

CLASS 10

DATE

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SUBJECT BIOLOGY

TEACHER

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CHAPTER - 10 NERVOUS SYSTEM

Parts of Brain -

Brain has 3 main parts visible externally

(i) Cerebrum (ii) Cerebellum (iii) Medulla oblongata

(i) Cerebrum (largest part of brain)

1. It is divided into two - right and left - halves called cerebral hemispheres. These two hemispheres are connected together by a sheet of nerve fibers called Corpus callosum. Function of corpus callosum is to transfer information from one hemisphere to the other.

2. Outer surface of cerebral hemisphere is highly convoluted with ridges and grooves. The folds are called the gyri and the grooves are called sulci. These convolutions increase the surface area to accommodate more nerve cells. Number of convolutions are believed to be associated with the degree of intelligence. Higher number of convolutions in human brain is due to larger number of nerve cells, hence higher the intelligence.

3. Each cerebral hemisphere is hollow internally and walls have two regions - outer cortex and inner medulla.

Cortex - outer region contains cell bodies of neurons and being grayish in colour is called "gray matter"

Medulla - inner region contains the axons (nerve fibres) of the neuron and is called "white matter"

function of Cerebrum

It is seat of intelligence, consciousness, thinking, memory, reasoning, perception, will power, planning, interpretation. It controls all voluntary actions.

Cerebrum is the storehouse of past experiences, which may be recalled during dreams or hypnotisation. Many past experiences (in subconscious/unconscious mind) are covered up by more recent impressions which dominate conscious activity.

ii. Cerebellum: Little brain

It is much smaller area of brain located just at the base and under the large cerebrum and above the medulla. It has numerous furrows but no convolutions. It has an outer cortex made of gray matter. Centrally it has white matter which, in a median section, appears like a branching tree.

Pons - is a bridge of nerve fibres connecting the two lobes of cerebellum. Transmission of impulses across the bridge (pons) ensures a coordination of muscular movements on both sides of the body.

function of cerebellum.

It is the motor area of the brain that helps to -

- Maintain body balance of the body (posture, equilibrium)
- Coordinate muscular activity (movement of skeletal muscles)

The impulse for performing a muscular act originates in cerebrum but cerebellum (with the help of coordinated functioning of muscles) helps in bringing

