

Model Answer of AS-2968

B.Sc. (R.T.) I Semester - 2013

RTZ-104: Vertebrates

①

Section - 'A'

Q.1. Objective Type Questions:

- ① Ventral to Nerve cord
- ② Organ system level
- ③ Urochordata
- ④ Head
- ⑤ Salmon
- ⑥ Dipnoi
- ⑦ Hyla
- ⑧ Herpetology
- ⑨ Mammals
- ⑩ All

Section - 'B'

Short Answer Type Questions:

Q.2. Describe Basic Primary characters of Chordates:

- ① Presence of Notochord → It consists of a series of large, vacuolated cells, enclosed in a single or double layered sheath of connective tissue.
 - It persists throughout life in some primitive chordates but in majority occurs only during embryonic stages being replaced in adult by a mesodermal cartilagenous or bony vertebral column.

⑥ Presence of Dorsal Tubular Nerve Cord:

- It is single, hollow and tubular. It is situated above alimentary canal and notochord.
- It is ectodermal in origin. Its cavity is neurocoel.
- In most chordates, anterior part forms brain and remaining part spinal cord. Both together form CNS.

⑦ Presence of Pharyngeal gill slits:

- These are paired gill clefts in lateral walls of embryonic pharynx.
- In aquatic chordates, it persists throughout life but in terrestrial higher chordates, these are closed during later embryonic development.

Q. 3. Write general characters of sub-phylum Cephalochordata with examples.

- These are marine forms and fish like appearance.
 - Three basic primary Chordate characters present throughout life.
 - Notochord extends upto head.
 - No distinct head but post anal tail present.
 - 'L' shaped segmental muscles present.
 - Ciliated oral hood with sensory cirri present.
 - Mouth is surrounded by velum.
 - Sac like liver attached to intestine.
 - Heart is absent.
 - Respiration is by gills.
 - Excretion by paired ciliated nephridia.
 - Fins present for swimming.
 - These are unisexual and gonads are segmented.
- eg. Branchiostoma (Amphioxus).

Q.4. Describe external features of Scoliodon:

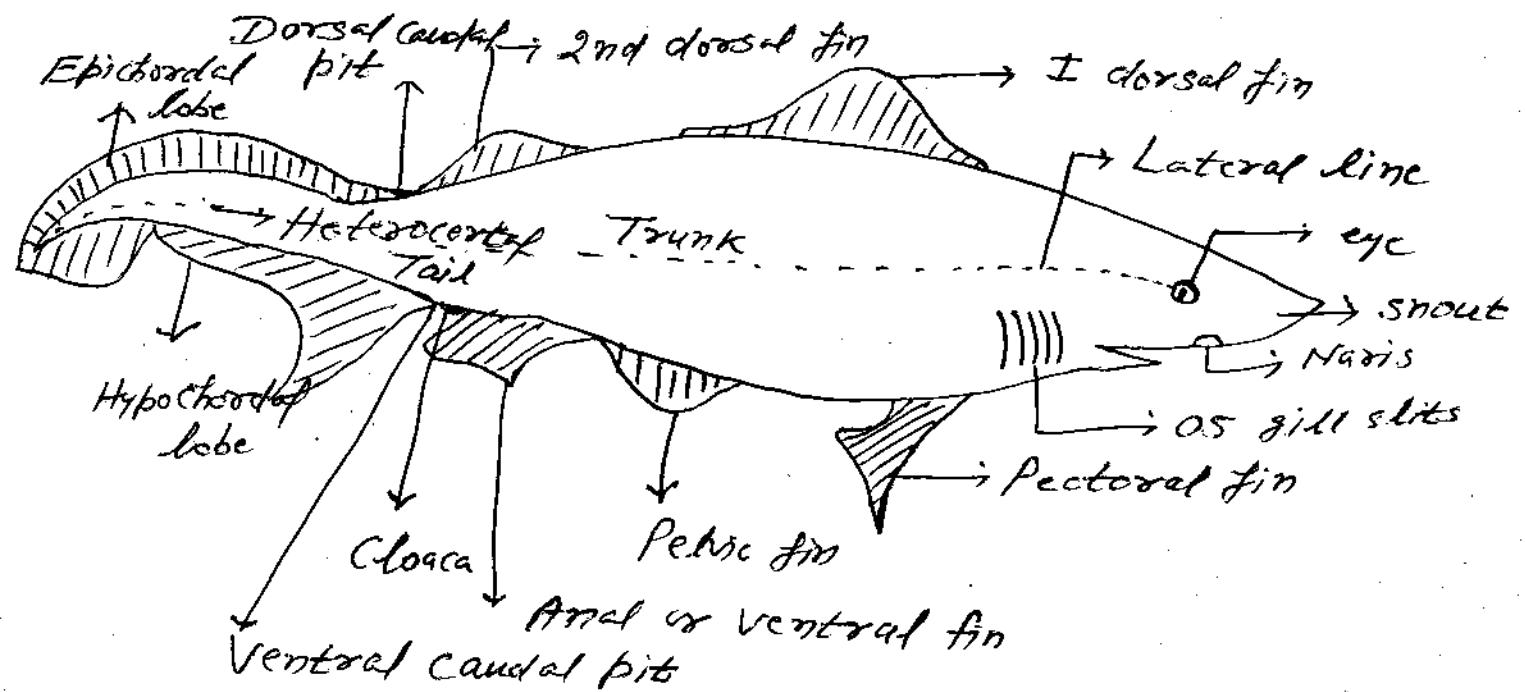
Systematic Position → Phylum - Chordata

Sub-phylum - Vertebrata, Super-class → Pisces

Class - Chondrichthyes, Genus - Scoliodon

Distribution → Coasts of India, West Indies, S. America, etc

Habits and Habitat → Marine, Carnivorous, predaceous, and OVO-viviparous.



(Female scoliodon)

External features →

- ① Shape → Elongated, spindle shaped & laterally compressed. Highly streamlined to reduce resistance of water.
- ② Size → About 60 cm in length.
- ③ Colour → Dorsal → Dark brown, Ventral → pale white.
- This colouration serves as a camouflage against predators in water.
- ④ Division of the body → Three regions:
 - Head
 - Trunk
 - Tail

⑨ Head: merges into trunk, neck absent, dorso-ventrally flattened and pointed out as a snout.

① Mouth → Ventral and crescentic bounded by jaws, sharp and backwardly directed teeth present (1 or 2 rows)

② Nares → 1 pair, ventro-anterior to mouth, only olfactory.

③ Eyes - 1 pair, circular with vertical pupil, eye lids poorly developed, nictitating memb. present.

④ External gill slits → 5 pairs, behind the eyes

⑤ Ampullary pores → Opening of Ampullae of Lorenzini, Thermoreceptor

⑥ Trunk →

① FINS → Paired and Unpaired, heterocercal tail, 1 pair clespers are associated with pelvic fins in male.

② Lateral line system → Contains neuromast organs which are Rheoceptors.

⑦ Tail → Having cloaca, Caudal pit (characteristics of Scoliodon)

- Skin → Leathery and hard, with placoid scales.

Q. 5. Describe important poisonous snakes of India:

- General characters of snakes → - Distributed in every kind of habitat.

- Elongated and lightly muscular body.

- Limbs absent.

- Head scales are used in taxonomic identification

- Locomotion by ventrals

- Moulting in one piece

- Bifid tongue is a sense organ for odours & vibrations

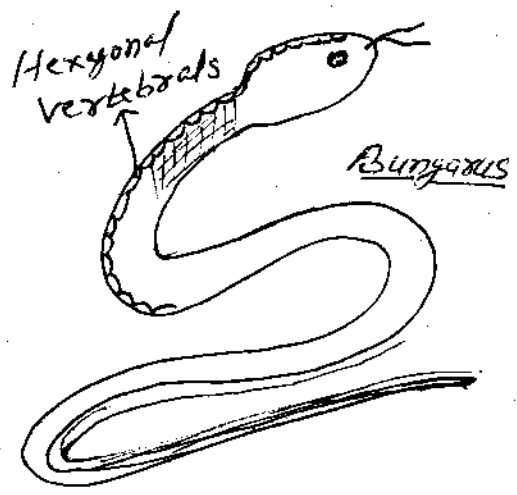
- Both poisonous and non-poisonous

- They are destroyer of harmful rodents.

- Following are the important poisonous snakes of India:

- ① Cobra (Naja naja) → Deadly poisonous - variable black and brown colour - Distinct head - Pupil round - Neck can dilate into a hood and supported by ribs and may bear spectacle marks dorsally.
- 3rd sublabial shield of upper lip touches eye and nasal shields.
 - Sub-caudal shields are in two rows.
 - Anterior and grooved fangs are erect permanently
 - Feeds on small birds, rats, frogs, lizards, etc.
 - Chief enemies are jungle fowls and mongoose
 - King Cobra (Naja khamet) is largest which mainly feeds on snakes and monitor lizards.

