INDIAN SCHOOL AL WADI AL KABIR

Class: XI	**DEPARTMENT OF SCIENCE: 2026 – 2027** **SUBJECT: BIOLOGY**	**Date: 26/08/2026**
Worksheet: 08	**UNIT- V- HUMAN PHYSIOLOGY** **CHAPTER:18- NEURAL CONTROL AND COORDINATION**	**Note:** **A4 FILE FORMAT**
CLASS & SEC:	**NAME OF THE STUDENT:**	**ROLL NO.**

I. MULTIPLE CHOICE QUESTIONS (1M)

1. Resting membrane potential is maintained by:
   A. Acetylcholine
   B. Sodium
   C. Potassium
   D. Both B and C
2. The correct arrangement 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
3. 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
4. During the rise of an action potential, what causes the reversal of polarity at the site of stimulation, making the inner side positive and outer side negative?
   A. Rapid efflux of K^+ ions
   B. Rapid influx of Na^+ ions
   C. Active transport of Cl^- ions
   D. Influx of negatively charged proteins
5. The sodium-potassium (Na^+-K^+) pump transports how many ions across the axonal membrane to maintain the resting potential?
   A. (2 Na^+) outwards for (3 K^+) inwards
   B. (3 Na^+) inwards for (2 K^+) outwards
   C. (3 Na^+) outwards for (2 K^+) inwards
   D. (2 Na^+) inwards for (3 K^+) outwards

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.

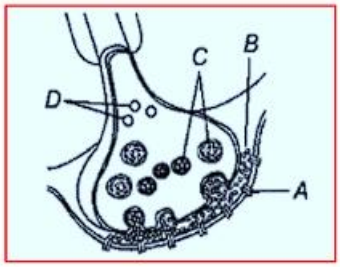
A. Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
C. Assertion (A) is true, Reason (R) is false.
D. Assertion (A) is false, Reason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

6. Assertion(A): Transmission of an impulse across electrical synapses is very similar to impulse conduction along a single axon.
   Reason(R): At electrical synapses, the membranes of pre- and post-synaptic neurons are separated by a wide, fluid-filled space called the synaptic cleft.

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): Nerve conduction is one-way conduction.
   Reason(R): Nerve impulse is transmitted from dendrite terminals to axon terminals.

II. VERY SHORT ANSWER TYPE QUESTIONS(2M)

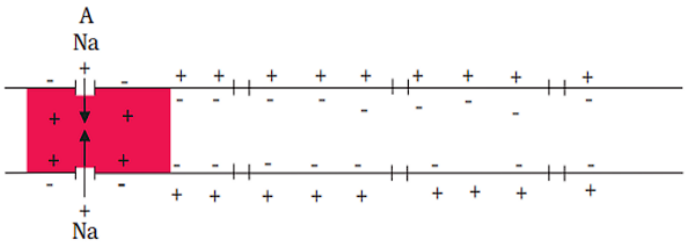
9. How does a neurotransmitter generate a new potential in the post-synaptic neuron?
10. Identify A, B, C, and D in the given diagram.



11. What is the difference between electrical transmission and chemical transmission?
12. Name the three constituent parts of the brain stem. Why is damage to the brain stem considered fatal?
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. Differentiate between:
    i) Myelinated and non-myelinated axons
    ii)Thalamus and Hypothalamus
    iii) Cerebrum and Cerebellum
15. Explain the process of generation and conduction of nerve impulses.
16. Given below represents axon membrane. Identify the special features associated with this membrane.



17. 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)

18. The human brain is the central information processing organ of our body, and it acts as the 'command and control system'. It is protected inside the skull and covered by three cranial meninges. The brain is divided into three major parts: forebrain, midbrain, and hindbrain. The forebrain consists of the cerebrum, thalamus, and hypothalamus. The cerebrum forms the major part of the human brain. A deep cleft divides the cerebrum longitudinally into two halves, which are connected by a tract of nerve fibres called the corpus callosum. The cerebrum controls memory, communication, and intelligence.
    The hypothalamus lies at the base of the thalamus. It contains a number of centres which control body temperature, urge for eating, and drinking. The midbrain is located between the thalamus/hypothalamus of the forebrain and pons of the hindbrain. A canal called the cerebral aqueduct passes through the midbrain. The hindbrain comprises the pons, cerebellum, and medulla. The medulla contains vital centres which control respiration, cardiovascular reflexes, and gastric secretions.
    A. Which specific tract of nerve fibres connects the left and right cerebral hemispheres?
    B. Name the part of the forebrain that acts as the main control center for body temperature, hunger, and thirst.
    C. Name the fluid-filled canal that passes through the midbrain. Mention its location relative to the parts of the brain and state its primary role.

