

Teaching Syllabus of Neuroanatomy

(For MBBS students)

Writers: All Teachers in the department of Human Anatomy

Time: 2019.10

Basic information of the course

Course Name	Neuroanatomy				
Course Code					
Teaching Department	Department of Human Anatomy				
Experiment Type	<input checked="" type="checkbox"/> Professional basic experiment <input type="checkbox"/> Professional experiment <input type="checkbox"/> Comprehensive experiment <input type="checkbox"/> Innovative experiment <input type="checkbox"/> Open experiment				
Course Type	<input checked="" type="checkbox"/> Compulsory <input type="checkbox"/> Elective				
Experimental Type	<input type="checkbox"/> Independent course <input checked="" type="checkbox"/> Non-independent course				
For Which Major	Foreign students				
Credits	3.5	Lecture Hours	48	Experiment Hours	16
Prerequisite course	Human Anatomy				
Website of the course					

I. Introduction and purposes

Neuroanatomy is the branch of human anatomy that deals with the nervous system and sensory organs, including the morphology of the organs, their position and

relationship, development and basic functions. It is also the fundamental subject to study other pre-clinic and clinic medicine. By the lectures and practice lessons, the students should master the basic theory, basic knowledge of the neuroanatomy, and the basic skill of practice.

II. Requirements

According to the study aims, the contents of neuroanatomy are divided into two different parts marked with “Master” and “Understand”. Mastering contents are more important, the students should read the text carefully, and be able to remember them firmly, to describe them precisely, to recognize the structures exactly, and to use the knowledge to analyze the clinic problems. For the understand contents, the students only need to get the general information about it.

III. Teaching schedule

Teaching schedule

Contents	Total hours	Lecture hours	Practice hours
Eye	4	3	1
Ear	4	3	1
Spinal cord	4	3	1
Brain stem	8	6	2
cerebellum	4	3	1
Diencephalons	4	3	1
Telencephalon	8	6	2
Spinal nerve	4	3	1
Cranial nerve	8	6	2
Automatic nervous system	4	3	1
Nervous pathway	8	6	2
Meninges, blood vessels of brain and spinal cord. Cerebrospinal fluid	4	3	1
Total hours	64	48	16

Contents of Outline

Chapter 1 The sensory organs

I . The eye

【Purposes and Requirements】

1. Know the general features of the eyeball.
2. Master the composition, principal feature and function of fibrous coat, vascular coat, and nervous coat.
3. Master the contents of the eyeball. Know the position of the anterior and posterior chamber. Master the production and circulation of aqueous humor.
4. Master the position, general features and functions of lens and vitreous body.
5. Master the layers of eyelid.
6. Master feature and division of the conjunctiva.
7. Master the composition of the lacrimal apparatus. Master the position of lacrimal gland. Know the drainage course of the tear.
8. Master the name, functions and innervations of muscles of the orbit.
9. Know the orbital fascia and fascial sheath of the eyeball.
10. Master the nerves of the orbit. Know the beginning, branches and distribution of the ophthalmic artery. Know the drainage of ophthalmic vein.

【Contents】

1. The general features of the eyeball.
2. The wall of the eyeball: composition, principal feature and function of fibrous coat, vascular coat, and nervous coat.
3. The contents of the eyeball: The position of the anterior and posterior chamber. The production and circulation of aqueous humor. The position, general features and functions of lens and vitreous body.
4. The accessory organs of eye: The layers of eyelid. The feature and division of the conjunctiva.

5. The composition of the lacrimal apparatus. The name, functions and innervations of muscles of the orbit. The orbital fascia and fascial sheath of the eyeball.
6. The blood vessels and nerves of eye.

