31 Neural Control and Coordinations in Animals

- **Nervous System :**

- In Human being all physiological processes control and coordination by Nervous system and Endocrine system.
- The nervous system provides and organised network of nerves for fast coordination.
- The endocrine system provides chemical integration through hormones.
- Nerve cell is the structural and functional unit of the nervous system.
- Three main functions of nervous system : (1) Receiving sensory stimuli from external and internal environment by nerves to the brain. (2) Processing the stimuli informations by brain. (3) Responding to stimuli transrmitting impulses from brain to body parts of cells.
- The nervous system of hydra is composed of network of nerve cells.
- The nervous system is well developed in insects, which consists of brain, ganglia and nervous system.
- Vertebrates have a highly developed nervous system.

- **Structures of Nervecell : (Three parts)**

(1) Cyton : The cyton may be oval, rounded or star shaped neuroplasma, which has a relatively large and spherical nucleus. Neuroplasm has mitochondria, golgibody and small basophilic granules i.e. Nissl's grenules.

(2) Dendrites : Several short branched tapering afferent processes.

(3) Axon : A Single, cylindrical and very long efferent processes with synaptic knob.

- **Synapse :** An ending branch of axon of first neuron and sequincial dendrites of record neuron never directly attached with each other but very small physical space is there so it is called synapse.

- **On basis of processes types of neurons :**

(1) Unipolar neuron : One axon only – e.g. found in embryonic stage.

(2) Bipolar neuron : One axon and one dendrite. eg. found in retina of eye.

(3) Multipolar neuron : One axon and more dendrites – present in the cerebral cortex.

- **Types of Axon or Types of nervefibres :**

Myelinated nerve fibers	Non-myelinated nerve fibers
– Two coat are present.	– Only one coat is present.
– Outer coat is neurilemma or sheath of schwann cell.	– Only one outer neurilemma is present .
– Inner coat is made up of fatty substances.	– Myelin sheath is absent.
– Mylein is absent at a certain points which are known as nodes of Ranvier.	– Nodes of ranvier is absent.
– This type of nerve fiber is in Pariferal nerve.	– This type of nerve fiber include in autonomous nerve.

(1) Control and coordination of all physiological activities in human, is by which system ?
(A) Blood circulatory system (B) Nervous system (C) Endocrine system (D) B and C both

(2) Provides chemical coordination for control and coordination of physiological activities.
(A) Excretory system (B) Endocrine system (C) Nervous system (D) B and C both

(3) For coordination of physiological activities provide quick arrangement.
(A) Nervous system (B) Endocrine system (C) Blood vascular system (D) A and B both

(4) In which animal phylum nerve net type nervous system is present ?
(A) Porifera (B) Coelenterata (C) Protozoa (D) Arthropoda

(5) Cyton is which shape ?
(A) Star (B) Oval (C) Round (D) All

(6) Where is secretory vesicle, located in nerve cell ?
(A) Cyton (B) Synapse (C) Synaptic knob (D) Nerve fibre

(7) Location of neuron, having one axon ..... .
(A) cerebral cortex (B) retina (C) embryonic stage (D) all

(8) Location of neuron having one dendron.
(A) Embryonic (B) Cerebral cortex (C) Retina (D) All of above

(9) Type of neuron having more than two axons.
(A) Multipolar (B) Bipolar (C) Unipolar (D) None

(10) Nerve, which has covering of schwann's cell.
(A) cranial nerve (B) Spinal nerve
(C) Autonomous nerve (D) All of above

(11) Nerve with two membranes surrounding nerve fibre ..... .
(A) cranial nerve (B) autonomous nerve
(C) spinal nerve (D) A and C

Answers : (1-D), (2-B), (3-A), (4-B), (5-D), (6-C), (7-C), (8-C), (9-A), (10-D), (11-D)

- **Structures of nerve fiber resting potential and Formation of nerve impulse :**

- **Structure of nerve fiber :** The neuroplasm possesses a higher negative charge compared to it, there is a higher positive charge on the outerside of plasma membrane. The distribution of positive and negative ions is responsible for this differences in electrical charges.

- This difference in electrical charges between the inside and the outisde plasma membrane is called the 'membrane potential'. In an unexcited state of nerve fibre, it is called 'resting potential' ! It can be measured using electrodes and voltmeter. Plasma membrane of nerve fiber has main two parts.

(1) Bilayer lipids - which is impermeable for ions.

(2) Specific protein present in coat.

Functions :

(1) **Ion channels :** Aqueous and made up of protein - carry out two way transport of ions selectively. - permeable to any one kind of ion only - Na^+, K^+, Cl^- and Ca^{+2} ion channels can occur transport in direction of concentration gradiant- Ion channels can be opened and closed. Chemical and electrical charges are responsible for this - bring differences in electrical potential.

(2) It play key roll to maintain the electrical potential and change.

(3) **Ion pumps** : Transportation of ions opposite to concentration gradient - In transportation energy consume as ATP - Mainly Na^+ and K^+ pump is there. - By the Na^+ pump 2 Na^+ goes outside. While $3K^+$ comes inside by K^+ pump - Ion pump maintain potential.

- **Resting Potential :** The nerve fibre is at rest, a negative electrical charge occurs on its inner side and a positive electrical charge occurs on its outerside.
- Such a nerve fibre is called polarized.
- For this, ions responsible Na^+ are concentrated on the outside of plasma membrane whereas K^+ are concentracted on its inside.
- Moreover protein molecules having negative charges on them also occur. They can not move out of plasma membrane.
- **Active potential or initiation of the Impulse :**
- Nerve fibre can become excited in verious ways. Touch, smell, pressure, chemical changes etc. include this.
- A change in the polarity of nerve fibre is called active potential.
- In the excited region Na^+ channels open up; the electrical excitation generated in plasma membrane in this region is reponsible for this. Na^+ ions are poured inside through its ion channels in plasma membrane. The lower concentration of Na^+ inside is responsible for this. Moreover, negatively charged proteins are also responsible. Thus, due to a sudden influx of a large number of Na^+ towards the inside, the plasma membrane in this region becomes positively charged on its inside. This phenomenon is called- depolarization. It is called active potential.
- It lasts for a very short period i.e a millionth part of a second (nearly 0.5 milli sec). The excited region immediately becomes repolarised.
- For repolarization, the process of closure of Na^+ ion channels is responsible, simultaneously, K^+ ion channels open up and K^+ ions go out of the plasma membrane.
- At the end of this phase, a difference in concentration of positive ions on two sides of plasma membrane is generated. Concentration of Na^+ increases on inside and that of K^+ increases on the outside.
- The activity of Na^+ - K^+ pump removes this imbalance.

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(12) Conduction of nerve impulse by nerve fibre is which type of process ?
(A) electrical (B) chemical (C) electrochemical (D) physical

(13) Which electrical charge is more towards outerside of neurolemma of inactive nervefibre ?
(A) Negative (B) Positive (C) Negative and positive (D) Neutral

(14) Membrane potential is ..... .
(A) difference of electric charge, innerside of nerve cell
(B) difference of electric charge, on outer surface of nerve cell
(C) difference of outer and inner electric charge of nerve cell
(D) inner and outer electric charge of nerve cell, become similar

(15) Conduction of ions by Na^+ - K^+ pump is of ..... type.
(A) Antiport (B) Symport (C) Uniport (D) biport

(16) Protein which conducts ions without utilization of ATP in neurilemma of nerve cell.
(A) Na^+ - K^+ pump (B) Na^+ passage (C) K^+ passage (D) B and C

(17) ..... is responsible for resting membrane potential of nerve fibre.
(A) Na^+ channel (B) K^+ channel (C) Na^+ - K^+ channel (D) Na^+- K^+ pump

(18) ..... is responsible for changing resting membrane potential of nerve fibre.
(A) Na^+ channel (B) K^+ channel (C) Na^+ and K^+ channel (D) Na^+- K^+ pump

(19) What is duration of active membrane potential on nerve fibre ?
(A) 1 Sec (B) 0.5 Millisec (C) 2 Sec (D) 5 Sec

(20) Which ions are responsible for creating active membrane potential ?
(A) K^+ (B) Ca^{++} (C) Cl^- (D) Na^+

(21) Condition for repolarisation is ..... .

(A) Na^+ - K^+ channels closed (B) Na^+ - K^+ channel open

(C) Na^+ channel closed, K^+ channel open (D) Na^+ channel open, K^+ channel closed

(22) Proper for repolarised nerve fibre is ..... .

(A) K^+ more towards innerside (B) Na^+ more towards innerside

(C) K^+ more towards outerside (D) B and C

(23) Filled with water and formed of protein

(A) Na^+channel (B) K^+channel (C) Ca^{+2} channel (D) All of above

(24) Responsible for opening of Na^+ channel of nervefibre.

