabbit?**
    Nephrons are the functional unit of kidney.

18. Find the number of segments in leech which are covered by a dark band of clitellum.

Clitellum is formed in the segments **9-11,** which is meant for producing cocoon.

19. The digestive system of the rabbit is made up of the following parts. Arrange them in order beginning from mouth. ★★

Mouth, Pharynx, Buccal cavity, Stomach, Oesophagus, Large intestine, small intestine, Anus.

V Short answer questions

1. Where are the suckers present in the leech and what are their functions?

Leech has two suckers.

- The **anterior sucker or oral sucker** is located in the anterior end of a leech.
- It is **ventral** in position.
- The **posterior sucker** is formed by the fusion of the last seven segments.
- The anterior sucker helps in feeding, while both the suckers help in attachment and locomotion.

2. Name the layers present in the body of leech. ★

Body wall of leech has **five layers.**

- Cuticle
- Epidermis
- Dermis
- Muscular layer
- Botryoidal tissue

3. Where are the external apertures present in the body of leech?

- **Mouth** is present in the **anterior** sucker.
- **Anus** is present in the **26th segment.**
- **Nephridiopores** are present in the last annulus of each segment from **6 to 22.**
- There is a **male** genital pore in the **10th** segment and a **female** genital pore in the **11th segment.**

4. Give an account of the nervous system of Leech.

- Central nervous system consists of leech consists of a **nerve ring** and a **paired ventral nerve cord.**
- Nerve ring is formed of suprapharyngeal ganglion, circumpharyngeal connective and subpharyngeal ganglion.
- The subpharyngeal ganglion is formed by the **fusion of four pairs** of ganglia.

5. Write the taxonomic position of Rabbit.

- Phylum – chordata
- Sub. phylum – Vertebrata
- Class – Mammalian
- Order – Lagomorpha
- Genus – Oryctolagus
- Species – Cuniculus

6. What are structures derived from the outer covering skin of Rabbit?

Hairs, claws, nails, sweat glands, sebaceous glands and mammary glands are the structures derived from outer covering skin of Rabbit.

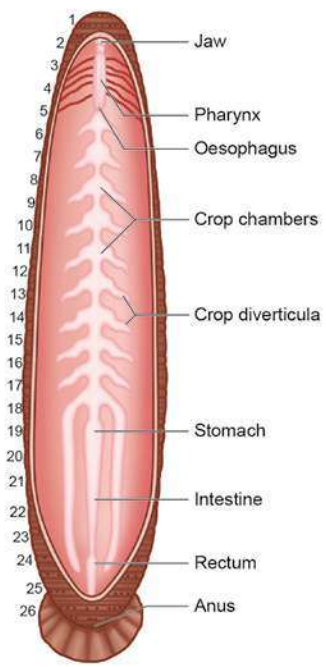
7. What are the nervous systems seen in Rabbits nervous system?

- Central nervous system (C.N.S)
  - brain
  - Spinal chord
- Peripheral nervous system (P.N.S)
  - 12 pairs of cranial nerve
  - 37 pairs of spinal nerve
- Autonomic nervous system (ANS)
  - sympathetic nerves
  - parasympathetic nerves

VI. Long answer questions

1. Give an account on the digestive system of leech.

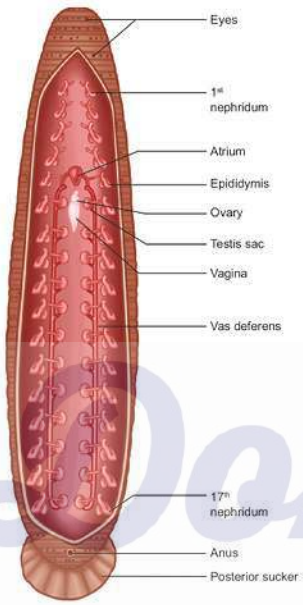
- Digestive system consists of a long alimentary canal and the digestive glands.
- Alimentary canal runs from mouth to anus.
- Mouth is a triradiate aperture which leads to the small buccal cavity.
- Buccal cavity leads to **pharynx**, which is surrounded by salivary glands.
- Secretion of saliva contains **hirudin** which prevents the coagulation of blood.
- Pharynx leads to **crop** through oesophagus.
- Crop is a largest portion of alimentary canal which has **10 chambers.**
- A pair of outgrowth arises as outgrowth from each chamber known as caeca or diverticula.
- This stores a **large amount** of blood.
- The last chamber leads to the stomach which in turn leads to the intestine.
- Intestine opens into rectum. Rectum opens into anus.



