

# UNIT - I

## PHYLUM : CHORDATA

### Synopsis :

#### Introduction

- The animals of phylum chordata exhibit – **diversity in form, physiology and habit**
- The largest deuterostomeate and enterocoelomate phylum is – **phylum chordata**
- The name chordata is derived from the Greek word. **chorde – string, ata – bearing.**  
The largest animal *Balaenoptera musculus* (blue whale) is a chordate, belonging to the class mammalia.
- In Hemichordata stomochord or buccal diverticulum is present.
- Stomochord resembles notochord but it is not homologous to notochord
- Hemichordata members are closely related to Echinoderms and chordates.

#### General characters of chordata

The four fundamental characters of chordates –

- 1) Notochord
- 2) Nerve Cord
- 3) Pharyngeal gill slits
- 4) Postanal tail

#### 1) Notochord or chorda dorsalis :

- The stiff, elastic supporting rod like structure present on the mid dorsal side is – **Notochord**
- Notochord is derived from – **chorda mesoderm**
- Notochord is made up of **a core of vacuolated cells**
- The outer covering of notochord is formed of – **elastic membrane**
- The inner covering of notochord is formed of – **fibrous sheath**
- The notochord is persistent in – **Amphioxus**
- The notochord is seen in embryonic stage in – **higher vertebrates**
- In the higher vertebrates the notochord in the adult stage is – **replaced partly or wholly by vertebral column**
- A small core of gel like material with in each intervertebral discs of adult mammals are called – **nuclei pulposi**

#### 2) Nerve cord :

- In chordates the nerve cord is **single– dorsal, tubular fluid filled and non ganglionated**
- Nerve cord is located – dorsal to the notochord
- Nerve cord is derived from **neural– ectoderm**
- In vertebrates the nerve cord is differentiated into

– **an anterior brain and a posterior spinal cord**

- The nerve cord controls and co – ordiates the body activities
  - Nerve cord is degenerated in - **Adult urochordates**
  - Nerve cord of non-chordates is - **Ventral, double solid and ganglionated**
- #### 3) Pharyngeal gill slits or Branchial clefts :
- The pharyngeal wall is perforated by gill slits in – **aquatic lower chordates**
  - The gillslits are meant for – **the exit of water from pharyngeal cavity**
  - The gill slits are persistent in – **protochordates, Fishes and some amphibians**
- In protochordates, gill slits primarily serve for – **filter feeding**
- They are functional in – **amphibian larvae**

- They are non - functional and vestigial in – **terrestrial vertebrates**
- In the terrestrial vertebrates, the gill slits are – **-confined to embryonic stage only.**
- The gill slits are developed as ectoderm invagination and their fusion with the **corresponding evagination from the endoderm of pharyngeal wall**

#### 4) Postanal tail

- The posterior prolongation of the body extending beyond the anus or cloaca – **tail**
- Tail has no coelom and viscera, but has muscles, nerve cord & notochord
- In chordates the tail is – **post anal**

#### Other chordate characters :

- Chordates are – **bilaterally symmetrical and show cephalization**
- Metamerism in triploblastic chordates is exhibited by – **musculature, arrangement of vertebrae, spinal nerves, blood vessels and ribs.**
- The segmentation is – **internal**
- Type of coelom is – **enterocoel**
- Endoskeleton is made up of – **bone or cartilage**
- Heart is **ventral and myogenic**
- Blood containing amino – acids glucose etc is collected from alimentary canal – **by hepatic portal vein**
- Based on the development of blastopore into anus – the chordates are – **said to be deuterostomeates**

- Cleavage is – **radial and indeterminate**

### **Ancestry of Chordates :**

- As per the geological records the chordates originated – **prior to cambrian period**

### **I. Echinoderm Ancestry :**

- Chordates might have evolved from free swimming auricularia larvae of Echinoderms by neoteny was stated by – **Garstang**
- In Auricularia adoral band of cilia help in feeding
- In auricularia larva circum oral band of cilia is helpful in locomotion.
- In Auricularia circum oral band of cilia and nervetract together forms **dorsal nerve cord**.
- In auricularia larva adoral band of cilia forms **endostyle**.
- Auricularia larva evolved into chordate by - **Neoteny**

### **II. Common Ancestry for Deuterostomes:**

- Proposed by Romer, Berrill, Barrington.
- According to them Echinoderms, Pterobranchs, Hemichordates and chordates show common ancestry.
- Radial and determinate cleavage
- Deuterostomeate, enterocoelom and Proteins.
- Muscle phosphagen in invertebrates is – **arginine phosphate**
- Both creatine phosphate and arginine phosphate are present in – **Hemichordates and Echinoderms**
- Bipinnaria larva of certain echinoderms is similar to tornaria larva of hemichordates.
- According to Hyman, the above all three groups of animals might have a common ancestor probably an arm feeder ancestor .`

### **II. Urochordate ancestry of vertebrates :**

- Urochordate ancestry of vertebrates is advocated by – **Garstang (1928)**
- And later elaborated by – **N. J. Berrill (1955) & Romer (1959)**

#### **According to them :**

- The adult ascidians reflect the primitive filter feeding condition of chordates
- The tadpole larva of ascidians failed to metamorphose into adult but produced paedomorphic adult.
- Paedomorphosis allowed chordate characters of larval tunicates to be passed on to succeeding generations of adult animals.

#### **Out line classification :**

- **Sub phylum – UROCHORDATA (Uro = Tail, Chorda = notochord, ata = bearing)**

#### **General Characters :**

- ✓ Sedentary or pelagic & planktonic marine animals
- ✓ Usually the adult body is – **degenerated**

- ✓ Around the body is a test made up of “**tunicin**”
- ✓ Tunicin is similar to – cellulose
- ✓ Hence this subphylum is also referred to as “Tunicata”
- ✓ Pharynx is – well developed and possess many gill slits
- ✓ On the ventral side of pharynx – “Endostyle” is present
- ✓ Atrium is lined by – ectoderm
- ✓ Urochordates are – filter feeders
- ✓ Notochord is present only in larval tail – hence the name Urochordata
- ✓ Blood vascular system is – “open type”
- ✓ Heart is – tubular
- ✓ Flow of blood is – “periodically reversed”
- ✓ Blood pigment is – “vanadium”
- In Urochordata heart alternately functions as systemic heart and branchial heart.
- Blood corpuscles of Urochordates - Vandocytes.
- Vandocytes have respiration pigment vanadium chromagen.
- In Urochordates excretion is by neural gland, nephrocytes
- During metamorphosis the larva undergoes – **retrogressive metamorphosis**
- True test is absent in -Larvacea or Appendicularia
- Skin secretes a gelatinous house around the body in larvacea
- ✓ Urochordata is divided into 3 classes.
  - 1) Ascidiacea
  - 2) Thaliacea
  - 3) Larvacea

#### **Ascidiacea :**

- Ascidians are commonly called – sea squirts
- These are – solitary, colonial and sedentary
- Body is enclosed in permanent test.
- Pharynx is large and perforated by numerous gill-slits.

Ex: *Herdmania, Ascidia* – Solitary, Sessile  
*Botryllus* – Sessile, colonial

#### **Class – Thaliacea :**

##### *Adult Thaliaceans are*

- Free living and pelagic
- Tunic (test) is – permanent, transparent and with mantle muscles are arranged incomplete or half rings (eg: *Salpa*) complete (eg: *Doliolum*).
- These animals exhibits – alternation of generations. eg: *Salpa, Doliolum*

Ex: colonial form & Bioluminiscent form – *Pyrosoma*

#### **Class : Larvacea**

- Small solitary, free swimming and Pelagic. Paedomorphic marine forms, with persistent tail notochord, nerve cord and brain are – Larvaceans

Ex: *Oikopleura*

**Sub – Phylum : Cephalochordata :** These are Marine, sedentary protochordates

- The notochord extends forward into the rostrum, beyond the brain is the characteristic of **– cephalochordata**
- Body of cephalochordates is – translucent and fish like
- Gills in cephalochordates are useful in – filter feeding mechanism
- On the ventral side of the pharynx of cephalochordate possesses – endostyle
- Blood is – without respiratory pigment
- Heart is – absent
- Excretory organs are – protonephridia with solenocytes
- Development is – indirect

Ex : *Branchiostoma or Amphioxus, Asymmetron*

- Urochordates and cephalochordates together are called – Acraniates (absence of Cranium)

**Sub phylum : Vertebrata / Craniata**

- Modification of notochord into vertebral column is the characteristic of – **vertebrata**
- In the vertebrates, brain is covered by cranium hence called – **craniata**
- Seven visceral arches and six pairs of Aortic arches are present
- Visceral arches occur in - wall of pharynx between successive pharyngeal gill slits.
- Gills are supported by - **Branchial arches**.
- Hepatic and Renal portal systems are present
- **Ostracodermi**

- The subphylum vertebrata is divided into superclasses

1) Agnatha 2) Gnathostomata superclasses

**Super class – Agnatha :**

- Agnatha includes – **jawless fishes**
- Visceral arches are unmodified.
- Paired appendages are absent.
- Super class – Agnatha is divided into classes –  
1) Ostracodermi 2) Cyclostomata

**Class – Ostracodermi:**

- These are – extinct
- Ostracoderms were abundant in ordovician period to Devonian period
- Paired fins are absent.
- The head is enclosed in a – **shield**
- The shield is made up of – **bony large dermal plates**
- The rest of the body is covered by – **small plates**
- Because of the above two characters the name “Ostracodermi”
- 10 pairs of gill slits present.
- 10 pairs of cranial nerves.