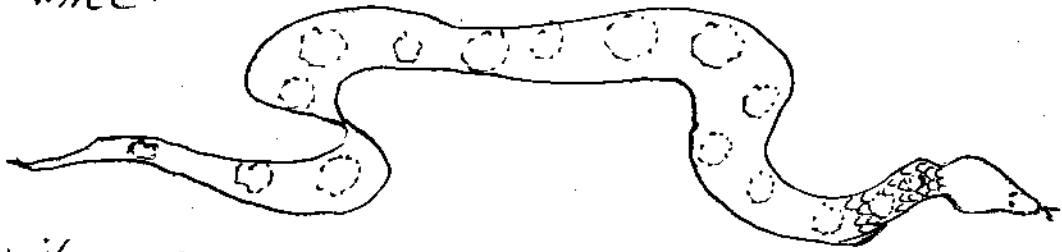
② Bungarus caeruleus (krait)



- vertebrae are large and hexagonal
- 4th infra labial is the largest
- sub-caudals are single
- Dorsal surface is brownish black with narrow white cross streaks
- Fangs are small but more poisonous
- Terrestrial and diurnal snake feeding on amphibians, lizards, snakes and mammals.
- Banded krait is restricted to N. India. Body is marked with alternate broad black and yellowish rings imparting a beautiful but dreadful appearance.

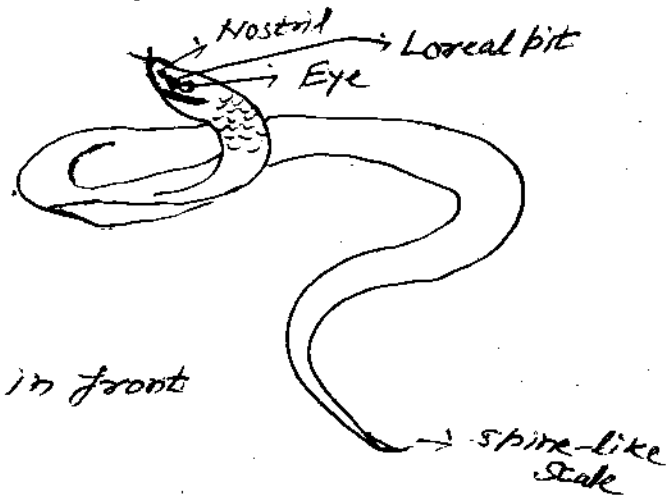
③ Pitless Vipers (*Vipera russelli*)

- Head is triangular covered with small scales
- Nostrils are lateral, oblique and very large
- Upper surface shows three rows of large black rings
- Head shows a yellow 'A'-mark
- Sub-caudal shields are in two rows
- Fangs are large, tubular and lie down when not in use
- It makes a loud hissing sound when attacked.
- Nocturnal, viviparous, thoroughly terrestrial and feeds chiefly on mice.



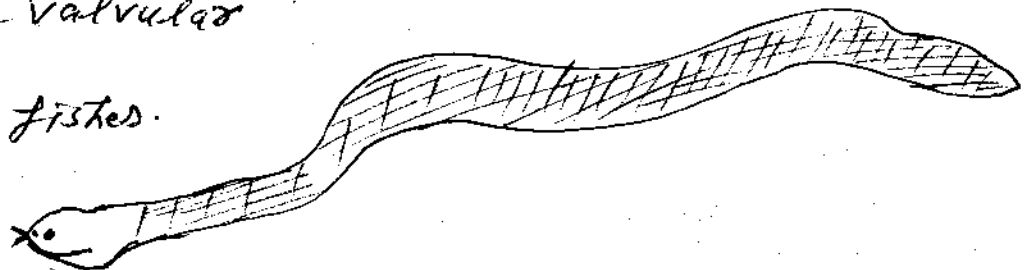
④ Pit viper (*Ancistrodon himalayensis*)

- Brown in colour
- Head bears shields
- Sub-caudals are in two rows and tail ends in a long spine like scale.
- Other characters are similar to pitless viper.



⑤ Hydrophis (Sea snake) :

- Lower jaw is deeply notched in front
- Oar like tail
- Highly poisonous
- Small head shielded above
- Small eye with round pupil
- Nostrils are valvular
- Viviparous
- Main food is fishes.