Digestive system of Leech

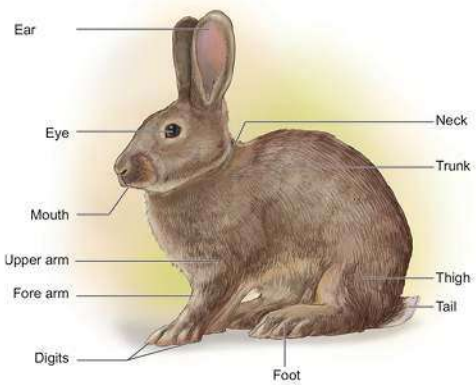
2. Describe the male reproductive system in leech.

- There are **eleven pairs** of testes, one pair in each segment form **12 to 22nd segment.**
- They are present in the testes sacs or scrotal sacs.
- Vas efferens **arises** from the testes.
- This **joins** with the vas deferens.
- The vas deferens becomes **convoluted** to form epididymis or sperm vesicle.
- The genital atrium is formed on either side of the **ejaculatory duct.**
- The genital atrium consists of two regions, prostrate glands and the penial sac.
- Penial sac contains the penis which opens through the genital pore.



Reproductive system of Leech

3. Give an account on the external morphology of rabbit.



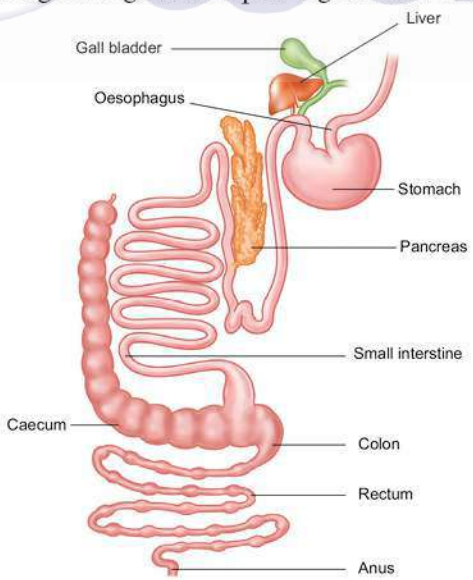
Rabbit - External features

- Body is covered with fur and is divided into head, neck, trunk and tail.
- There is a mouth and just above the mouth are two openings called nostrils.
- Hair arises from each side of the upper lip called vibrissae (whiskers).
- External ear is situated on top of the head.
- Neck connects the head and the trunk.

- Trunk is divided into anterior thorax and posterior abdomen.
- In females, teats or nipples are present on the ventral side of the body.
- Trunk bears two pairs of pentadactyl limbs.
- In females, slit like vulva is present on the ventral side and in males, penis is present on the ventral side of the anus.
- Testes is enclosed by scrotal sacs.
- Tail is short.
- Skin is the outermost covering of the body and structures like hairs, claws, nails and glands like sweat glands, sebaceous glands and mammary glands are present.

4. Describe the digestive system of rabbit.

- The digestive system includes the alimentary canal and the associated digestive glands.
- The alimentary canal consists of the mouth, buccal cavity, pharynx, oesophagus, stomach, small intestine, caecum, large intestine and anus.
- Mouth leads to the **buccal** cavity.
- Through the **pharynx** it reaches oesophagus.
- Oesophagus opens into the stomach followed by small intestine.
- Caecum is present in between the small intestine and large intestine.
- Caecum contains bacteria that helps in the digestion of cellulose.
- Large intestine has colon and rectum.
- It finally **opens** into the anus.
- The digestive glands are salivary glands, gastric glands, liver, pancreas and intestinal glands. The secretion of digestive glands help in digestion of food.