- Skull was present.
- They are called – **armoured fishes**
- Vertebral columns and Girdles are absent

Ex : *Cephalaspis, Hemicyclospis.*

**Class : Cyclostomata :**

- These are extant jawless fishes.
- Body of cyclostomes is – **eel like**
- Paired fins are – **absent**
- Endoskeleton is – **cartilaginous**
- Fins present are – **only unpaired fins (median fins)**
- Mouth is – **Ventral, Suctorial and circular**
- Hence the name – “**Cyclostomata**” is given
- Gills are - **5-16 pairs.**
- Heart is – **two chambered**
- Portal system is – **only hepatic portal system**
- Renal portal system is – **not developed**
- Semicircular canals in the internal ear are – **one or two**
- Gonoducts are – **absent, Gonad is single.**
- Cyclostomata include – **Lampreys and Hagfishes**
- Ex : 1) Petromyzon 2) Myxine
- Scale less skin contains - **unicellular mucous glands**
- Imperfect neural arches over the notochord represents - **vertebrae**
- Tongue bears - **Horny teeth**
- Ammocoete larva resembles - **Branchiostoma**

1) *Petromyzon :*

- Commonly called – **lamprey**
- It is – sanguivorous (sucks blood from sharks)
- Suctorial buccal funnel contains – **many horny teeth**
- Gill pouches are seven pairs
- Number of semi circular canals in the internal ear - **two**
- 10 pairs of cranial nerves are present.
- Petromyzon exhibits – **anadromous migration**
- Ascending fresh water rivers and streams for spawning by *Petromyzon* is – **anadromous migration**
- Larva of *Petromyzon* is – **Ammocoete**

2) *Myxine :*

- Commonly called – **hagfish**
- The body is – **eel like**
- 8 pairs of cranial nerves are present.
- Around the mouth are – **sensory tentacles present**
- Number of Gill pouches are – **six pairs**
- Number of semicircular canals – **one**
- Hagfishes produce enormous quantity of slime, hence they are called slime eels
- They are – **necrophagous** (feed on dead fish)

## GENERAL CHARACTER OF CHORDATA

### LEVEL - I

1. Notochord of chordates is derived from
  - 1) Ectoderm
  - 2) Chorda-mesodem
  - 3) Endoderm
  - 4) Ecto-endoderm
2. In which of the following, nerve cord is degenerate in adult condition?
  - 1) Amphioxus
  - 2) Myxine
  - 3) Petromyzon
  - 4) Ascidia
3. In chordates nerve cord is derived from
  - 1) Ectoderm
  - 2) Endoderm
  - 3) Mesoderm
  - 4) Ecto - mesoderm
4. The type of cleavage found in the chordates is
  - 1) Radial and determinate
  - 2) Radial and indeterminate
  - 3) Spiral and determinate
  - 4) Spiral and indeterminate
5. Pharyngeal gill slits of chordates are derived from
  - 1) Ectoderm
  - 2) Ecto-endoderm
  - 3) Endoderm
  - 4) Mesoderm
6. Structure that exhibit segmentation in chordates is by are
  - 1) Blood vessel
  - 2) Muscles
  - 3) Nerves
  - 4) Muscles & Nerves
7. The largest chordate is
  - 1) Scoliodon
  - 2) Rhinodon
  - 3) Belemnites
  - 4) Paedocypris progenetica
8. The buccal diverticulum of hemichordates resembles
  - 1) Nerve cord
  - 2) Gill slits
  - 3) Vertebral column
  - 4) Notochord
9. The following are the statement regarding pharyngeal slits of chordates
  - (i) They are persistent throughout the life in protochordates
  - (ii) They are persistent in fishes
  - (iii) They are seen in some amphibians

**Select the correct statement :-**

  - 1) I & III
  - 2) Only III
  - 3) Only II
  - 4) I, II & III
10. The flow of blood in the dorsal blood vessel of chordates is
  - 1) Anterior to posterior
  - 2) Posterior to Anterior
  - 3) Both anterior and posterior
  - 4) Only anterior
11. Which of the following is a chordate feature not shared by the non - chordates
  - 1) Bilateral symmetry
  - 2) Metamerism
  - 3) Axial organisation
  - 4) Pharyngeal gill slits
12. The part of the body which extend beyond anus and doesnot posses coelom and visceral organs
  - 1) Coccyx
  - 2) Post anal tail
  - 3) Posterior limb
  - 4) All of the above
13. Gnathostomes has
  - 1) Paired appendages
  - 2) Paired nostrils
  - 3) Paired jaws
  - 4) 1, 2 & 3

### LEVEL - II

14. The following are the statements related to Chordates
  - I. Notochord is the derivative of chorda mesoderm
  - II. It is replaced by vertebral column in higher chordates
  - III. It is represented by nuclei pulposi in adult mammalsThe Correct combination is
  - 1) All are true
  - 2) Only I and II
  - 3) Only I and III
  - 4) Only III and II
15. Following are the statements regarding Pharyngeal gill slits.
  - I) They are formed by inpushing of pharyngeal wall & Outpushings of body wall
  - II) They are persistent, life - long in *Herdmania* & *Branchiostoma*
  - III) In higher chordates, they occur only for a brief period during embryonic development.In the above the correct statements are
  - 1) I & II
  - 2) II & III
  - 3) I & III
  - 4) All
16. Statement (S) : In chordates segmentation is internal  
Reason (R) : Internal segmentation is seen by the arrangement of vertebrae
  - 1) Both S and R are correct, R explains S
  - 2) Both S and R are correct but R doesnot explains S
  - 3) S is true, R is false
  - 4) Both S and R are false

## ANCESTRY OF CHORDATES

### LEVEL-I

17. The circumoral band of cilia present across its lateral body surface in auricularia larva is useful for
  - 1) Food collection
  - 2) Excretion
  - 3) Nutrition
  - 4) Locomotion
18. Chordates have originated prior to
  - 1) permian period
  - 2) Ordovician period
  - 3) Cambrian period
  - 4) Devonian period
19. The muscle phosphogen present in echinoderms and hemichordates is
  - 1) Phosphocreatine Only
  - 2) Phosphoarginine Only
  - 3) Both Phosphocreatinine and Phosphoarginine
  - 4) Ornithine



43. The following are the statements regarding urochordates  
 i) Body of urochordates is covered by tunic  
 ii) Dorsal nerve cord is reduced to dorsal ganglion in the adult  
 iii) Circulatory system is closed type  
 iv) Excretion is by neural gland, nephrocytes  
 Select the correct statements  
 1) i, ii & iii are correct 2) ii, iii & iv are correct  
 3) i, ii & iv are correct 4) i, ii, iii & iv are correct
44. The following are the statements about appendicularia  
 i) All are solitary  
 ii) Skin secretes loose gelatinous house around the body, which is periodically replaced  
 iii) Sexually mature forms retain larval forms of their ancestors  
 Select the correct statements  
 1) i, ii & iii are correct  
 2) Only iii is correct  
 3) Only ii is correct  
 4) All correct

### CEPHALOCHORDATA

#### LEVEL - I

45. Amphioxus belongs to the subphylum  
 1) Urochordata 2) Vertebrata  
 3) Cephalochordata 4) Hemichordata
46. Cephalochordates and urochordates are grouped under  
 1) Craniata 2) Acraniata  
 3) Vertebrata 4) Gnathostomata

#### LEVEL - II

47. Following are statements regarding Cephalochordates  
 I) Excretory organs are protonephridia with solenocytes  
 II) Circulatory system lacks heart & shows colourless blood  
 III) Skull is absent hence called Acraniata  
 1) I & II 2) II & III  
 3) I & III 4) I, II & III

### VERTEBRATA

#### LEVEL - I

48. The extant jawless vertebrates belong to  
 1) Ostracodermi 2) Osteichthyes  
 3) Cyclostomata 4) Elasmobranch
49. Blood flow is not periodically reversed in  
 1) Oikopleura 2) Herdmania  
 3) Petromyzon 4) Ascidia
50. The animal, which has no larval stage in its life history is:  
 1) Myxine 2) Ascidia  
 3) Petromyzon 4) Oikopleura