Q.6. Briefly classify class Reptilia with suitable examples:

- General characters → - Creeping animals, adapted for land life.
- Mostly carnivorous, air breathing & oviparous
 - Limbs pentadactyle or absent.
 - Exoskeleton of horny epidermal scales, shields & scutes
 - Skin is devoid of glands.
 - Jaw bears homodont teeth, absent in turtle
 - Heart incomplete four chambered (Crocodiles - 4 chambered)
 - Respiration by lungs & Jacobson's organ present
 - Uricotelic
 - Unisexual, hemipenis present, oviparous.

Classification → Based on openings of temporal region.

- Sub-class - I Anapsida → No temporal openings
 - Order ① Chelonia → Webbed limbs - Carapace and plastron present - single nasal opening - Teeth absent
 - eg. Terrapins (Fresh water), Tortoises (Terrestrial), Turtles (Marine)
- Sub-class - II Euryapsida → Extinct
 - 1 pair dorso-lateral temporal openings
- Sub-class III Parapsida - Extinct.
 - 1 pair dorso-lateral temporal openings
- Sub-class - IV Synapsida → Extinct
 - 1 pair lateral temporal openings
- Sub-class - V Diapsida →
 - 2 pairs temporal openings

Order ① Rhynchocephalia

- Lizard like, Pentadactyle, burrowing
- Skin with granular scales and a mid-dorsal row of spine
- Nasal openings separate
- Vestigial pineal eye present
- Copulatory organ absent eg. Sphenodon

Order ② Squamata :

- Limbs clawed or absent
- Exoskeleton horny with scales, shields and spines
- Teeth mostly pleurodont
- Male with hemipenis

eg. Herodactylus, Calotes, Uromastix, Heloderma,
Maja, Python

Order ③ Crocodylia →

- Aquatic and Carnivorous
- Tail laterally compressed
- Limbs clawed and webbed
- Thick skin with scales, bony plates and scutes
- Abdominal ribs present
- Teeth Heterodont, & Thecodont
- Heart 4 chambered

eg. Crocodylus, Gavialis, Alligator

Q.7. Shortly describe general characters of class Mammalia

- Mostly terrestrial, few are aquatic.
- Body is divisible into head, neck, trunk and tail
- Limbs 2 pairs, pentadactyle, variously adapted for walking, running, climbing, burrowing, swimming or flying
- Hind limbs are absent in Cetaceans and Sirenians
- Exoskeleton includes hairs, spines, scales, claws, nails, hoofs, horns and bony dermal plates
- Skin with various glands including mammary glands.
- Diaphragm present
- Cervical vertebrae usually seven
- Teeth heterodont, thecodont and diphyodont
- Pulmonary respiration
- Homothermic
- 4 chambered heart
- R.B.Cs. are enucleated.

- Urinary bladder present & urochelic
- Corpus callosum & Corpora quadrigemina present
- Pinna present
- Unisexual, sexual dimorphism, penis present, testes in scrotum, Oviparous and viviparous, Placenta present.
- These are amniotes
- Parental care present
- Shows greatest intelligence.

Section - C

Long Answer Type Questions:

Q. 8. Classify the Urochordata with general characters and suitable examples:

General Characters:

- ① Most primitive chordates
 - ② Pharyngeal gill slits present
 - ③ Notochord restricted to tail in larva
 - ④ Larva is tadpole shows Retrogressive metamorphosis
 - ⑤ Adult body assymetric, Covered by test or tunic, secreted by mantle, composed of Tunicin.
 - ⑥ Alimentary canal is 'U' shaped.
 - ⑦ Heart Ventral and tubular
 - ⑧ Nervous system in the form of antero-dorsal nerve ganglion.
 - ⑨ Neural gland is excretory
 - ⑩ specialized sense organs absent
 - ⑪ Reproduction asexual or sexual
 - ⑫ Hermaphrodite
 - ⑬ Gonad is bisexual → Ovotestis
- Divided into three classes on the basis of test and location of apertures:

I. Class → Larvacea: - These are tailed animals.

- Pelagic form
 - Possess basic chordate characters throughout life
 - Test is jelly like, without cells and with both openings
 - Body is divided into Trunk and tail.
 - Single pair of pharyngeal gill slits opening out directly or into a small atrial cavity.
 - Only sexual reproduction.
- eg. Oikopleura

II. Class - Ascidacea: - These are sessile

- Test with cells, fibres and both apertures
 - Stigmata numerous
 - Adult without tail, Notochord or nerve cord
 - Reproduction mostly sexual or both.
 - Branchial and atrial apertures at the same upper end
- eg. Herdmania, Ascidia