II. The ear

【Purposes and Requirements】

1. Know the parts and functions of ear.
2. Know the formation of external ear. Master the general feature of external auditory meatus. Know the characteristic of external auditory meatus in the infant.
3. Master the position, general feature and parts of tympanic membrane.
4. Master the formation of middle ear. Master the position, general feature of walls of tympanic cavity. Know the complication of otitis media.
5. Know the name of auditory ossicles.
6. Master the position, parts and function of auditory tube. Master the characteristic of auditory tube in the infant.
7. Master the position of mastoid antrum and mastoid cells.
8. Master the position and division of the internal ear. Master the general feature and parts of bony labyrinths. Master the relationship between the bony labyrinths and membranous labyrinth.
9. Know general feature of membranous labyrinth.
10. Master the position of receptors of hearing and receptors of balance.
11. Know the conduction pathway of sound wave.

【Contents】

1. Know the parts and functions of ear.
2. The external ear. The general feature of external auditory meatus. The position, general feature and parts of tympanic membrane.
3. The middle ear. The position and parts. The position, general feature of walls of tympanic cavity. The name of auditory ossicles. The position, parts and function of auditory tube and the characteristic of auditory tube in the infant. The position

of mastoid antrum and mastoid cells.

4. The internal ear: The position and division of internal ear. The general feature and parts of bony labyrinths. The relationship between the bony labyrinths and membranous labyrinth. The general feature of membranous labyrinth.
5. The position of receptors of hearing and receptors of balance.
6. The conduction pathway of sound wave.

Chapter 2 The nervous system

I . Introduction

【Purposes and Requirements】

1. Know the functions of the nervous system in the living body. Master the divisions of the nervous system.
2. Know the structure of neuron, the classification of neuron.
3. Know the concept of reflex and the basic organization of reflex arc.
4. Master the basic terms of nervous system.

【Contents】

1. The concept and components of central and peripheral nervous system.
2. The structure of neuron, the classification of neuron.
3. The concept of reflex and the basic organization of reflex arc.
4. The concepts of grey mater, white mater, cortex, medulla, nerve fiber tract, nerve, nucleus and ganglion.

II . The spinal cord

【Purposes and Requirements】

1. Master the position and gross appearance of the spinal cord, the relations of the spinal segments to the corresponding vertebrae.
2. Master the arrangements of the grey matter. Master the position and function of important nuclei in gray matter (motor cells in the anterior column,

intermediolateral nucleus in the lateral column, nucleus proprius, substantia gelatinosa, dorsal nucleus in the posterior column). Master the concept of Rexed's lamina of grey matter.

3. Master the arrangements of the white matter. Master the approximate position and function of fasciculus gracilis, fasciculus cuneatus, spinothalamic tract, the lateral corticospinal tract and anterior corticospinal tract in the white matter. Know the position and function of rubrospinal tract, vestibulospinal tract, tectospinal tract, reticulospinal tract, anterior and posterior spinocerebellar tracts.
4. Know the functions of the spinal cord. Know the clinical symptoms and their anatomical mechanism of different injury to spinal cord.

【Contents】

1. The position and gross appearance of the spinal cord: cervical and lumbosacral enlargements, conus medullaris; The concept of spinal segment and relations of the spinal segment to the corresponding vertebrae.
2. The arrangement of the gray matter. Position and function of nuclei in grey matter. The concept of Rexed's lamina of grey matter.
3. The arrangement of the white matter. The approximate position and function of tracts in white matter.
4. The functions of the spinal cord. Know the clinical symptoms of Brown-Sequard syndrome, complete spinal cord transection, poliomyelitis, and their anatomical mechanism.

III. The brain stem

【Purposes and Requirements】

1. Master the position and divisions of the brain.
2. Master the gross appearance of the brain stem (including the floor of the fourth ventricle).
3. Know the characters of the internal structures of brain stem.
4. Master the classification of the nuclei in brain stem. Master the functional classification, components and relations to the cranial nerves of the nuclei of the cranial nerves
5. Master the position and function of the nucleus gracilis, nucleus cuneatus. Know

the position and function of the inferior olivary nucleus, pontine nucleus, nucleus ceruleus, red nucleus and substantia nigra.

