

## NERVOUS SYSTEM

## **Points to Remember**

- Nervous system controls and coordinates the activities of our body.
- Neuron is the structural and functional unit of the cell and has three parts- cyton, dendrites and axon.
- > A receptor is a cell or group of cells that receives the stimuli.
- An effector is a part of the body which can respond to a stimulus according to the instructions from the brain or the spinal cord.
- > CNS is formed of brain and spinal cord.
- > PNS consists of all nerves which connect brain and spinal cord to all parts of the body.
- > ANS operates automatically and formed of sympathetic and parasympathetic nerves.
- A reflex action is a rapid, automatic response to a stimulus which is not under the voluntary control of the brain.

## TEXT BOOK EVALUATION

#### I. Book Exercise – Choose the best answer **Bipolar neurons are found in** 1. a) retina of eye d) respiratory epithelium b) cerebral cortex c) embryo **Ans.:** a) Retina of eye 2. Site for processing of vision, hearing, memory, speech, intelligence and thought is a) kidney b) ear c) brain d) lungs Ans.: c) Brain In reflex action, the reflex arc is formed by 3. a) brain, spinal cord, muscle b) receptor, muscle, spinal cord c) muscle, receptor, brain d) receptor, spinal cord, muscle **Ans.:** d) Receptor, spinal cord, muscle Dendrites transmit impulse cell body and axon transmit impulse cell body. 4. a) away from, away from b) towards, away from c) towards, towards d) away from, towards **Ans.:** b) Towards, away from The outer most of the three cranial meninges is 5. a) arachnoid membrane b) piamater c) duramater d) myelin sheath Ans.: c) Duramater There are pairs of cranial nerves and pairs of spinal nerves. 6. a) 12, 31 b) 31, 12 d) 12, 21 c) 12, 13 **Ans.:** a) 12, 31 7. The neurons which carries impulse from the central nervous system to the muscle fibre. a) afferent neurons b) association neuron c) efferent neuron d) unipolar neuron Ans.: c) Efferent neuron

8.	Which nervous band connects the twocerebral hemispheres of brain?				
	a) thalamus	b) hypothalamus	c)	corpus callosum	d) pons
0	Nodo of Panyior is foun	d in			Ans.: c) corpus callosum
9.	a) muscles	b) axons	c)	dendrites	d) cvton
	-,		-7		Ans.: b) Axons
10.	Vomiting centre is locat	ed in			
	a) medulla oblongata	b) stomach	c)	cerebrum	d) hypothalamus
	Name alle de catal				Ans.: a) Medulla oblongata
11.	a) neurilemma	b) sarcolemma	c)	axon	d) dendrites
	a) neurienina	b) sarcolemina	C		Ans.: b) Sarcolemma
12.	A person who met with	an accident lost co	ontrol of l	oody temperature	, water balance, and hunger.
	Which of the following	part of brain is suppo	osed to b	e damaged?	
	a) Medulla oblongata	b) cerebrum	C)	pons	d) hypothalamus
					Alis. u) hypothalainus
<i>II. I</i>	Book Exercise – Fill in the	e blanks			
1.	is the longes	t cell in our body.			Ans.: Neuron / Nerve cell
2.	Impulses travels rapidly in	neurons	5.		Ans.: Myelinated
3.	A change in the environm	ent that causes an an	imal to rea	act is called	Ans.: Stimulus
4.	carries the impulse towards the cell body. Ans.: Dendrite				
5.	The two antagonistic component of autonomic nervous system are and				
				Ans.:	Sympathetic / Parasympathetic
6.	A neuron contains all cell	all cell organelles except Ans.: Centriole			
7.	maintains the	e constant pressure in	iside the c	ranium.	Ans.: Cerebrospinal fluid
8.	and	Increases the surface area of cerebrum. Ans.: Gyri and Sulc			
9.	The part of human brain w	which acts as relay cer	nter is	·	Ans.: Thalamus
<i>III.</i>	Book Exercise – State wl If false correct the staten	hether the following nent.	statemen	ts are true or false	<u>):</u>
1.	Dendrons are the longe	st fibres that conduc	ts impuls	es away from the	cell body.
	Ans.: False.				
	Correct statement : Axc	<b>n</b> is the longest fibres	s that cond	ducts impulses awa	y from the cell body.
2.	Sympathetic nervous system is a part of central nervous system.				
	Correct statement : Svm	nathetic nervous syst	em is a na	art of <b>Autonomic</b> m	ervous system
3.	Hypothalamus is the the	ermoregulatory cent	re of hun	nan body.	
	Ans.: True.				
4.	Cerebrum controls the v Ans.: False.	oluntary actions of o	our body.		
	Correct statement : Cer	ebellum controls the	voluntary	actions of our body	у.
5.	<b>In the central nervous s</b> Ans.: True.	system myelinated fi	bres form	the white matter	<b>.</b>

6. All the nerves in the body are covered and protected by meninges. Ans.: False.

**Correct statement :** All the nerves in the body are covered and protected by **Epineurium**.

- 7. Cerebrospinal fluid provides nutrition to brain. Ans.: True.
- 8. Reflex arc allows the rapid response of the body to a stimulus. Ans.: True.
- 9. Pons helps in regulating respiration. Ans.: True.

