Affinities of Cyclostomes:

Cyclostomes are evidently chordate. They are primitive vertebrates. Their ammocoete larva resembles in most characters with that of Branchiostoma, which shows primitive relationship. Whereas, adult cyclostomes possess specialised as well as degenerate characteristics.

I. Primitive Characters of Cyclostomes:

(A) Characters Resembling those of Amphioxus:

1. Absence of jaws, exoskeleton and paired fins.

2. Continuous notochord (but with an added sheath).

3. Segmental musculature (myotomes) but little modified from head to tail.

4. Ciliated alimentary tract straight and without much regional specialisation.

5. Relatively large numbers of gill-slits.

6. Endostyle in lamprey larva.

7. Gonads without gonoducts.

Besides these, the ammocoete larva of lampreys resembles Amphioxus as follows:

1. Fish-like body.

2. Oral hood anterior to mouth.

3. Continuous dorsal and caudal fins.

4. Ciliated digestive tract.

5. Filter feeding habit and

6. Endostyle functions in feeding.

(B) Characters more Primitive than in Fishes (Differences from Fishes):

1. No biting jaws, Scales, true teeth, true fin rays, girdles, ribs, stomach, spleen and gonoducts.

2. Continuous median dorsal fin.

3. Diphycercal caudal fin.

4. Single median nostril, instead of paired.

5. Cranium incomplete or poorly developed.

6. No vertebrae or poorly developed vertebrae.

7. Rudimentary pancreas.

8. No spinal valve, or only slightly developed spiral valve, in intestine.

9. Brain relatively small or generalised.

10. Ninth and tenth cranial nerves not enclosed in the cranium. Absence of medullated nerves.

11. Sympathetic nervous system very primitive and poorly developed.

12. Heart a rather loosely twisted S-shaped tube without conus arteriosus.

13. Lateral line organs poorly developed and in isolated pits.

14. Hypophysial duct rather large, open to the exterior and not connected with the pituitary body.

(C) Affinities with Ostracoderms:

Cephalaspids and anaspids are fossil agnathans that show similarity to the modem cyclostomes than pteraspids (Neterostraci or Pteraspida). Ostracoderms belonging to Ordovician are the Oldest fossil vertebrates. They were abundant in Silurian period and become extinct in Devonian. Probably they were the forerunners of higher fishes.

The fossil ostracoderms and present cyclostomes are kept in Agnatha due to the following similarities:

1. Presence of a median pineal eye.

2. Presence of velar pump-like lamprey.

3. Endostyle sac-like.

4. Single nasal opening though nasal sacs are paired.

5. Brain is like that of lamprey.

6. Two semicircular canals in the ear.

7. Dorsal and ventral nerve roots separate up to 15.

8. Pairs of branchial pouches surrounded by a branchial basket.

9. Continuous uncostricted notochord.

10. Absence of jaws.

Stensio holds that the pteraspids have given rise to the myxinoids, and the cephalaspids to the lampreys. The Agnatha were the first animals of the chordate type to become large. They feed on detritus on the bottom. The lampreys and hagfishes have been derived from early Agnatha by the evolution of a sucking mouth, perhaps with loss of the bony skeleton and paired limbs.

II. Specialised Characters:

1. Sucking mouth buccal funnel and horny teeth (in lampreys)

for attachment.

2. Powerful tongue armed with sharp horny teeth works as a rasping organ.

3. Secretion of anticoagulants in saliva to feed on blood of prey.

4. Sac-like gill-pouches. Located far behind head. It is probably an adaptation to burrowing.

5. Complete separation of lower sac-like respiratory pharynx from upper digestive pharynx.

6. Water entering gill-pouches and also leaving them through external gill openings and not through mouth.

7. In hagfishes, presence of large mucus secreting mucous glands.

8. Dorsal position of nostril on head in lampreys.

9. Large, heavy-yolked egg, with meroblastic cleavage and no larval stage in hags.

III. Degenerate Characters:

1. Simple elongated eel-like body more marked in hags. Whereas ostracoderms body is broad fish-like.

2. Rudimentary paired eyes covered by thick skin in hags.

3. Lack of exoskeleton or bony armour.

4. Absence of paired fins and girdles.

5. Lack of ossification of endoskeleton, it is cartilaginous.

6. Reduced liver and lack of gall-bladder and bile-duct in adult lamprey.