Frog

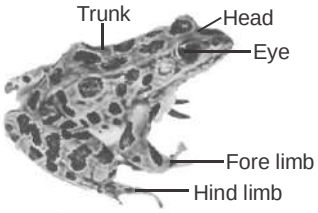
Classification

Kingdom	**=**	**Animalia**
Phylum	**=**	**Chordata**
Super Class	**=**	**Tetrapoda**
Class	**=**	**Amphibia**
Order	**=**	**Anura**
Genus	**=**	**Rana**
Species	**=**	**tigrina**

- Frogs can live both on land and in freshwater and belong to class Amphibia of phylum Chordata.
- The most common species of frog found in India is Rana tigrina.
  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.
- You might have also noticed changes in the colour of the frogs while they are in grasses and on dry land. They have the ability to change the colour to hide them from their enemies (camouflage).
- This protective coloration is called mimicry. You may also know that the 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 called as summer sleep (aestivation) and winter sleep (hibernation).

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.

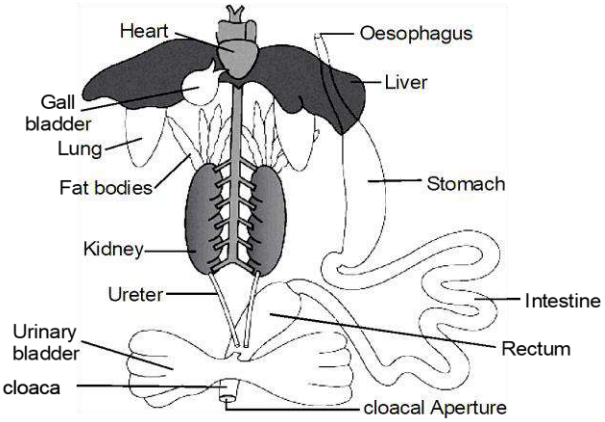


External feature of frog

- 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 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, excretory and reproductive systems with well developed structures and functions.



Diagrammatic representation of internal organs of frog showing complere digestive system

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 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)**. 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.**
- 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 sac like **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.

Excretory System

- The elimination of nitrogenous wastes is carried out by a well developed excretory system.
- The excretory system consists of a pair of kidneys, ureters, cloaca and urinary bladder.
- These are compact, dark red and bean like structures 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 frogs.
- The **ureters act as urinogenital duct** which opens into the cloaca. In females the ureters and oviduct open seperately in the cloaca.
- The thin-walled urinary bladder is present ventral to the rectum which also opens in the cloaca.
- The frog excretes urea and thus is a **ureotelic animal.**
- Excretory wastes are carried by blood into the kidney where it is separated and excreted.

Coordination System

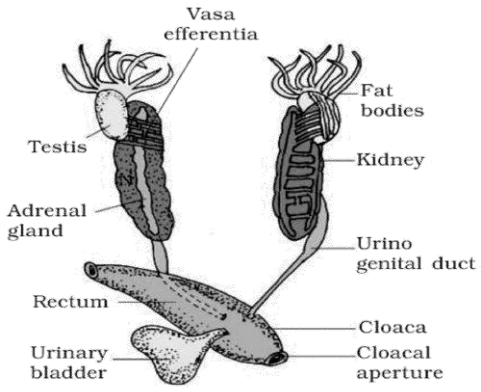
- The system for control and coordination is highly evolved in the frog. It includes both **endocrine system** and neural system.

Endocrine System

- 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.

Nervous System

- 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.



Male reproductive system

Sensory System

- 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.

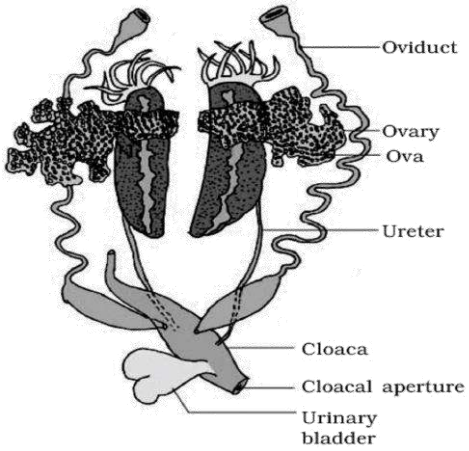


Fig : Female reproductive system

Male Reproductive System

- 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.