51. The vertebrates in which the gametes do not pass out through gonoducts are  
 1) Fishes 2) Reptiles  
 3) Amphibians 4) Cyclostomes
52. The number of semicircular canals in exclusively marine cyclostomes are  
 1) Two 2) One pair  
 3) One 4) Two pairs
53. The Ammocoete larva in life history of Petromyzon is initially released in to  
 1) Fresh waters 2) Marine waters  
 3) Brackish waters  
 4) Both fresh water & Marine water
54. One of the following is sanguivorous.  
 1) Amphioxus 2) Petromyzon  
 3) Myxine 4) Ascidia
55. The animal that ascends fresh water rivers and streams  
 1) Lamprey 2) Myxine  
 3) Amphioxus 4) Pyrosoma
56. In which group of animals mouth is round and paired appendages are absent and jaws also absent  
 1) Protochordates 2) Pisces  
 3) Amphibia 4) Cyclostomata
57. A sanguivorous, ectoparasitic anadromous animal is : (EAM-2006)  
 1) Eel 2) Salmon  
 3) Slime eel 4) Lamprey

#### LEVEL - II

58. Statement (S) : Petromyzon exhibit anadromous migration  
 Reason (R) : It moves from sea to river for reproduction  
 1) Both S and R are correct, R explains S  
 2) Both S and R are correct but R does not explain S  
 3) S is true, R is false 4) Both S and R are false
59. The following are the statements regarding cyclostomata  
 i) Cyclostomata includes lampreys and hag fishes  
 ii) Heart is two chambered  
 iii) Kidneys are metanephric  
 Select the correct statements  
 1) i & ii are correct 2) ii & iii are correct  
 3) i & iii are correct 4) Only iii is correct
60. The following are the steps in evolution of vertebrates  
 a) Gnathostome b) Prevertebrates  
 c) Agnathan  
 Arrange the above in evolutionary sequence  
 1) a - b - c 2) b - c - a  
 3) b - a - c 4) c - b - a
61. The following are various taxa in the kingdom animalia  
 a) Cephalochordates b) Aves  
 c) Reptilia d) Amphibia  
 Arrange the above in evolutionary sequence

- 1) a - b - c - d                      2) b - c - a - d  
 3) a - d - c - b                      4) a - b - d - c
62. The following are the chordates  
 a) Mammals                              b) Fishes  
 c) Tunicates                              d) Amphibia
- Arrange the above in evolutionary sequence  
 1) a - b - c - d                      2) c - b - d - a  
 3) b - c - d - a                      4) d - a - b - c

## PISCES OR FISHES

### The Most Flourishing Devonian Vertebrates

#### Introduction

- Study of fishes is called **-Ichthyology**
  - The first group of vertebrata with biting jaws (Gnathostomes) in evolution are **-Fishes**
  - Fishes evolved during **-Silurian period**
  - The most flourishing group of aquatic vertebrates during Devonian period are **-fishes**
  - The golden age of fishes is **-Devonian period**
  - The single largest group of vertebrates is **-Fishes**
  - Fishes are **-Aquatic, gill breathing animals with paired fins for Locomotion**
  - the earliest gnathostomes were **- Acanthodians (Climatius)**
  - Placoderms appeared shortly after **- Acanthodians**
  - Acanthodians gave rise to **- Bony fishes**
  - Placoderms gave rise to **- Cartilaginous fishes**
  - Smallest fish - ***Paedocypris progenetica***
  - The largest fish - ***Rhinodon typus, whale shark.***
- 1.2.1 General Characters**
- Fishes are **- Cold blooded, or Poikilothermic or ectothermal animals**
  - Neck is absent in fishes; it is an adaptation to **- Aquatic life**
  - The exoskeleton of fishes consists of **- Mesodermal scales or dermal denticles**
  - Skin glands are **-Multi cellular Mucous glands, their secretion reduce friction with water**
  - Unpaired fins are **- Dorsal, ventral, anal and caudal fins**
  - Paired fins are **- Pectoral and pelvic fins**
  - Unpaired fins helps in **- Maintaining balance**
  - Paired fins helps in **- Locomotion**
  - Caudal fin of tail helps in **- Propulsion and changing the direction of animal during locomotion**
  - In fishes vertebrae are **- Amphicoelous**
  - All viscera except kidneys are enclosed by **- Plaeuroperitoneal cavity.**
  - Counter current flow of blood in gill filaments enhances **- oxygenation of blood**
  - The anterior or posterior wall of gill surface has -

#### Hemibranch or Demibranch.

- The functional surface of hemibranch consists of a large number of transverse folds called as **- Lamellae**
  - The two hemibranchs of a single gill arch together with interbranchial septum constitute **- Holobranch.**
  - Nostrils in fishes are **- Paired external nostrils; they don't open into pharynx, except in lung fishes**
  - The respiratory organs are **- paired gills**
  - Heart of fishes is **- Two chambered with one auricle and one ventricle**
  - The flow of blood is only towards gills and hence it is called **- Branchial heart**
  - Blood pumped to the gills (Respiratory organs) does not return to the heart and is directly sent to the body parts, hence this type of circulation is called **-Single circulation**
  - The blood flowing through heart is always impure (deoxygenated), hence it is called **- Venous heart**
  - The excretory organs in fishes are **- Mesonephric Kidneys**
  - The chief nitrogenous excretory product in fishes is **- Ammonia (ammonotelic)**
  - The other nitrogenous products in fishes are **- Urea (Ureotelic in Elasmobranchs) ▪ Urinary bladder is - Absent**
  - Brain is covered by single membrane called **-Meninx primitiva**
  - Number of cranial nerves are **- 10pairs**
  - The ear in fishes is **-Only internal ear**
  - The function of internal ear is **- Mainly balance and also hearing**
  - In fishes eyes are **- Without eye lids**
  - Presence of lateral line sense organs or Neuromast organs (or) lateral line sense organs is characteristic feature of **- fishes**
  - Lateral line sense organs are **- Rheoreceptors which help as receptors of water current and pressure in water**
  - Sexes are separate and fertilization is **-External or internal**
  - Fishes are **- Anamniotes**
- Classification of Pisces**
- There are about 25,000 extant species of jawed fishes. They are classified into **-Placodermi (extinct); Chondrichthyes (living) Osteichthyes (living)**
- Class I. Placodermi :**
- These are considered as ancestors of **- chondrichthyes.**
  - They originated from ostracoderms during Silurian

Period and became extinct in the beginning of **Mesozoic era.**

- The first pair of gill slits of placodermi are functional which are non functional in higher fishes are modified into - **spiracles.**
- Body was enclosed in heavy bony armour.
- Example for placodermi - **Bothryolepis, Dunkelosteus**

### **Class II. Chondrichthyes :**

- The endoskeleton is made up of - **Cartilage**
- Gill slits are - **4 to 7 pairs with out operculum**
- In chondrichthyes Intestine has - **spiral valve or scroll valve.**
- Gills are lamelliform.
- Air bladder is absent.
- Mouth is - **ventral in position**
- The chief nitrogenous excretory material is - **Urea**
- In males pelvic fins are provided with - **Claspers**
- Caudal fin is - **Heterocercal**
- Fertilization is - **Internal**
- Most sharks and all rays are - **viviparous and possess yolk sac placenta**
- Subclasses of chondrichthyes - **Elasmobranchi and Holocephali.**

### **Subclass I. Elasmobranchii:**

- This includes sharks, rays and skates.
- Skin is covered by placoid scales.
- Operculum is absent.
- Five to seven pairs of gill-slits are present. (Ex: six pairs in Hexanchus and seven pairs in Heptanchus).

#### **A. Sharks:**

- Body is spindle shaped. These are pleurotrematic with five to seven pairs of lateral gill-slits.

#### **Examples :**

**Rhyncodon / Rhinodon ( whale shark )**

- (Largest fish and 2<sup>nd</sup> largest vertebrate)

#### **Scoliodon**

- Indian dog fish is - **Scoliodon**
- The dry skin of shark is called - **Shagreen (used in polishing)**

**Stegostoma (Tiger shark or Zebra shark)**

**Sphyrna (zygaena) Hammer headed Shark.**

#### **B. Rays and Skates**

Their body is greatly flattened dorsoventrally. They are hypotrematic elasmobranchs

- Spiracles are always present, large and dorsal.

**Ex: Myliobatis:**

Commonly called - **Sea vampire or eagle ray**

#### **Torpedo:**

The common name is - **Electric ray**

Electric organ is modified - **Dorsal muscles**

#### **Rhinobatis**

Commonly called Guitarfish (Skate)

**Trigon (sting ray)**

**Pristis (saw fish)**

**Raja (skate)**

### **Subclass II. Holocephali or Bradyodonti:**

- In adult Holocephali - Scales absent.
- In adult holocephali, spiracles, cloaca - **absent.**
- Gill slits are covered by operculum in chondrichthyes - **Holocephali.**
- Example for Holocephali - **Chimaera, Hydrolagus, Callorhynchus.**

### **Class III. Osteichthyes:**

Mouth - **Terminal**

Caudal fin - **Homocercal or Diphycercal**

In some fishes air bladder which acts as Hydrostatic organ is present

- Four pairs of filamentous gills are present.
- Subclasses of Osteichthyes - Acanthodii, Sarcopterygii, and actinopterygii

### **Subclass I. Acanthodii:**

- The oldest known Gnathostomes - **Acanthodii**
- Acanthodii became extinct during - **Permian period.**
- Type of scales in Acanthodii - **Ganoid scales**
- Type of caudal fin in Acanthodii - **Heterocercal**
- Example for Acanthodii - **Climatius, Diplacanthus**

### **Subclass II. Sarcopterygii:**

- These are lobe-**finned fishes**
- Paired fins have a fleshy lobe containing jointed skeleton and muscles, resembling tetrapod limb.
- Internal nares are present (hence the name Choanichthyes). Intestine has a spiral valve.
- This subclass is classified into two orders: Crossopterygii and Dipnoi.