(A) Touch (B) Smell (C) Pressure (D) All of above

(25) Important characteristic of active membrane potential ..... .

(A) Intensity of stimulation should constant (B) Intensity of stimulation should not constant

(C) Intensity of stimulation is specific and less (D) All of above

Answers : (12-C), (13-B), (14-C), (15-A), (16-D), (17-D), (18-C), (19-B), (20-D), (21-C), (22-D), (23-D), (24-D), (25-C)

- **Conduction of nerve impulse :**

- The nerve impulse in nerve fibre conducted along one direction.
- This process is self-induced because when the membrane electric potential is reduced in the nearby region, the ion-channels in the region automatically open up.
- Thus sequential depolarization and repolarization progress and the nerve impulse moves along in that direction.
- To protect the impulse weakening through diffusion all arounds nerve fibre is surrounded by a medullary layer. This conduction is very speedy (100 meters per second).
- In these nerve fibres, active potential after it is generated, does not move in cyclic waves gradually. It moves directly from one Ranvier's node to the next node. Such a conductions is known as 'Saltatory Conduction.'

- **Transmission of Impulse by Synapse (Phases) :**

Impuse - The synaptic knob of the axon, it depolarises the presynaptic membrane - Ca^{+2} permeability increases. - Ca^{+2} from the synaptic cleft enter into synaptic knob - Releases acetylcholine in synapse- Acetylcholine receptors complex - Post synaptic membrane allows Na^+ to enter the cell and cause depolarization - Generate new action potential in the post synaptic membrane. Now the nerve impulse passes to next neuron. - Now acetylcholine is hydrolysed in presence of acetylcholine esterase - Resynthesised into acetylcholine in presence of ATP.

- Ca^{+2} and Na^+ ions presence in synapse - postsynaptic membrane having receptive protein.
- Acetyle choline esterase present in synaptic cleft and post synaptic membrane.
- In synapse direction of impulse is not proper because dendrites can not produce neurotransmitters.

(26) Conduction of nerve impulse by nerve fibre is by sequential of ..... .

(A) depolarization and depolarization (B) repolarization and repolarization

(C) depolarization and repolarization (D) repolarization and depolarization

(27) Prevents spreading of nerve impulse intosurrounding medium ..... .

(A) nourilemma (B) myelin layer

(C) sarcolemma (D) both A and B

(28) Shows saltatory conduction of nerve impulse ..... .

(A) cranial nerve (B) spinal nerve

(C) autonomous nerve (D) A and B both

(29) In which nerve, active membrane potential once formed moves ahead cyclic, continuously without interruption ..... .

(A) Sympathetic nerve (B) Parasympathetic nerve

(C) Spinal nerve (D) A and B

(30) Conduction of nerve impulse is possible through ..... .

(A) Acetic acid (B) Choline (C) Acetyl choline (D) Acetyl Co-A

(31) For conduction of nerve impulse through synapse ..... .

(A) Ca^{+2} should come out from presynaptic membrane

(B) Ca^{+2} should enter presynaptic membrane

(C) Ca^{+2} should enter post-synaptic membrane

(D) Ca^{+2} should come out through post-synaptic membrane

(32) When Na^{+} Channel of post synaptic membrane open up ?

(A) When Ca^{+} enters synaptic node.

(B) When acetyl choline released in synapse.

(C) When acetyl choline is hydrolysed.

(D) Acetyl choline receptor unit is formed.

(33) Where does hydrolysis of acetyl choline occur ?

(A) Synaptic node (B) Synaptic groove

(C) Post synaptic membrane (D) Pre-synaptic membrane

(34) True sequence for conduction of nerve impulse through synapse.

(1) Hydrolysis of acetylcholine. (2) Secretion of acetyl choline

(3) Entry of Ca^{++} into synaptic knob. (4) Formation of acetyl choline receptor complex.

(A) 2 - 3 - 4 - 5 - 1 (B) 5 - 3 - 4 - 2 - 1

(C) 3 - 2 - 4 - 5 - 1 (D) 1 - 2 - 3 - 4 - 5

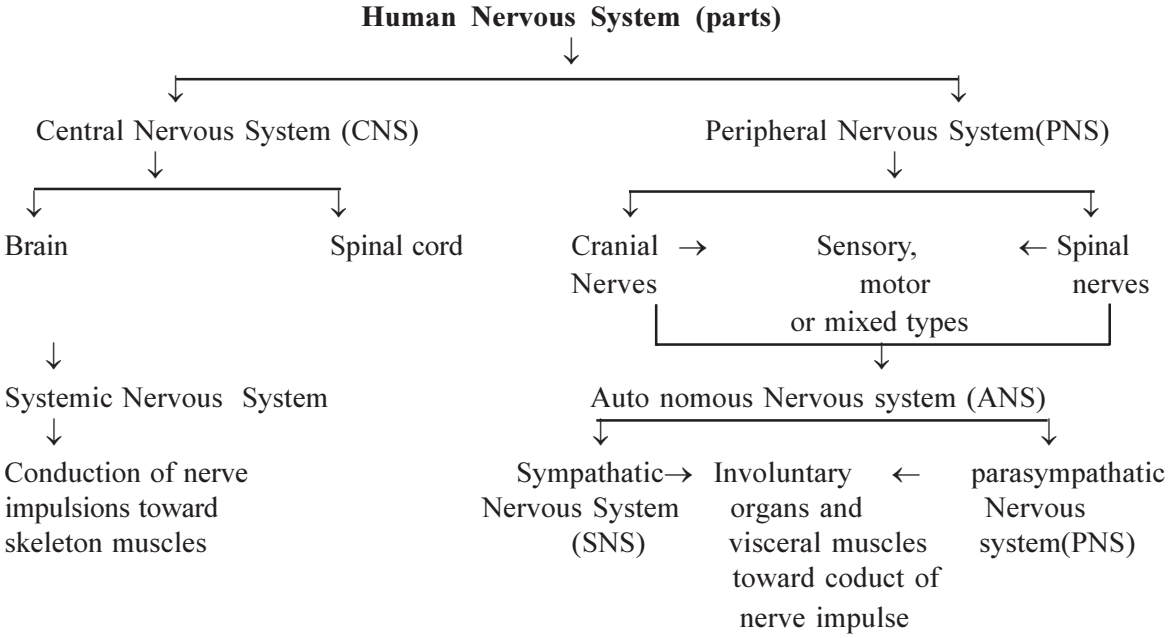
(35) Location of Acetyl choline esterase - ..... .

(A) Synaptic knob (B) Pre synaptic membrane

(C) Post-synaptic membrane (D) All of above

Answers : (26-C), (27-B), (28-D), (29-D), (30-C), (31-B), (32-D), (33-B), (34-C), (35-C)

- **Human Nervous System :**



- **Central Nervous system :** The CNS consists of the brain and the spinal cord. The CNS has two distinct regions (1) White matter- White in colour and consists of myelienated fibres (2) Gray matter- cyton bodies along with their dendrites and axon.

- Meaninges of Central Nervous System (CNS):

(1) The *inner membrane* is pia matter which is thin highly vascular membrane

(2) Middle membrane arachnoid matter which is a thin transparent membrane but non vascular

(3) The outer membrane is dura matter. The thickest membrane which covers the brain. It is also adherent to the inner surface of cranial bones by fibrous and vascular processes.

- **Human brain :**
  - Weight about 1200 to 1400 gm.
  - Number of neurons is about 100 billions.
  - The brain can be divided into three major parts.
    (1) Fore brain (2) Mid brain (3) Hind brain

(1) Fore brain :

A. Olfactory Lobes : Small, club shaped solid appear- only found in ventral view, covered by cerebral, hemisphere.

B. Cerebrum : The largest parts of brain. - They are separated from each other by a longitudinal cerebral fissure. Two hemispheres are connected by a large bundle of myelinated fibres known as corpus callosum. Surface of the ecrebral cortex is highly folded to increase the area for accommodating more nerve cells. The folds are called gyri and the depression between them are Known as Sulci Three wide and deep sulci are termed as fissures. Which divide each hemisphere into four lobes.

(B1) Anterior frontal lobe: The premotor area fronted lobe controls involuntary movements and autonomic nervous system. The associated area of the frontal lobe is concerned with memory, reasoning,learning and creative ability- control voluntery movements.

(B2) Middle parietal lobe : Associated touch, cold, temperature and pain.

(B3) Posterior occipital lobe : Visual and auditory areas which are centres for hearing and sight. Each cerebral hemisphere encloses a cavity called lateral ventricle, whcih is closed in front but open behind into third ventricle of diencephalon by a aperture known as formen of manro.

(B4) Lateral temporal lobe : Concerned with sound, smell, emotion and memory.