Female Reproductive System

- 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.

Exercise - I

1. Frog is :
(1) Herbivorous (2) Carnivorous
(3) Both (4) None

2. Oxygenated blood from lungs is carried to the heart by :
(1) Pulmonary arteries (2) Pulmonary veins
(3) Cardiac vein (4) None

3. Colour of skin of tadpole of frog is changed accordingly to that of surroundings by :
(1) Melatonin (2) Intermedin
(3) Vasopressin (4) Adrenalin

4. Frog in water is:
(1) Myopic (2) Hypermetropic
(3) Abiapic (4) None

5. In frog gastrulation is completed by :
(1) Epiboly (2) Emboly
(3) Both (4) None

6. Winter sleep is known as :
(1) Hibernation (2) Aestivation
(3) Nocturnal (4) None

7. The centre responsible for the contraction of heart of frog is :
(1) Bundle of His
(2) Sinu auricular node
(3) Chordae tendinae
(4) None

8. The function of eustacean canal in frog is :
(1) To produce sound
(2) Serve as passage of air to lungs
(3) To keep balance of air on both sides of ear drum
(4) Make the sound loud

9. Nuptial pad is present in frog :
(1) Male frog (2) Female frog
(3) Both (4) None

10. The chief nitrogenous waste material present in the urine of frog :
(1) Urea (2) Uric acid
(3) Ammonia (4) Allantois

11. Frog is :
(1) Monoecious (2) Dioceous
(3) Aceous (4) None

12. Frog is :
(1) Oviparous (2) Ovoviviparous
(3) Viviparous (4) None

13. These cells of testis secrete testosterone :
(1) Leydig cells (2) Sertoli cells
(3) Cells of bojanus (4) None

14. Mullerian duct in frog is described as :
(1) Wolfian duct (2) Ureter
(3) Urinogenital duct (4) Oviduct

15. In frog, calcified cartilage is found in :
(1) Scapula (2) Maxilla
(3) Coracoid (4) Pubis

16. Number of spinal nerves in frog :
(1) 8 pairs (2) 9 pairs
(3) 10 pairs (4) 12 pairs

17. In frog, raising of buccal floor is effected by :
(1) Petrohyals (2) Sternohyals
(3) Pectoralis major (4) Coracobrachialis

18. Tadpole larva is connecting link between :
(1) Prochordates-fishes
(2) Fishes-amphibians
(3) Invertebrates-chordates
(4) Amphibians-reptiles

19. Third and fourth ventricles are connected by :
(1) Interventicular septum
(2) Foramen Magnum
(3) Ductus botalli
(4) Ductus sylvius

20. This portal system is present in frog, but absent in rabbit :
(1) Hepatic portal systems
(2) Renal portal system
(3) Both (1) and (2)
(4) None

21. Ureter of male frog carries :
(1) Urine
(2) Ova
(3) Sperms
(4) Urine and sperms

22. Consider the following four statements (A-D) related to the common frog Rana tigrina, and select the correct option stating which ones are true(T) and which ones are false(F).

Statements :

(A) On dry land it would die due to lack of O_2 if its mouth is forcibly kept closed for a few days
(B) it has four-chambered heart
(C) On dry land it turns uricotelic from ureotelic
(D) Its life-history is carried out in pond water

