

NEET Important Questions with Solutions from Neural Control and Coordination

Q.1. _____(A) _____ neuron has one axon and one dendrite and is found in _____ (B) _____.

Fill in the blanks with the correct option for A and B respectively.

- A) A: Unipolar; B: retina
- B) A: Bipolar; B: embryonic stage
- C) A: Bipolar; B: retina
- D) A - Multipolar, B - cerebral cortex

Answer: A: Bipolar; B: retina

Solution:

- Neurons are divided into three major types: Unipolar, bipolar, and multipolar.
- Unipolar neurons have only one part of the neuron that extends away from the cyton or soma.
- These neurons are absent in vertebrates but are found in insects.
- A bipolar neuron has one axon and one dendrite extending from the cyton or the cell body.
- The example of a bipolar neuron is a retinal bipolar cell found in the retina of the eye.
- It receives signals from photoreceptor cells and transmits these signals to ganglion cells that carry the message to the optic lobe of the brain.
- Multipolar neurons contain one axon and multiple dendrites. They are found in the central nervous system comprising the brain and spinal cord.

Q.2. Cerebellum is concerned with the

- A) Contraction of voluntary muscles
- B) Coordinating and regulating muscle tone
- C) Maintaining posture, orientation, and the equilibrium of the body
- D) All of the above

Answer: All of the above

Solution:

The cerebellum is the second largest part of the brain and is a constituent of the hindbrain. It is located near the brain stem. It carries out several functions such as coordination of voluntary muscles, coordinating and regulating muscle tone, and maintaining posture, orientation, and the equilibrium of the body.

Q.3. A person entering an empty room suddenly finds a snake right in front of the door. Which one of the following is likely to happen in his neuro-hormonal control system?

- A) Hypothalamus activates the parasympathetic division of the brain and release of corticotropin-releasing hormone to stimulate the release of hormone-like the adrenalin from the adrenal medulla.
- B) Neurotransmitters diffuse rapidly across the cleft and transmit a nerve impulse to stimulate the release of androgens from the adrenal cortex.
- C) The sympathetic nervous system is activated stimulating release of epinephrine and norepinephrine from the adrenal medulla.
- D) The parasympathetic nervous system is activated stimulating release of epinephrine and norepinephrine from the adrenal medulla.

Answer: The sympathetic nervous system is activated stimulating release of epinephrine and norepinephrine from the adrenal medulla.

Solution:

Epinephrine and norepinephrine are secreted by the adrenal medulla in response to the stress of any kind and during emergency situations and are called emergency hormones or hormones of flight or fight.

Q.4. Light rays entering the eye are controlled by:

- A) Pupil

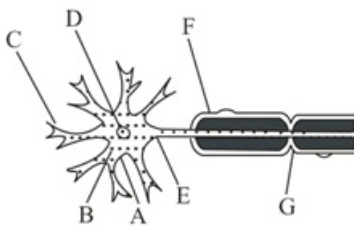


- B) Iris
- C) Cornea
- D) Lens

Answer: Pupil

Solution: The pupil is the opening which controls the amount of light entering an eye. When the light intensity is high, it decreases in size and when light intensity is low it dilates to allow more light in the eye to make the eye able to see the object.

Q.5. In the diagram of a multipolar myelinated neuron given below, different parts have been indicated by alphabets; choose the answers in which these alphabets have been correctly matched with the parts which they indicate



- A) A = Cell body, B = Nissl bodies, C = Nucleus, D = Dendrites, E = Naked portion of axon, F = Myelin sheath, G = Node of Ranvier
- B) A = Cell body, B = Nissl bodies, C = Naked portion of axon, D = Dendrites, E = Nucleus, F = Myelin sheath, G = Node of Ranvier
- C) A = Cell body, B = Nissl bodies, C = Naked portion of axon, D = Nucleus, E = Dendrites, F = Myelin sheath, G = Node of Ranvier
- D) A = Cell body, B = Nissl bodies, C = Dendrites, D = Nucleus, E = Naked portion of axon, F = Myelin sheath, G = Node of Ranvier

Answer: A = Cell body, B = Nissl bodies, C = Dendrites, D = Nucleus, E = Naked portion of axon, F = Myelin sheath, G = Node of Ranvier

Solution: Typical neuron has the following structures:

1. The cell body or cyton or soma (A). This contains Nissl granules (B), nucleus (D), and projections.
2. Dendrites are the protoplasmic projections (C).
3. The long protoplasmic projection is called axon (E). On the axon there is axolemma which may have covering of myelin sheath (F). The myelin sheath has nodes of Ranvier (G).