## *IV.* Book Exercise – Match the items in column-I to the items in column-II:

#### **Column I**

- **Nissil's granules** 1.
- Hypothalamus 2.
- 3. Cerebellum
- 4. Schwann cell

Ans :

Column I			Column II		
1	Nissil's granules	С	Cyton		
2	Hypothalamus	а	Forebrain		
3	Cerebellum	d	Hindbrain		
4	Schwann cell	b	Peripheral Nervous system		

#### V. Book Exercise – Understand the assertion statement. Justify the reason given and choose the correct choice.

- a) Assertion is correct and reason is wrong.
- b) Reason is correct and the assertion is wrong.
- c) Both assertion and reason are correct.
- d) Both assertion and reason are wrong.
- **1. Assertion:** Cerebrospinal fluid is present throughout the central nervous system. Reason: Cerebrospinal fluid has no such functions.

Ans : a) Assertion is correct and reason is wrong

2. Assertion: Corpus callosum is present in space between the duramater and piamater. It serves to maintain the constant intracranial pressure. Reason:

Ans : d) Both assertion and reason are wrong

#### VI. Book Exercise – Short answer question.

#### 1. Define stimulus.

'Stimulus' refers to the changes in the environmental condition, that are detected by receptors present in the body.

## 2. Name the parts of the hind brain.

Hindbrain is formed of three parts

- a) Cerebellum,
- b) Pons and
- Medulla oblongata. c)

- Column II
- (b) **Peripheral Nervous system**
- (c) Cyton
- (d) Hindbrain
- Forebrain (a)

## 3. What are the structures involved in the protection of brain?

The structures involved in the protection of brain are

- a) Skull
- b) Three membranes of meninges
  - i) Duramater
  - ii) Arachnoid membrane and
  - iii) Piamater
- c) Cerebrospinal fluid.
- 4. Give an example for conditioned reflexes. Playing harmonium by striking a particular key on seeing a music note is an example of conditioned reflexes which required conscious training effort.
- 5. Which acts as a link between the nervous system and endocrine system? Hypothalamus acts as a link between the nervous system and endocrine system.

## 6. Define reflex arc.

i)

A reflex action is any response that occurs automatically without consciouness. The pathway taken by nerve impulse to accomplish reflex action is called reflex arc.

## VII. Book Exercise – Differentiate between.

#### **1.** Voluntary and involuntary actions.

	Voluntary action		Involuntary action
i)	The Voluntary actions are under the control	i)	Involuntary action are <b>not under our control</b> .
	of our will. e.g Eating,Locomotion etc.		e.g Breathing,Heart beat etc.
ii)	It is controlled by the <b>brain</b> .	ii)	It is controlled by the <b>spinal cord</b> .
iii)	All voluntary actions result in a <b>muscular</b>	iii)	Involuntary actions result in a <b>muscular</b>
	action.		action or secretion from some gland.

#### 2. Medullated and non-medullated nerve fibre.

	Medullated nerve fibre	Non-medullated nerve fibre			
i)	The axon is <b>covered with myelin sheath</b> .	i)	The axon is <b>not covered by myelin sheath</b> .		
ii)	They form the <b>white matter</b> of the brain.	ii)	They form the grey matter of the brain.		
iii)	They also known as <b>Myelinated</b> nerve fibre.	iii)	They also known as <b>Non-myelinated</b> nerve fibre.		

#### *VIII. Book Exercise – Long answer question :*

#### 1. With a neat labelled diagram explain the structure of a neuron.

A neuron typically consists of three basic parts: Cyton, Dendrites and Axon.

- **Cyton :** 1. Cyton is also called cell body or perikaryon.
  - 2. It has a central nucleus with abundant cytoplasm called **neuroplasm**.
  - 3. The cytoplasm has large granular body called **Nissl's granules** and the other cell organelles like mitochondria, ribosomes, lysosomes, and endoplasmic recticulum.
  - 4. Neurons do not have the ability to divide.
  - 5. Several neurofibrils are present in the cytoplasm that help in transmission of nerve impulses to and from the cell body.
- ii) **Dendrites**: 1. These are the numerous branched cytoplasmic processes that project from the surface of the cell body. They conduct nerve impulses towards the cyton.
  - 2. The branched projections increase the surface area for receiving the signals from other nerve cells.

- iii) Axon:
- 1. The axon is a single, elongated, slender projection.
  - 2. The end of axon terminates as fine branches which terminate into knob like swellings called **synaptic knob**.
  - 3. The plasma membrane of axon is called **axolemma**, while the cytoplasm is called **axoplasm**. It carries impulses away from the cyton.
  - 4. The axons may be covered by a protective sheath called **myelin sheath** which is further covered by a layer of **Schwann cells** called **neurilemma**.
  - 5. Myelin sheath breaks at intervals by depressions called **Nodes of Ranvier**.
  - 6. The region between the nodes is called as **internode**.
  - 7. Myelin sheath acts as insulator and ensures rapid transmission of nerve impulses.
- 2. Illustrate the structure and functions of brain.



	Structure	Functions		
	I. Fore	e brain		
1.	<b>Cerebrum</b> is the largest portion forming nearly two-third of the brain. The cerebrum is longitudinally divided into two halves as right and left <b>cerebral hemispheres</b> .	The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.		
	The <b>outer</b> portion of each cerebral hemisphere is formed of <b>grey matter</b> and is called <b>cerebral cortex</b> .			
	The <b>inner or deeper</b> part is formed of <b>white</b> matter and is called <b>cerebral medulla</b> .			
2.	Thalamus present in cerebral medulla	Acts as relay station.		
3.	<b>Hypothalamus</b> lies at the base of the thalamus.	Temperature control, thirst, hunger, urination, important link between nervous system and endocrine glands		
	II. Mic	l brain		
4.	<b>Corpora quadrigemina</b> is the dorsal portion of the mid brain consists of four rounded bodies.	It controls visual and auditory (hearing) reflexes.		