### **Order A. Crossopterygii:**

- This includes rhipidistians (Eg: **Osteolepis, Eusthenopteron**) and Coelacanth. Internal nares were present in rhipidistians, absent in coelacanth.
- Scales are cosmoid.
- Paired fins are lobed. Median fins are separate.
- Spiracles are present. Air bladder is reduced and acts as a hydrostatic organ.
- They appeared in Devonian Period and were thought to have become extinct in Cretaceous Period. Only one coelacanth genus, **Latimeria** is extant.
- It has characteristic three-lobed diphycercal tail.
- It is viviparous.
- They found near Comoros island between Africa & Madagascar
- They were identified by - **C. Latimer**
- Coelacanth fish is referred to as living fossil by - **Smith**

Eg: *Latimeria chalumnae*, *Latimeria menadoensis*.

### Order B. Dipnoi:

These are commonly called - **lung fishes**

Dipnoi fishes are having internal nostrils and 1 or 2 lungs

Caudal fin - **Diphycercal**

Median fin is continuous with - **Caudal fin**

- Body is covered by - **Cycloid scales**
- Number of Genera in Dipnoi fishes is - **3**
- Spiracles are absent.
- They exhibit discontinuous distribution. Romer described them as **uncles of Amphibia**.

### Examples

#### 1. Neoceratodus

- Neoceratodus is restricted to - **Burnett and Mary rivers of Queens land, Australia**
- It is also known as - **Burnett salmon**
- It has - **Single lung**

#### 2. Protopterus

- It is found in rivers of tropical Africa.
- During unfavorable conditions it undergoes - **Aestivation**

#### 3. Lepidosiren

- Lepidosiren is a - **South American lung fish**

### Sub Class – III

#### Actinopterygii

- Actinopterygii fishes are - **Ray finned fishes**
- Fins are supported by - **Dermal finrays**
- Internal nostrils do not open into Buccal cavity
- It is divided into 3 infraclasses - **a) Chondrostei b) Holostei c) Teleostei**

### Infraclass – 1 Chondrostei

- This includes primitive ray finned fishes.
- Endoskeleton of these fishes is - **Cartilaginous**
- Mouth opening is - **Large**
- Skin is covered by - **Ganoid scales**
- Caudal fin is - **Heterocercal**
- Diphycercal caudal fin present in bichir.
- Air bladder functions as a lung and is connected to pharynx.
- Intestine has spiral valve.

Ex : 1. *Acipenser (Sturgeon)*;

2. *Polypterus(bichir)*

### Infraclass – 2 Holostei

- This includes intermediate ray-finned fishes.
- Mouth opening is - **Small**
- Body is covered by - **Ganoid or Cycloid scales**
- Tail fin is - **abbreviated - Heterocercal**

- Spiracles are absent.
- Air bladder mainly hydrostatic and is connected to **pharynx**.
- Intestine has a vestigial **spiral valve**.  
Ex : *Amia* (Bowfin), *Lepisosteus* (Garpike)

### Infraclass– 3 Teleostei

- It includes advanced ray-finned fishes.
  - Mouth is small and terminal
  - Exoskeleton - **Cycloid or ctenoid scales**.
  - Tail fin is - **Homocercal**
  - In some air bladder or swim bladder acts as - **Hydrostatic organ**
- Spiracles are **absent**
- Intestine lacks **spiral valve**.

#### 1. Echeneis

- It is also called - **Sucker fish**
- Anterior (frist) dorsal fin is modified into - **a Sucker**
- This fish attaches themselves to the Sharks and lead as ectocommensalic life.

#### 2. Hippocampus

- It is commonly called - **Sea horse**
- Skin is covered by - **Bony plates**
- Tail is - **Prehensile**
- Male has a - **Brood pouch**
- Brood pouch is formed by - **Pelvic fins**
- The young ones are developed in - **Brood pouch**

#### 3. Exocoetus

- It is commonly called - **Flying fish**
- The fins useful for gliding are - **Pectoral fins**
- Fish takes a leap with the - **Powerful tail**

#### 4. Eel – (Anguilla)

- Eel migrate during autumn from freshwater to sea water, it is called - **Catadromous migration**

## PISCES (FISHES)

### GENERAL CHARACTERS

#### LEVEL-I

63. The use of paired fins in fishes is
  - 1) Balance
  - 2) Locomotion
  - 3) Propulsion
  - 4) Reduce friction
64. The scales and scutes in fishes are derived from
  - 1) Ectoderm
  - 2) Mesoderm
  - 3) Endoderm
  - 4) Peritoneum
65. The fishes with internal nostrils are
  - 1) Elasmobranchs
  - 2) Crossopterygians
  - 3) Actinopterygians
  - 4) Only Dipnoi fishes
66. The number of protective layers (meninges) found around the brain of fishes
  - 1) 1
  - 2) 1 or 2
  - 3) 2
  - 4) 3
67. Presence of lateral line sense organs is characteristic feature of
  - 1) Cyclostomes and Urochordates

- 2) Urochordates and Cephalochordates  
3) Apodans 4) Fishes
68. Study of fishes is called  
1) Herpetology 2) Ichthyology  
3) Ecology 4) Fisheries
69. Lung in dipnoi fishes is a modified  
1) Gills 2) Air-bladder  
3) Pulmonary sac 4) Respiratory trees
70. The number of Cranial nerves in fishes is  
1) 10 pairs 2) 12 pairs 3) 14 pairs 4) 8 pairs
71. Fishes mainly excrete ammonia because  
1) They are carnivores 2) They are aquatic  
3) they are herbivores  
4) Urea content in the blood is high
72. Ichthyopsida includes  
1) Fishes only  
2) Amphibians only  
3) Fishes & Amphibians  
4) Amphibians & Reptiles
73. The structures absent in fishes are  
1) Eyelids, neck, tympanum  
2) Neck, tail, tympanum  
3) Neck, urinary bladder, internal ear  
4) Internal ear, tympanum, middle ear
74. The type of Kidneys present in adult fishes are  
1) Pronephros 2) Mesonephros  
3) Metanephros 4) Solenocytes
75. The number of semicircular canals in the internal ear of fishes is  
1) Two 2) Three 3) Four 4) Many
76. The bottom dwelling fishes are specialized in having  
1) Laterally compressed body  
2) Dorso ventrally compressed body  
3) Stream lined body  
4) Short compact body
77. The number of chambers present in the heart of fishes is  
1) 4 2) 3 3) 2 4) 1
78. The following are the statements about heart of a fish  
I. The heart of a fish consists of one ventricle and one auricle  
II. The flow of blood from the heart is always to gills only  
III. The blood flow through heart is mixed blood  
The correct combination is  
1) I and II 2) II and III  
3) I and III 4) I, II & III
79. The part of hemibranch made of thin epithelium and provided with blood capillaries  
1) Gill Lamellae 2) Holobranch  
3) Demi branch 4) Operculum
80. The biting jaws enabled gnathostomes to become  
1) Carnivores 2) Omnivores  
3) Herbivores 4) Osmotrophs
81. The exoskeleton of fishes composed of  
1) Bony plates 2) Dermal scales  
3) Feathers  
4) Both Bony plates & Dermal scales
82. The fins that assist in stabilizing the body during swimming  
1) Pectoral fins 2) Pelvic fins  
3) Dorsal, ventral and caudal fins  
4) All of the above
83. The transverse septum in fishes separates  
1) Head and trunk 2) Thorax and abdomen  
3) Two lobes of tail fin  
4) pericardial and pleuroperitoneal cavity
84. The heart of fishes is venous heart, because  
1) Oxygenated blood only passes through it  
2) Deoxygenated blood only passes through it  
3) Mixed blood only passes through it  
4) None of the above
85. Heart of fishes is  
1) One chambered 2) Two chambered  
3) Three Chambered 4) Four chambered
86. The type of blood circulation in fishes is  
1) Single circulation 2) Double Circulation  
3) Incomplete Double Circulation  
4) complete Double Circulation
87. Lateral line organs in fishes acts as a  
1) Thigmoreceptors 2) Rheoreceptors  
3) Tangoreceptors 4) Chemoreceptors