	(A)	(B)	(C)	(D)
(1)	F	T	T	F
(2)	T	F	F	T
(3)	T	T	F	F
(4)	F	F	T	T

23. Spawn means :
(1) Mass of sperms (2) Mass of ova
(3) Group of muscle (4) None

24. A male frog can be distinguished from a female by :
(1) Vocal sacs
(2) Copulatory organs
(3) Both
(4) None

25. Tadpole of frog is :
(1) Aminotelic (2) Ureotelic
(3) Uricotelic (4) Amonotelic

26. During hibernation, frog respires with :
(1) Buccal lining (2) Skin
(3) Lungs (4) All

27. Animals without constant body temperature are called :
(1) Poikilotherms
(2) Endotherms
(3) Homeotherms
(4) Warm blooded animals

28. The development of sex organs in larval condition, is called :
(1) Parthenogenesis
(2) Parthenocarpy
(3) Paedogenesis
(4) Neoteny

29. Menninges in frog are :
(1) Duramater & Piamater
(2) Duramater & Arachnoid
(3) Piamater & Arachnoid
(4) None of the above

30. Bidder's canal is found in :
(1) Testes of frog
(2) Kidney of frog
(3) Kidney of Mammal
(4) None

31. Wolffian ducts represent in frog :
(1) Vas deferens (2) Oviduct
(3) Bidder's canal (4) None

32. Poison glands of toad are :
(1) Parotid glands (2) Parotoid glands
(3) Perineal glands (4) None

33. Eggs of frog are :
(1) Mesolecithal (2) Megalecithal
(3) Telolecithal (4) Both (1) and (2)

34. Cleavage in frog is :
(1) Meroblastic (2) Spiral
(3) Holoblastic (4) None

35. If skin of frog becomes dry it will :
(1) Move fast
(2) Remain immovable
(3) Move slow
(4) Die

36. Conus arteriosus is a part of the heart because :
(1) It has values
(2) It has cardiac muscles
(3) It is a part of atrium
(4) It is connected to ventricle

37. When heart of frog is cut, it will ?
(1) Not beat at all
(2) Stop beating soon after
(3) Continue to beat for a long time it kept dry
(4) Continue to beat for a long time it kept moist

38. Columella auris is a modified :
(1) Quadrate
(2) Articulate
(3) Hyomandibular
(4) Columella auris

39. How many eggs are laid by a female frog at a time ?
(1) 100 – 200 (2) 500 – 1000
(3) 2500 – 3000 (4) 5000 – 6000

40. Three chambered heart of frog is not as efficient as four-chambered human heart because :
(1) Heart muscles are not strong
(2) It does not hold enough blood
(3) Ventricle does not pump blood properly
(4) Oxygenated and deoxygenated blood mix up

41. In frog during hibernation and aestivation the metabolic rate is :
(1) Minimum
(2) Maximum
(3) Remains unchanged
(4) None of these

42. Aquatic nature of habitat is found in :
(1) Frog (2) Toad
(3) Both (4) None

43. Frog tongue is :
(1) Bifurcated at the tip
(2) Tongue is not bifurcated
(3) Tongue is trifurcated
(4) None of these

44. Frog has no neck, if it would have present then:
(1) Swimmed easily in water
(2) Swallowed its prey easily
(3) Breathed easily by floating on water surface
(4) Been unable to leap on land easily

45. Frogs are usually not found in :
(1) Lakes (2) Ponds
(3) Oceanic islands (4) None

46. The common name of Rana tigrina is :
(1) Mud puppies
(2) Indian bull frog
(3) Congo eel
(4) Cave salamender

47. Frog is :
(1) Cold blooded animal
(2) Warm blooded animal
(3) Both
(4) None of these

48. Skin of frog is characterized by the absence of:
(1) Mucous glands (2) Chromatophores
(3) Scales (4) Epidermis

49. Ureters act as urinogenital ducts in :
(1) Frog's males
(2) Human males
(3) Human females
(4) Frog's both males and females

50. The croaking voice of male frog is very loud because the :
(1) Vocal sacs acts as resonators
(2) Air is forced with great force through glottis
(3) Male frog has higher number of vocal cords which vibrate with different frequencies
(4) Vocal cord one stretched very much