	III. Hind brain						
5.	<b>Cerebellum</b> is second largest part of the brain formed of two large sized hemispheres and middle vermis.	It coordinates voluntary movements and also maintains body balance.					
6.	<b>Pons</b> is a bridge of nerve fibre that connects the lobes of cerebellum.	It relay signals between the cerebellum, spinal cord, midbrain and cerebrum. It controls respiration and sleep cycle.					
7.	<b>Medulla oblongata</b> is the posterior most part of the brain that connects spinal cord and various parts of brain.	It has cardiac centres, respiratory centres, vasomotor centres to control heart beat, respiration and contractions of blood vessels respectively. It also regulates vomiting and salivation.					

## 3. What will you do if someone pricks your hand with a needle? Elucidate the pathway of response with a neat labelled diagram.

- When a needle pricks our hand, we withdraw our hand away from the source of pain, the needle. This stimulus (pain) in turn triggers an impulse in sensory neuron.
- ii) The sensory neuron transmits or conveys the message to the spinal cord.
- iii) Spinal cord interprets the stimulus and the impulse is passed on to the relay neuron which in turn transmits it to a motor neuron.
- iv) **Motor neurons** carry command from spinal cord to our arm.
- v) Muscle in our arm contracts and we withdraw our hand immediately from the source of pain, the needle.

Dorsal root

ganglion

#### 4. Describe the structure of spinal cord.

- i) Spinal cord is a cylindrical structure lying in the neural canal of the vertebral column.
- ii) It is covered by meninges.
- iii) It extends from the lower end of medulla oblongata to the first lumbar vertebra.
- iv) The posterior most region of spinal cord tapers into a thin fibrous thread like structure called **filum terminale**.
- v) Internally, the spinal cord contains a cerebrospinal fluid filled cavity known as the **central canal**.
- vi) The grey matter of spinal cord is 'H' shaped. The upper end of letter 'H" forms **posterior horns** and lower end forms **anterior horns**.
- vii) A bundle of fibres pass into the posterior horn forming **dorsal** or **afferent root**. Fibres pass outward from the anterior horn forming **ventral** or **efferent root**.
- viii) These two roots joins to form **spinal nerves**.
- ix) The white matter is external and have bundle of nerve tracts.
- x) Spinal cord conducts sensory and motor impulses to and from the brain. It controls reflex actions of the body.



Reflex action and its pathway



Central

White

Grev matter

Structure of spinal cord

#### 5. How nerve impulses are transferred from one neuron to next neuron?

- i) All the information from the environment are detected by the receptors located in our sense organs such as the eyes, the nose, the skin etc.
- ii) Information from the receptors is transmitted as **electrical impulse** and is received by the dendritic tips of the neuron.
- iii) This impulse travels from the dendrite to the cell body and then along the axon to its terminal end.
- iv) On reaching the axonal end, it causes the nerve endings to release a chemical called **neurotransmitter** which diffuses across a synapse and starts a similar electrical impulse in the dendrites of the next neuron, then to their cell body to be carried along the axon.
- v) In this way, the electrical signal reaches the brain or spinal cord.
- vi) The response from brain (or spinal cord) is similarly passed on to the effector organs such as the muscle or gland cell, that undergoes the desired response.
- vii) The flow of nerve impulses from axonal end of one neuron to dendrite of another neuron through a **synapse** is called **synaptic transmission**.

## 6. Classify neurons based on its structure.

Based on structure the neurons classified as follows:

- Unipolar neurons: Only one nerve process arises from the cyton which acts as both axon and dendron. They found in early embryos but not in adult.
- ii) **Bipolar neurons:** The cyton gives rise to **two nerve processes** of which one acts as an axon while another as a dendron. They found in **retina of eye** and **olfactory epithelium** of nasal chambers.
- iii) **Multipolar neurons:** The cyton gives rise to **many dendrons** and an **axon**. They found in **cerebral cortex** of brain.



Nerve impulse transmission

(A) (B) (C) Unipolar (A), Bipolar (B) and multipolar (C) neurons

## IX. Book Exercise – Higher Order Thinking Skills (HOTS)

- 1. 'A' is a cylindrical structure that begins from the lower end of medulla and extend downwards. It is enclosed in bony cage 'B' and covered by membranes 'C'. As many as 'D' pairs of nerves arise from the structure 'A'.
  - i) What is A?
  - ii) Name (a) bony cage 'B' and (b) membranes 'C'.
  - iii) How much is D?
  - i) A is **Spinal cord**.
  - ii) (a) Bony cage 'B' is **Vertebral column**.
    - (b) Membranes 'C' are **Duramater, Arachnoid membrane** and **Piamater of Meninges**.
  - iii) D **31 Pairs** of nerves.
- 2. Our body contains a large number of cells 'L' which are the longest cells in the body. L has long and short branch called as 'M' and 'N' respectively. There is a gap 'O' between two 'L' cells, through which nerve impulse transfer by release of chemical substance 'P'.
  - i) Name the cells L.
  - ii) What are M and N?
  - iii) What is the gap O?
  - iv) Name the chemical substance P.
  - i) L Neurons or Nerve cells.
  - ii) M Axon and N Dendron.

iii) **Synapse** is the gap O.

iv) The chemical substance P is Neurotransmitters (Acetylcholine).

