INDIAN SCHOOL AL WADI AL KABIR

Class: XI	**DEPARTMENT OF SCIENCE: 2025 – 2026** **SUBJECT: BIOLOGY**	**Date: 02/09/2025**
Worksheet: 08	**UNIT- V- Human Physiology** **CHAPTER:18- Neural control and coordination**	**Note:** **A4 FILE FORMAT**
NAME OF THE STUDENT	**CLASS & SEC:**	**ROLL NO.**

I. MULTIPLE CHOICE QUESTIONS (1M)

1. What is the role of the myelin sheath in neurons?
   A. To transmit nerve impulses
   B. To insulate and speed up the transmission of nerve impulses
   C. To generate electrical signals
   D. To store neurotransmitters
2. Resting membrane potential is maintained by:
   A. Acetylcholine
   B. Sodium
   C. Potassium
   D. Both B and C
3. The correct arrangements of cranial meninges from outermost to innermost is:
   A. Pia mater, dura mater, arachnoid
   B. Arachnoid, dura mater, pia mater
   C. Pia mater, arachnoid, dura mater
   D. Dura mater, arachnoid, pia mater
4. Where are receptor sites for neurotransmitters found?
   A. Pre-synaptic membrane
   B. Tips of axon
   C. Post-synaptic membrane
   D. Membrane of synaptic vesicles
5. The myelinated nerve fibres are enveloped with_____ which form a myelin sheath around the axon.
   A. Neuroglia cell
   B. Schwann cells
   C. Myelin cell
   D. Multipolar cell

Two statements are given - one labelled as **Assertion (A)** and the other labelled as **Reason (R)**.
Select the correct answer to these questions from the codes (A), (B), (C) and (D) as given below.

A. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).

B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).

C. Assertion (A) is true, Reason (R) is false.
D. Assertion (A) is false, Reason (R) is true.

6. Assertion(A): The Schwann cells secrete myelin sheath around axons.
   Reason(R): Unmyelinated axons are not enveloped by Schwann cells.

7. Assertion (A): Electrical synapses are rare in our system.
   Reason (R): Impulse transmission across an electrical synapse is slower than that across a chemical synapse.

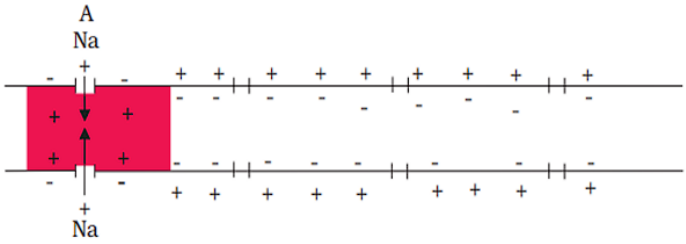
8. Assertion (A): The cerebral cortex has motor areas, sensory areas and association areas.
   Reason(R): The association areas are responsible for intersensory association, memory and communication.

II. VERY SHORT ANSWER TYPE QUESTIONS(2M)

9. State the difference between myelinated and non-myelinated neuron.
10. What do grey and white matter in the brain represent?
11. Mention the membrane layers that protect the brain.
12. What is the difference between electrical transmission and chemical transmission?
13. i)What does it mean to generate an action potential?
    ii)What is the role of sodium and potassium ions in the propagation of an action potential?

III. SHORT ANSWER TYPE QUESTIONS (3M)

14. Explain the process of generation and conduction of nerve impulses.
15. Given below represents axon membrane. Identify the special features associated with this membrane.



16. Distinguish between the following:
    i) Bipolar and multipolar neurons
    ii) Afferent and efferent nerve fibers
    iii) Somatic and autonomic nervous system

IV. CASE STUDY BASED QUESTIONS (4M)

The forebrain consists of the cerebrum, thalamus, and hypothalamus. The cerebrum, the largest part, is divided into left and right hemispheres connected by the corpus callosum. Its outer layer, the cerebral cortex (grey matter), contains motor, sensory, and association areas responsible for memory and communication. The inner white matter consists of myelinated fibres. The thalamus coordinates sensory and motor signals, while the hypothalamus regulates body temperature, hunger, and hormone secretion. The limbic system, including the amygdala and hippocampus, along with the hypothalamus, controls emotions, motivation, and sexual behavior.