III Class - Thaliacea: - pelagic forms

- Test transparent with fewer or no cells and fibres
- Body barrel shaped
- With branchial and atrial apertures at opposite ends
- Life cycle includes of alternation of dimorphic sexual and asexual generations

eg. Pyrosoma, Doliolum, Salpa

Q.9. Describe parental care in fishes:

- Pay little parental care
- Mostly by male parent

① Nest building: eg. Amia

- Build a circular nest among aquatic plants. The male guards the eggs and afterwards young.
- eg. Prototerus → digs oval pits or holes at the base of

fall swamp grasses. The male vigorously guards them and even thrashes surface to aerate water around the eggs.

- eg. Betta → Eggs collected by the male in their mouth are thrown to adhere to floating nests of mucous & air bubbles.

② Coiling round eggs → eg. Pholis

- The male guards by coiling round the eggs rolled into a ball or sphere until they hatch.

③ Attachment to body → eg. Kribia

- Male of new Guinnee fish entangles the egg mass on a hook like process on head until they are hatched.

④ Integumentary cups → eg. Aspredo

- Fertilized eggs are pressed into the soft spongy skin of belly of the female. Each egg is settled in a cup like depression and carried until hatching.

⑤ Shelter in mouth → eg. Arius, Tilapia

- Eggs and young are kept in mouth of male fish.

⑥ Brood Pouches → eg. Hippocampus (male)

- Eggs in brood pouch of male transferred by female.

⑦ Mermaids purse → eg. Scyllium (Oviparous sharks)

- Female lays fertilized eggs inside protective horny egg capsule or mermaids purses, which remain anchored to sea weeds by their long tendrils. The young hatch out after rupturing the egg case.

⑧ Viviparity: eg. Squalodon

- Fertilization & development internal

- Nourishment by yolk sac placenta

- Young are born with the characteristics of the adult.

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Q.10. Explain the general characters of Class Aves:

- Stream lined body (spindle shaped)
- Body is divided into Head, neck, trunk and tail.
- Toothless beak or bill present.
- Body is covered by feathers.
- Warm blooded animals
- Neck is long and flexible
- Tail short and stumpy
- Forelimbs are modified into wings
- Hind limbs are adapted for walking, running, perching, scratching, capturing, swimming, etc., usually bear four clawed toes.
- Exoskeleton is in the form of feathers, scales, claws, etc.
- Skin is dry and devoid of glands except preen gland.
- Pectoral flight muscles are well developed.
- Bones are pneumatic
- Synsacrum present
- Caudal vertebrae form pygostyle
- Sternum is boat shaped & keeled
- Furcula present
- Carpometacarpus & Tarsometatarsus present
- Oesophagus is differentiated into crop and gizzard.
- 4 chambered heart present
- Lungs are continuous with air sacs
- Sound is produced by syrinx.
- Urinary bladder is absent
- Greatly developed olfactory lobes
- Olfactory organs poorly developed
- Eyes with nictitating memb.
- Sexual dimorphism well marked.
- Penis absent except ratites.
- Left functional ovary & oviduct present
- Oviparous.
- Parental care is well marked.

Q.11. Describe flight adaptation in birds:

- Young (1958) → "Birds are masters of air"
- Birds show anatomical, embryological, physiological, etc. adaptations.
- Flight adaptation is associated to reduce body weight.
- (a) Shape → stream lined → minimise resistance to wind.
- (b) Feathers → insulation & buoyancy
- (c) Wings → For flight
- (d) Short tail → Serves as rudder for steering during flight.
- (e) Beak → Used as a forcep, horny & without teeth.
- (f) Mobile neck and head →
- (g) Bipedal locomotion → Well developed in ratites.
- (h) Skin → Loose, for extensive movement of muscles
- (i) Perching → In resting or sleeping states
- (j) Endoskeleton → Pneumatic bones, keeled sternum to provide muscles attachment, compact synsacrum & Pygostyle
- (k) Digestive system → High metabolic rate.
- (l) Airsacs and respiration → for buoyancy and most efficient respiration.
- (m) Warm bloodness → Body temp. → 40-60°C
- (n) Circulatory system → Largest heart according to the body proportion, high proportion of Hb.
- (o) Urinary Secretion →
- (p) Brain & sense organs → Large eyes, rapid accommodation
- (q) Single ovary & oviduct →
- (r) Urinary bladder → Absent.