			Additional – Choose	the	best answer		
1.	Axon and dendrites are	dep	arting from				
	a) Cyton	b)	Cell body	c)	Perikaryon	d)	All the above <b>Ans.:</b> d) All the above
2.	Cytoplasm of neuron is	calle	ed				
	a) Neuroplasm	b)	Nucleoplasm	c)	Axoplasm	d)	Non of the above <b>Ans.:</b> a) Neuroplasm
3.	The numerous branched	l cyt	oplasmic processes th	at	project from the surfa	ace	of the cell body.
	a) Nervefibres	b)	Axon	c)	Dendrites	d)	Nerves Ans.: c) Dendrites
4.	Single, elongated, slend	er p	rojection of neuron.				
	a) Nervefibres	b)	Axon	C)	Dendrites	d)	Nerves
-	The places werehouse	- <b>f</b>	ven is colled				<b>Ans.:</b> D) Axon
э.	a) Axoplasm	br a)	Neurilemma	c)	Myelin sheath	d)	Axolemma
6	acts as insu	lato	r and ensures ranid tr	anc	mission of nerve imn	ulca	
0.	a) Myelin sheath	b)	Neurilemma	C)	Nodes of Ranvier	d)	Schwann cell Ans.: a) Myelin sheath
7.	Chemicals produced by through synapse or syna	syn: aptie	aptic knob to transmit c junction are known a	ts ir as _	nformation from one	neı	Iron to another neuron
	a) Axoplasm	b)	Neurilemma	c)	Neurotransmitters	d) A	Axolemma <b>ns.:</b> c) Neurotransmitters
8.	are found in e	early	y embryos but not in a	dul	t.		
	a) Unipolar Neurons	b)	Bipolar Neurons	c)	Multipolar Neurons	d) A	None of the above <b>ns.:</b> a) Unipolar Neurons
9.	carry impul fibre or the gland.	ses	from the central nerv	ous	s system to effector	org	an such as the muscle
	a) Sensory neurons	b)	Afferent neurons	c)	Efferent neurons	d)	All the above Ans.: c) Efferent neurons
10.	Involuntary functions lib blood pressure etc. are o	ke h cont	unger, thirst, sleep, sv rolled by	wea _•	iting, sexual desire, a	ango	er, fear, water balance,
	a) Thalamus	b)	Pons	c)	Hypothalamus	d)	Medulla Oblongata <b>Ans.:</b> c) Hypothalamus
11.	controls the	sec	retion of hormones fro	om	anterior pituitary gla	nd.	
	a) Thalamus	b)	Pons	c)	Hypothalamus	d)	Medulla Oblongata <b>Ans.:</b> c) Hypothalamus
12.	Midbrain is located betw	veer	n and hin	d b	rain.		
	a) Thalamus	b)	Cerebellum	c)	Pons	d)	Medulla Oblongata <b>Ans.:</b> a) Thalamus
13.	Cerebellum, pons and m	nedu	lla oblongata are the I	parl	ts of		
	a) Fore brain	b)	Mid brain	c)	Hind brain	d)	Cerebrum <b>Ans.:</b> c) Hind brain

14.	coordinates voluntary movements and also maintains body balance.					nce.	
	a) Cerebrum	b)	Pons	c)	Cerebellum	d)	Spinal cord
							Ans.: c) Cerebellum
15.	The posterior most part	t of	the brain.				
	a) Medulla oblongata	b)	Pons	c)	Cerebellum	d)	Spinal cord
						Ar	ns.: a) Medulla oblongata
16.	The nervou	s sy	stem is formed of syn	npat	hetic and parasym	pathe	tic nerves.
	a) Central	b)	Peripheral	c)	Autonomic	d)	None of the above
							Ans. : c) Autonomic
17.	The fattest organ in ou	r bo	dy is				
	a) Liver	b)	Kidney	c)	Brain	d)	Stomach
							Ans.: c) Brain
18.	The grey matter of spin	al c	ord is sh	ape	d.		
	a) `H'	b)	`V′	c)	`Ľ	d)	`C′
							<b>Ans.:</b> a) `H'
19.	Reflex actions of the bo	ody i	s controlled by				
	a) Medulla oblongata	b)	Pons	c)	Cerebellum	d)	Spinal cord
							Ans.: d) Spinal Cord
20.	The nerves arising from	n the	brain and the spinal	cord	l constitute		nervous system.
	a) Central	b)	Peripheral	c)	Autonomic	d)	None of the above
							Ans.: b) Peripheral

## Additional – Fill in the blanks

1.	The changes in the environmental condition, that are detected by receptors present in the body is terme <b>Ans.:</b> Stim	ed as Iulus
2.	Relevant changes in the activities of organisms to a particular are called their reaction responses. Ans.: Sti	າs or imuli
3.	The working together of various organs in a systematic, controlled and efficient way to produce pr response to various stimuli is called Ans.: Coordinates and the systematic of the sys	oper ation
4.	The coordination between the various cells and organs to maintain physiological balance is called	
	Ans.: Homeos	stasis
5.	is the structural and functional unit of the nervous system. Ans. : Neuron or nerve	e cell
6.	is the longest cell of the human body with a length of over 100mm. Ans.: Ne	uron
7.	are the highly specialized cells to detect, receive and transmit different kinds of stimuli.	
	Ans.: Neu	irons
8.	Information is conducted through neurons in the form of impulses from one part of the bog another. Ans.: Elect	dy to trical
9.	Neuroglia are also called as cells. Ans.:	Glial
10.	A number of are bundled up together to form nerves. Ans.: Nerve fi	ibres
11.	is also called cell body or perikaryon. Ans.: C	yton
12.	The cytoplasm of neuron has large granular body called granules. Ans.: N	issl's

13. \_\_\_\_\_\_ of the cytoplasm help in transmission of nerve impulses to and from the cell body.