A. What are the main components of the forebrain?
B. How does the hypothalamus contribute to body regulation?
C. What is the function of the thalamus?

OR

D. What role does the limbic system play in brain function?

V. LONG ANSWER TYPE QUESTIONS (5M)

17. Compare the following:
    i) CNS and PNS
    ii) Resting potential and action potential
18. Explain the process of the transport and release of a neurotransmitter with the help of a labelled diagram.

Answer Key

<table>
<tr><th>Q. No.</th><th>Answer</th></tr>
<tr><td>I.</td><td>MULTIPLE CHOICE QUESTIONS (1M)</td></tr>
<tr><td>1</td><td>B. To insulate and speed up the transmission of nerve impulses</td></tr>
<tr><td>2</td><td>D. Both B and C</td></tr>
<tr><td>3</td><td>D. Dura mater, arachnoid, pia mater</td></tr>
<tr><td>4</td><td>C. Post-synaptic membrane</td></tr>
<tr><td>5</td><td>B. Schwann cells</td></tr>
<tr><td></td><td>ASSERTION & REASONING</td></tr>
<tr><td>6</td><td>c) A is true but R is false.</td></tr>
<tr><td>7</td><td>c) A is true but R is false.</td></tr>
<tr><td>8</td><td>a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).</td></tr>
<tr><td>II</td><td>VERY SHORT ANSWER TYPE QUESTIONS(2M)</td></tr>
<tr><td>9</td><td>Myelinated neuron-The axon of these nerve fibres is covered with Schwann cells. They are present in cranial nerves and spinal nerves.
Non-myelinated neuron- The axon of these nerve fibres is enclosed with Schwann cells that does not form myelin sheath. They are found in ANS and somatic nervous system.</td></tr>
<tr><td>10</td><td>The cerebral cortex is referred to as the grey matter due to its greyish appearance. The inner part of cerebral hemisphere gives an opaque white appearance to the layer below grey matter and, hence, is called the white matter.</td></tr>
<tr><td>11</td><td>Cranial meninges (consisting of an outer layer called dura mater, a very thin middle layer called arachnoid mater and an inner layer (which is in contact with the brain tissue) called pia mater protects the brain.</td></tr>
<tr><td>12</td><td>
<table>
<tr><th>Electrical transmission</th><th>Chemical transmission.</th></tr>
<tr><td>Transmission of nerve impulse takes place via electrical synapse.</td><td>Transmission of nerve impulse takes place via chemical synapse.</td></tr>
<tr><td>Neurotransmitters does not required.</td><td>Neurotransmitters required</td></tr>
<tr><td>It is quick and faster. Nerve impulse transmit like a single neuron</td><td>Comparatively it is slower. Nerve impulse transmits from one neuron to next neuron via a synaptic cleft (gap/space between nerve endings of two neuron)</td></tr>
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13	i) An action potential is a rapid sequence of changes in the voltage across a membrane. ii) Sodium (Na^+) and potassium (K^+) ions play a crucial role in generating an action potential. During depolarization, Na^+ ions rush into the neuron, making the inside more positive. During repolarization, K^+ ions exit the neuron, restoring the negative charge. This exchange creates the electrical signal that transmits nerve impulses.
III	**SHORT ANSWER TYPE QUESTIONS (3M)**
14	**Polarization (Resting State):** In a resting neuron, the membrane is more permeable to potassium ions than sodium ions. The sodium-potassium pump actively transports three $Na+$ out for every two $K+$ in, maintaining a negative charge inside and a positive charge outside. **Depolarization (Action Potential):** A stimulus causes sodium channels to open, leading to a rapid influx of $Na+$. This reverses the membrane's polarity, with the inside becoming positive and the outside negative, generating an action potential. **Repolarization:** The sodium channels quickly close while potassium channels open, allowing $K+$ to flow out of the cell. This restores the original charge polarity, and the sodium-potassium pump then works to reestablish the initial ionic concentrations. This wave of depolarization moving down the axon constitutes the nerve impulse.
15	V**oltage-gated ion channels:** The membrane contains a high concentration of voltage-gated sodium and potassium channels, particularly at the axon hillock and nodes of Ranvier. These channels open and close in response to changes in membrane potential, allowing the rapid ion movements that generate an action potential. **Sodium-potassium pump:** This is an active transporter that pumps three Na+ions out of the cell for every two $K+$ ions it pumps in. This action maintains the electrochemical gradients and a negative resting membrane potential, making the neuron ready to fire an impulse. **Anionic proteins:** Large, negatively charged protein molecules are synthesized and trapped inside the axon, unable to pass through the neural membrane. Their presence contributes significantly to the overall negative charge inside the cell, which is crucial for establishing the resting potential.
16.	i) Bipolar neurons have one axon and one dendrite extending from the soma. Multipolar neurons contain one axon and many dendrites. ii)Afferent pathways bring information from the body to the central nervous system, and efferent pathways bring information from the central nervous system to the body. iii) The somatic nervous system is responsible for voluntary actions such as scratching an itch. The autonomic nervous system is responsible for most involuntary movements in the body such as digestion.
IV	**CASE STUDY BASED QUESTIONS (4M)**
	A.The forebrain consists of the cerebrum, thalamus, and hypothalamus. B. The hypothalamus regulates body temperature, hunger, and hormone secretion. C. The thalamus coordinates sensory and motor signals, acting as a relay center for the brain. OR D. The limbic system, including the amygdala and hippocampus, controls emotions, motivation, and sexual behavior.
V	**LONG ANSWER TYPE QUESTIONS (5M)**
17	<table><tr><th>**Central neural system (CNS)**</th><th>**Peripheral neural system (PNS)**</th></tr></table>