6. Master the position and function of the pyramidal tract, medial lemniscus, lateral lemniscus, trigeminal lemniscus and spinal lemniscus in the brain stem.
7. Know the position and function of the reticular formation.
8. Master the position and communication of the fourth ventricle.
9. Know the major structures in the transverse sections of the brain stem at the following levels: medulla oblongata at the levels of the decussation of pyramid, at the levels of the decussation of medial lemniscus, at the levels of olives; pons at the level of caudal and middle parts; midbrain at the level of inferior and superior colliculi.
10. Know the clinical symptoms and their anatomic mechanism after injury to the brain stem at different part.

【Contents】

1. The position and divisions of the brain.
2. The gross appearance of the medulla oblongata, pons and midbrain.
3. The characters of the internal structures of brain stem. The central canal opened, the appearance of the inferior olivary nucleus and two decussations in medulla oblongata; The tegmentum and basilar parts of the pons; The appearance of the tectum and cerebral peduncles in midbrain).
4. The position, function and functional classification of the nuclei of the cranial nerves in the brain stem. The nuclei of the non-cranial nerves.
5. The position and function of pyramidal tract, medial lemniscus, lateral lemniscus, trigeminal lemniscus and spinal lemniscus in the brain stem.
6. The position and function of the reticular formation.
7. The position and communication of the fourth ventricle.
8. The major structures in the transverse sections of the brain stem at different levels:
9. The clinical symptoms after injury to the brain stem at different part.

IV. Cerebellum

【Purposes and Requirements】

1. Master the position and gross appearance of the cerebellum. Master lobes and

functional divisions of cerebellum. Master the position of tonsil of cerebellum and its clinical importance.

2. Know the structure of the cerebellum. Know the names of the cerebellar nuclei.
3. Know the fiber connections of the archicerebellum, paleocerebellum and neocerebellum.
4. Know the function of the cerebellum.

【Contents】

1. The position and gross appearance of the cerebellum. Lobes and functional divisions of cerebellum. Tonsil of cerebellum.
2. White and gray matter of cerebellum. cerebellar nuclei.
3. Fiber connections of the archicerebellum, paleocerebellum and neocerebellum.
4. Function of the cerebellum.

V. The diencephalons

【Purposes and Requirements】

1. Master the position and divisions of the diencephalon.
2. Master the position and communication of the third ventricle.
3. Know the general appearances, subdivisions of the thalamus and the different nuclei.
4. Master the names, fiber connections, and functions of the specific thalamic nuclei (including the medial and lateral geniculate bodies).
5. Master the location and boundaries of hypothalamus. Know the names and positions of main nuclei of hypothalamus. Master the connections of the hypothalamus with the hypophysis.
6. Know the functions of the hypothalamus.
7. Master the shape and position of hypophysis and pineal gland.

【Contents】

1. The position and divisions(thalamus, metathalamus, hypothalamus, epithalamus, subthalamus) of diencephalon.
2. Position and communication of the third ventricle.
3. General appearances, subdivisions of the thalamus and the different nuclei.
4. The names, fiber connections, and functions of the specific thalamic nuclei

(including the medial and lateral geniculate bodies).

5. The location and boundaries of hypothalamus. The names and positions of main nuclei of hypothalamus. The connections of the hypothalamus with the hypophysis.
6. Functions of the hypothalamus.
7. Functions of the hypophysis and pineal gland.

VI. The telencephalon

【Purposes and Requirements】

1. Master the main fissures, sulci and gyri of the surface of the cerebral hemisphere, the lobes of the cerebral hemisphere.
2. Master the position and functional localizations of the somesthetic area, visual area, auditory area, motor area of the cerebral cortex. Master the position of the language area of the cerebral cortex.
3. Master the organization and position of the basal nuclei, the components and function of the corpus striatum.
4. Know the classification of the nerve fibers in the cerebral hemisphere.
5. Master the position and divisions of the internal capsule, the names and locations of the nerve fiber tracts in the internal capsule.
6. Master the feature of the lateral ventricles and their choroids plexuses.
7. Know the components of the limbic lobe, the concept of the limbic system.