## LEVEL-II

### **OPTIONS FOR STATEMENT / REASON TYPE**

Note : 1) Both S and R are correct, R explains S

2) Both S and R are correct but R doesnot

explains S

3) S is true, R is false

4) Both S and R are false

88. Statement (S) : Fishes are anamniotic poikilotherms

Reason (R) : During embryonic stages of fish the

amnion is not developed and body temperature

of fishes is not constant

89. Statement (S) : Lateral line sense organs are

rheoreceptors

Reason (R) : They help in maintaining the balance

against water currents

90. Statement (S) : The heart of a fish is known as

branchial heart

Reason (R) : The blood flow through the heart of a

fish is always deoxygenated

91. The smallest fish in the world

1) Rhinodon typus

2) Paedocypris progenetica

3) Mystichthyes lozerensis

4) Climatius

## **PLACODERMI**

### **LEVEL -I**

92. Placoderms became extinct in the beginning of  
1) Silurian                      2) Mesozoic era  
3) Cambrian                     4) Ordovician
93. Placoderms appeared during  
1) Silurian                      2) Permian  
3) Cambrian                     4) Ordovician
94. Jawless fish  
1) Hag fish                      2) Eel  
3) Flying fish                   4) Sea horse
95. Body was enclosed in heavy bony armour in  
1) Bothryolepis                2) Climatius  
3) Dunkelosteus  
4) Both Bothryolepis and Dunkelosteus
96. The first pair of gill slits present in front of the hyoid arch is the functional in  
1) Climatius                     2) Dunkelosteus  
3) Diplacanthus                4) Chimaera
97. The bony armoured fishes have evolved during  
1) Devonian period          2) Silurian period  
3) Ordovician period        4) Carboniferous period
98. The oldest known gnathostome belongs to the sub class  
1) Acanthodi                    2) Actinopterygii  
3) Elasmobranchi              4) Holocephali
99. The fish in which the fins are supported by large spines and had a series of lateral spines  
1) Holocephali                 2) Acanthodi  
3) Sarcopterygii               4) Elasmobranchi

## **CHONDRICHTHYES**

### **LEVEL-I**

100. Which one of the following are absent in cartilaginous fishes  
1) Ctenoid & Cycloid scales  
2) Placoid scales  
3) Heterocercal caudal fin                      4) Claspers
101. Fertilization is internal in  
1) Sharks only                    2) Skates only  
3) Rays only                      4) Sharks, Skates & Rays
102. The dry skin of shark is called  
1) Shagreen                      2) Green shark  
3) Dermis                         4) Isinglass
103. Scales are absent in adults of  
1) Dog fishes                    2) Flying fishes  
3) Flat fishes                     4) Rat fishes
104. Saw fish is  
1) Myliobates                    2) Zygaena 3) Pristis  
4) Trygon
105. The following is a ray fish  
1) Pristis                         2) Stegostoma  
3) Rhinobatis                   4) Scoliodon

106. Primitive ray-finned fishes are  
1) Acipenser and Polypterus  
2) Protopterus & Neoceratodus  
3) Torpedo and Myliobatis  
4) Exocoetus and Hippocampus
107. Electric organs in Torpedo are the modified  
1) Dorsal muscles              2) Ventral muscles  
3) Caudal muscles              4) Neck muscles
108. The cartilaginous fishes with four pairs of gills and operculum is.  
1) Myliobates                    2) Chimaera  
3) Torpedo                        4) Rhinobates
109. Cartilaginous fish possessing operculum  
1) Chimaera                      2) Hydrolagus  
3) Rhinobatis  
4) both Chimaera and Hydrolagus
110. The type of placenta in sharks and rays  
1) Allantoic placenta          2) Yolk sac placenta  
3) Chorionallantoic placenta  
4) Deciduous placenta
111. Gills are lamelliform in these fishes  
1) Placodermi                    2) Chondrichthyes  
3) Osteichthyes                4) Ostracodermi
112. The number of pairs of gill slits in Heptanchus hexanchus respectively  
1) 6 & 7 pairs                    2) 7 & 6 pairs  
3) In both 6 pairs only        4) In both 7 pairs only

### **LEVEL-II**

113. The following are the statements about Elasmobranchs  
I. The Endoskeleton of these fishes is made up of cartilage  
II. Skin is covered by placoid scales.  
III. Operculum is absent.  
The correct combination is  
1) I and II                        2) II and III  
3) I and III                       4) All

## **OSTEICHTHYES**

### **LEVEL-I**

114. Bony fishes differ from Elasmobranch fishes in the presence of  
1) Spiracle                        2) Scales  
3) Operculum                     4) Claspers
115. Oviparous fish is  
1) Scoliodon                      2) Pristis  
3) Rhinodon                      4) Exocoetus
116. Ctenoid scales are present in  
1) Lung fishes                    2) Teleosts  
3) Cat fishes                      4) Elasmobranchs
117. The structures which help in gliding in flying fish are  
1) Pelvic fins                      2) Pectoral fins  
3) Caudal fin                      4) Anal fin



## OPTIONS FOR STATEMENT / REASON TYPE

- 1) Both S and R are correct, R explains S  
2) Both S and R are correct but R does not explain S  
3) S is true, R is false  
4) Both S and R are false
142. Statement (S) : Eel is a catadromous fish  
Reason (R) : Eel migrates during breeding season from Fresh water to Sea water
143. Statement (S) : Male Hippocampus exhibits parental care  
Reason (R) : In male Hippocampus pelvic fins combine to form brood pouch and young ones develop in the brood pouch
144. Statement (S) : Dipnoi fishes exhibit discontinuous distribution  
Reason (R) : Romer called them as uncles of Amphibians
145. Statement (S): The living species of Coelacanthidae is considered as a living fossil by Smith  
Reason (R) : Latimeria has been existing since the Jurassic period with very little change
146. The following are the statements about Rhipidistia fishes  
I. The fishes belong to this group are all extinct.  
II. Internal nares were present  
III. The members of this group are widely distributed and are called living fossils  
The correct combination is  
1) I and II                      2) II and III  
3) I and III                     4) All
147. The following are the statements about seahorse  
I. It belongs to infraclass teleostei  
II. Tail is prehensile.  
III. both males and females have brood pouch  
The correct combination is  
1) I and II   2) II and III   3) I and III   4) All
148. The following are the statements about Actinopterygii  
I. They are known as ray finned fishes  
II. Nostrils do not open into mouth cavity  
III. It is divided into 3 infraclass, namely, Chondrostei, Holostei, Teleostei  
The correct combination is  
1) I and II                      2) II and III  
3) I and III                     4) I, II & III

## AMPHIBIA

### (Pioneers of true voice production)

- The first animals to attempt transition from aquatic mode to terrestrial mode of life - **Amphibians**
- The earliest tetrapods are - **Amphibians**
- Amphibians descended from fishes during **Devonian period**

- The ancestors of Amphibians are **Osteolepid fishes**
  - Amphibians flourished during **Carboniferous period**
  - Fishes and Amphibians are included under the group - **Ichthyopsida or Anamniota**
  - The largest living amphibian - **Andrias davidianus** (chinese giant salamander)
  - The largest frog - **Conraua goliath (Rana goliath)**
  - Study of amphibians - **Batrachology.**
- ### 1.3.1 General Characters
- Amphibians are - **Cold blooded / Poikilothermic / Ectothermic animals**
  - Amphibians breed and develop in - **Fresh water**
  - Adult Amphibians are - **Terrestrial, lung breathing and some are partly aquatic**
  - Skin of Amphibians is - **Smooth or rough**
  - The glands present in the skin of amphibians are - **Mucous glands / Paratoid glands**
  - In Amphibians exoskeleton is - **Absent (except in caecilians)**
  - In Amphibians concealed dermal scales are present in the members of - **Apoda**
  - Skin colour in Amphibians is due to **Chromatophores**
  - Amphibian's skull is **Dicondylic**
  - Two occipital condyles of skull articulate with - **Atlas**
  - Upper jaw or both the jaws of Amphibians possess - **Small homodont teeth**
  - Sternum appears for the first time in - **Amphibians**
  - In adult amphibians the respiration is through - **Lungs, Skin and Buccal lining**
  - Persistent gills in adult amphibians are seen in - **Aquatic Amphibians**
  - The number of chambers in the heart of amphibians is - **Three (2 auricles and 1 ventricle)**
  - The type of blood that flows through the heart of Amphibians is - **Mixed blood**
  - In Amphibians Renal portal system and hepatic portal system are - **Well developed**
  - The type of kidneys in Amphibians is - **Mesonephric**
  - First tetrapods with urinary bladder are - **Amphibians**
  - Based on the chief nitrogenous excretory material, the Amphibians are described as - **Ureotelic**
  - Number of cranial nerves in Amphibians is **10 pairs**
  - Nostrils of amphibians are connected to the - **Bucco – Pharyngeal cavity**
  - Harderian gland secrete oil and lacrimal gland which secrete tears first appeared in - **Amphibia**

- The organs that developed for the first time in Amphibians are - **Middle ear with tympanum and Eustachian recess**
- In Amphibians the lateral line system is restricted to - **Larval forms and some aquatic adults**
- In Amphibians, males are without - **copulatory organ(except in apoda)**
- In Amphibians, fertilization is **External (except in apoda)**
- In Amphibians, eggs are with moderate amount of yolk, as they are known as - **Mesolecithal eggs**
- The development in Amphibians is - **Indirect, includes aquatic larva**
- Evolutionary phenomenon that involves changes in rate and timing of development - **Heterochrony**
- Embryonic or Juvenile characteristics of ancestors appear in in adults of descendants is - **Paedomorphosis.**
- Somatic development is halted before sexual maturity is called as - **Progenesis**
- Adult characters of ancestors appear in the adults of descendants is the phenomenon of - **Peramorphosis**
- Normal sexual maturity overtakes slowed somatic development - **Neoteny**

### 1. 3. 2 Classification:

- J.Z. Young classified the class Amphibia into three subclasses: Labyrinthodontia, Lepospondyli and Lissamphibia.