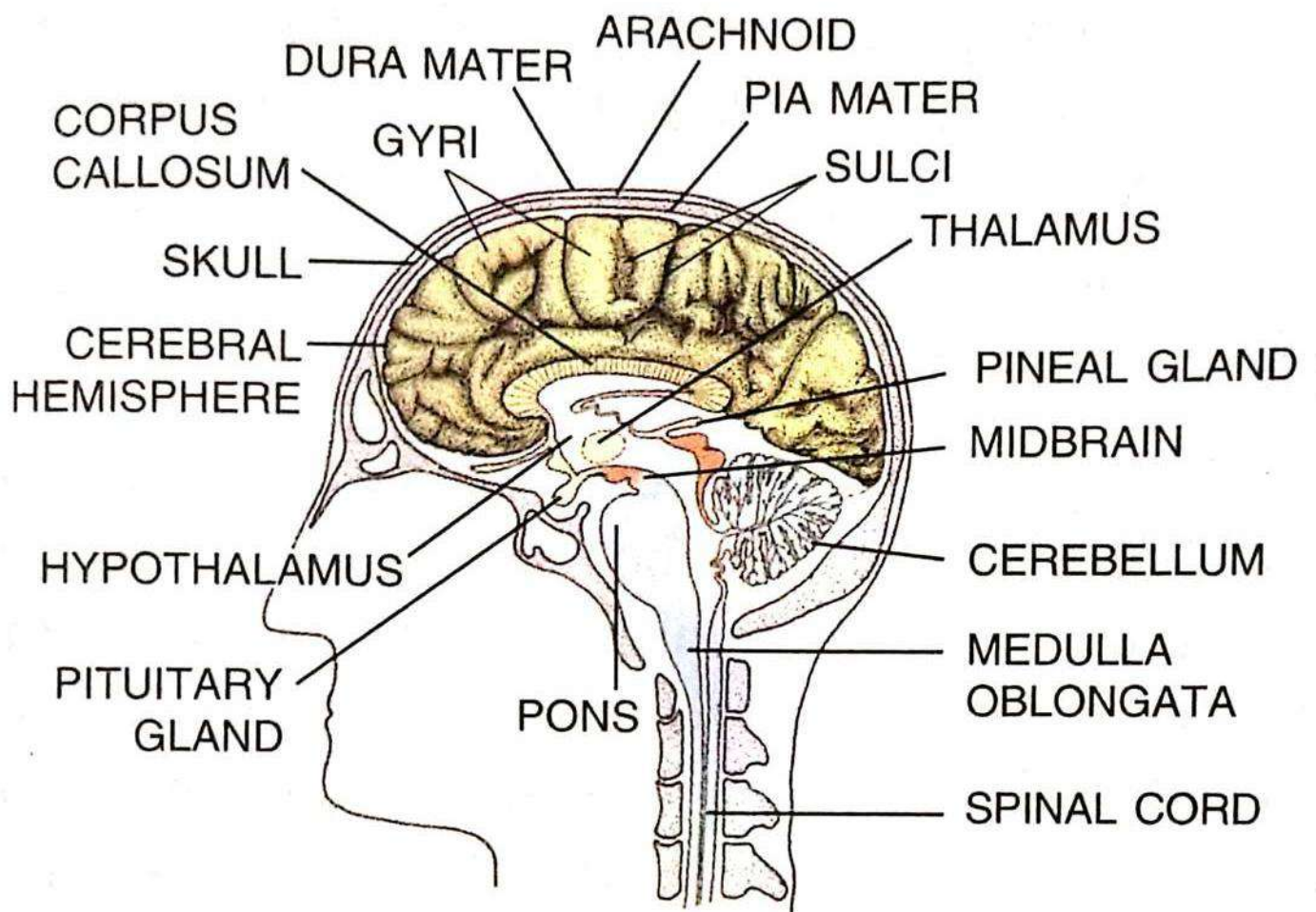


Fig. 10.5 : Brain located inside the head (sectional view)

out the muscular act. For ex. if you stand up and walk, the impulse (thought) for this activity arises in cerebrum. The act of walking involves coordinated working of many muscles. Proper coordination and timing of their contraction and relaxation is the responsibility of the cerebellum.

Alcohol affects coordination of head eyes and limbs. An alcoholic person does not have complete control over his body when drunk, thus walks clumsily. The cerebellum due to the effect of alcohol is unable to coordinate muscular movements properly.

(iii) Medulla Oblongata.

It is lowest part of brain located at the base of skull. It is roughly triangular and is continued behind as spinal cord. Injury to medulla results in death.

Function -

It controls the activities of internal organs Eg. peristaltic movement of alimentary canal, breathing movements, heart beat etc.

Three Primary regions of Brain -

i) Forebrain has 2 parts -

a) Cerebrum

b) Diencephalon which further has 2 parts -

1) Thalamus is concerned with relaying sensory impulses - pain and pressure impulses to cerebrum

2) Hypothalamus - coordinates various autonomic

activities of body including water balance, control of pituitary gland, body temperature, blood pressure etc

ii) Midbrain A small tubular part that connects forebrain to hindbrain. It controls the reflexes for sight (eyes) and hearing (ears).

iii) Hindbrain. It further has three parts -

1) Cerebellum

2) Pons - located in the centre of brain below cerebellum. It connects the two hemispheres of cerebellum and carries the impulses from one hemisphere of cerebellum to the other hemisphere and coordinates muscular movements on both sides of body.

3) Medulla oblongata.

SPINAL CORD.

i) It extends from medulla of brain down almost whole length of backbone to end at the second lumbar vertebra and lies within the neural canal of vertebra.

ii) Unlike brain, the gray matter containing cell bodies of neurons (motor and association neurons) lies on inner side and white matter containing axons of neurons lie on the outer side.

iii) In the centre there is a small central canal which runs along the entire length of spinal cord and is continuous with cavities of brain.

iv) Central canal contains the cerebrospinal fluid (CSF)

a) CSF acts as a cushion that protects the brain and spinal cord from injuries. b) CSF forms a medium

Teacher's Signature

for the exchange of food materials, waste products and respiratory gases with neurons.

Protective membranes Externally spinal cord is covered by all three meninges - dura mater, arachnoid, pia mater in continuation with those of the brain.

Functions of Spinal cord -

- 1) It controls reflexes below the neck.
- 2) It conducts sensory impulses from skin and muscles to the brain
- 3) It conducts motor responses from brain to muscles of the trunk and limbs.

Peripheral Nervous System - carries impulses to and from the central Nervous system
It is divided into two parts -

i) Somatic Nervous System

It further consists of two sets of nerves -

a) Cranial Nerves - emerge from brain. There are 12 pairs of cranial nerves like - (i) sensory [olfactory (smell), optic (sight), auditory (hearing)] (ii) Motor Eg one going to the eye muscles (iii) Mixed nerve Eg those going to and coming from face and tongue.

b) Spinal Nerves - emerge from spinal cord
There are 31 pairs - 8 pairs in neck region, 12 pairs in thorax, 5 pairs in lumbar, 5 pairs in sacral and 1 pair in coccygeal region.