C. Diencephalon : Enclosed a cavity of the third ventricle, the roof of the cavity is known as the epithalamus, the right and left sides are known as thalamus and floor as the hypothalamus. Epithalamus is not formed of nervous tissues, but it is made up of blood vessels possessing folds. Which form anterior choroid plexus. Just behind this the epithalamus forms a short stalk; the pineal stalk and at its tip is a rounded body known as pineal body is present. Pineal body recreates hormone melatonin. The hypothalamus is visible in the ventral view of the brain. The optic nerve originating from the eyes forms acrossing, the optic chiarma in front of the hypothalamus. The hypothalamus is small, possessing 4gm weight. The pituitary is attached to the hypothalamus by a stalk called the infundibulum. The diencephalon encloses a cavity termed as third ventricle which communicates arterially with the lateral ventricle of cerebrum by the foramen of monro and posteriosly with the forth ventricles of medulla oblongata by a narrow passage called the iter which is present in mid brain.

(2) Mid brain- Very small and it consists of four small lobes; the coropora quadrigemia.

Quadrigemia

Upper a pair of lobes	Lower a pair of lobes
- Superior colliculi	**- Inferior Colliculi**
Which receives impulses from the eyes and muscles of head and controls visual reflexes.	Which receives impulses from the ears and muscles of the head and controls the auditory reflexes.

(3) Hind brain : It is made up by three structures.

Hind brain

Cerebellum	**Pons Varolli**	**Medulla Oblongeta**
- very large and well developed. - Two large lateral parts,the cerebral hemispheres and small vormis. - Branching tree like structure of white matter surrounded by a sheath of greatly folded grey matter. - Control muscular activities like running, talking and typing.	- An oval mass which consists of mainly nerve fibres. - Bridges the cerebellar hemispheres and medulla oblongata. - It relays impulses between medulla oblongata, cerebellar hemispheres and between the brain and cerebellum.	- It is pyramid shaped. - The posterior most of the part of the brain that connects the spinal cords. - It encloses a cavity, the fourth ventricle. - This ventricle has a very thin non nervous epithelial, folded roof is called postorior choroid plexus. - Centres for cardiac activities, respiration, vasoconstrictor that control heart beat, breathing, blood pressure salivation, swallowing vomiting, sneezing, coughing and other involuntary fuctions.

(36) Included in peripheral nervous system is ..... .

(A) brain and cranial nerves (B) spinal cord and spinal nerves

(C) brain and spinal cord (D) cranial nerves and spinal nerves

(37) Function of motor nerves.

(A) Conduction of nerve impulse towards peripheral gland.

(B) Conduction of nerve impulse towards muscles.

(C) From tissue/organs conduction of nerve impulse towards peripheral nervous system.

(D) Both A and B.

(38) Nerve conducting nerve impulse towards striated muscle is of ..... nervous system.
(A) sympathetic (B) parasympathetic (C) visceral nervous system (D) all of above

(39) Menninges cover which structure ?
(A) Brain (B) Central nervous system
(C) Spinal cord (D) Brain and Spinal cord

(40) Menninges without blood capillary ..... .
(A) Arachnoid (B) Middle layer (C) Duramatter (D) Piamatter

(41) Gray matter is formed of ..... .
(A) Medullated nerve fibre (B) Non-medullated nerve fibre
(C) Axon (D) Both B and C

(42) ..... is not part of forebrain.
(A) Diencephalon (B) Cerebrum (C) Cerebellum (D) Olfactory lobe

(43) More broad and deep sulci number is ..... .
(A) Four (B) Three (C) Innumeralbe (D) Two

(44) Making of ship blocks by student, this activity is associated with which lobe of cerebral cortex ?
(A) Parietal lobe (B) Occipital lobe (C) Lateral temporal lobe (D) Frontal lobe

(45) Student become very much happy due to good result, this action is associated with which lobe of cerebral cortex ?
(A) Parietal lobe (B) Occipital lobe (C) Lateral temporal lobe (D) Frontal lobe

(46) Parts of brain, which do not have nervous tissue.
(A) Thalamus - medulla oblongata (B) Hypothalamus - cerebellum
(C) Mid brain - Epithalamus (D) Medulla oblongala - epithalamus

(47) Connected by Iter ..... .
(A) Both lateral ventricles (B) Lateral and third ventricle
(C) Lateral and forth ventricle (D) Third and forth ventricle

(48) What is called left and right wall of third ventricle ?
(A) Hypothalamus (B) Epithalamus (C) Pineal body (D) Thalamus

(49) Iter is present in ..... .
(A) mid brain (B) diencephalon (C) cerebram (D) medulla oblongata

(50) What is proper for inferior coliculi ?
(A) Receives nerve impulses from eyemuscles (B) Pair of lobes in upper region of mid brain
(C) Pair of lobes in lower region of mid brain (D) Controls reflex action of vision

(51) Vermis is part of ..... .
(A) Diencephalon (B) Cerebellum (c) Cerebrum (D) Medulla oblongatal/Hind brain

(52) Oval structure is included in which part of the brain ?
(A) Fore brain (B) Midbrain (C) A and B (D) Hind brain

Answers : (36-D), (37-D), (38-C), (39-B), (40-A), (41-D), (42-C), (43-B), (44-D), (45-C), (46-D), (47-D), (48- (D), (49-A), (50-C), (51-B), (52-D)

- **Reflex Action :** It is a monotonous or unchangeable response to a stimulus. An involuntary response to stimulus given by reflex center of brain /spinal cord without knowledge of the voluntary centres of brain is called reflex action.

- Reflex action is done by brain and spinal cord.

With knowledge ← Reflex action → Without knowledge

↓ ↓ ↓

When see food saliva secretion ocur (conduct by brain) Heart beat, Peristalysis of digestion canal

- **Reflex Arc :** The nerve chain between a receptor and effector organ

Receptor organs - Skin Stimulation → afferent nerve (Sensory impulse) → CNS (Brain, Spinal cord)

↓

Analysis of sensory impulses

↓

Motor nerve (Motor impulse)

Respond ← effector organ (muscle and gland)

- **The animal by reflex action respond quickly to harmful stimuli and serves the animal from harmful effect.**

Types of Reflex Action

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Sensory Reception and processing (Interitances)	**Conditioned Acquired Reflexes**
- Away the hand from hot material	- Conditioned reflexes are acquired during life.
- Blinking of eyes	- Gradually developed by training and experience
- Sneezing	- No inheritance
- Yawning	- Animal behaviours
- Knee jerk	- eg. habits, likes and dislikes, prejudices and
- Heart beats	interests. Typing, riding a bicycle, knitting etc.
- Paristalisis are examples	

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(53) Where are reflex centers situated ?

(A) Nerves (B) Brain (C) Spinal cord (D) B and C both

(54) Movement of diaphragm during respiration is reflex activity of ..... .

(A) spinal cord (B) brain (C) nerves (D) A and B both

(55) Reflex activity occurring without our knowledge is ..... .

(A) peristalsis of digestive tube (B) shouting for escaping from wild animal

(C) flickering of eye (D) touching of hot substance, hand is removed

(56) Location of unipolar nerve cell in spinal cord.

(A) Ventral root (B) Dorsal root gangtion

(C) Dorsal root (D) Between dorsal and ventral horn

(57) Reflex center for reflex activity occurring in spinal cord.

(A) Sensory neuron (B) Motor neuron (C) Inter connected neuron (D) All of above

(58) How is reflect arch in spinal cord is formed ?

(A) Receptor organ - spinal cord - brain - muscle (B) Receptor organ - brain - muscle - spinal cord

(C) Receptor organ - brain - muscle (D) Receptor organ - spinal cord - muscle

(59) ..... is unconditional reflex action.

(A) Yawning (B) Kneeting (C) Tying (D) Cycling

(60) ..... is acquired reflect action

(A) Sneezing (B) Habits of person

(C) Peristalsis of digestive system (D) Flickering of eyes

Answers : (53-D), (54-B), (55-A), (56-B), (57-C), (58-D), (59-A), (60-B)

- **Eye structure and Mechanism -**

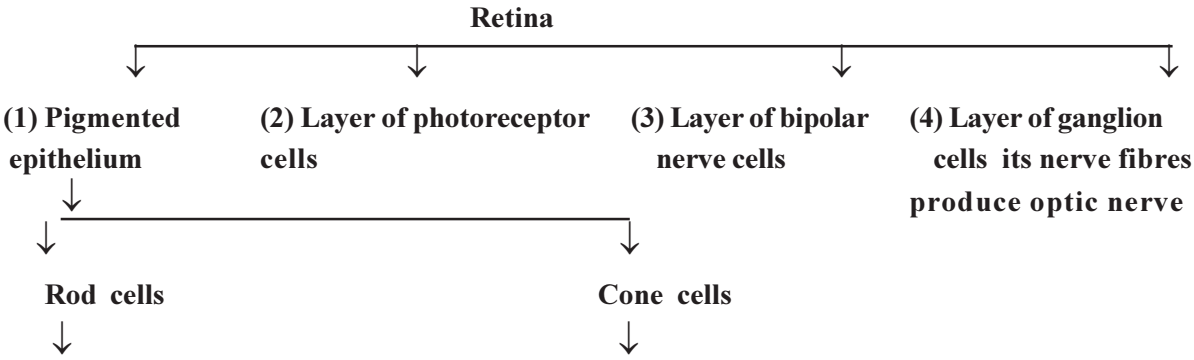
The eyes are located in a deep protective bony cavities, known as orbits. The eye is hollow spherical in shape, about 2.5 cm in diameter and its weight is about 6 to 8 g.