#### Sub Class I. Labyrinthodontia:

- Extinct amphibians. Enamel and dentine at the base of the tooth was folded.
- Some had scales. Others had dry leathery skin.
- This subclass includes three orders:  
Order I. Ichthyostegalia. Ex: *Ichthyostega*.  
Order II. Temnospondyli. Ex: *Eryops*  
Order III. Anthracosauria. Ex: *Seymouria*

#### Subclass II. Lepospondyli (Spool Like vertebrae):

- Small salamander-like extinct amphibians. Ex: *Diplocaulus*.

#### Subclass III. Lissamphibia (smooth amphibians):

- All the extant amphibians belong to this subclass. This includes three orders: Apoda, Urodela and Anura.

**Order – 1 Gymnophiona (or) Apoda**(Gr., Gymnos – naked, ophioneos – serpent like ; A without, podos – foot)

- Limbless amphibians are known as - **Blind worms or caecilians**
- Apoda members live in - **India, Srilanka, Pakistan & Africa subtropical regions of America , Africa and Asia**
- Burrowing forms with elongated snake like body and without tail are seen in the order – **Apoda**

- The Amphibians in which skin is transversely wrinkled and minute scales are embedded in the grooves of skin in - **-Apodans**
- In the members of Apoda limbs and limb girdles and tail are - **Absent**
- Eyes of Apodans are - **Rudimentary, Lidless and almost Non – functional**
- The blind worms sense their way with the help of - **Protrusible tentacle**
- In the members of Apoda tentacle lies in between - **Eye and nostrils**
- In Apoda members males possess - **Protrusible copulatory organ (Cloaca)**
- Parental care is commonly observed in the members of - **Gymnophiona**
- In Apoda parental care is exhibited by - **Females**
- The number of external gills in the larva of members of Apoda is - **3 pairs**
- Examples of Gymnophiona / Apoda are - **Ichthyophis (Female guards the eggs by coiling around them till they hatch), Uraeotyphlus, Gegenophis (Scales are absent) and Typhlonectes (Aquatic and ovoviviparous).**

#### Order – 2 Urodela or Caudata

(Gr. Ur = tail, delos= visible, L, caude = tail)

- Lizard like body with a distinct post anal tail is seen in the members of - **Urodela / caudata**
- The limbs of urodeles are - **2 pairs of weak and equal limbs**
- In urodeles teeth are present in - **Both the jaws**
- Middle ear is absent.
- In amphibians eyelids are - **absent or present**
- Skin is scaleless.
- Vertebrae are usually opisthocelous (amphicoelous in some) and are numerous.
- Ribs are present.
- Sternum is poorly developed. It is absent in some
- Vocal cords are absent.
- Copulatory organ is absent.
- Fertilization is usually internal. Female picks up spermatophore, deposited by male, with the lips of her cloaca.
- As most urodeles occur in North America it is called as - **Head quarters of urodela**
- This order includes two groups.

#### A. Perinnibranchiata:

- Gills and gill-slits persist in adult. Tail is compressed, with tail fin. Eyes lack eyelids. Ex: *Necturus* (mud puppy), *Proteus* (cave-dwelling blind salamander), *Siren* (mud eel).

#### B. Caducibranchiata:

- Gills are lost in the adult. Tail is cylindrical, without tail fin. Eyes often have eyelids.

Ex: *Amphiuma* (Congo eel), *Ambystoma* (Adult is paedomorphic because of neoteny. Its larva is called Axolotl).

The only Indian caudate species found in Himalayan region is - *Tylotriton*

**Order – 3 Salientia (or) Anura :** (L : Salions – Leaping, Gr: An without, oura-tail)

- Specialised successful amphibians without a tail in the adult condition belongs to the order  
– **Salientia or Anura**
- In anurans the limbs are - **Unequal (hind limbs are longer than fore limbs)**
- In the members of Anura the hind limbs help in  
– **Leaping and swimming (with web)**
- Gills or gill slits are absent in the adults of the order  
– **Anura**
- In Anurans the tympanum and eyelids are  
– **well developed**
- The body of anurans is with  
– **Fused head and trunk, neck is absent**
- In amphibians the neck is - **absent**
- The type of vertebrae in Anurans is **Procoelous and are fewer (generally 9).**
- In anurans caudal vertebrae fused to form urostyle.
- Ribs are reduced or absent.
- sternum is present.
- Teeth are present only on upper jaw or absent.
- Gills and gill-slits are absent in adult.
- Vocal cords are present.
- Middle ear and tympanum are present.
- Eys are large and have eyelids.
- In Ascaphus, a permanent tubular extension of the cloaca resembles tail and acts as a copulatory organ.
- Fertilization is external in most species.

Ex: *Rana tigrina* (Common Indian frog), *Bufo melanosticus* (Common toad), *Alytes obstetricians* (Midwife toad; male exhibits parental care). *Hyla* (Tree frog), *Rhacophorus* (Flying frog).

## AMPHIBIA

### General characters

#### LEVEL - I

149. Amphibians originated during  
1) Cretaceous period 2) Devonian period  
3) Silurian period 4) Ordovician period
150. The ancestors of amphibians are  
1) Ostracodermi fishes  
2) Elasmobranchi fishes  
3) Osteolepid fishes 4) Cyclostomata fishes
151. Amphibians flourished during  
1) Carboniferous period  
2) Devonian period  
3) Ordovician period 4) Silurian period
152. Larynx for the first time appears in  
1) Fishes 2) Reptiles  
3) Amphibians 4) Birds
153. Renal portal system and hepatic portal system of amphibians are  
1) Rudimentary 2) Well developed  
3) Not well developed 4) Absent
154. The organs developed for the first time in Amphibians are  
1) Tympanum and external ear  
2) Lungs and nostrils  
3) Middle ear with tympanum and Eustachian recess  
4) Eustachian recess and external ear
155. In Amphibians egg is described as  
1) Macrolecithal 2) Alecithal  
3) Microlecithal 4) Mesolecithal
156. Syststemic arch and Pulmonary arch are Connected by a blood vessel, called  
1) Ductus caroticus 2) Ductus botalli  
3) Ligamentum arteriosum  
4) Ductus canaliculus
157. Harderian gland which secrete watery fluid (tears) appeared for the first time in  
1) Aves 2) Fishes 3) Reptiles 4) Amphibians
158. The type of skull in amphibians is  
1) Monocondylic 2) Dicondylic  
3) acondylic 4) Tricondylic
159. The vertebra with anterior concavity and posterior convexity are called.  
1) Amphicoelous 2) Procoelous  
3) Opisthocoelous 4) Amphiplatyon
160. Batrachology is the study of  
1) Fishes 2) Amphibians  
3) Lizards 4) Snakes
161. An amphibian can live in water or near water because  
1) To keep its skin moist which only facilitates cutaneous respiration  
2) It can get its food easily in water  
3) Its hind limbs are webbed and help in swimming  
4) It can see through its transparent eyelids while swimming
162. The largest living amphibian  
1) Rana goliath 2) Amphiuma  
3) Necturus 4) Andrias dravidianus
163. The first quadripedal vertebrates that can move about on land  
1) Reptiles 2) Mammals  
3) amphibians  
4) Reptiles and Amphibians
164. The largest living frog is  
1) Andrias davidianus 2) Conraua goliath  
3) Rana tigris 4) Bufo melanosticus



- 3) S is true, R is false  
 4) Both S and R are false
184. Statement (S) : Apodans are blind worms  
 Reason (R) Eyes are small, nonfunctional, buried beneath the skin or skull bones  
 1) Both S and R are correct, R explains S  
 2) Both S and R are correct but R doesnot explains S  
 3) S is true, R is false  
 4) Both S and R are false