		Ans.: Neurofibrils
14.	Dendrites conduct nerve impulses towards the	Ans.: Cyton
15.	The end of axon terminates as fine branches which terminate into knob like swellings ca	alled
		Ans.: Synaptic knob
16.	The cytoplasm of axon is called	Ans.: Axoplasm
17.	carries impulses away from the cyton.	Ans.: Axon
18.	The axons of some neurons are covered by a protective sheath called	Ans.: Myelin sheath
19.	Myelin sheath is covered by a layer of Schwann cells called	Ans.: Neurilemma
20.	Myelin sheath breaks at intervals by depressions called An	s.: Nodes of Ranvier
21.	The region between the Nodes of Ranvier is called as	Ans.: Internode
22.	A junction between synaptic knob of axon of one neuron and dendron of next neuron is	called
	Ans.: Synapse	or synaptic junction
23.	neurons are found in retina of eye and olfactory epithelium of nasal chamb	ers.
		Ans.: Bipolar
24.	neurons conduct impulses between sensory and motor neurons.	Ans.: Association
25.	Myelinated nerve fibres form the matter of the brain.	Ans.: White
26.	Non-myelinated nerve fibres form the matter of the brain.	Ans.: Grey
27.	Information from the receptors is transmitted as electrical impulse and is received by the the neuron.	a tips of Ans.: Dendritic
28.	released by nerve endings diffuses across a synapse and pass electrical imp of the next neuron. An	ulse to the dendrites <b>s.:</b> Neurotransmitter
29.	The flow of nerve impulses from axonal end of one neuron to dendrite of another neuron is called synaptic transmission.	n through a <b>Ans.:</b> Synapse
30.	The important neurotransmitter released by neurons is called	Ans.: Acetylcholine
31.	The Nervous System acts as centre for information processing and control.	Ans.: Central
32.	The Central Nervous System (CNS) consists of the and	
	Ans.: Brain	n and the spinal cord
33.	The Peripheral nervous system (PNS) is made up of the which connect the to all parts of the body.	brain and spinal cord <b>Ans.:</b> Nerves
34.	The brain is protected by the bony structure called	Ans.: The skull
35.	Spinal cord is protected by of vertebral column.	Ans.: Vertebrae
36.	Brain is covered by three layered connective tissue membrane known as	Ans.: Meninges
37.	The middle layer of meninges, provides web like cushion for the brain.	
	Ans. A	Arachnoid membrane
38.	is the innermost layer of meninges.	Ans.: Piamater
39.	is an inflammation of the meninges surrounding our brain and spinal cord.	Ans.: Meningitis
40.	Meningitis is caused due to the infection by virus or bacteria in the fluid surrounding the	e
		Ans.: Meninges
41.	The forebrain is formed of and Ans.: Cerebru	m and diencephalon
42.	of fore brain consists of dorsal thalamus and ventral hypothalamus.	Ans.: Diencephalon

43.	is the largest portion forming nearly two-third of the brain.	Ans.: Cerebrum
44.	divides cerebrum longitudinally into right and left cerebral hemispheres.	Ans.: Median cleft
45.	and increase surface area of cerebral cortex.	Ans.: Gyri and sulci
46.	Elevations found in cerebral cortex is termed as	Ans.: Gyri
47.	Depressions found between gyrus is termed as	Ans.: Sulci
48.	present in cerebral medulla is a major conducting centre for sensory and	d motor signalling. <b>Ans.:</b> Thalamus
49.	acts as a thermoregulatory (temperature control) center of the body.	Ans.: Hypothalamus
50.	Four rounded bodies present on the dorsal portion of the mid brain is called	•
	Ans.:	Corpora quadrigemina.
51.	control visual and auditory (hearing) reflexes. Ans.:	Corpora quadrigemina
52.	is a bridge of nerve fibre that connects the lobes of cerebellum.	Ans.: Pons
53.	Respiration and sleep cycle are controlled by	Ans.: Pons
54.	connects spinal cord and various parts of brain.	ns. : Medulla oblongata
55.	The most crucial molecules that determine our brain's integrity and the ability are	·
	Ans.: Esse	ential Fatty Acids (EFAs)
56.	Spinal cord is a cylindrical structure lying in the of the vertebral column	. Ans.: Neural canal
57.	The posterior most region of spinal cord tapers into a thin fibrous thread like structur	e called
		Ans.: Filum terminale
58.	Internally, the spinal cord contains a cerebrospinal fluid filled cavity known as the	
50	The busin is even ended in a special fluid environment called	
59.	The brain is suspended in a special fluid environment called Ans.: Co	erebrospinal nuid (CSF)
60.	is responsible for maintaining a constant pressure inside the cranium.	ns · Cerebrospinal fluid
61	Δ is any response that occurs automatically without consciouness	
62	Winking of eves when any dust particles enters speezing coughing vawning	etc are examples for
oz.	reflexes.	Ans.: Simple or basic
63.	reflexes are inbuilt and unlearned responses.	Ans.: Simple or basic
64.	Most of the reflex actions are monitored and controlled by the spinal cord,	hence also known as Ans.: Spinal reflexes
65.	The pathway taken by nerve impulse to accomplish reflex action is called	Ans.: Reflex arc
66.	The nerves arising from the brain are called	Ans.: Cranial nerves
67.	Optic nerves which innervates the eye are an example for nerves.	Ans.: Cranial
68.	In man, there are pairs of cranial nerves.	<b>Ans.:</b> 12
69.	Autonomic Nervous System controls the involuntary functions of the org	ans. <b>Ans.:</b> visceral
70.	Autonomic nervous system (ANS) is also called as nervous system.	Ans.: Visceral
71.	Two cerebral hemispheres are interconnected by thick band of nerve fibres called	
		Ans.: Corpus callosum
72.	The outer portion of cerebral hemisphere is formed of grey matter called	
		Ans.: Cerebral cortex
73.	supplies nutrients to the brain.	ns.: Cerebrospinal fluid

## Additional – True or false

Neuroglia initiate or conduct nerve impulses.
Ans.: False.