Q.6. When a neuron is in resting state i.e., not conducting any impulse, the axonal membrane is:

- A) Comparatively more permeable to Na^+ ions and nearly impermeable to K^+ ions
- B) Equally permeable to both Na^+ and K^+ ions
- C) Impermeable to both Na^+ and K^+ ions
- D) Comparatively more permeable to K^+ ions and nearly impermeable to Na^+ ions

Answer: Comparatively more permeable to K^+ ions and nearly impermeable to Na^+ ions

Solution: A neuron is the structural and functional unit of the nervous system. The neuron during resting state, i.e., when not conducting any impulse, the axonal membrane is comparatively more permeable to K^+ ion and nearly impermeable to Na^+ ions.

Q.7. During an accident, the hypothalamus of a person is damaged. Which of the following function/s will be impaired in such a person?



- A) Decision making and memory
- B) Speech and voluntary movements
- C) Regulation of sexual behaviour and synthesis of vasopressin
- D) Motor functions and hormonal release of the pineal gland

Answer: Regulation of sexual behaviour and synthesis of vasopressin

Solution: The hypothalamus contains a number of centres, which control body temperature and urge for eating and drinking. It also contains several groups of neurosecretory cells, which secrete hormones called hypothalamic hormones and synthesize hormones like oxytocin and vasopressin. The inner parts of cerebral hemispheres and a group of associated deep structures like the amygdala, hippocampus, etc., form a complex structure called the limbic lobe or limbic system. Along with the hypothalamus, it is involved in the regulation of sexual behaviour, expression of emotional reactions (e.g., excitement, pleasure, rage and fear) and motivation.

Q.8. Which of the following is an incorrect difference between electrical and chemical synapse?

- A)

Feature	Chemical synapse	Electrical synapse
Impulse transmission	Slower	Faster
- B)

Feature	Chemical synapse	Electrical synapse
Synaptic cleft	Smaller	Larger
- C)

Feature	Chemical synapse	Electrical synapse
Abundance in body	More abundant	Less abundant
- D)

Feature	Chemical synapse	Electrical synapse
Direction of impulse	Unidirectional	Bidirectional

Answer:

Feature	Chemical synapse	Electrical synapse
Synaptic cleft	Smaller	Larger

Solution:

- **Chemical synapses** relay information with the help of chemicals. They are slow and steady in nature.
- **Electrical synapses** use electricity or electrical impulses. These are quicker but less abundant in the body as compared to chemical synapses.
- A chemical synapse is a gap between two neurons in which the information passes chemically.
- The chemicals are called "neurotransmitter molecules". An electrical synapse is a gap between two neurons that has channel proteins. It can travel straight over the synapse.
- The electrical synapses are faster and smaller after a synapse, while chemicals can increase a signal and can take a long time.
- Electrical synapses have smaller synaptic cleft so that the channel proteins can reach from one cell to another. In an electrical synapse, the synaptic cleft measures 0.2 nm while in the chemical synapse, it is around 20 nm.

Q.9. Consider the following four statements and choose the option which includes correct ones only:

- (i) Myelinated nerve fibres are found in cranial and spinal nerves.
- (ii) Unmyelinated nerve fibres is enclosed by a Schwann cells that forms a myelin sheath around the axon.
- (iii) Unmyelinated nerve fibres are found in autonomous and the somatic neural systems.
- (iv) Only myelinated nerve fibres are enveloped with Schwann cells and not the unmyelinated ones.