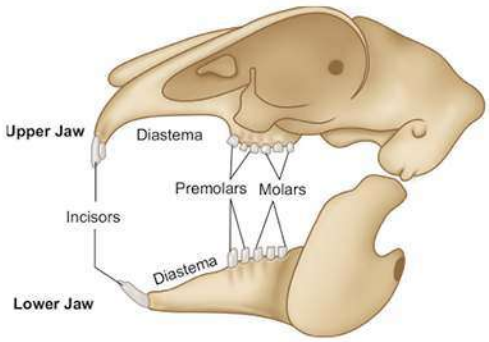


Digestive system of Rabbit

5. Give an account on the dentition of rabbit.

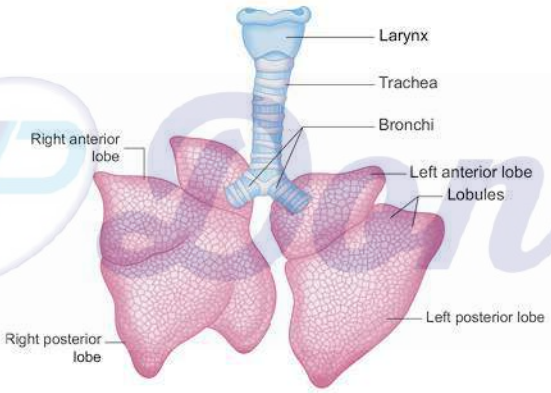
- Rabbit has **two sets** of teeth, milk teeth and permanent teeth. Hence called as diphyodont dentition.
- There are **four kinds** of teeth in mammals. Hence called as the heterodont dentition. They are Incisors(I), canines(C), premolars(PM) and molars(M).

- Dental formula of rabbit is $\left(I\frac{2}{1}, C\frac{0}{0}, PM.\frac{3}{2}, M\frac{3}{3}\right)$ which is written as $\frac{2033}{1023}$.
- Canines are absent in rabbit. The gap between the incisor and premolar is called **diastema**.
- It helps in mastication and chewing of food.



Dentition of Rabbit (Arrangement of teeth in jaws)

6. Explain the pathway of respiratory system in rabbit.



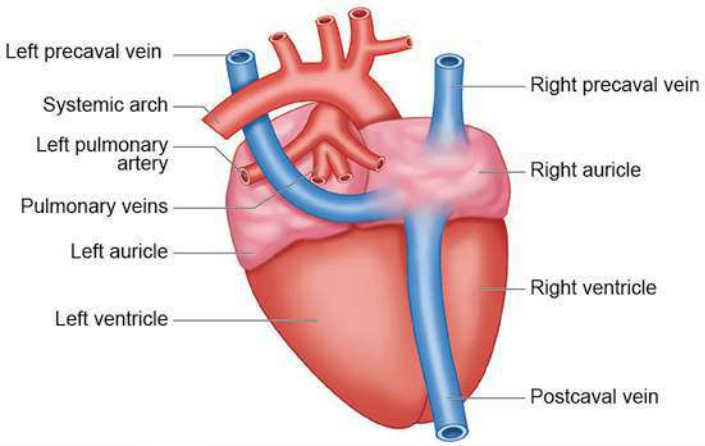
Lungs of Rabbit

- The larynx leads to the trachea or wind pipe.
- Tracheal walls are supported by cartilaginous rings which help in the free passage of air.
- Epiglottis prevents the entry of food into the trachea.
- Trachea divides into two branches called bronchi.
- Bronchi, on entering each lung, divides into many branches called bronchioles. It ends in alveoli.
- Expiration and Inspiration takes place which allows the exchange of gases.
- Inspiration is an active process and expiration is a passive process.

7. Explain the structure of heart in rabbit.

- Heart is enclosed by a double layered membrane called the pericardium.
- Heart is four chambered with two auricles and two ventricles.
- The right and left auricle and is separated by interauricular septum.
- The right and left ventricle is separated by interventricular septum.
- The right auricle opens into the right ventricle by right auriculoventricular aperture guarded by a tricuspid valve.
- The left auricle opens into the left ventricle by left auriculoventricular aperture guarded by a bicuspid valve or mitral valve.

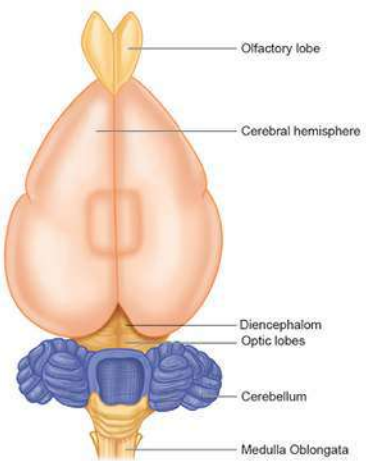
- The opening of the pulmonary artery and aorta are guarded by three semilunar valves.
- The right auricle receives deoxygenated blood through two precaval and one postcaval veins from all parts of the body.
- Left auricle receives oxygenated blood from the pulmonary veins from the lungs.
- Pulmonary trunk arises from the right ventricle carrying the deoxygenated blood to the lungs.
- Systemic aorta arises from the left ventricle supplying oxygenated to all parts of the body.