Correct statement : Neuroglia do not initiate or conduct nerve impulses.

- 2. The nerve fibres are the long slender processes of neurons. Ans.: True.
- **3.** Efferent neurons carry impulses from the sense organ to the central nervous system. **Ans. :** False.

**Correct statement:** <u>Afferent</u> neurons carry impulses from the sense organ to the central nervous system.

## Each neuron can transmit 1,000 nerve impulses per minute. Ans.: False.

**Correct statement :** Each neuron can transmit 1,000 nerve impulses per second.

- 5. Duramater is the outermost thick fibrous membrane of meninges. Ans.: True.
- 6. Arachnoid membrane of meninges is a thin delicate membrane and richly supplied with blood. Ans.: False.

**Correct statement :** <u>**Piamater</u></u> of meninges is a thin delicate membrane and richly supplied with blood.</u>** 

## The inner or deeper part of cerebral hemisphere is formed of white matter called cerebral cortex. Ans.: False.

**Correct statement :** The inner or deeper part of cerebral hemisphere is formed of white matter called **cerebral medulla**.

- 8. Thalamus acts as a relay centre. Ans.: True.
- **9.** Hypothalamus is an important link between nervous system and endocrine system. **Ans.:** True.
- **10. Hypothalamus lies at the base of the thalamus. Ans.:** True.
- **11.** Spinal cord regulates vomiting and salivation. **Ans.:** False.

**Correct statement : <u>Medulla Oblongata</u>** regulates vomiting and salivation.

- **12. EFAs cannot be synthesised and must be obtained from food. Ans. :** True.
- **13.** The central canal of the spinal cord is filled with Cerebrospinal fluid. **Ans.:** True.
- **14.** Nerves arising from spinal cord are called cranial nerves.

Ans.: False.

Correct statement: Nerves arising from spinal cord are called **spinal nerves**.

15. Neurons do not have the ability to divide.

Ans.: True.

## Additional – Match the following

1. Pons

(a) Afferent neurons(b) Efferent neurons

(d) Corpora quadrigemina

- 2. Forebrain
- 3. Mid brain
- 4. Hind brain
- 5. Neuroglia
- 6. Cyton
- 7. Schwann cells
- 8. Sensory

Motor

(h) Neurilemma(i) Bridge

(c) Glial cells

(e) Cerebellum

(f) Relay centre

(g) Diencephalon

10. Thalamus (j) Perikaryon

## Ans :

9.

1.	Pons	(i)	Bridge
2.	Forebrain	(g)	Diencephalon
3.	Mid brain	(d)	Corpora quadrigemina
4.	Hind brain	(e)	Cerebellum
5.	Neuroglia	(c)	Glial cells
6.	Cyton	(j)	Perikaryon
7.	Schwann cells	(h)	Neurilemma
8.	Sensory	(a)	Afferent neurons
9.	Motor	(b)	Efferent neurons
10.	Thalamus	(f)	Relay centre

## Additional – Assertion and Reason

- a) Both A and R are true and R is the correct explanation of A.
- b) Both A and R are true but R is not the correct explanation of A.
- c) A is true but R is false.
- d) Both A and R are false.

**Reason:** 

1. Assertion: All spinal nerves are mixed nerves.

Each spinal nerve has a sensory root and a motor root.

## Ans : a) Both A and R are true and R is the correct explanation of A

Assertion: A reflex action is a rapid, automatic response to a stimulus.
Reason: Reflex action is under the voluntary control of the brain.

Ans : c) A is true but R is false

**3. Assertion:** Efferent neurons carry impulses from the central nervous system to effector organ such as the muscle fibre or the gland.

**Reason:** Association neurons conduct impulses betweeen sensory and motor neurons.

Ans : b) Both A and R are true but R is not the correct explanation of A

- **4. Assertion:** Neurons have the ability to divide.
- **Reason:** Neurotransmitters are produced by cyton.

Ans : d) Both A and R are false

## Additional – Short answers

## 1. What are the three components of nervous system?

The components of the nervous system are

a) Neurons b) Neuroglia and

## c) Nerve fibres.

## 2. What are neurotransmitters?

Chemicals produced by synaptic knob to transmits information from one neuron to another neuron through synapse or synaptic junction are known as neurotransmitters.

## 3. Classify neurons based on their functions.

- a) **Sensory or afferent neurons** carry impulses from the sense organ to the central nervous system.
- b) **Motor or efferent neurons** carry impulses from the central nervous system to effector organ such as the muscle fibre or the gland.
- c) Association neurons conduct impulses betweeen sensory and motor neurons.

## 4. Classify the Nerve Fibres based on the presence or absence of myelin sheath.

Nerve fibres are of two types based on the presence or absence of myelin sheath.