【Contents】

1. The general features and lobes of cerebral hemisphere.
2. The position of the functional centers, the language area of the cerebral cortex.
3. The organization and position of the basal nuclei, the components and function of the corpus striatum.
4. The association fibers, commissural fibers and projection fibers in the cerebral hemisphere.
5. The position and divisions of the internal capsule, the names and locations of the nerve fiber tracts in the internal capsule.
6. The feature of the lateral ventricles and their choroids plexuses.
7. The components of the limbic lobe, the concept of the limbic system.

VII.. The spinal nerve

【Purposes and Requirements】

1. Master the components, the main branches and distribution of spinal nerves.
2. Master the formation and position of the cervical plexus. Know the names of the cutaneous branches, the components, function and course of phrenic nerve.
3. Master the formation, position and main branches names of the brachial plexus. Master the course, branches and distribution of musculocutaneous n., median n., ulnar n., radial n., axillary n. Know the clinical feature when they injured.
4. Master the branches and distribution characteristics of the anterior branches of the thoracic nerves.
5. Master the formation, position and main branches of the lumbar plexus. Master the course, branches and distribution of the femoral n., obturator n..
6. Master the formation, position and main branches of the sacral plexus. Master the course, branches and distribution of the sciatic n., common peroneus n., deep peroneus n., superficial peroneus n. and tibial n. Know the clinical feature when they injured.

【Contents】

1. The components, the main branches and distribution of spinal nerves.
2. The formation and position and branches of the cervical plexus(the cutaneous branches and the phrenic nerve).
3. The formation, position and main branches names of the brachial plexus (musculocutaneous n., median n., ulnar n., radial n., axillary n).
4. The branches and distribution characteristics of the anterior branches of the thoracic nerves.
5. The formation, position and main branches of the lumbar plexus(the femoral n., obturator n).
6. The formation, position and main branches of the sacral plexus(the sciatic n., common peroneus n., deep peroneus n., superficial peroneus n. and tibial n.).

VIII. The cranial nerves

【Purposes and Requirements】

7. Know the organization and classification of cranial nerves. Master the names, attachment to the brain, passages through the skull, functional nature and distribution of the cranial nerves.
8. Know the function and distribution of the olfactory nerve.
9. Master the function, formation, course and coverings of optic nerve.
10. Master the components of fibers and distribution of the oculomotor nerve.
11. Master the distribution of the trochlear nerve, abducent nerve, vestibulocochlear nerve, hypoglossal nerve, and accessory nerve.
12. Master the components of fibers of the trigeminal nerve. Master the functional nature and position of the trigeminal ganglion. Master the main branches and distribution of the ophthalmic nerve, the maxillary nerve, the mandibular nerve (auriculotemporal, lingual, inferior alveolar nerves and nerve of masticatory muscle).
13. Master the components of fibers of the facial nerve, the distribution of its main braches (chorda tympani nerve, facial muscular branches).
14. Master the components of fibers of the glossopharyngeal nerve, the distribution of its main braches (lingual branch, pharyngeal branch, carotid branch).
15. Master the components of fibers, course, main branches and distribution of the vagus nerve.
16. Know the functional nature and position of the ciliary ganglion, the pterygopalatine ganglion, the submandibular ganglion and otic ganglion).

【Contents】

7. The organization and classification of cranial nerves. The name of cranial nerves and their attachment to the brain, passages through the skull, functional nature, and the distribution.
8. The function and distribution of the olfactory nerve.
9. The function, formation, course and coverings of optic nerve.
10. The components of fibers and distribution of the oculomotor nerve.
11. The distribution of the trochlear nerve, abducent nerve, vestibulocochlear nerve, hypoglossal nerve, and accessory nerve.
12. The components of fibers of the trigeminal nerve. The main branches and distributions of the ophthalmic nerve, the maxillary nerve, the mandibular nerve

- (auriculotemporal, lingual, inferior alveolar nerves and nerve of masticatory muscle). The functional nature and position of the trigeminal ganglion.
13. The components of fibers of the facial nerve, the main braches (lingual branch, pharyngeal branch, carotid branch) and distributions.
 14. The components of fibers of the glossopharyngeal nerve, the main braches (lingual branch, pharyngeal branch, carotid branch) and distributions.
 15. The components of fibers, course, main branches and distributions of the vagus nerve.
 16. The functional nature and position of the ciliary ganglion, the pterygopalatine ganglion, the submandibular ganglion and otic ganglion).