- A) (i) and (ii).
- B) (i) and (iii).
- C) (iii) and (iv).
- D) (ii) and (iv).

Answer: (i) and (iii).



- Solution:**
- Myelinated nerve fibres are covered by a myelin sheath. The Schwann cells fold around the nerve axon and form the myelin sheath.
 - The speed of transfer of nerve impulse is more in myelinated nerve fibres.
 - They are present in the white matter of the brain and spinal cord.
 - Unmyelinated nerve fibres or nonmyelinated nerve fibres are not covered by a myelin sheath.
 - They have grooves of Schwann cells that are not wound around the nerve axon.
 - The speed of transfer of these nerve fibres is slow.
 - They are found in the autonomic and somatic nervous systems.

Q.10. The resting membrane potential of a neuron is maintained by

- A) Hormones
- B) Neurotransmitters
- C) Ion pumps
- D) Myelin

Answer: Ion pumps

Solution: When the neuronal membrane is at rest, the resting membrane potential is more negatively charged due to the accumulation of more sodium ions outside the cell than potassium ions inside the cell. Potassium ions tend to diffuse out of the cell at a much faster rate than sodium ions. It is because neurons have many more potassium leakage channels than sodium leakage channels. To maintain the negative potential inside the cell, sodium-potassium pumps move two potassium ions inside the cell and three sodium ions outside the cell. It helps to keep the resting potential. The sodium-potassium pump is the ion channel that are protein complexes or single protein that penetrates a cell membrane. It catalyzes the passage of specific ions through that membrane.

Q.11. The sequence of ear ossicles starting from the eardrum is:

- A) Malleus, incus, stapes
- B) Incus, malleus, stapes
- C) Malleus, stapes, incus
- D) Stapes, incus, malleus

Answer: Malleus, incus, stapes

Solution: The middle ear contains three ossicles called the malleus, incus, and stapes which are attached to one another in a chain-like fashion. The malleus is attached to the tympanic membrane and the stapes is attached to the oval window of the cochlea. The ear ossicles increase the efficiency of transmission of sound waves to the inner ear.

Q.12. In the resting state of the neural membrane, diffusion due to concentration gradients, if allowed, would drive

- A) K^+ into the cell
- B) K^+ and Na^+ out of the cell
- C) Na^+ into the cell
- D) Na^+ out of the cell

Answer: Na^+ into the cell

Solution: In the resting state of a nerve fibre, the concentration of K^+ ions is high intracellularly. On the other hand, the concentration of Na^+ ions is high extracellularly. Concentration gradient is the difference in concentration in these two ions across the cell membrane. If diffusion is allowed through a concentration gradient, it will cause the movement of Na^+ into the cell.

Q.13. Injury localized to the hypothalamus would most likely disrupt:

- A) Coordination during locomotion.



- B) Regulation of body temperature.
- C) Motor functions.
- D) Creative thoughts and decision making.

Answer: Regulation of body temperature.

Solution: The motor cortex or M1 is one of the principal brain areas involved in motor function, which is located at the frontal lobe of the brain. The motor cortex is concerned with the generation of neural impulses that control the execution of the movement of skeletal muscle.

The cerebrum initiates and coordinates movement, while the cerebellum controls posture, balance, muscular activity, etc.

Creativity is the function of the frontal lobe of the brain. It plays an important role in abstract, creativity, learning, etc.

Hypothalamus contains a number of centres that control body temperature, urge for eating and drinking, sexual drive, rage, anger, etc.

Q.14. Which of the following statements are correct with respect to repolarization?

- (i) K^+ diffuses outside the axonal membrane.
- (ii) Resting membrane potential of the membrane is restored.
- (iii) No movement of ions takes place across axon membrane.
- (iv) Na^+ diffuses outside the axon membrane.