    OR

    D. Which part of the hindbrain contains the vital regulatory centres for breathing and gastric secretions?

V. LONG ANSWER TYPE QUESTIONS (5M)

19. Name the parts of human forebrain indicating their respective functions.
20. Explain the process of the transport and release of a neurotransmitter with the help of a labelled diagram.

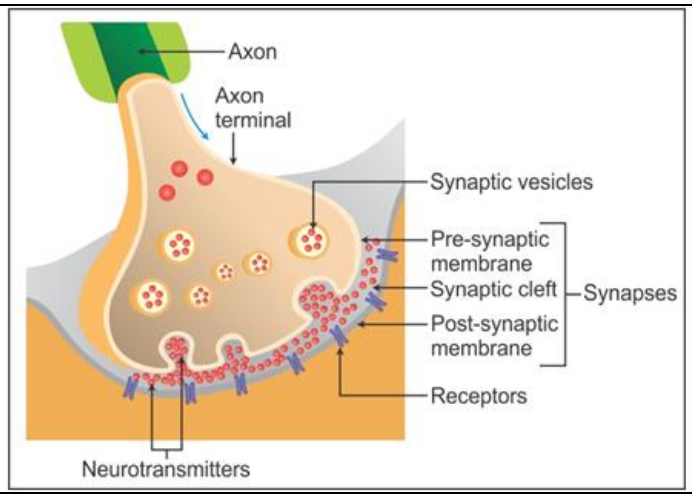
Answer Key

Q. No.	Answer
I.	**MULTIPLE CHOICE QUESTIONS (1M)**
1	D. Both B and C
2	D. Dura mater, arachnoid, pia mater

3	B. Schwann cells
4	B. Rapid influx of Na^+ ions
5	C. (3 Na^+) outwards for (2 K^+) inwards
	ASSERTION & REASONING
6	C. Assertion (A) is true, Reason (R) is false.
7	C. Assertion (A) is true, Reason (R) is false.
8	a) Both Assertion (A) and Reason (R) are true and Reason (R) is the correct explanation of the Assertion (A).
II	**VERY SHORT ANSWER TYPE QUESTIONS(2M)**
9	• The released neurotransmitters diffuse across the synaptic cleft and **bind to specific receptors** present on the post-synaptic membrane. • This binding action opens specific **ion channels**, allowing the entry of ions which can generate a new electrical potential (either excitatory or inhibitory) in the post-synaptic neuron.
10	A- postsynaptic knob, B- Neurotransmitters C- Synaptic vesicles with neurotransmitters D- Ions like Ca++
11	**Electrical transmission** / **Chemical transmission?** Transmission of nerve impulse takes place via electrical synapse. / Transmission of nerve impulse takes place via chemical synapse. Neurotransmitters does not required. / Neurotransmitters required It is quick and faster. Nerve impulse transmit like a single neuron / 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)
12	The brain stem forms the vital connection between the brain and spinal cord, consisting of the midbrain, pons, and medulla oblongata. **Fatality Reason:** It contains the primary autonomic reflex centers that control essential survival functions like respiration (breathing), gastric secretions, and cardiovascular reflexes. Damage to this area stops these vital rhythms instantly.
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	**i) Myelinated and Non-Myelinated Axons** Myelinated Axons / Non-Myelinated Axons Enwrapped with Schwann cells, which form a myelin sheath around the axon. / Enclosed by a Schwann cell that does not form a myelin sheath around the axon. Gaps between two adjacent myelin sheaths called nodes of Ranvier are present. / Nodes of Ranvier are absent on the axon. Commonly found in spinal and cranial nerves. / Commonly found in autonomous and somatic neural systems. **ii) Thalamus and Hypothalamus**