The eye has two parts wall and contents.

↓

↓ **Walls**	↓ **Contents**
- Made up of three layers.	- **Lens is solid, elastic, transparent biconwex** and consists of laminated fibrous tissue which is enclosed in thin elastic membrane known as lens capsule. The lens focuses light on retina.
(1) Sclera :	- The lens divides eyeballs cavity into two chambers.
- The fibrous layer consists of sclera and cornea.	- The anterior small aqueous chamber and the posterior large vitreous chamber.
- Sclera froms the posterior 5/6 part of the collagen fibres.	- Aqueours chamber is filled with a watery clear fluid, the aqueous humor, which is secreted by ciliary processes of ciliary body.
- While cornea forms, 1/6th part made up of connective tissues and lacks blood vessels.	- The vitreous chamber is full of transparent fluid thick the vitreous humour which is secreted by retina during development of eye.
- Conjunctiva is thin, transparent and composed of stratified epithelium which cornea externally covers and exposed part of sclera.	
(2) Choroid :	
- It is composed of connective tissue and blood vessels. Blood vessels of choroid nourish the retina.	
- Iris is a circular shelf like diaphragm and perforated in the centre by an aperture termed as pupil.	
- The iris works like diaphragm of a camera. Just behind the iris, the choroid is thickened to form ciliary body. Which contain circular and radial muscle fibers.	

(3) **Retina :** It is delicate layer of optic part. It compared of four layers.



- Purple pigments termed as rhodopsin
- Very sensible
- Function at night and dimlight.
- In bright light rhodopsin splits in to scotopsin and retinal through a process of bleaching. Spliting of rhodopsin depolarizes the rod cells and that releases a neurotransmitter which sends the nerve impulse to there optic nerve via bipolar and ganglion cells.
- In the dark, rhodopsin is resynthesized from retinal and scotopsin. which becomes functional.
- On the retina there is a small depression known as fovea. Which has only cone cells.
- The retina from where optic nerves starts is known as blind spot. It lacks the receptor cells and is insensitive to light.

- It contains iodopsin pigments.
- It function in day light and produce complete images and give colour vision.
- They are less sensitive as compared to rod cells.
- In human eye, three types of cone cells are found which produce their own photopigment, each absorbing light rays of different wave lengths.
- Erythrolab (red light)
- Chlorolab (green light)
- Cynolab (blue light)
- Lack of one of moe types of conecells cause colour blindness.

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(61) Cornea of eye is part of which membrane ?
(A) Sclera (B) Fibrous layer (C) Choroid (D) Retina

(62) What is improper for eye membrane ?
(A) It is transparent. (B) It is formed of stratified epithelium.
(C) It innervates eye ball. (D) It completely covers cornea.

(63) Number of layer covering lens from outer side ..... .
(A) Three (B) Two (C) One (D) Four

(64) ..... is layer of eye, made up of collagen.
(A) Retina (B) Choroid (C) Cornea (D) Sclera

(65) Optic nerve is formed of which nervefibre ?
(A) Cone cells (B) Ganglionated cell layer
(C) Bipolar neurons (D) Cone cells and Rod cells

(66) It is second layer, of retina from innerside
(A) photo receptor cell layer (B) ganglionated nerve cells
(C) bipolar neurons (D) pigmented epithelium

(67) Location of blood capillary which providing nutrition to retina.
(A) Retina (B) Choroid (C) Sclera (D) Cornea

(68) What is present in rod cells during intense light ?

(A) Rhodopsin (B) Iodopsin

(C) Scotopsin (D) Scotopsin and retinal

(69) How fovea centralis differ from normal retina ?

(A) Presence of cone cells (B) Presence of cone and rod cells

(C) Absence of Rod cells (D) Absence of cone and rod cells

(70) Cyanolab is sensitive for which colour ?

(A) Blue (B) Red (C) Green (D) All of above

(71) The fluid occurs in the large cavity of eye ball is secreted by whom ?

(A) Choroid (B) Processes of ciliary body

(C) Retina (D) Sclera

(72) During daytime, in visual process, whose position is changed ?

(A) Red cells (B) Cone cells (C) Pigment epithelium (D) A and B both

Answers : (61-B), (62-C), (63-B), (64-D), (65-B), (66-C), (67-B), (68-D), (69-C), (70-A), (71-C), (72-D)

- **Structure of ear, mechanism of hearing and abnormalities of nervous system :**
- **Structure of ear :** It has three parts (1) External ear (2) Middle ear and (3) Inner ear

(1) External ear :

Pinna	External auditory canal
- It is oval, some what funnel shaped - Stiff outer ridge is known as helix. - While its flexible lower lobe is known as lobule.	- It is an S-shaped tube which spreads inwards up to the tympanic membrane. - The outer part of mear bears hair which prevents entry of dust particles. - Its inner parts have wax glands. It secretes a brownish falty substance known as earwax. It protects and lubricates the lining of canal.

(2) Middle ear : Divide in three regions.

Tympanic membrane	Fenestra/Cavity apertures	Inner bony wall
It is a thin, oval membrane made up of connective tissue with fibres, covered with skin outside and muscle membrane inside.	Three small movable articulated bones. The ear ossicles. - Hammer shaped ossicle is called the malleus which attached to tympanic membrane. - Inner ossicle known as stapes is straupshaped. - The middle anvil shaped is known incus. It is externally joined to the malleus and internally to the stapes.The function of ear ossicles is to trasmit the vibration from the tympainic membrane to internal ear and amplify vibration 20 times.	- It has two apertures lining covered. - Upper aperture is known as fenestra ovalis - Lower aperture is known aperture rotunder.

(3) Internal ear : It is an irregular, delicate and complicated organ, it is known as membranous labyrinth, which is enclosed in a bony labyrinth. The space between these two is filled with fluid called perilymph. The membranous labyrinth is also filled by another fluid, the endolymph. The membranous labyrinth consists of 3 parts : (1) Vestibule duct (2) Semi circular ducts (3) Cochlear duct.

(1) **Vestibule** : Vestibule is a sac like part and consists of two chambers, the large utricle and smaller saccule, which leads into cochlear duct. Two Sensory spots are present in macula of utricle and macula of sacrule. They are located in the wall of utricle and sacule. A macula consists of hair cells and supporting cells. The supporting cells contain many minute particles known as earstones or otoliths composed of calcium carbonate and protein.

(2) **Semi circular ducts** : Three semi circular ducts are arranged on outerior porterior and lateral sides. Each duct opens into the utricle on both ends. One end of each duct is swollen to form ampulla. Sensory spot is found on each ampulla and is known as crista its function is to maintain equilibrium.

(3) **Cochlear duct** : It is spirally coiled tube, resembling a shell of snail. It is a part of the bony labyrinth. Which encloses the cochear duct together termed as the cochlea. Cochlea has three longitudinal chambers, known as scalae, which are separated from one another by a thin membrane. The middle chamber is termed as scale media, which consists of organ of corti. The roof of scala media is called as Reissner's membrane and floor is termed as basilar membrane. Organ of corti is an organ of hearing which consists of receptor cells hair cells and supporting cells. The hair cells bear hair at their free surface and at the basal region synaps has contact with dendrites of nerve cells. The tips of hair are embedded in a tectorial membrane, supporting cells are of two types, longer pillar cells and shorter phalangeal cells.

- **Mechanism of Hearing :** Sound waves → way of external ear → vibrations on tympanic membrane → vibratious of ear ossicles → Vibrations through ear ossicles to fenestra ovalis → vibration pass to the basilar membrane of cochlear canal → Travel on the other side of the canal to Reissner's membrane → Vibration cause a movement of endolymph → catch, sensory cells which found in the organ of corti → Nerve impulses develop → Transmitted by nerve fibers via auditory nerves → Auditory area of cerebrum. Where the impulses are analysed and sound is recognised.
- **Disorelers of the Nervous System : -**

Disordes of the Nervous System

Multiple sclerosis	**Parkinson's disease**	**Sciatica**
- **Reason :** Mylin sheath of spinal nerve are damaged, effect occurs on the function of nerve. This	- Associated with deficiency of the neurotransmitted dopamine and ageing.	- Caused by degeneration of intervertebral disc. it is also popular as 'slipped' out of

disease occur in young and middle aged persons. **Symptons :** Shaky movement of limb rapid involuntary movements of the eyes. defects in speech paralysing in greater or less a degree, finally causing death.	Symptoms : Tremor, rigidity and lack of spontaneous movements.	intervertebral disc. - **Symptom :** A continuous pain in back, thigh and leg.