51. In frog :
(1) Salivary glands are present
(2) Salivary glands are absent
(3) Both statement are correct
(4) None

52. What is correct statement in frog ?
(1) Salivary gland is present
(2) Enzymes are absent in bile juice
(3) Wall of stomach contain three layers
(4) Pyloric sphincter does not regulates the flow of food

53. Digested food is absorbed through wall of :
(1) Ileum
(2) Cardiac stomach
(3) Pyloric stomach
(4) None

54. Respiration in tadpole is :
(1) Cutaneous (2) Buccal
(3) Both (1) and (2) (4) Branchial

55. In frog cutaneous respiration is carried out by:
(1) Skin (2) Lungs
(3) Gills (4) None

56. One of the main functions of frog's skin is :
(1) Diffusion of respiratory gases
(2) Absorption of ultraviolet rays to produce vitamin D
(3) Excretion of nitrogenous wastes in the form of uric acid
(4) None

57. The venous system of frog differs from that of rabbit in the presence of :
(1) Hepatic portal system
(2) Renal portal system
(3) Three vena cavae
(4) Hepatic vein

58. Heart of frog differs from that of rabbit by the presence of :
(1) Sinus venosus
(2) Four chambers
(3) Both (1) and (2)
(4) None

59. At most favorable condition (20°C) the frog respires through :
(1) Pulmonary respiration
(2) Cutaneous respiration
(3) Buccopharyngeal respiration
(4) All of the above

60. Foramen of monro provides a passage connecting:
(1) Brain with spinal cord
(2) Lateral ventricles with third ventricle in the brain
(3) Fourth ventricle with optic ventricle
(4) Middle ear with the pharynx

61. Which of the following is absent in the heart of frog ?
(1) Sinus venosus
(2) Interauricular septum
(3) Interventricular septum
(4) Auriculo ventricular valves

62. In pulmonary respiration a frog has to swallow air because it has :
(1) No vagus nerve
(2) No diaphragm
(3) Other respiratory organs
(4) No trachea

63. The third cranial nerve of frog is :
(1) Trochlear (2) Olfactory
(3) Occulomotor (4) Optic

64. How frog takes oxygen during winter ?
(1) Only by cutaneous respiration
(2) Only by buccopharyngeal respiration
(3) Only by pulmonary respiration
(4) None of these

65. The life of RBC in frog in :
(1) 80 days (2) 100 days
(3) 120 days (4) 150 days

66. Lubrication of eyelids provides :
(1) Harderian glands
(2) Swammerdam glands
(3) Eustachian gland
(4) All the above

67. In frog, statoacoustic organ is found in :
(1) Ear (2) Eye
(3) Nose (4) Mouth

68. Nitrogenous waste material is excreted mainly as :
(1) Urea is tadpole, but as ammonia in frog
(2) Urea in frog and tadpole both
(3) Urea in frog, as ammonia in tadpole
(4) Uric acid in frog, but as urea in tadpole

69. Frogs differ from humans in possessing :
(1) thyroid as well as parathyroid
(2) paired cerebral hemispherses
(3) hepatic portal system
(4) nucleated red blood cells

70. Metamorphosis is present in :
(1) Snake (2) Frog
(3) Lizard (4) Shark

71. Which of the following statement is correct w.r.t frog ?
(1) Frog is myopic on land and hypermetropic in water
(2) Ear in frog serve as balancing organ only
(3) In females frog ureter carries both ova and urine
(4) Corpus callosum is a sheet of nerve fibers which connect the left and right cerebral hemispheres

72. consider the following statements with certain blanks and choose the option which correctly fills up these blanks :
(A) A triangular structures called sinus venosus is present on ___(i)___ side of heart.
(B) The alimentary canal is adult frog is___(ii)___ because they are ___(iii)___.
(C) Frog absorbs water through the___(iv)___.
(1) A (i) Dorsal
B (ii) Short, (iii) Carnivores
C (iv) Skin
(2) A (i) Ventral
B (ii) Short, (iii) Carnivores
C (iv) Cloaca
(3) A (i) Ventral
B (ii) Short, (iii) Carnivores
C (iv) Skin
(4) A (i) Dorsal
B (ii) Long, (iii) Herbivores
C (iv) Skin