Heart of Rabbit

8. Elaborate on the internal structure of brain in rabbit.

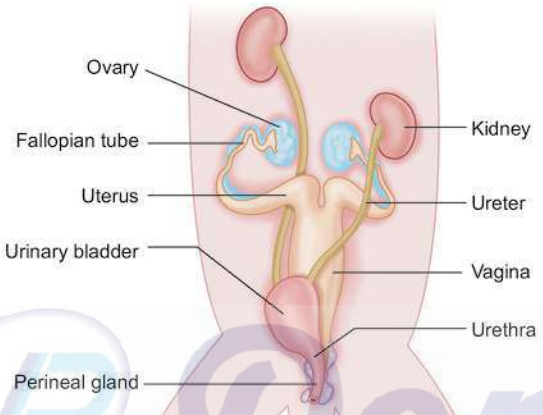
- Brain is situated in the cranial cavity.
- It is enclosed by three membranes called the outer duramater, inner piamater and the middle arachnoid membrane.
- Brain is divided into forebrain (prosencephalon), midbrain (mesencephalon) and hind brain (rhombencephalon).
- Forebrain consists of a pair of olfactory lobes, cerebral hemispheres and diencephalon.
- The right and left cerebral hemispheres are connected by a nerve tissue called corpus callosum.
- Midbrain consists of optic fibres.
- Hindbrain consists of the cerebellum, pons varolii and medulla oblongata.



Brain of Rabbit (Dorsal view)

9. Explain the female reproductive system of rabbit with a labelled diagram.

- Female reproductive system consists of a pair of ovaries. From each ovary arises the oviduct.
- Anterior part of the oviduct is the fallopian tube which leads to the uterus.
- The uterus joins together to form a median tube called vagina.
- The common tube formed by the union of urinary bladder and vagina is called urinogenital canal vestibule. This opens into the exterior called the vulva.
- A pair of cowper's gland and perineal gland are the accessory glands in the female reproductive system.



Female reproductive system of Rabbit

10. Give an account on the feeding and digestion in leech.

- The leech feeds by sucking the blood of cattle and other domestic animals.
- During feeding, it attaches itself to the host with the help of the posterior sucker and makes a triradiate or 'Y' shaped incision in the skin of the host.
- Blood is sucked by muscular pharynx and salivary amylase is poured.
- This blood is stored in the crop and diverticula.
- The blood then passes into the stomach.
- Digestion takes place in stomach by the action of proteolytic enzyme.
- The digested blood is slowly absorbed by the intestine.
- Undigested food is stored in rectum and ejected by the anus.
- Leeches prevent blood clotting by secreting a protein called hirudin.

VII. Higher Order Thinking skills (HOTS)

1. What is blood letting and where is it used?

- Blood letting is a technique of bleeding in a patient to remove toxic impurities from the body.
- Leech therapy is used as a treatment in ayurveda.

Unit Test - 13

Structural Orgnaisation of Animals

Time : 1 hr | Marks : 30

I. Choose the most suitable answer and write the code with the corresponding answer. 5 × 1 = 5

1. The segments of leech are known as
   a) Metameres (somites) b) Proglottids
   c) Strobila d) All of the above
2. The animals which give birth to young ones are
   a) Oviparous b) Viviparous c) Ovoviviparous d) All the above.
3. There are five pairs of eyes on the dorsal side of the first five segments
   a) Five pairs b) Six pairs c) Eight pairs d) Nine pairs
4. Crop is divided into _____ chambers.
   a) 10 b) 12 c) 9 d) 8
5. Excretion in rabbit is in the form of _____
   a) Ammonia b) Urea c) Uric acid d) Amino acid

II. Answer the following questions in one or two lines. 5 × 2 = 10

1. Write the dental formula of rabbit.
2. Which organ acts as suction pump in leech?
3. How does leech suck blood from the host?
4. Why are the rings of cartilages found in trachea of rabbit?
5. Give an account of the nervous system of Leech

III. Answer the following questions in brief. 2 × 4 = 8

1. Where are the suckers present in the leech and what are their functions?
2. Explain the male reproductive system of rabbit with a labelled diagram.

IV. Answer the following questions in detail. 1 × 7 = 7

1. i) How is the circulatory system designed in leech to compensate the heart structure?
   ii) Where are the external apertures present in the body of leech?