(73) Helix is part of ..... .
(A) middle ear (B) internal ear
(C) tympanic membrane (D) external ear

(74) Location of round window ..... .
(A) external wall of middle ear (B) inner wall of inner ear
(C) inner wall of middle ear (D) inner wall of external ear

(75) Ossicles present in oval window - ..... .
(A) malleus (B) incus (C) stapes (D) all of above

(76) Location of exolymph fluid.
(A) Membranous labyrinth
(B) Bony labyrinth
(C) outside of bony labyrinth
(D) Between bony labyrinth and membranous labyrinth

(77) Otoliths are present in which structure ?
(A) Mecula utricle (B) Crista (C) Mecula sacculi (D) A and C both

(78) What is location of crista ?
(A) Sacculi (B) Utricle (C) Ampulla (D) Organ of corti

(79) Location and function of organ of corti - ..... .
(A) scela, hearing (B) scela, balance (C) saccule, hearing (D) ampulla, balance

(80) Sensory cells of organ of Corti, identify movement of ..... .
(A) Exolymph (B) Ressiner's membrane
(C) Bacillar membrane (D) Endolymph

(81) Tactorial memberane is part of ..... .
(A) Maculla (B) Organ of corti
(C) Crista (D) Ressiner's membrane

(82) It is disease due to irregularity of nervous system due to injury of medulla-membrane ..... .
(A) Multiple sclerosis (B) Parkison's (C) Sciatica (D) Atherosclerosis

(83) Disease due to deficiency of neurotransmitter.
(A) Multiple sclerosis (B) Sciatica (C) Parkinson's (D) Arthritis

(84) Due to dislocation of intervertebral disc ..... discease is observed.
(A) Multiple sclerosis (B) Arthritis (C) Epilepsy (D) Reumatid arthritis

Answers : (73-D), (74-C), (75-B), (76-D), (77-D), (78- C), (79-A), (80-D), (81-B), (82-A), (83-C), (84-C)

Column type questions :

(85)

Column-I	Column-II	
(1) Multipolar neuron	(P) Retina	(A) (1-R) (2-Q) (3-P)
(2) Bipolar neuron	(Q) Embryo	(B) (1-R) (2-P) (3-Q)
(3) Unipolar neuron	(R) Cerbral cortex	(C) (1-P) (2-R) (3-Q)
		(D) (1-Q) (2-P) (3-R)

(86)

Column-I	Column-II	
(1) Cyton	(P) Autonomous nerve	(A) (1-R) (2-S) (3-P) (4-Q)
(2) Dendron	(Q) Secretory vesicles	(B) (1-R) (2-P) (3-Q) (4-S)
(3) Synaptic Knob	(R) Nissi's granules	(C) (1-R) (2-Q) (3-S) (4-P)
(4) Non-medullated	(S) Pointed processes nerve	(D) (1-R) (2-S) (3-Q) (4-P)

(87)

Column-I	Column-II	
(1) Ion pump	(P) Na^+ outside neurilema	(A) (1-R) (2-S) (3-P) (4-Q)
(2) Ion passage	(Q) Na^+ inside neurilema	(B) (1-S) (2-R) (3-P) (4-Q)
(3) Resting potential	(R) Active transport of ions	(C) (1-P) (2-S) (3-R) (4-Q)
(4) Membrane potential	(S) passive transport of ions	(D) (1-Q) (2-S) (3-P) (4-R)

(88)

Column-I (Process)	Column-II (Follow up process)
(1) Depolarilation of presynaptic membrane	(P) Na^+ enters post synaptic membrane.
(2) Active membrane potential in post synaptic membrane	(Q) Acetyl choline released statasco form and further conduction
(3) Ca^{+2} enters synaptick nob	(R) Hydrolysis of Acetyl choline
(4) Receptor complex is formed with acetyl choline	(S) Ca^{+2} enters synaptic knob

(A) (1-Q) (2-S) (3-P) (4-R) (B) (1-S) (2-R) (3-Q) (4-P)
(C) (1-R) (2-S) (3-Q) (4-P) (D) (1-Q) (2-S) (3-P) (4-R)

(89)

Column-I	Column-II	
(1) Visceral nervous system	(P) Thin and capillarized membrane	(A) (1-Q) (2-S) (3-P) (4-R)
(2) Autonomous nervous system	(Q) Conduction of nerve impulse towards striated muscle	(B) (1-Q) (2-S) (3-R) (4-P)
(3) Dura matter	(R) Thick and durable membrane	(C) (1-S) (2-Q) (3-R) (4-P)
(4) Pia matter	(S) Conduction of nervous impulse towards visceral muscles	(D) (1-Q) (2-P) (3-R) (4-S)

(90)

Column-I	Column-II	
(1) Lateral temporal lobe	(P) Control of voluntary nervous system	(A) (1-Q) (2-R) (3-P) (4-S)
(2) parietal lobe	(Q) Associated with sound and smell	(B) (1-Q) (2-R) (3-S) (4-P)
(3) occipital lobe	(R) Sensation of touch	(C) (1-Q) (2-S) (3-R) (4-P)
(4) Frontal lobe	(S) Audio-visual centres	(D) (1-R) (2-Q) (3-S) (4-P)

(91)

Column-I	Column-II	
(1) Iter	(P) Medulla oblongata	(A) (1-S) (2-R) (3-T) (4-Q) (5-P)
(2) central cavity	(Q) Diencephalon	(B) (1-R) (2-S) (3-P) (4-Q) (5-T)
(3) Lateral ventricles	(R) Mid brain	(C) (1-R) (2-S) (3-T) (4-Q) (5-P)
(4) Third ventricle	(S) Spinal cord	(D) (1-S) (2-R) (3-Q) (4-T) (5-P)
(5) Forth ventricle	(T) Cerebrum	

(92)

Column-I	Column-II	
(1) medulla oblongata	(P) Branched structure like tree	(A) (1-Q) (2-R) (3-P) (4-S)
(2) Olfactory lobe	(Q) Pyramid shape	(B) (1-R) (2-Q) (3-P) (4-S)
(3) cerebellum	(R) Dumbel shape	(C) (1-P) (2-R) (3-Q) (4-S)
(4) Bridge	(S) Oval shape	(D) (1-S) (2-R) (3-P) (4-Q)

(93)

Column-I	Column-II	
(1) Retina	(P) Covered fibrous tissue	(A) (1-S) (2-Q) (3-R) (4-P)
(2) Eye membrane	(Q) Delicate layer at the site of vision	(B) (1-P) (2-Q) (3-R) (4-S)
(3) Ciliary body	(R) Thick Choroid	(C) (1-Q) (2-S) (3-P) (4-R)
(4) Lens	(S) Stratified Epithelium	(D) (1-Q) (2-S) (3-R) (4-P)

(94)

Column-I	Column-II	
(1) Rod cells	(P) Absence of rod cells	(A) (1-R) (2-S) (3-Q) (4-P)
(2) Cone cells	(Q) Absence of recepter cells	(B) (1-R) (2-S) (3-P) (4-Q)
(3) Fovea centralis	(R) Rhodopsin	(C) (1-S) (2-R) (3-P) (4-Q)
(4) Blind spot	(S) Iodopsin	(D) (1-R) (2-Q) (3-P) (4-S)

(95)

Column-I	Column-II	
(1) Eustachian tube	(P) $CaCO_3$ + protein	(A) (1-Q) (2-S) (3-R) (4-P)
(2) Stapes	(Q) "S" shaped	(B) (1-S) (2-Q) (3-P) (4-R)
(3) Ossicles	(R) Tympanic membrane	(C) (1-Q) (2-S) (3-P) (4-R)
(4) Oval window	(S) Band shape	(D) (1-P) (2-S) (3-Q) (4-R)

Answers : (85-B), (86-D), (87-A), (88-C), (89-B), (90-B), (91-C), (92-A), (93-D), (94-B), (95-C)

- **A - Statement, R - Reason type questions**

Questions given below, select proper option for it.

(A) A and R both right, R is explanation of A.

(B) A and R are right, but R is not explanation of A.

(C) A is right, R false.

(D) A is false, R right.