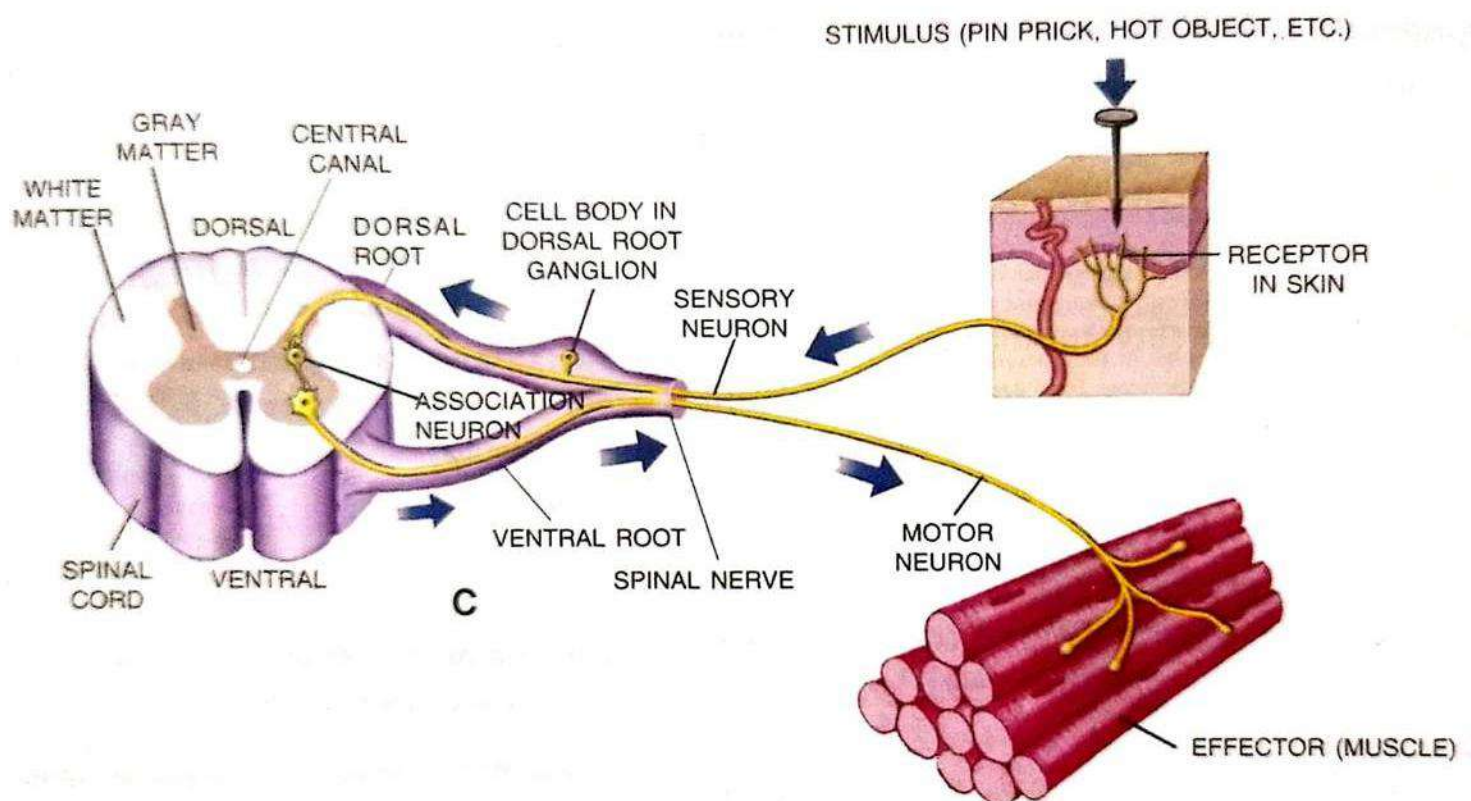


Fig. 10.9 : C-Diagrammatic sketch of the internal structure of spinal cord and nervous pathway in spinal reflex

Structure of Spinal Cord and Spinal Nerve -

- 1) Spinal nerves originate from spinal cord by means of two roots - Dorsal and Ventral root.
- 2) Each dorsal root has an ovoid dorsal ganglion
- 3) All spinal nerves are mixed nerves, having both sensory and motor fibres. At the junction the two roots - sensory and motor fibres separate out - sensory fibres continue into dorsal root and motor fibres continue into ventral root. Both roots enter the grey matter of the spinal cord and end in respective dorsal and ventral horns of grey matter.

Autonomic Nervous System

Nerves controlling involuntary actions of smooth muscles and glands. This system thus controls the involuntary actions of internal organs.

It consists of a pair of chains of nerves and ganglion on either side of backbone i.e. spinal cord.

