

COMPARATIVE ACCOUNT OF CRANIAL NERVES (DISTRIBUTION AND ORIGIN)

Q.State a brief account on cranial nerve and its significance.

- i) Cranial nerves have roots enclosed in the braincase. Most are named and numbered by Roman numerals from anterior to posterior.
- ii) The conventional system for numbering these nerves is sometimes inconsistent. For instance, most anamniotes are said to have ten numbered cranial nerves plus six pairs of unnumbered, lateral line cranial nerves.
- iii) **A few anamniotes** (Fish, amphibia) and all amniotes are said to have 12. In fact, there is an additional terminal nerve at the beginning of this series. If counted at all, it is numbered 0 to avoid renumbering the conventionally numbered sequence. Further, the second cranial nerve (II) is not a nerve at all but an extension of the brain.
- iv) Nevertheless, by convention it is called the optic "nerve." The eleventh cranial nerve (XI) represents the merger of a branch of the tenth cranial nerve (X) with elements of the first two spinal nerves (C-1 and C-2). Despite its composite structure, it is called the spinal accessory nerve and designated by Roman numeral XI.
- v) In addition to these numbered cranial nerves, up to six pairs of unnumbered, lateral line cranial nerves are present in jawed fishes and many amphibians.
- vi) **Phylogenetically**, the cranial nerves are thought to have evolved from dorsal and ventral nerves of a few anterior spinal nerves that became incorporated into the braincase. Dorsal and ventral nerves fuse in the trunk but not in the head, and they produce two series: dorsal cranial nerves (V, VII, IX, and X) and ventral cranial nerves (III, IV, VI, and XII).
- vii) Like spinal nerves, the cranial nerves supply somatic and visceral tissues and carry general sensory and motor information. Some cranial nerves consist of only sensory or only motor fibers. Other nerves are mixed, containing both types.
- viii) *Cranial nerves concerned with localized senses* (e.g., sight, hearing, lateral line, olfaction, taste) are called special cranial nerves to distinguish them from those concerned with the sensory or motor innervations of the more widely distributed viscera, general cranial nerves.
- ix) Primitively, all cranial nerves serving the branchial pouches formed three branches per pouch: pretrematic, posttrematic, and pharyngeal (Figure 1).
- x) **In amniotes** (Reptiles, Birds, Mammals-Amniotes are characterized by having an egg equipped with an amnion, an adaptation to lay eggs on land or retain the fertilized egg within the mother. Amniote embryos, whether laid as eggs or carried by the female, are protected and aided by several extensive membranes.), these tend to be lost or their homologues become uncertain.
- xi) Most anamniotes possess **17 cranial nerves**. The first few spinal nerves behind the braincase become housed in the skull of later derived groups. But in anamniotes, these anterior spinal nerves are still partially outside the skull.
- xii) **In cyclostomes**, these anterior spinal nerves outside the skull are called **occipitospinal nerves**.
- xiii) In other fishes and amphibians, the anterior spinal nerves become partially incorporated into the braincase. They exit via foramina in the occipital region of the skull and are called occipital nerves. Occipital nerves unite with the next few cervical spinal nerves to form the composite hypobranchial nerve that supplies hypobranchial muscles in the throat (Figure 2).
- xiv) Latimeria (coelacanth) and many amphibians have 17 cranial nerves.
- xv) In amniotes, the lateral line nerves are lost and the occipitospinal nerves are incorporated into the skull and modified. Their roots shift from the spinal cord forward into the medulla. In this way, amniotes derive the eleventh and twelfth cranial nerves. The 12 numbered cranial nerves are illustrated in Figure 3 and 4.

Q. Give a proper description on distribution and origin of different cranial nerves in vertebrates.

Olfactory nerve (I):

The olfactory nerve is a sensory nerve concerned with the sense of smell. Olfactory cells lie in the mucous membrane of the olfactory sac. A short axon leads from each cell to the olfactory bulb. Each axon constitutes an olfactory fiber. Collectively, the olfactory fibers form the short olfactory nerve, which is the only cranial nerve composed of the axons of the receptor cells themselves.

Optic nerve (II):