**URODELA**  
**LEVEL - I**

185. If gills and gill slits persist in the adult, it is called  
 1) Caducibranchiata    2) Perinnibranchiata  
 3) Tetrabranchiata    4) Dibbranchiata
186. The land of urodela is  
 1) South america    2) North America  
 3) Eastern america    4) Western America
187. A good example for neoteny is  
 1) Bipinnaria larva    2) Axolotl larva  
 3) Ammocoetes larva    4) Dipleurula larva
188. The following structures are absent in urodeles  
 1) Vocal cords    2) Middle ear  
 3) Ribs  
 4) Both vocal cords and middle ear
189. Amphibians having tail belong to the order  
 1) Urodela    2) Apoda  
 3) Gymnophiana    4) Anura
190. External gills are present throughout the life in  
 1) Ichthyophis    2) Necturus  
 3) Rhacophorus    4) Alytes
191. In which of the following limbs are vestigial  
 1) Tylatriton    2) Amblystoma  
 3) Amphiuma    4) Siren
192. An evolutionary phenomenon that involves changes in the rate and timing of development  
 1) Paedogenesis    2) Perennibranchiate  
 3) Heterochrony    4) Caducibranchiate
193. Embryonic or Juvenile characteristic of ancestors appear in adults of descendants is a phenomenon of  
 1) Pedomorphosis    2) Paedogenesis  
 3) Phylogeny    4) Parthenogenesis
194. The adult characters of ancestors appear in the adults of descendants  
 1) Pedomorphosis    2) Peramorphosis  
 3) Parthenogenesis    4) Polygamous

**LEVEL - II**

**OPTIONS FOR STATEMENT / REASON TYPE**

- Note : 1) Both S and R are correct, R explains S  
 2) Both S and R are correct but R doesnot explains S

- 3) S is true, R is false  
 4) Both S and R are false
195. Statement (S) : Axolotl larva exhibits neoteny of paedogenesis  
 Reason (R) : As the water in which it lives lacks iodine, thyroxine is not secreted properly and leads to neoteny
196. Statement (S) : In urodela though copulatory organ is absent, fertilization is internal  
 Reason (R) : Female picks up spermatophores deposited by males with the help of cloaca

**ANURA**  
**LEVEL - I**

197. Flying frog is  
 1) Hyla    2) Rhacophorus  
 3) Bufo    4) Alytes
198. The poisonous skin glands present in toads are called  
 1) Parotoid glands    2) Sebaceous glands  
 3) Mucus glands    4) Salivary glands
199. Frogs and toads belongs to the order  
 1) Apoda    2) Urodela    3) Anura    4) Caudata
200. Webbed digits in both limbs are seen in  
 1) Bufo    2) Rhacophorus  
 3) Hyla    4) Rana
201. The multicellular glands in amphibians are  
 1) Mucous glands  
 2) Poisonous glands  
 3) Lacrimal glands    4) Cutaneous glands
202. A Frog differs from the toad by the absence of  
 1) External ear    2) Tail  
 3) Neck    4) Rough skin
203. Amphibian order without ribs but with sternum and girdles  
 1) Anura    2) Apoda  
 3) Urodela    4) Temnospondyli
204. The caudal vertebrae of amphibians fuse to form  
 1) Pygostyle    2) Urostyle  
 3) Holostyle    4) Autostyle
205. The permanent tubular extension of the cloaca resembles tail and acts as a copulatory organ  
 1) Rhacophorus    2) Ascaphus  
 3) Alytes    4) Hyla
206. Match the following
- |    | List - I              | List - II        |
|----|-----------------------|------------------|
|    | A) Rana tigrina       | 1) Indian frog   |
|    | B) Bufo               | 2) Toad          |
|    | C) Alytes             | 3) Mid wife toad |
|    | D) Hyla               | 4) Flying frog   |
|    | E) Rhacophorus        | 5) Tree frog     |
|    | A    B    C    D    E |                  |
| 1) | 1    2                | 3    4    5      |
| 2) | 1    2                | 3    5    4      |
| 3) | 2    1                | 3    5    4      |
| 4) | 1    2                | 5    4    3      |

207. Statement (S) : In Anurans mostly vertebrae are procoelous  
Reason (R) : Caudal vertebrae are fused to form urostyle  
1) Both S and R are correct, R explains S  
2) Both S and R are correct but R doesnot explains S  
3) S is true, R is false  
4) Both S and R are false

208. Statement (S) : Amphibians are tetrapods  
Reason (R) : Amphibians are first vertebrates to attempt transistion between water and land  
1) Both S and R are correct, R explains S  
2) Both S and R are correct but R doesnot explains S  
3) S is true, R is false  
4) Both S and R are false

209. The Salientia Member with digits of fore and hind limbs webbed is : (EAM-2004)  
1) Rana  
2) Rhacophorus  
3) Proteus  
4) Hyla

210. Which of the following vertebrates show the formation of middle ear (eustachian recess) for the first time ? (EAM-2007)  
1) Exocoetus  
2) Rana  
3) Echis  
4) Hippocampus

#### LEVEL - II

211. Following are the statements about Bufo  
I. It is the common toad with diurnal habit  
II. Behind the tympanum are parotoid glands, which secretea poisonous substance  
III. It is a member of Salientia  
The correct combination is  
1) I and II  
2) II and III  
3) I and III  
4) All

#### OPTIONS FOR STATEMENT / REASON TYPE

- Note : 1) Both S and R are correct, R explains S  
2) Both S and R are correct but R doesnot explains S  
3) S is true, R is false  
4) Both S and R are false
212. Statement (S) : In the members of Anura the limbs are strong and unequal  
Reason (R) : Hind limbs are longer and help in giving support
213. Statement (S) : Alytes is commonly called Mid wife toad  
Reason (R) : Female Alytes exhibits parental care
214. Statement (S) : In anurans tympanum and middle ear are present  
Reason (R) : Eustachian tubes connect middle ear with pharynx to equalize pressure on both sides of tympanum

#### LEVEL- III

215. Match the following & identify the correct combination.

##### List - I

- A. Myxine  
B. Extinct jawless fish  
C. Oikopleura  
D. Branchiostoma

##### List - II

- I. Neotenous  
II. Hag fish  
III. Cephalaspis  
IV. Acraniate  
V. Craniate

- |    | A   | B   | C   | D  |
|----|-----|-----|-----|----|
| 1) | II  | III | I   | IV |
| 2) | I   | II  | III | IV |
| 3) | II  | III | IV  | V  |
| 4) | III | IV  | V   | II |

216. Study the following

Organism	Character	Group
i. Petromyzon	Fish like but without paired fins	Agnatha
ii. Amphibia	First tetrapods	Amniota
iii. Herdmania	Solitary, sedentary tunicate	Urochordata
iv. Amphioxus	Fish like burrowing form	Urochordata

Which of the above two correct

- i) i & ii 2) i & iv 3) i & iii 4) iii & iv

217. The statement regarding the correct sequence of layers of notochord from outside to inside  
1) Vacuolated cells - elastic connective tissue - Fibrous tissue  
2) elastic connective tissue - Vacuolated cells - Fibrous tissue  
3) Fibrous tissue - Vacuolated cells - elastic connective tissue  
4) elastic connective tissue - Fibrous tissue - Vacuolated cells

218. Match the following

##### List - I

- A) Notochord  
B) Nerve cord  
C) Nuclei pulposi  
D) Stomocord  
E) Branchial clefts

##### List - II

- i) Derived from ectoderm  
ii) Derived from chordamesoderm  
iii) Derived from ectoderm and endoderm  
iv) Remnants of notochord  
v) Resembles the notochord

- |    | A  | B   | C   | D   | E   |
|----|----|-----|-----|-----|-----|
| 1) | i  | ii  | iii | iv  | v   |
| 2) | ii | i   | iv  | v   | iii |
| 3) | i  | i   | iv  | iii | v   |
| 4) | ii | iii | iv  | v   | i   |

219. Match the following

##### List - I

- A) Symmetry  
B) Coelom  
C) Heart  
D) Muscle phosphogen

##### List - II

- i) Enterocoelom  
ii) Phosphocreatinine  
iii) Anus  
iv) Myogenic



- V) Hagfish
- |    |    |    |     |     |
|----|----|----|-----|-----|
|    | A  | B  | C   | D   |
| 1) | II | IV | III | I   |
| 2) | II | I  | IV  | III |
| 3) | v  | I  | IV  | III |
| 4) | II | I  | III | IV  |

232. Match the following and choose the correct answer.

- |               |                      |
|---------------|----------------------|
| List – I      | List – II            |
| A) Rhinodon   | I) Largest anamniote |
| B) Stegostoma | II) Electric ray     |
| C) Torpedo    | III) Rat fish        |
| D) Chimaera   | IV) Flying fish      |
|               | V) Zebra Shark       |

- |    |    |    |     |     |
|----|----|----|-----|-----|
|    | A  | B  | C   | D   |
| 1) | I  | V  | II  | III |
| 2) | V  | II | III | IV  |
| 3) | II | V  | IV  | III |
| 4) | I  | II | III | IV  |

233. Match the following and choose the correct answer.

- |               |                 |
|---------------|-----------------|
| List – I      | List – II       |
| A) Pristis    | I) Sea vampire  |
| B) Myliobatis | II) Guitar fish |
| C) Rhinobatis | III) Saw fish   |
| D) Raja       | IV) Ostracoderm |
|               | V) Skate        |