Autonomic Nervous system further has 2 parts -

- i) Sympathetic Nervous System arises from the spinal cord between the neck and waist region. It prepares the body for violent action against abnormal conditions. It is stimulated by the hormone adrenaline secreted by adrenal glands.
- ii) Para sympathetic Nervous System located at two places - one anteriorly in head and neck and other posteriorly in the sacral region. This system is more concerned with reestablishing

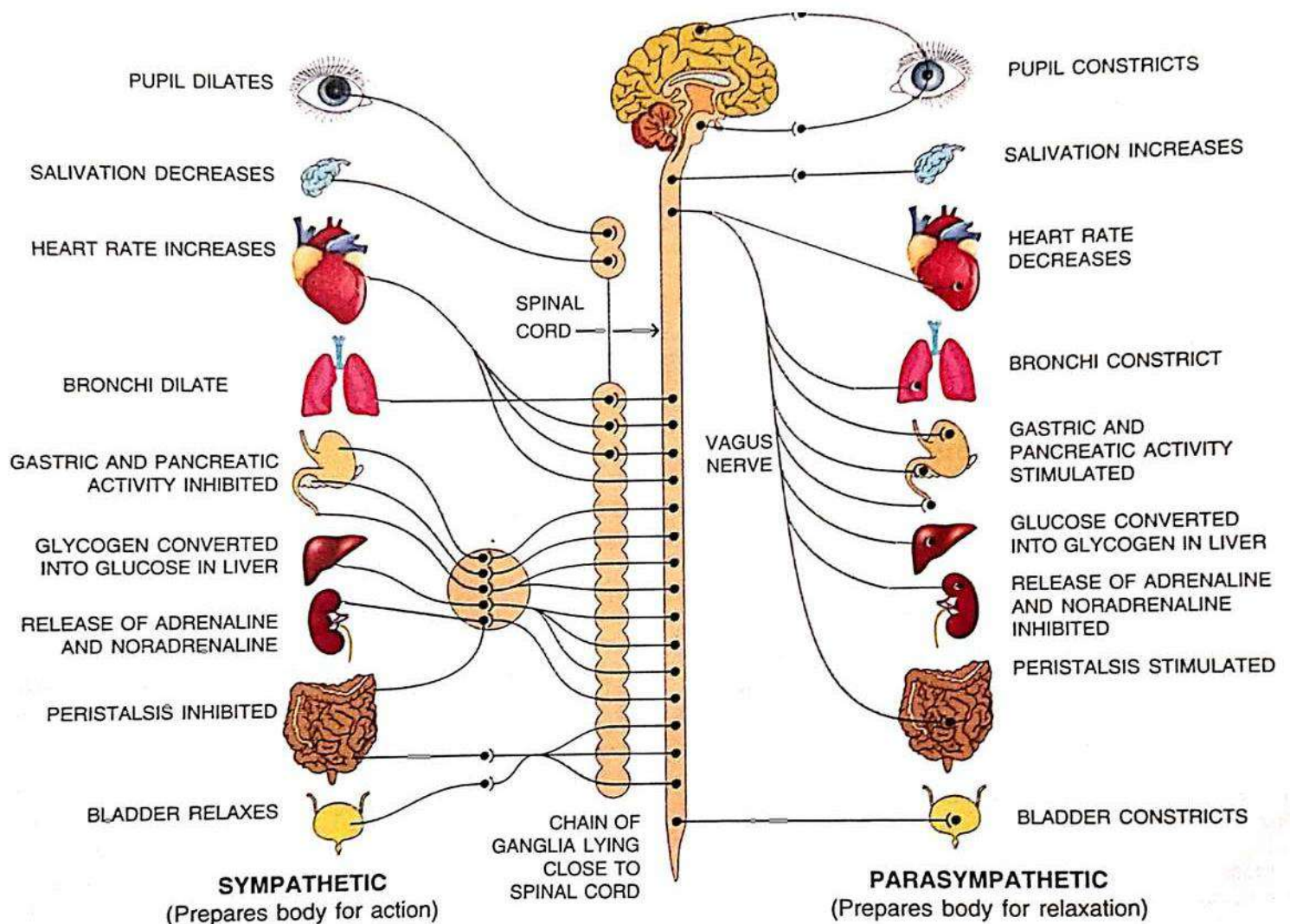


Fig. 10.8 : Autonomic nervous system showing the opposing effects of its two parts – sympathetic and parasympathetic

normal conditions after violent act is over.

Thus we see that these two systems are in general opposite to each other in action.

Table 10.1 shows the effect of two parts of autonomic nervous system on various body organs [students need to learn the table].

Home Assignment

Q.1 Answer the following 'Review questions' given on Page 136-137 of your text book

D Descriptive Type

Q. No. 2 (a), (d), (e) and (g)

Q No 3

E Structured / Application / skill type

Q No. 2, 3 and 4.

Q.2

Draw a well labelled diagram of -

a) Human brain [Fig 10.5 in text book]

b) Internal structure of Spinal cord and nervous pathway in reflex action [Fig 10.9 in text book]

Draw in your class notebooks.

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