(96) Statement A : Conduction of nerve impulse in nerve fibre is autonomous.
Reason R : Ion channels open automatically when active membrane potential increases in nearest region of nerve fibre.
(A) (B) (C) (D)

(97) Statement A : Direction for conduction of nerve impulse is fixed in synapse.
Reason R : Dendrites can not secrete neurotransmitter substances.
(A) (B) (C) (D)

(98) Statement A : In autonomous nerve, saltatory conduction of nerve impulse is not observed.
Reason R : Nerve fibres of autonomous nerves are non-medullary.
(A) (B) (C) (D)

(99) Statement A : Olfactory lobe can be visible only from dorsal view of brain.

Reason R : Olfactory lobes are totally covered by cerebral hemisphere.

(A) (B) (C) (D)

(100) Statement A : Due to repolarisation, on both side of neurilemma, difference occurs in concen tration of positive ions.

Reason R : Na - K pump removes imbalance.

(A) (B) (C) (D)

(101) Statement A : Conduction of nerve impulse takes place through synapse.

Reason R : Acetyl choline esterase is secreted in synapse.

(A) (B) (C) (D)

(102) Statement A : Kneeting is acquired reflex action.

Reason R : Kneeting is inherited by person.

(A) (B) (C) (D)

(103) Statement A : Depolarised rod cells release neurotransmitter conduction of nerve impulse towards optic nerve.

Reason R : In intense light Rhodopsin dissociates into scotopsin and Retinol.

(A) (B) (C) (D)

(104) Statement A : The function of inner ear is heading and maintaining balance.

Reason R : Organ of corti present in the structure of inner ear.

(A) (B) (C) (D)

(105) Statement A : In multiple sclerosis disease rapid, uncontrol movement of eyes is observed.

Reason R : In this disease medulary layer is affected so function of nerves is effected.

(A) (B) (C) (D)

Answers : (96-C), (97-D), (98-A), (99-D), (100-B), (101-C), (102-C), (103-A), (104-B), (105-A)

- **True - False (T - F) Type questions :**

Select proper option for T/F from the questions given below :

(106) (1) Multiple sclerosis is due to dislocation of intervertebral disc.
(2) In Epilepsy deficiency of dopamine is found.
(3) Multiple sclerosis, paralytic attack leads to death.
(4) In parkinson's discease selfinduced movement increases.
(A) FFTT (B) FFTF (C) FFFF (D) FTTT

(107) (1) Phalangeal cells are present in the structure of maculla.
(2) Semicircular canals opens at both the ends of sacculi.
(3) Scale are cavities of cochlea.
(4) Ossicles, amplifies sound waves 20 times.
(A) FFFT (B) FTTF (C) FTTT (D) FFTT

(108) (1) Fovea centralis is active during daylight.
(2) Aqueous humor is secreted from processes of ciliary body.
(3) Cynolab is sensitive for blue colour.
(A) FTT (B) FFF (C) TTT (D) TFF

(109) (1) Ear wax is brown coloured oily substance.
(2) Round window is apeture in the inner wall of mid ear.
(3) Retina is formed of three layers.
(4) Sclera is formed of 6/5 part.
(A) TFFF (B) TFFT (C) TTTF (D) TTFF

(110) (1) Cyton of motor neuron is in dorsal horn of spinal cord.
(2) Third ventricle connects with forth ventricle by iter.
(3) Grooves of cerebral cortex are called sulci.
(4) Upper lobes of mid brain are called superior coliculi.
(A) TTFT (B) TTTT (C) TFFT (D) TTFF

(111) (1) Brain weighs approximate 1200 to 1400 gm.
(2) Feeling of pain is by parietal lobe.
(3) Synapse has approximate 200A^{o} length.
(A) FFF (B) TTT (C) TFF (D) FTT

(112) (1) Speed of conduction of nerve impulse is 100 m/sec.
(2) For Repolarisation Na^{+}channel opens, K^{+}channel closes.
(3) Na^{+} - K^{+} pump, opens and closes.
(4) Floor of Diencephalon is called hypothalamus.
(A) FFTT (B) FTTT (C) FFFT (D) TTTT

(113) (1) Speed of conduction of nerve impulse is physical, chemical, electrical change observed in neurilemma.
(2) Nissl's granules are acidophilic.
(3) Multipolar neuron is found in retina.
(4) Medullary sheath is found on nerves fibres of autonomous nerves.
(A) TFFT (B) TFTT (C) TTFF (D) FFTT

Answer : (106-B), (107-D), (108-C), (109-A), (110-C), (111-B), (112-C), (113-A)

(114) Medullary sheath is shown in Fig. 1.
(A) T (B) U (C) V (D) R

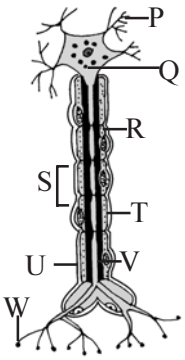

Figure 1

(115) What is indicated by V in Fig. 1 ?
(A) Medullary sheath (B) Neurilemma
(C) Ranvier's node (D) Axon

(116) White, shining structure found in Fig. 1.
(A) T (B) U (C) V (D) R

(117) What is indicated by W in Fig. 1 ?
(A) Node of Ranvier (B) Synaptic Knob
(C) Dendron (D) Nissl's granunule

(118) What is indicated by "P" in Fig. 2 ?
(A) Depolarization (B) Polarization
(C) Non polarity (D) Repolarization

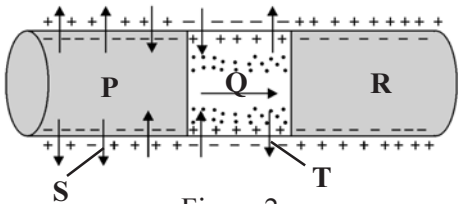

Figure 2

(119) In Fig. 2 "T" and "S" indicates sequential change of location.
(A) K^{+} and Na^{+} (B) K^{+} and K^{+}
(C) Na^{+} and K^{+} (D) Na^{+} and Na^{+}

(120) In Fig. 3 where is receptor protein ?

(A) V (B) X

(C) U (D) P

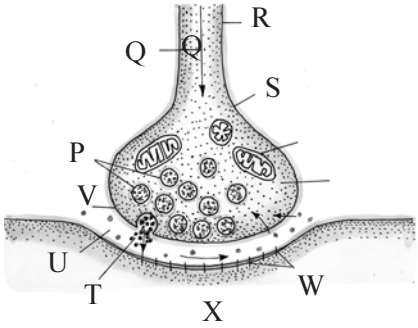

Figure 3

(121) What is indicated by "U" in Fig. 3 ?

(A) Groove of Synapse (B) Presynaptic membrane

(C) Post synaptic membrane (D) Receptor protein

(122) Fig. 4 indicates which view of Brain ?

(A) Dorsal (B) Lateral

(C) Ventral (D) Posterior

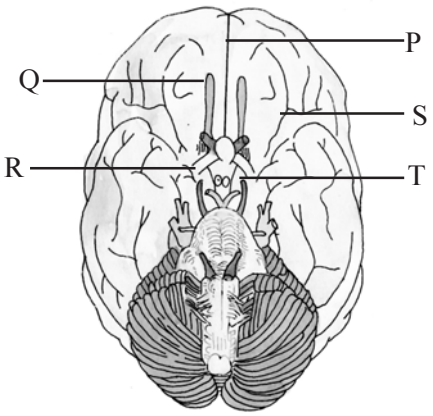

Figure 4

(123)Shows olfactory bulb in Fig. 4.

(A) S (B) T

(C) Q (D) R

(124) What is indicated by "R" in Fig. 4 ?

(A) Infundibulum (B) Pituitary gland

(C) Olfactory bulb (D) Optic chiasmata

(125) What is indicated by "P" in Fig. 4 ?

(A) Sulci (B) Gyri (C) Lateral groove (D) Corpus callosum

(126) In Fig. 5 indicates taste region - ..... .

(A) Q (B) X

(C) W (D) U

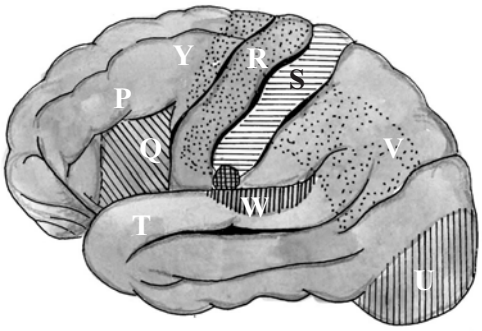

Figure 5

(127) Which region of Fig.5 associated with creative skill ?

(A) Q (B) Y

(C) R (D) P

(128) What is indicated by "Y" in Fig. 5 ?

(A) Premotor area (B) Sensory speech area

(C) Motor speech area (D) Auditory area

(129) Corpus callosum is shown in Fig. 6.