- A) (i) and (ii)
- B) (iii) and (iv).
- C) (ii) and (iv)
- D) (i) and (iv)

Answer: (i) and (ii)

Solution: In repolarization, the Na^+ channels close after 0.5 msec and the membrane becomes extra permeable to K^+ ions. This leads to the opening of K^+ ion gates and efflux of the K^+ ions through the axonal membrane. The interior of the neuron becomes negative and the potential falls back to resting potential. Thus, during the transmission of a nerve impulse, the potential on the inner side of the plasma membrane is again back to a negative state. This phenomenon of change of membrane potential from excited state or active state to resting state is called "Repolarization".

Q.15. Read the following statements and choose the correct option:

Statement-I: Action potential generation in neuron follows all or no principle.

Statement-II: Higher than threshold stimulus causes larger amount of voltage change within in neuron.

- A) Both statements are correct.
- B) Both statements are incorrect.
- C) Only statement-I is correct.
- D) Only statement-II is correct.

Answer: Only statement-I is correct.



Solution: The all-or-none law is the principle that defines the strength by which a nerve or muscle fibre responds to a stimulus. The response is independent of the intensity of the stimulus. The nerve fiber will generate a complete response or there will be no response whenever the given stimulus exceeds the threshold potential. The electrical stimulus below threshold potential strength fails to elicit a propagated action or spike potential. If the stimulus is of threshold strength or more, a spike or a nervous impulse with maximum magnitude is generated. Either the single fibre will not at all respond with spike production, or it returns to the maximum capacity or ability under the conditions. This property of the nerve fibre is termed the all-or-none relationship. This relationship holds only for the unit of tissue-like for nervous tissue the unit is the neuron for skeletal muscle the unit is the single muscle fiber. Higher than threshold stimulus will never cause a more significant amount of voltage change within the neuron. Thus, the voltage change within neuron remains the same even if the impulse is higher than the threshold value.

Q.16. Pons, cerebellum and medulla together constitute:

- A) Hindbrain
- B) Midbrain
- C) Forebrain
- D) Telencephalon
- E) Cerebral hemispheres

Answer: Hindbrain

Solution: Pons, cerebellum, and medulla oblongata carry out a wide range of body functions such as regulation of sleep, equilibrium, balance, respiration, cardiac control, body movement, vasodilation, coughing, sneezing, etc. These three organs are the parts of the hindbrain, which is also named as rhombencephalon. It is located at the posterior basal part of the brain.

Q.17. Which of the following is the correct transmission of visual impulse in the retina of human eye?

- A) Bipolar cells → Ganglion cell → Cone
- B) Cone → Ganglion cells → Bipolar cell
- C) Cone → Bipolar cell → Ganglion cell
- D) Ganglion cell → Bipolar → Cone

Answer: Cone → Bipolar cell → Ganglion cell

Solution: The light passes through the cornea and focused on the retina. The retina is made up of photoreceptors. The photoreceptors like rods and cones convert the light to electrochemical impulses which transmit through bipolar cells to ganglion cells and reach the brain through the optic nerve.

Q.18. The point where the optic nerve enters the retina of the eyeball is called

- A) Blind spot
- B) Fovea
- C) Aqueous chamber
- D) Vitreous chamber

Answer: Blind spot

Solution: The inner layer is the retina, and it contains three layers of neural cells. Starting from inside to outside, these are ganglion cells, bipolar cells and photoreceptor cells.

The optic nerves leave the eye and the retinal blood vessels enter it at a point medial to and slightly above the posterior pole of the eye-ball. Since, there is no photoreceptor cells present in that region, it is called the blind spot.

Q.19. The organ of Corti is situated on the



- A) Basilar membrane in the tympanic canal
- B) Reissner's membrane in the vestibular canal
- C) Basilar membrane in the median canal
- D) Reissner's membrane in the tympanic canal

Answer: Basilar membrane in the median canal

Solution: The inner ear is responsible for sound detecting and maintenance of the balance. The inner ear contains a sensory organ of hearing called the organ of Corti that contains receptor cells called phonoreceptors, which help in the detection of sound. It is situated on the basilar membrane in the median canal. The basilar membrane is a stiff structural element within the cochlea of the inner ear.

