

CHAPTER – 10 NERVOUS SYSTEM

P. 138 CHECK YOUR PROGRESS 1

A. Name the following.

1. Sensory nerves
2. Motor neuron
3. Neuron
4. Dendrites
5. Axolemma
6. Receptor organs are eyes, ears, muscles, skin, etc.
7. Synapse
8. Neurotransmitters
9. Acetylcholine, Norepinephrine

P. 143 CHECK YOUR PROGRESS 2

A. State whether the following statements are True or False.

- | | | |
|----------|----------|----------|
| 1. True | 2. False | 3. False |
| 4. False | 5. False | 6. False |

B. Cerebrum

C. Given below are some sensory capabilities of human brain. Name the structures associated with these.

1. Cerebrum
2. Hypothalamus
3. Cerebellum
4. Cerebrum
5. Medulla oblongata

P. 145 CHECK YOUR PROGRESS 3

A. Answer these questions.

1. The peripheral nervous system (PNS) comprises the nerves that connect the central nervous system with different parts of the body. Peripheral nervous system is divided into two sub-divisions – somatic nervous system and autonomic nervous system.
2. The PNS comprises of cranial nerves connected directly to the brain and spinal nerves emerging from spinal cord. The autonomic nervous system also being a part of the PNS consists of 22 pairs of ganglia and lie close to the spinal cord and are associated with organs they control.
The central nervous system consists of the brain and the spinal cord.

3. These two divisions are anatomically and functionally distinct. The sympathetic fibres arise from the thoracic (chest) and lumbar (waist) region of the spinal cord, whereas the parasympathetic fibres arises from the brain and the sacral (pelvic) region of the spinal cord. The effect of the two systems is antagonistic.

In general, the sympathetic system stimulates a particular function and prepares the body for violent actions against unusual emergency conditions, while the parasympathetic system has inhibitory or calming down effect, i.e. it reestablishes normal conditions after the violent action is over.

Also refer Table 10.5 from Pg 145 of textbook.

4. ANS is primarily a motor system consisting of neurons that control the functioning of many organs:
i. Heart muscles ii. Glands iii. Smooth muscles (muscles of blood vessels, digestive, respiratory and reproductive tracts)

Organ	Sympathetic nervous system	Parasympathetic nervous system
Heart	It increases the heartbeat rate.	It decreases the heartbeat rate.
Eyes	It dilates the pupils of the eyes.	It constricts the pupils of the eyes.
Stomach	It inhibits gastric and pancreatic activities.	It stimulates gastric and pancreatic activities.
Blood vessels	It results in the constriction of blood vessels and increases blood pressure. It stimulates sweat glands.	It results in the dilation of blood vessels and lowers blood pressure. It stimulates tear glands.
Bronchi	Bronchi dilate	Bronchi constrict.
Urinary bladder	Bladder relaxes.	Bladder constricts.

6. The hand automatically shows the direction to turn a cycle without thinking because it is a reflex action. Due to previous learning about directions the brain actually remembers its reflex that is called conditioned reflex.

P. 146 EXERCISES

I. Multiple-Choice Questions

A. Choose the most appropriate answer.

- | | | | |
|------|-------|-------|-------|
| 1. b | 2. b | 3. b | 4. b |
| 5. d | 6. b | 7. b | 8. a |
| 9. c | 10. a | 11. b | 12. c |

II. Assertion–Reason Type Questions

- A. 1. b 2. c 3. a 4. c

III. Very Short Answer Type Questions

A. Name the following.

1. Corpus callosum
2. Cerebrum
3. Hypothalamus
4. Cerebrospinal fluid
5. Medulla oblongata
6. Cerebellum
7. Motor neuron
8. Myelin sheath
9. Acetylcholine
10. Sympathetic nervous system

B. Identify the odd term in each set and name the category to which the remaining three belong.

1. Odd term- Cerebrum, Category- Hindbrain
2. Odd term- Cerebrum, Category- Parts of brain
3. Odd term- photon, Category- Parts of neuron
4. Odd term- Typing, Category- Natural reflexes

C. Given below is an example of a certain structure and its special functional activity.

e. g. Kidney and excretion

Fill in the blanks on a similar pattern.