(A) S (B) Q

(C) P (D) W

U

(130) What is indicated by "S" in Fig. 6 ?
(A) Post choroid plexus (B) Ant. choroid plexus
(C) Coliculi (D) Infundibulum

(131) Which is midbrain part in Fig. 6 ?
(A) Q (B) R
(C) W (D) S

(132) Which structures are hind brain in Fig. 6 ?
(A) W, Y, V (B) Q, X, V
(C) U, W, Y (D) X, W, Y

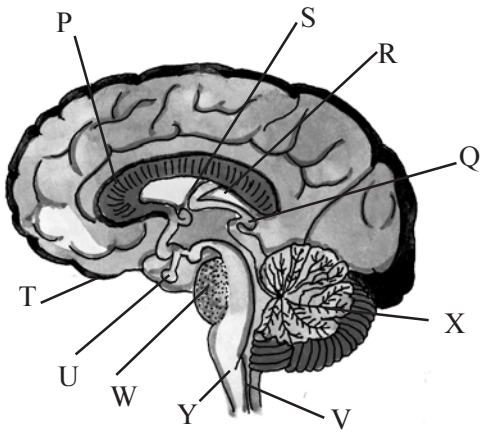

Figure 6

(133) Iter is shown in Fig. 7.
(A) S (B) U
(C) T (D) R

(134) Which part, surrounds "R" in Fig.7 ?
(A) Mid brain (B) Medulla oblongala
(C) Diencephalon (D) cerebram

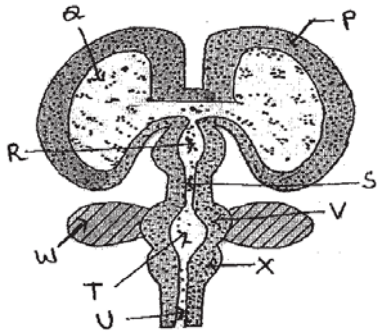

Figure 7

(135) In Fig. 7, which structure is not for ventricles ?
(A) Q (B) S
(C) R (D) T

(136) In Fig. 8 indicates dorsal root ganglion.
(A) W (B) Z
(C) U (D) V

(137) What is indicated by "U" in Fig. 8 ?
(A) Sensory nerve cyton (B) Motor nerve cyton
(C) Interglial nerve cells (D) Dorsal root ganglion

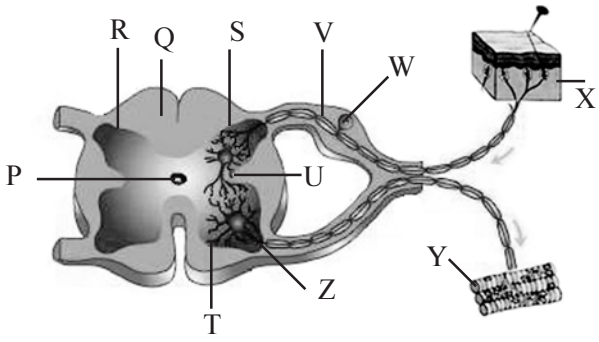

Figure 8

(138) Shows Idopsin in Fig. 9.
(A) Q (B) P
(C) T (D) U

(139) What is indicated by "U" in fig. 9 ?
(A) Photo receptor cells (B) Pigmented epithelium
(C) Bipolar neuron (D) Ganglionated cells

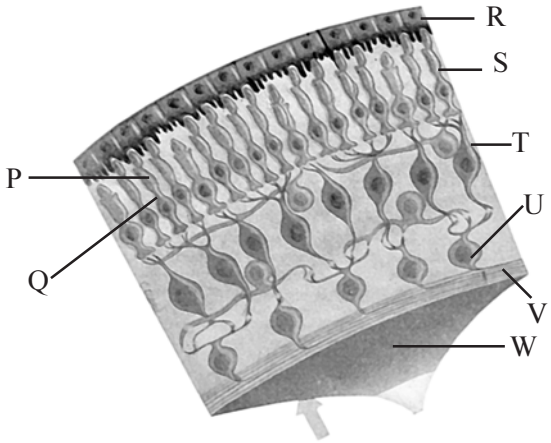

Figure 9

(140) In Fig. 9 Bipolar neurons are shown.
(A) S (B) U (C) T (D) V

(141) What is indicated by "P" in Fig. 10 ?
(A) Post semicircular canal (B) Ant. semicircular canal
(C) Lateral semicircular canal (D) Dorsal semicircular canal

(142) Where are otoliths found in Fig. 10 ?
(A) T (B) V
(C) S (D) W

(143) What is shown by "V" in Fig. 10 ?
(A) Crista (B) Macula
(C) Organ of corti (D) Otolith

(144) In Fig. 10 tissue is indicated.
(A) S (B) T
(C) U (D) V

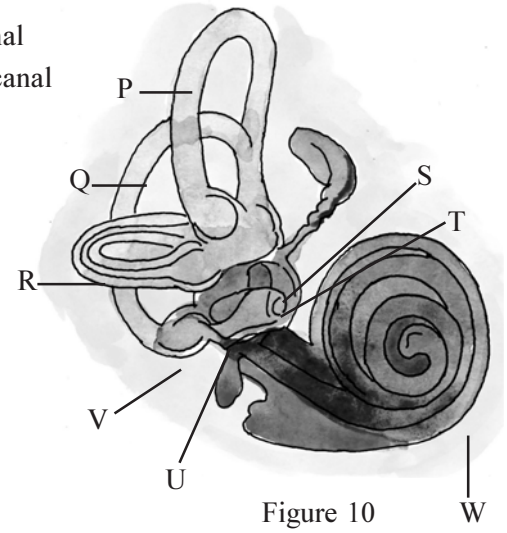

Figure 10

(145) Which internal structure is shown by Fig. 11 ?
(A) Cristra (B) Macula
(C) Int-ear (D) Organ of corti

(146) Tactorial membrane is shown in Fig. 11 ..... .
(A) P (B) S
(C) R (D) Q

(147) "Q" is cavity of ..... shown in Fig. 11.
(A) Vestibule (B) Cochlea
(C) Ampulla (D) Saccule

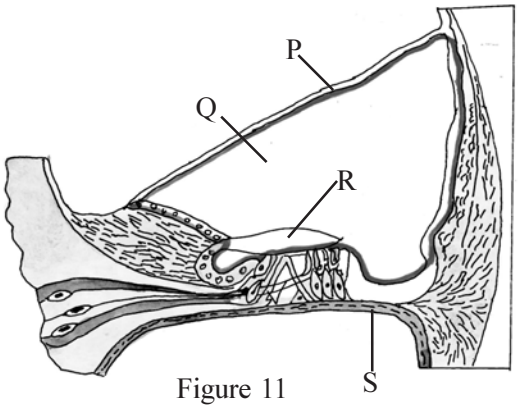

Figure 11

Answers : (114-B), (115-D), (116-A), (117-B), (118-D), (119-C), (120-B), (121-A), (122-C), (123-C), (124-D), (125-C), (126-B), (127-D), (128-B), (129-C), (130-B), (131-A), (132-D), (133-B), (134-C), (135-B), (136-D), (137-C), (138-B), (139-D), (140-C), (141-B), (142-C), (143-A), (144-B), (145-D), (146-C), (147-B)

- **Cerebral Spinal fluid :** It present in middle and inner meanings even in ventricles and cranial, iter also present surrounded to spinal cord. It is structurally identical to blood plasma. Protein and Cholesterole less in amont. It gives protections against jurking. It gives floatting to brain.

- **Systems Occurs in Brain :**

(1) Reticulate System	(2) Limbic system
- It is made up by network of entire nerve fibers which are present in brain item. It has two group centers which is made up by neurons. - Its centers conveys massages to centers of brain accordingly. - It has centers of sleep and wake. Its stimulate situation person get wake cond. less stimuli situation induce sleepness.	- It locates inner side of cerebrum Frontal to be parietal, Thalamus and Hypothamus are connected with it. - This area inspire to person, like Angriness, painfulness, Joyful and emotions type of experience can get. By that way person is learning and express his/her emotions. - Hipocampus is the one part of limbic system.Memory of short duration is remember for the long period.

- **Paripheral Nervous system :** Cranial Nerves + Spinal Nerves.
- **Cranial nerves :** The nerves arising from the brain is called cranial nerves.
  - Human being have 12 pairs fo cranial nerves. even in Reptiles, Birds and Mammal also. Amphibian and fishes having 10 pair of cranial nerves.
  - Sentory nerves : I, II, VIII
  - Motor nerves : III, IV, VI, XI, XII
  - Mixed nerves : V, VII, IX and X
  - In ANS (Autonomous Nervous System) III, IX and X nerve fibers of cranial nerves are found.
  - Vegus nerve (X) - Longest cranial nerve.
  - Trigeminal nerve (V) - Biggest cranial nerve.
  - Abducens nerve (VI) - Smallest cranial nerve
  - Truchear nerve (IV) - Thinest cranial nerve
- **Spinal nerves :** In human 31 pairs, In rabbit 37 pairs of spinal nerves are present. All nerves are mixed type.
  - Types of nerves given on basis of origin.

    cervical nerves - 8 pair, Thoralic nerves - 12 pair, Lumbar nerves - 5 pair, scaral nerves - 5 pair, coccygeal nerve - 1 pair.
  - In rabbit Lumber nerves - 7 pair, and coccygeal nerves - 6 pair.