- i) **Myelinated nerve fibre:** The axon is covered with myelin sheath.
- ii) Non-myelinated nerve fibre: The axon is not covered by myelin sheath.

## 5. What is the correct pathway of an impulse through a neuron?

Stimulus  $\longrightarrow$  Receptor  $\longrightarrow$  Dendrite  $\longrightarrow$  Cyton  $\longrightarrow$  Axon  $\longrightarrow$  Synaptic knobs  $\longrightarrow$  Neurotransmitters  $\longrightarrow$  Another Dendrite.

## 6. What are Neurotransmitters?

Neurotransmitters are the chemicals which allow the transmission of nerve impulse from the axon terminal of one neuron to the dendron of another neuron or to an **effector organ**. The important neurotransmitter released by neurons is called **Acetylcholine**.

## 7. Give the expansions for the following?

a) CNS b) PNS c) ANS d) EFA e) CSF f) EEG

- a) CNS Central nervous system
- b) PNS Peripheral nervous system
- c) ANS Autonomic nervous system
- d) EFA Essential Fatty Acid
- e) CSF Cerebrospinal fluid
- f) EEG Electroencephalogram.

## 8. What are the three divisions of Human nervous system?

- a) Central nervous system (CNS),
- b) Peripheral nervous system (PNS) and
- c) Autonomic nervous system (ANS).

## 9. What are the three layers of meninges from outermost to innermost?

- i) **Duramater** is the outermost thick fibrous membrane.
- ii) Arachnoid membrane is the middle, thin vascular membrane providing web like cushion.
- iii) **Piamater** is the innermost, thin delicate membrane richly supplied with blood.

## 10. What is meningitis?

- a) Meningitis is an inflammation of the membranes (meninges) surrounding our brain and spinal cord.
- b) It can occur when fluid surrounding the meninges becomes infected.
- c) The most common causes of meningitis are viral and bacterial infections.

## 11. What are the parts of forebrain?

- The forebrain is formed of
- a) Cerebrum and

## b) Diencephalon

## Diencephalon consists of

- i) Dorsal **thalamus** and
- ii) Ventral hypothalamus.

## 12. What are four lobes of cerebral hemisphere?

Cerebral hemisphere is divisible into four lobes such as

- a) Frontal lobe.
- b) Parietal lobe.
- c) Temporal lobe and
- d) Occipital lobe.

## 13. What are the functions of cerebrum?

The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.

## 14. What are the functions of Hypothalamus?

- i) Hypothalamus controls involuntary functions like hunger, thirst, sleep, sweating, sexual desire, anger, fear, water balance, blood pressure etc.
- ii) It acts as a thermoregulatory (temperature control) center of the body.
- iii) It controls the secretion of hormones from anterior pituitary gland and
- iv) It is an important link between nervous system and endocrine system.

## 15. What is corpora quadrigemina?

Four rounded bodies present on the dorsal portion of the mid brain is called corpora quadrigemina. Corpora quadrigemina control visual and auditory (hearing) reflexes.

## 16. Write the location and functions of Pons.

Location: The pons is a portion of the brain stem, located above the medulla oblongata.

Functions: i. Pons is a bridge of nerve fibre that connects the lobes of cerebellum.

- ii. It relay signals between the cerebellum, spinal cord, midbrain and cerebrum.
- iii. It controls respiration and sleep cycle.

## 17. Write the location and functions of Medulla Oblongata.

- i) Medulla oblongata is the posterior most part of the brain.
- ii) It connects spinal cord and various parts of brain.
- iii) It has cardiac centres, respiratory centres, vasomotor centres to control heart beat, respiration and contractions of blood vessels respectively.
- iv) It also regulates vomiting and salivation.

## 18. What is the fattest part of our body?

Brain is the fattest organ in our body. As the brain constitutes nearly 60 percent of fat, it is considered as the fattest organ in our body.

## 19. Write a note on Autonomic nervous system (ANS).

Autonomic nervous system (ANS) is also called as visceral nervous system as it regulates the function of internal visceral organs (Heart, Lungs, Liver, Pancreas etc.) of our body through its two antagonistic (opposite) components **sympathetic** and **parasympathetic systems**.

## 20. What is EEG? What are the uses of EEG?

Electroencephalogram (EEG) is an instrument which records the electrical impulses of brain.

**Uses :** An EEG can detect abnormalities in the brain waves and help in diagnoses of seizures, epilepsy, brain tumors, head injuries, etc.

## Additional – Long Answers

#### 1. Describe the structure of cerebrum. Write a note on its functions.

#### I. Structure of Cerebrum :

- i) Cerebrum is the largest portion forming nearly two-third of the brain.
- ii) The cerebrum is longitudinally divided into two halves as right and left **cerebral hemispheres** by a deep cleft called **median cleft**.
- iii) Two cerebral hemispheres are interconnected by thick band of nerve fibres called **corpus callosum**.
- iv) The outer portion of each cerebral hemisphere is formed of grey matter and is called **cerebral cortex**.
- v) The inner or deeper part is formed of white matter and is called **cerebral medulla**.
- vi) The cortex is extremely folded forming elevations called **gyri** with depressions between them termed as **sulci** that increase its surface area.
- vii) Each cerebral hemisphere is divisble into a frontal lobe, a parietal lobe, a temporal lobe and an occipital lobe. These lobes are also known as **cerebral lobes** and are associated with specific functions.

#### II. Functions of cerebrum :

The cerebrum is responsible for the thinking, intelligence, consciousness, memory, imagination, reasoning and willpower.