IX. The autonomic nervous system

【Purposes and Requirements】

1. Master the organization of the autonomic nervous system.
2. Know the main differences between the autonomic motor nerves and somatic motor nerves, the concepts of the preganglionic and postganglionic neurons.
3. Master the position of the lower center of the sympathetic system, the position and formation of the sympathetic trunk, the positions of main prevertebral ganglia (celiac, superior and inferior mesenteric ganglia).
4. Know the concept of the white and grey communicating rami, the distributions of the preganglionic and postganglionic fibers of the sympathetic system.
5. Know the positions of the superior, middle and inferior cervical ganglia, and the distribution of their postganglionic fibers.
6. Master the origins, fiber connections and distribution of the greater and lesser splanchnic nerves.
7. Master the distribution of the postganglionic fibers of the lumbar and pelvic portion.
8. Master the position of the lower center of the parasympathetic system.
9. Master the origin of the preganglionic fibers in oculomotor nerve, the place where they synapse on postganglionic neurons and the distribution and function of postganglionic fibers.
10. Master the origin of the preganglionic fibers in the facial and glossopharyngeal

nerves, the place where they synapse on postganglionic neurons and the distribution of postganglionic fibers.

11. Master the origin of the preganglionic fibers and distribution of postganglionic fibers of the parasympathetic fibers in vagus nerve.
12. Master the formation and distribution of the pelvic splanchnic nerve.
13. Master the main differences between the sympathetic and parasympathetic systems.
14. Know the positions and distribution of the main visceral plexuses.
15. Know the pathway of visceral sensory. Know the concept of referred pain.

【Contents】

1. Organization of the autonomic nervous system.
2. The main differences between the autonomic motor nerves and somatic motor nerves. Preganglionic and postganglionic neurons.
3. The lower center of the sympathetic system, the position and formation of the sympathetic trunk, Prevertebral ganglia (celiac, superior and inferior mesenteric ganglia).
4. White and grey communicating rami, the distributions of the preganglionic and postganglionic fibers of the sympathetic system.
5. The superior, middle and inferior cervical ganglia, and the distribution of their postganglionic fibers.
6. The origins, fiber connections and distribution of the greater and lesser splanchnic nerves.
7. The distribution of the postganglionic fibers of the lumbar and pelvic portion.
8. The lower center of the parasympathetic system.
9. The origin of the preganglionic fibers in oculomotor nerve, ciliary ganglia, and the distribution and function of postganglionic fibers.
10. The origin of the preganglionic fibers in the facial and glossopharyngeal nerves, submandibular ganglia, pterygopalatine ganglia, otic ganglia, and the distribution of postganglionic fibers.
11. The origin of the preganglionic fibers and distribution of postganglionic fibers of the parasympathetic fibers in vagus nerve.
12. The formation and distribution of the pelvic splanchnic nerve.
13. The main differences between the sympathetic and parasympathetic systems.

14. The positions and distribution of the main visceral plexuses.
15. The pathway of visceral sensory. Referred pain.

X. The nervous pathways

【Purposes and Requirements】

1. Master the concept of nervous pathway.
2. Master the formations of the deep sensory pathway and fine touch sensory pathway of the trunk and limbs: the positions of the three order neurons, the positions of the nerve fibers tracts in each part of the central nervous system, the site of crossover, and the destination.
3. Know the unconscious deep sensory pathway of the trunk and limbs.
4. Master the formations of the superficial sensory pathway and light touch pathway of the trunk, limbs, head and face: the positions of the three order neurons, the positions of the nerve fiber tracts in each part of the central nervous system, the site of crossover, and the destination.
5. Master the formation of the visual pathway: the positions of the three order neurons, the positions of the nerve fiber tracts in each part of the central nervous system, the site of crossover, and the destination. Master the formation of pupillary light reflex.
6. Know the formation of the auditory pathway.
7. Master the formations of the pyramidal system. The position of the corticospinal tract and corticonuclear tract in each part of the central nervous system, the site of crossover, and the connections of their lower motor neurons.
8. Master the concept and position of the upper and lower motor neurons of the pyramidal system.
9. Master the concept of the extrapyramidal system. Know the concepts of the cortico-pallidal system and cortico-ponto-cerebellar-cortex system system.