- **Autonomous Nervous system or visceral Nerous System :**
  - Every impulses are controled / managed by two motor neurons and one gangilon. From this one cyton connected with CNS. and one pre gangionic fibre it have - other which cyton is present is ganglion and it has one post ganglionic fibre.

Parasympathetic Nervous System	Sympathic Nervous system
(1) Act at the resting situation.	(1) Act at the emergency.
(2) Neurotransmitter is Acetyl choline.	(2) Neurotransmitter is Non apinephrine.
(3) Preganglionic fibre is longer than post ganglionic fibre.	(3) Post ganglionic fibre is longer than pre-ganglionic fibre.
(4) Pre ganglionic fibre is origin from lower region of brain and spinal cord.	(4) Pre ganglionic fibres are originated from middle part of spinal cord.
(5) Increases heart beat, quickly breathing, enlargment of pupil, stop digestion.	(5) Normal heart beat, Normal breating contraction of pupil digestion can occur.

- **Deficiencies linked with vision :**

(1) Glucoma- Stopped aqueous humor fluid in vessel so can not spread outside- so pressure increases in anterior cavity - retina can damaged partially and then get partial blindness and after that complet blindness can occur.

(2) Cataract : By the ageing, sunlight or by the other reason catarat can occur. lens get impermeable - vision is totally stop. Transplant synthetic lens and remove this deficiency.

(3) Myopia (Nearsightedness) : Nearby obejcts easily seen but distant object can not seen easily - long eyehalls from so focus. in front of retina - Eyeglasses with concave lenses correct this problem.

(4) Hyper myopia (Hyperopia or Farsightedness) : Distance object is easily seen by person, but can not seen nearby object clearly - Eye ball become shorten. So focus arising behind retina - Eye- glasses with covex lens can correct the problem.

- **Sensory organ : Nose** Olfafactory sensory organ - It has nasal cavity in upper part as olfactory hairs- on those olfactory sensory cells of epithelia is presence for conduction - In this epithelial pillar cells and gland of Bowmann is present - Mucin is serected by bowmnn's gland - Olfactory hair having sensory centres which conected with smell molecule olfactory sersory cells through olfactory related impulses origin - which transmitted in olfactory ganglion of brain. Experience of smell which catch by olfactory sensory centre of celebrum.

- **Questions for NEET**

(148) Location of cerebro-spinal fluid.

(A) Arachnoid and Pia mater (B) Ventricles of brain

(C) Iter (D) All of above

(149) Function of cerebrospinal fluid

(A) Protects brain from friction (B) Gives buoyancy to brain

(C) Both A and B (D) Conduction of impulses

(150) ..... Has centre for wakefulness and sleep.

(A) Reticular system (B) Limbic system (C) Cerebrum (D) Diencepnalon

(151) Function of hippo campus.

(A) Sends messages to related parts of brain.

(B) Experience feeling of pain and anger.

(C) Convert short term memory into long term memory.

(D) Induces sleep and wakefulness.

(152) Number of cranial nerves in human ..... .

(A) 10 pair (B) 8 pair (C) 14 pair (D) 12 pair

(153) Which nerves of brain are motor nerves ?

(A) I, II, VIII (B) III, IV, VI, XI, XII (C) V, VII, IX, X (D) III, IV X

(154) In which cranial nerves, nerve fibres of Parasympathetic nervous system are observed ?

(A) III (B) IX (C) X (D) All of above

(155) Select proper option for pair.

Column - I	**Column - II**	
(1) X	(P) Largest	(A) (1-S) (2-P) (3-R) (4-Q)
(2) V	(Q) Smallest	(B) (1-S) (2-Q) (3-P) (4-R)
(3) VI	(R) Thinnest	(C) (1-S) (2-P) (3-Q) (4-R)
(4) IV	(S) Longest	(D) (1-P) (2-S) (3-Q) (4-R)

(156) Number of spinal nerves in Rabbit ..... .

(A) 31 Pairs (B) 37 Pairs (C) 12 Pairs (D) 10 Pairs

(157) Number of coccygeal nerves in human and rabbit sequentially.
(A) 5 Pairs -7 Pairs (B) 6 Pairs - 1 Pair (C) 8 Pairs - 6 Pairs (D) 1 Pair - 6 Pairs

(158) Which sentence is improper for parasympathetic nervous system.
(A) Functions during resting phase.
(B) Nor-epinephrin is neurotransmitter substance.
(C) Pre-ganglionic fibre is longer than post ganglionic fibre.
(D) Enlarges lens.

(159) From where pre-ganglionic Fibre of para-sympathetic nervous system arises ?
(A) Brain (B) Lower region of spinal cord
(C) Mid region of spinal cord (D) Upper region of spinal cord

(160) Vision related disease due to increase in pressure of aqueous humor ?
(A) Cataract (B) Glaucoma (C) Short sight (myopia) (D) Long sight far

(161) Which defect of spectacle can be removed by concave lens ?
(A) Glucoma (B) Myopia (C) Cataract (D) Far sight

(162) In which defect person can not see nearby things clearly ?
(A) Glucoma (B) Cataract (C) Myopia (D) Far sight

(163) Reason for cataract.
(A) Eye ball shortens (B) Eye ball lengthens.
(C) Vessels blocked (D) Lens becomes nontransparent.

(164) Organ having Bowman's gland - ..... .
(A) Eye (B) Ear (C) Nose (D) Kidney

(165) How many pair of cranial nerves are sensory in human ?
(A) 5 (B) 4 (C) 6 (D) 3

(166) How many pair of peripheral nerves are of mixed type of human ?
(A) 31 (B) 35 (C) 4 (D) 70

(167) Neurotransmitter substance released sympathetic nervous system.
(A) Epinephrin (B) seratonin (C) Nor epinephrin (D) Acetylcholine

(168) Which option is correct for spinal nerves in column -I and column-II.

Column- I	**Column - II**	
(1) Cervical nerves	(P) 1 - Pair	(A) (1-S) (2-R) (3-Q) (4-P)
(2) Thoracic nerves	(Q) 5 - Pairs	(B) (1-Q) (2-S) (3-R) (4-P)
(3) Sacral nerves	(R) 8 - Pairs	(C) (1-P) (2-S) (3-Q) (4-R)
(4) Coccygeal nerves	(S) 12 - Pairs	(D) (1-R) (2-S) (3-Q) (4-P)

(169) Function of parasympathetic nervous system ..... .
(A) increases heart beat (B) increases breathing
(C) increases digestion (D) increase size of eye ball

Answers : (148-D), (149-C), (150-A), (151-C), (152-D), (153-B), (154-D), (155-C), (156-B), (157-D), (158-B), (159-C), (160-B), (161-B), (162-D), (163-D), (164-C), (165-D), (166-B), (167-C), (168-D), (169-C)

Human Neural System

- Neural system performs three basic functions : receiving, processing and responding

Central Nervous System

Brain

- Central information processing organ

Fore brain

- Fore brain consists of olfactory lobes, cerebrum and diencephalon.
- The largest and complex cerebrum is divided into two cerebral hemisphere, Each one contain frontal, parietal, temporal and occipital lobes.
- Diencephalon contains epithalamus, thalamus and hypothalamus.

Mid brain

- Dorsal portion contains four lobes of corpora quadrigemina which is equivalent to optic lobes of lower animals.

Central Nervous system (CNS)

Brain

Central information processing organ

Spinal Cord

- It conducts impulses to the brain and controls most of the reflex activities.

Hind brain

- Cerebellum maintains posture and equilibrium and controls muscular activities.
- Medulla oblongata is cardiac centre, respiratory centre, vasomotor centre and reflex centre
- Pons varolii has respiratory centre pneumotaxic and apneustic centre.

Preripheral Nervous System

- Nerves outside the brain and spinal cord

Cranial nerves

- 12 pairs, 10 pairs from brain stem

Peripheral Nervous System

Nerves outside the brain and spinal cord

Carnial Nerves - 12 pairs, 10 pairs from brain stem

Spinal nerves

- 31 pairs of spinal nevers; (1) cervical nerves-8 pairs, (2) thoracio nerves - 12 pairs, (3) lumbar nerves - 5 pairs, (4) sacral nerves - 5 pairs, (5) coccygeal - 1 pair