1. body balance
2. helps in conduction of nerve impulses
3. protective covering of brain
4. neurotransmitter
5. signalling process
6. reflex action
7. cardiac centre
8. protective brain box
9. to control movement, memory and emotion

D. Match the terms of Column A with those of Column B and write down the matching pairs.

- | | | | |
|------|------|------|------|
| 1. d | 2. a | 3. b | 4. c |
| 5. f | 6. e | | |

E. Complete the following paragraph by filling in the blanks (1) to (5) with appropriate words.

1. synapse
2. axon
3. receptors
4. signals
5. speed up

IV. Short Answer Type Questions

A. Answer these questions.

1. Cerebrum enables us to perceive the objects around us.
2. Meninges are protective coverings of the brain that consist of three layers.
 - i. The outer tough, protective layer dura mater is formed of fibrous tissue.
 - ii. The middle arachnoid layer is a delicate membrane.
 - iii. The inner thin, transparent and highly vascular layer is the pia mater.
3. Cerebrospinal fluid is present in the membranes of the brain.
4. Cranium (brain box of the skull) protects the brain.
5. a. Cerebellum; b. Synapse
6. Stimulus, receptor organ, sensory nerve, spinal cord, motor nerve, muscle action
7. Corpus callosum is a thick band of nerve fibres that divides the cerebrum into left and right hemispheres. It helps in the transfer of information from one hemisphere to another.

Corpus callosum is situated beneath the cortex of the brain.
8. The hindbrain comprises of cerebellum, pons and medulla oblongata. Cerebellum maintains body balance and controls postures and coordinates muscular activities.

Medulla oblongata is the lowermost part of the brain located at the base of the skull. It contains vital reflex centres and controls the activities of the internal organs.

Pons forms the part of the brain stem at the floor of hindbrain. It is a bridge of transverse

nerve tracts extending from the cerebrum to the cerebellum. It also connects the forebrain to the spinal cord.

9. a. Simple reflex
- b. Simple reflex
- c. Simple reflex
- d. Conditioned reflex
- e. Conditioned reflex
- f. Conditioned reflex

V. Long Answer Type Questions

A. Answer these questions.

1. Cerebrum governs mental abilities like thinking, reasoning and learning.

Refer to page 139, ICSE Living Science Biology 10

2. Sympathetic nerve fibres arise from the thoracic and lumbar region of the spinal cord and prepare the body for violent actions against unusual emergencies.
3. The parasympathetic nervous system in our body has an inhibitory or calming down effect, i.e. it re-establishes normal conditions after a violent action is over.
4. The cerebrum (because of highly developed grey matter) governs mental abilities like thinking, reasoning, learning, memory and intelligence. It also controls all voluntary functions, will power, emotions and speech. It enables us to observe things around us through sense organs. This part of the brain also controls feelings of love, admiration and hatred. Centres for subconscious mind are also located in the cerebrum.

Cerebellum maintains body balance and controls muscular activities. It makes the body movements smooth, steady and coordinated. It regulates and coordinates contraction of skeletal muscles.

5. A reflex action may be defined as a spontaneous, automatic and mechanical response to stimulus controlled by the spinal cord without the involvement of the brain. The pathway followed by sensory and motor nerves in a reflex action is called the reflex arc. An example of reflex action is knee jerk response in which if a sharp tap is made below the knee cap, then the leg is involuntarily extended.

Refer to figure 10.12 on page 141 of textbook.

VI. Structured/ Application/ Skill Type Question

A.