Consists of the spinal cord and the brain	It consists of the spinal nerves and the cranial nerves
The spinal column is protected by the vertebral column, whereas the brain is protected by the skull	No protective structures
No subdivisions	It is divided into the autonomic nervous system and the somatic nervous system
Processes information and regulates the responses to impulses.	Nerves of PNS pass impulses to the CNS and responses from the CNS to various structures of the body

ii)

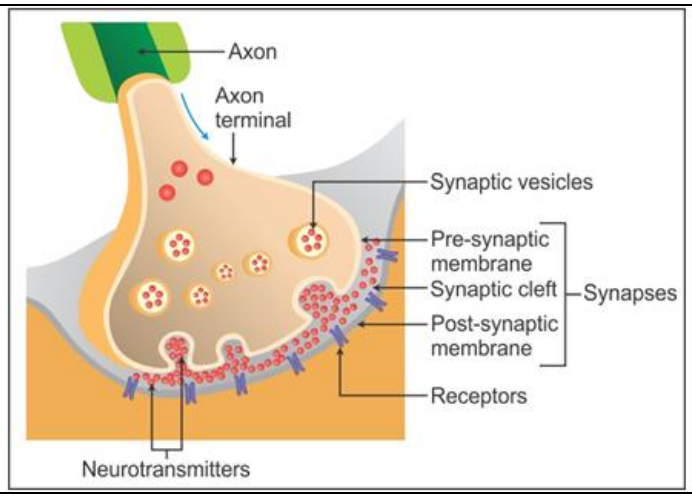
Resting potential	Action potential
1. It is the potential difference across the nerve fibre when there is no conduction of nerve impulse.	1. It is the potential difference across nerve fibre when there is conduction of nerve impulse.
2.The membrane is more permeable to K+ ions than to Na+ ions.	2. The membrane is more permeable to Na+ ions than to K+ ions.

18

Neurotransmitters are chemical messengers stored in small membrane-bound sacs called synaptic vesicles, which are found in the synaptic knob at the end of the axon terminal.
Release of neurotransmitters

1. Arrival of Nerve Impulse: When a nerve impulse (action potential) reaches the axon terminal, it stimulates the synaptic vesicles to move towards the presynaptic membrane.
2. Fusion with Membrane: The synaptic vesicles fuse with the presynaptic plasma membrane.
3. Exocytosis: The fusion process releases the neurotransmitters into the synaptic cleft, the fluid-filled space between the presynaptic and postsynaptic neurons.
4. Binding to Receptors: The released neurotransmitters then diffuse across the synaptic cleft and bind to specific receptors located on the postsynaptic membrane, thus transmitting the impulse to the next neuron.

The new potential developed may be either excitatory or inhibitory.



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