73. Which of the following statement w.r.t. frogs is not correct ?

(1) The alimentary canal of adult frog is short because frog are carnivorous

(2) Bidder canal is urinogenital duct in both male and female frog

(3) Chromatophore present in skin of frog help in metachrosis

(4) Frog's egg is noncleidoic so on terristrial conditon can dessicate and destroyed, hence frog reproduces in water

74. Cutaneous respiration (Respiration by skin) occurs in frog :

(1) When frog is in water

(2) During hibernation

(3) During aestivation

(4) All of above

75. Right atrium of frog's heart recieves deoxyblood from :

(1) Body part directly

(2) Body parts through sinus venosus

(3) Body parts through conus arteriosus

(4) Body parts through vena cava directely

76. R.B.C. of frog is :

(1) Biconcave and nucleated

(2) Biconvex and enucleated

(3) Biconvex and nucleated

(4) Biconcave and enucleated

77. Male frog can be distinguised from female frog by :

(A) Presence of sound producing vocal sac

(B) Presence of copulatory pad on first digit of fore limb

(C) Presence of cloaca

(D) Presence of nails in digits

(1) A, D (2) A, C

(3) A, B (4) B, D

78. During extreme heat or cold frog take shelter in deep burrows to protect themselves where they respire through :

(1) Bucco-pharynx

(2) Lungs

(3) Skin

(4) Respires anaerobically

79. Frog drinks water during :

(1) Rainy time

(2) Summer time

(3) During reproduction

(4) Never, but absorbs through skin

80. Male frog can be distinguished with female by the presence of vocal sac and :

(1) Copulatory pad on the first digit of fore limb

(2) Copulatory pad on the first digit of hind limb

(3) Penis

(4) Brood pouch

81. In frog a triangular structure joins the right atrium called as :

(1) Conus arteriosus

(2) Sinus venosus

(3) Vena cava

(4) Pylangium

82. Right atrium receives blood from and ventricle carry blood to :

(1) Conus arteriosus and sinus venosus respectively

(2) Sinus venosus and conus arteriosus respectively

(3) Sinus venosus and aorta respectively

(4) Vena cava and conus arteriosus respectively

[NEET – 2017]

83. Select the **correct** route for the passage of sperms in male frogs :

(1) Testes → Vasa efferentia → Kidney → Seminal Vesicle → Urinogenital duct → Cloaca

(2) Testes → Vasa efferentia → Bidder's canal → Ureter → Cloaca

(3) Testes → Vasa efferentia → Kidney → Bidder's canal → Urinogenital duct → Cloaca

(4) Testes → Bidder's canal → Kidney → Vasa efferentia → Urinogenital duct → Cloaca

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

Select the best option from the following statements.

(a) Frog is a poikilotherm.

(b) Frog does not have any coronary circulation.

(c) Heart is "myogenic" in nature.

(d) Heart is autoexcitable

Options :

(1) Only (d) (2) (a) and (d)

(3) (c) and (d) (4) Only (c)

[NEET – 2022]

85. Tegmina in cockroach, arises from:

(1) Prothorax

(2) Mesothorax

(3) Metathorax

(4) Prothorax and Mesothorax

ANSWER-KEY

Que.	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**
Ans.	2	2	1	2	3	1	2	3	1	1	2	1	1	4	4	3	1	2	4	2	4	2	2	3	4
Que.	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**	**41**	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**
Ans.	2	1	3	1	2	1	2	1	3	4	2	4	3	3	4	1	1	1	4	3	2	1	3	1	1
Que.	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**	**61**	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**
Ans.	2	2	1	4	1	1	2	3	3	2	3	2	3	1	2	1	1	3	4	2	1	1	2	4	2
Que.	**76**	**77**	**78**	**79**	**80**	**81**	**82**	**83**	**84**	**85**															
Ans.	3	3	3	4	1	2	2	3	3	2															