	Parts	Location	Function
1.	Neurotransmitter	Synapse	Transfers information from one neuron to another
2.	Cerebrospinal fluid	Brain and spinal cord	Protects from shocks
3.	Medullary sheath	Neuron	To transfer nerve impulse across the axon more quickly
4.	Cerebellum	Hindbrain	Maintains body balance and controls muscle activities
5.	Corpus callosum	Cerebrum	Joins the two cerebral hemispheres
6.	Gyri and Sulci	Cerebrum	Increases surface area for more nerve cells

B. 1. i. Cerebrum

ii. Cerebellum

iii. Pons

iv. Medulla oblongata

v. Spinal cord

2. i. Cerebrum (because of highly developed grey matter) governs mental abilities like thinking, reasoning, learning, memory and intelligence. It also controls all voluntary functions; will power, emotions and speech.

iii. Pons forms the part of the brain stem at the floor of hindbrain. It is a bridge of transverse nerve tracts extending from the cerebrum to the cerebellum. It also connects the forebrain to the spinal cord.

3. If a person's cerebellum gets damaged, he or she may not be able to walk. Such a person can learn to walk again but with difficulty.

Functions that would be affected if a medulla oblongata was damaged would include one's respiration, reflexes, defecation, blood pressure, swallowing, etc, as the nerve signals between the brain and spinal cord would no longer be working.

C. 1. Reflex action

2. Synapse

3.
 - i. Sensory neuron
 - ii. Dorsal root ganglia
 - iii. White matter
 - iv. Grey matter
 4.
 - v. (Synapse) – It allows information to pass from one neuron to another.
 - vi. (Motor neuron) – These neurons take messages away from the CNS towards the effector organ.
 5. In spinal cord, the grey matter is inside and white matter is outside around it. In brain, grey matter is outside and white matter is inside.
 6. The arrows indicate the sequence of events that constitute a reflex arc. The pathway indicates the pathway of reflex action.
 7. Spinal nerve
- D. 1.**
- i. Sensory neuron
 - ii. Sensory cell body in dorsal root ganglia
 - iii. White matter
 - iv. Grey matter
 - v. Ventral root
2. $Q \rightarrow R \rightarrow P$
 3. Simple or natural reflexes are those reflexes which do not require any previous learning experience. Such reflexes are inborn and inherited from parents.

Examples:

- i. Blinking of eyelids in response to a foreign particle that enters the eye. The stimuli in this case is 'entrance of a foreign particle into the eye'.
- ii. Closing of eyelid in response to a strong beam of light being flashed on the eyes. The stimuli in this case is 'strong beam of light being flashed on the eyes'.

- E. 1.**
 - i. Cerebrum
 - ii. Cerebellum
 - iii. Medulla oblongata
 - iv. Spinal cord
 2. The outer layer of the cerebrum is the cerebral cortex that contains cell bodies of neurons (grey matter). The inner region of cerebrum consists of white matter that has axons of nerve cells.
In the spinal cord, the clusters of cytons forming the grey matter lie in the inner region whereas axons forming the white matter lie in the outer region.
 3. Function of medulla oblongata [iii] – It contains vital reflex centres such as cardiac centre, respiratory centre and centres for swallowing, sneezing, coughing and vomiting. Thus, it controls involuntary functions of the body like heart beat, swallowing and breathing.
Function of spinal cord [iv] – The spinal cord conducts reflexes below the neck. It conducts sensory impulses from skin and muscles to the brain, and motor responses from brain to the muscles of trunk and limbs.
 4. Corpus callosum
- F. 1.**
- i. Frontal lobe (cerebrum)
 - ii. Auditory area (cerebrum)
 - iii. Occipital lobe (cerebrum)
 - iv. Cerebellum
 - v. Medulla Oblongata
2.
 - a. Blindness
 - b. Unable to walk
 3.
 - i. Functions for thinking
 - ii. Functions for hearing
 - v. Controls the reflex centres like that of respiratory, cardiac and swallowing mechanisms