## Additional – Draw and label

#### Draw and label the following diagrams.

Medulia obiorgata

Structure of neuron. 1. 2. Types of neuron. 3. Nerveimpulsetransmission. AXON Neuro-Transmitters Nodes of Ranvier Synaps 610 KI Myelin sheath (A) (B) (C)Receptors Unipolar (A), Bipolar (B) and Dendrite multipolar (C) neurons Reflex action and its pathway. 5. 4. Structure of brain. Spinal cord (CNS) Message to brain Sensory neuror Receptors = Heat pain Receptors in skir Motor Relay neuron neuron

Effector = Muscle in arm

## Important Abbreviations to remember

1.	CNS	Central Nervous System		
2.	PNS	Penipheral Nervous System		
3.	ANS	Autonomic Nervous System		
4.	EEG	Electroencephalogram		
5.	EFAs	Essential Fatty Acids		
6.	CSF	Cerebro Spinal Fluid		

# UNIT TEST - 15

## Time : 1.15 Hrs.

3

<i>I.</i> C	hoose the best answer					(5 × 1 =	: 5)		
1.	<b>Bipolar neurons are fou</b> a) retina of eye	b) cerebral corte	x c)	embryo	d)	respiratory epitheliu	m		
2.	In reflex action, the reflex arc is formed by a) brain, spinal cord, muscle c) muscle, receptor, brain			receptor, muscle, spinal cord receptor, spinal cord, muscle					
3.	Vomiting centre is location a) medulla oblongata	t <b>ed in</b> b) stomach	c)	cerebrum	d)	hypothalamus			
4 coordinates voluntary movements and also maintains body balance.									
	a) Cerebrum	b) Pons	c)	Cerebellum	d)	Spinal cord			
5.	The fattest organ in ou	r body is	· 、	<b>_</b> .	N				
	a) Liver	b) Kidney	C)	Brain	d)	Stomach			
<i>II.</i> I	Fill in the blanks					(5 × 1 =	: 5)		
6.	is the longest cell in our body.								
7.	maintains the constant pressure inside the cranium.								
8.	The part of human brain which acts as relay center is								
9.	released by nerve endings diffuses across a synapse and pass electrical impulse to the dendrites of the next neuron.								
10.	The middle layer of meni	nges,	provides web	like cushion for	the brain.				

## *III. State whether the statements are true or false. Correct the false statement*

 $(5 \times 1 = 5)$ 

Marks: 50

- 11. Sympathetic nervous system is a part of central nervous system.
- 12. In the central nervous system myelinated fibres form the white matter.
- 13. Reflex arc allows the rapid response of the body to a stimulus.
- 14. Nerves arising from spinal cord are called cranial nerves.
- 15. The central canal of the spinal cord is filled with cerebrospinal fluid.

## IV. Match the following

- 16. Nissil's granules
- 17. Hypothalamus
- 18. Cerebellum
- 19. Schwann cell
- 20. Motor

- Forebrain (a) (b) Efferent neurons
  - Cyton
- (c) Hindbrain (d)

- Peripheral Nervous system

## V. Assertion and Reasoning

 $(5 \times 1 = 5)$ 

 $(5 \times 1 = 5)$ 

**Direction:** In each of the following questions, a statement of Assertion is given and a corresponding statement of Reason is given just below it. Of the statements given below, mark the correct answer as

If both A and R are true and R is the correct explanation of A. a.

(e)

- b. If both A and R are true but R is not the correct explanation of A.
- If A is true but R is false. d. If both A and R are false. c.
- 21. **Assertion:** Corpus callosum is present in space between the duramater and piamater. Reason: It serves to maintain the constant intracranial pressure.
- 22. Assertion: Cerebrospinal fluid is present throughout the central nervous system. Cerebrospinal fluid has no such functions. Reason:
- 23. Assertion: All spinal nerves are mixed nerves. Each spinal nerve has a sensory root and a motor root. Reason:
- 24. Assertion: A reflex action is a rapid, automatic response to a stimulus. Reason: Reflex action is under the voluntary control of the brain.
- 25. Assertion: Neurons have the ability to divide. Reason: Neurotransmitters are produced by cyton.

## VI. Write the answer for the following questions in word or sentence

- 26. Define stimulus.
- 27. Name the parts of the hind brain.
- 28. What are the three components of nervous system?
- 29. Which acts as a link between the nervous system and endocrine system?
- 30. What is corpora guadrigemina?

## VII. Write the short answer for ANY 5 of the following questions

- 31. Differentiate between voluntary and involuntary actions.
- 32. Give an example for conditioned reflexes.
- 33. What are the structures involved in the protection of brain?
- 34. 'A' is a cylindrical structure that begins from the lower end of medulla and extend downwards. It is enclosed in bony cage 'B' and covered by membranes 'C'. As many as 'D' pairs of nerves arise from the structure 'A'. i) What is A? ii) Name (a) bony cage 'B' and (b) membranes 'C'. iii) How much is D?
- 35. What is EEG? What are the uses of EEG?
- 36. What are Neurotransmitters?
- 37. What are the three layers of meninges from outermost to innermost?

## VIII. Write long answer for the following questions

38. With a neat labelled diagram explain the structure of a neuron.

or

- Illustrate the structure and functions of brain. 39
- 40. How nerve impulses are transferred from one neuron to next neuron?

41 Describe the structure of cerebrum. Write a note on its functions.

## $(6 \times 2 = 12)$

 $(2 \times 5 = 10)$ 

 $(5 \times 1 = 5)$