- |    |     |    |     |    |
|----|-----|----|-----|----|
|    | A   | B  | C   | D  |
| 1) | III | I  | II  | V  |
| 2) | III | II | III | IV |
| 3) | IV  | I  | V   | II |
| 4) | I   | II | IV  | V  |

234. Match the following and choose the correct answer.

- |                 |                                 |
|-----------------|---------------------------------|
| List – I        | List – II                       |
| A) Neoceratodus | I) Rivers of tropical Africa    |
| B) Protopterus  | II) Garpike                     |
| C) Polypterus   | III) Cartilaginous endoskeleton |
| D) Lepisosteus  | IV) Single lung                 |
|                 | V) Spiracle                     |

- |    |    |     |     |     |
|----|----|-----|-----|-----|
|    | A  | B   | C   | D   |
| 1) | I  | III | II  | IV  |
| 2) | IV | I   | V   | III |
| 3) | V  | I   | III | IV  |
| 4) | IV | I   | III | II  |

235. The following are the statements about Dipnoi fishes

- I. They have one or two lungs and internal nostrils  
 II. Their body is covered by cycloid scales and has a diphyccercal caudal fin  
 III. They are good example for discontinuous distribution

The correct combination is

- 1) I and II    2) II and III    3) I and III  
 4) I, II & III

236. The following statements are about osteichthyes

- I. In osteichthyes the types of scales are cycloid ctenoid, ganoid

II. In Osteichthyes the number of gills are 4 pairs

III. In some osteichthyes fishes the endoskeleton is made up of cartilage

The correct combination is

- 1) I and II    2) II and III  
 3) I and III    4) I, II & III

237. Study of the following

<u>Infraclass</u>	<u>Fish Name</u>	<u>Character</u>
I. Teleostei	Echeneis	Homocercal tail fin
II. Chondrostei	Acipencer	Heterocercal tail fin
III. Dipnoi	Neoceratodus	Presence of two lungs
IV. Rhipidistia	Latimeria	Air breathing

Identify the correct combination from the above

- 1) I and II    2) II and III    3) III and IV    4) I and IV

238. Study the following

<u>Fish</u>	<u>Scales</u>	<u>Caudal fin</u>
I. Scoliodon	Placoid	Heterocercal
II. Protopterus	Cycloid	Diphycercal
III. Polypterus	Cycloid	Diphycercal
IV. Exocoetus	Cosmoid	Homocercal

Identify the correct combination from the above

- 1) I and II    2) II and III    3) III and IV    4) I and IV

239. Study the following

<u>Fish</u>	<u>Distribution</u>	<u>Character</u>
I. Neoceratodus	Australia	Single lung
II. Protopterus	Africa	Aestivation
III. Polypterus	North America	Heterocercal caudal fin
IV. Amia	South America	Cartililagenous endoskeleton

Identify the correct combination from the above

- 1) I and II    2) I and III    3) III and IV    4) I and IV

240. Match the following

List - I	List - II
A) Ostracodermi	i) Extinct fishes
B) Cyclostomata	ii) Cartilagenous fishes
C) Placodermi	iii) Extant jawless vertebrates
D) Chondrichthyes	iv) Extinct jawless vertebrates

	A	B	C	D
1)	iv	iii	i	i
2)	i	ii	iii	iv
3)	i	iv	iii	ii
4)	iii	iv	i	ii

241. Match the following

List - I	List - II
A) Lancelets	i) 10 Pairs of gillslits and 10 pairs of cranial nerves
B) Cephalaspis	ii) Anadromous migration
C) Myxine	iii) Gillslits opens into atrium
D) Petromyzon	iv) One semicircular canal
E) Oikopleura	v) Protonephridia with

- |    |    |    |             |   |     |
|----|----|----|-------------|---|-----|
|    |    |    | solenocytes |   |     |
|    | A  | B  | C           | D | E   |
| 1) | v  | i  | iv          | i | iii |
| 2) | i  | iv | iii         | i | v   |
| 3) | iv | i  | iii         | i | v   |
| 4) | i  | iv | i           | v | iii |
242. Match the following
- |                 |                                 |
|-----------------|---------------------------------|
| <b>List - I</b> | <b>List - II</b>                |
| A) Tetrapods    | i) Reptiles, birds and mammals  |
| B) Amniotes     | ii) Amphibians, reptiles, birds |
| C) Anamniotes   | iii) Fishes and amphibians      |
| D) Saurapsida   | iv) Reptiles and birds          |
- |    |   |   |     |     |
|----|---|---|-----|-----|
|    | A | B | C   | D   |
| 1) | i | i | iv  | iii |
| 2) | i | i | iii | iv  |
| 3) | i | i | iii | iv  |
| 4) | i | i | iv  | iii |
243. Match the following
- |                            |                          |
|----------------------------|--------------------------|
| <b>List - I</b>            | <b>List - II</b>         |
| A) Devonian period         | i) Climatius             |
| B) Acanthodians            | ii) Golden age of fishes |
| C) Paedocypris progenetica | iii) Whale shark         |
| D) Rhinodon typus          | iv) Smallest fishes      |
| E) Ichthyology             | v) Study of fishes       |
- |    |   |   |     |     |    |
|----|---|---|-----|-----|----|
|    | A | B | C   | D   | E  |
| 1) | i | i | iii | iv  | v  |
| 2) | i | i | iii | iv  | v  |
| 3) | i | i | iv  | iii | v  |
| 4) | i | i | iii | v   | iv |
244. Match the following
- |                         |                      |
|-------------------------|----------------------|
| <b>List - I</b>         | <b>List - II</b>     |
| A) Scoliodon sorrakowah | i) Bichir            |
| B) Polypterus           | ii) Congo eel        |
| C) Amphiuma             | iii) Indian dog fish |
| D) Hyla                 | iv) Tree frog        |
- |    |     |     |     |    |
|----|-----|-----|-----|----|
|    | A   | B   | C   | D  |
| 1) | iii | i   | i   | iv |
| 2) | iii | i   | iv  | i  |
| 3) | i   | iii | i   | iv |
| 4) | i   | i   | iii | iv |
245. Match the following
- |   |                                       |
|---|---------------------------------------|
| <b>List - I</b><br>(Name of the animal) | <b>List - II</b><br>(Number of gills) |
| A) Hydrolagus                           | i) 5 pairs                            |
| B) Myliobatus                           | ii) 6 pairs                           |
| C) Hexanchus                            | iii) 4 pairs                          |
| D) Heptanchus                           | iv) 7 pairs                           |
- |    |     |     |     |    |
|----|-----|-----|-----|----|
|    | A   | B   | C   | D  |
| 1) | i   | i   | iii | iv |
| 2) | iii | i   | i   | iv |
| 3) | iii | i   | iv  | i  |
| 4) | i   | iii | iv  | i  |

246. Match the following
- |                 |   |
|-----------------|---|
| <b>List - I</b> | <b>List - II</b>                        |
| A) Petromyzon   | 1) Pelvic fins are absent               |
| B) Anguilla     | 2) Pelvic fins are modified as claspers |
| C) Neoceratodus | 3) Paired fins are absent               |
| D) Hippocampus  | 4) Pelvic fins form brood pouch         |
| E) Amphiuma     | 5) Rudimentary limbs                    |
|                 | 6) Paddle like paired fins              |
- |    |     |     |    |    |    |
|----|-----|-----|----|----|----|
|    | A   | B   | C  | D  | E  |
| 1) | iii | i   | vi | iv | v  |
| 2) | iii | i   | vi | v  | iv |
| 3) | i   | iii | iv | vi | v  |
| 4) | i   | iii | iv | v  | vi |
247. Statement (S) : Actinopterygii are commonly called ray finned fishes  
Reason (R) Paired fins lack fleshy lobe and supported by dermal rays
- Both S and R are correct, R explains S
  - Both S and R are correct but R doesnot explains S
  - S is true, R is false
  - Both S and R are false
248. Statement (S) : Sarcopterygians are named as choanichthyes  
Reason (R) They have internal nares
- Both S and R are correct, R explains S
  - Both S and R are correct but R doesnot explains S
  - S is true, R is false
  - Both S and R are false
249. The following are the statements about echeneis
- Its is commonly called sucker fish
  - It leads ectocommensalic life on sharks
  - The pectoral muscles are modified as suckers
- Select the correct statements
- Only i is correct
  - Only ii is correct
  - i & ii are correct
  - i, ii and iii are correct
250. The following are the statements about gills of cartilagenous fishes
- Gills are lamelliform in them
  - Sharks are pleurotrematic in nature
  - Rays and skates are pleurotrematic
- Select the correct statements
- i & ii are correct
  - ii & iii are correct
  - i & iii are correct
  - i, ii and iii
251. Match the following and choose the correct combination
- |                 |                           |
|-----------------|---------------------------|
| <b>List - I</b> | <b>List - II</b>          |
| A) Ichthyophis  | I) Vestigial limbs        |
| B) Alytes       | II) Parental care by male |