【Contents】

1. Concept of nervous pathway, sensory and motor nervous pathway.
2. The deep sensory pathway and fine touch sensory pathway of the trunk and limbs.
3. The unconscious deep sensory pathway of the trunk and limbs.
4. The superficial sensory pathway and light touch pathway of the trunk, limbs, head

and face.

5. The visual pathway. Pupillary light reflex.
6. The auditory pathway.
7. The corticospinal tract and corticonuclear tract.
8. Upper and lower motor neurons of the pyramidal system.
9. The extrapyramidal system.

XI. The Meninges and Blood Vessels of Brain and Spinal Cord, and Cerebrospinal Fluid

【Purposes and Requirements】

1. Know the structural characters and arrangement of the dura mater, arachnoid mater, and pia mater of the spinal cord.
2. Master the position and contents of the epidural space. Master the position and contents of the subarachnoid space. Master the position and clinical importance of the terminal cistern.
3. Master the structural characters of the cranial dura mater, the positions of cerebral falx and tentorium of cerebellum, the names and locations of dural venous sinuses.
4. Master the location and general shape of the cavernous sinus. Master the names of the structures that pass through the sinus and the structures that lie within its lateral wall. Master the communications between this sinus and facial veins, and their clinic importance.
5. Master the feature of the arachnoid of brain, the position and contents of the subarachnoid space and arachnoid granulations. Master the position of cerebellomedullary cistern. Know other cistern of the brain.
6. Know the structural characters of the pia mater of the brain, the formation of the choroids plexuses.
7. Master the production and circulation of the cerebrospinal fluid.
8. Master the course of the internal carotid artery, vertebral artery and basilar artery; the origins and distributions of the anterior, middle and posterior cerebral arteries; the formation and position of the circle of Willis.
9. Know the venous drainage of the brain.
10. Know the blood vessels of spinal cord.

【Contents】

1. The structural characters and arrangement of the dura mater, arachnoid mater, and pia mater of the spinal cord.
2. The position and contents of the epidural space, subarachnoid space of the spinal cord. The position and clinical importance of the terminal cistern.
3. The structural characters and arrangement of the dura mater, arachnoid mater, and pia mater of the brain.
4. The positions of cerebral falx and tentorium of cerebellum, the names and locations of dural venous sinuses.
5. The location and general shape of the cavernous sinus. The name of the structures that pass through the sinus and the structures that lie within its lateral wall. The communications between this sinus and facial veins, and their clinic importance.
6. The position and contents of the subarachnoid space and arachnoid granulations of the brain. Cerebellomedullary cistern.
7. The formation of the choroids plexuses.
8. The production and circulation of the cerebrospinal fluid.
9. The course of the internal carotid artery, vertebral artery and basilar artery; the origins and distributions of the anterior, middle and posterior cerebral arteries; the formation and position of the circle of Willis.
10. The superficial and deep venous drainage of the brain.
11. The blood vessels of spinal cord.

IV. Annual update of the experimental projects

V. The corresponding relationship of experimental teaching

	1.Practical Ability	2.The ability to use knowledge to analyze phenomena	3.Strengthen the ethical concept of experimental animal	4.Cultivating clinical thinking ability	
Experiment 1					
Experiment 2					

Experiment 3					
Experiment 4					

VI. Assessment and evaluation methods

Attendance 10%, experiment exam 30%, Final exam: 60%

VII. Reference books:

1. G.J. Romanes. Cunningham's Manual of practical anatomy. Oxford medical publications. Wolters Kluwer Lippincott Williams & Wikins.
2. 《Gray's Anatomy》 (41th ED), Susan Standring, Churchill Livingstong, 2015