.	<table><tr><th>Thalamus</th><th>Hypothalamus</th></tr><tr><td>The cerebrum wraps around this structure in the forebrain.</td><td>It lies at the base of the thalamus.</td></tr><tr><td>Acts as a major coordinating centre for sensory and motor signaling.</td><td>Contains vital centres that control body temperature, urge for eating and drinking.</td></tr><tr><td>Does not secrete regulatory body hormones.</td><td>Contains neurosecretory cells that secrete hypothalamic hormones.</td></tr></table> **iii) Cerebrum and Cerebellum** <table><tr><th>Cerebrum</th><th>Cerebellum</th></tr><tr><td>Forms the major part of the human forebrain.</td><td>Forms a prominent part of the hindbrain.</td></tr><tr><td>A deep cleft divides it longitudinally into left and right cerebral hemispheres.</td><td>It features a very convoluted surface to provide additional space for many more neurons.</td></tr><tr><td>Contains motor, sensory, and large association areas for memory and communication.</td><td>Coordinates skeletal muscular activities and maintains body balance.</td></tr></table>
15	The ion channels of the neuron plasma membrane are selectively permeable. In the resting, stage membrane is more permeable to K+ ions and nearly impermeable to Na+ ions and negatively charged proteins present in the axoplasm. This difference in concentration forms a concentration gradient. The ionic gradient is maintained by the sodium-potassium pump. The Na- K pump transports 3 Na+ outwards for 2 K+ into the cell. Due to this the outer surface of the membrane acquires a positive charge while its inner surface becomes negatively charged and therefore is polarised (resting potential). When a stimulus is applied at a site on the polarised membrane, the membrane at site A becomes freely permeable to Na+, which leads to a rapid influx of Na+ followed by the reversal of the polarity at that site, and the membrane is depolarised. (Action potential) Depolarisation is followed by the increase in permeability of K+ to the membrane leading to a change in polarization. (repolarisation).
16	The axon membrane has several special features essential for nerve impulse conduction: **Resting Membrane Potential** – Maintains a negative charge inside the neuron due to ion distribution. **Selective Permeability** – Contains ion channels that regulate sodium (Na^+) and potassium (K^+) movement. **Sodium-Potassium Pump** – Actively transports Na^+ out and K^+ in to maintain polarization. **Voltage-Gated Channels** – Open and close in response to electrical signals for action potential generation. **Myelin Sheath (if present)** – Speeds up impulse transmission by saltatory conduction. **Nodes of Ranvier** – Gaps in the myelin sheath that facilitate rapid signal propagation.
17.	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)**
18	A. The corpus callosum connects the two cerebral hemispheres. B. The hypothalamus controls body temperature, eating, and drinking. C. The narrow canal that passes through the midbrain is called the cerebral aqueduct. Its primary function is to connect the third and fourth ventricles of the brain so that cerebrospinal fluid can circulate freely. OR D. The limbic system, including the amygdala and hippocampus, controls emotions, motivation, and sexual behavior.
V	**LONG ANSWER TYPE QUESTIONS (5M)**
19	(i) Cerebrum: It forms major part (approx. 80%) of brain. A deep cleft divides the cerebrum longitudinally into two halves, which are termed as the left and right cerebral hemispheres. The hemispheres are connected by a tract of nerve fibres called corpus callosum. The layer of cells which covers the cerebral hemisphere is called cerebral cortex. The cerebral cortex is referred to as the grey matter due to its greyish appearance. The neuron cell bodies are concentrated here giving the colour. The cerebral cortex contains motor areas, sensory areas and large regions that are neither clearly sensory nor motor in function. These regions called as the association areas are responsible for complex functions like intersensory associations, memory and communication. Fibres of the tracts are covered with the myelin sheath, which constitute the inner part of cerebral hemisphere. They give an opaque white appearance to the layer and, hence, is called the white matter. (ii)Thalamus: The cerebrum wraps around a structure called thalamus, which is a major coordinating centre for sensory and motor signalling. (iii) Hypothalamus: It is very important part of the brain. It lies at the base of the thalamus. It contains a number of centres which control body temperature, urge for eating and drinking. It also contains several groups of neurosecretory cells, which secrete hormones called hypothalamic hormones / neurohormones. The inner parts of cerebral hemispheres and a group of associated deep structures like amygdala, hippocampus, etc., form a complex structure called the limbic lobe or limbic system. Along with the hypothalamus regulates sexual behaviour, expression of emotional reactions (e.g., excitement, pleasure, rage and fear), and motivation.
20	A nerve impulse is transmitted from one neuron to another through junctions called synapses. A synapse is formed by the membranes of a pre-synaptic neuron and a post-synaptic neuron, which may or may not be separated by a gap called synaptic cleft. There are two types of synapses, namely, electrical synapses and chemical synapses. At a chemical synapse, the membranes of the pre- and post-synaptic neurons are separated by a fluid-filled space called synaptic cleft. Chemicals called neurotransmitters are involved in the transmission of impulses at these synapses. The axon terminals contain vesicles filled with these neurotransmitters. When an impulse (action potential) arrives at the axon terminal, it stimulates the movement of the synaptic vesicles towards the membrane where they fuse with the plasma membrane and release their neurotransmitters in the synaptic cleft. The released neurotransmitters bind to their specific receptors, present on the post-synaptic membrane. This binding opens ion channels allowing the entry of ions which can generate a new potential in the post-synaptic neuron. The new potential developed may be either excitatory or inhibitory.



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