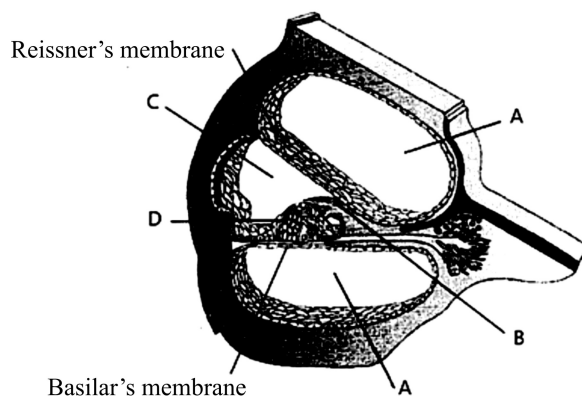
Q.20. The purplish red pigment rhodopsin contained in the rods of photoreceptor cells of the human eye, is a derivative of:

- A) Vitamin B₁
- B) Vitamin C
- C) Vitamin D
- D) Vitamin A

Answer: Vitamin A

Solution: The daylight (photopic) vision and colour vision are functions of cones and the twilight (scotopic) vision is the function of the rods. The rods contain a purplish-red protein called the rhodopsin. Rhodopsin, contained in the rod type of photoreceptor cells of the human eye, is a derivative of vitamin A.

Q.21. Given below is a diagrammatic cross-section of a single loop of the human cochlea.



Which one of the following options correctly represents the name of three different parts?

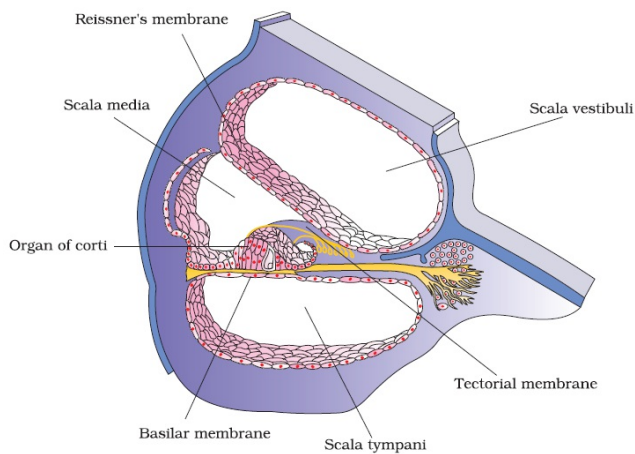
- A) A-Tectorial membrane;
B-Perilymph;
C-Secretory cells;
D-Endolymph
- B) A-Endolymph;
B-Sensory hair cells;
C-Serum;
D-Tectorial membrane



- C) A-Sensory hair cells;
B-Endolymph;
C-Tectorial membrane;
D-Perilymph
- D) A-Perilymph;
B-Tectorial membrane;
C-Endolymph;
D-Organ of Corti

Answer: A-Perilymph;
B-Tectorial membrane;
C-Endolymph;
D-Organ of Corti

Solution: The cochlea has three fluid-filled sections. The perilymph fluid in the canals differs from the endolymph fluid in the cochlear duct. The organ of the Corti is the sensor of pressure variations.



Q.22. Pneumotaxic centre which can moderate the functions of the respiratory rhythm centre is present at:

- A) Pons region of brain
B) Thalamus
C) Spinal cord
D) Right cerebral hemisphere

Answer: Pons region of brain

Solution: The pneumotaxic centre which can moderate the function of the respiratory rhythm centre is present in the pons region of the brain. The neural signal from this centre can reduce the duration of inspiration and thereby alter the respiratory rate.



Q.23. Match the column I (the parts of the human brain) with column II (the functions), and identify the correct choice from the given option.

	Column-I		Column- II
(A)	Cerebrum	(1)	Controls the pituitary
(B)	Cerebellum	(2)	Controls vision and hearing
(C)	Hypothalamus	(3)	Controls the rate of heart beat
(D)	Midbrain	(4)	Seat of intelligence
		(5)	Maintains body posture

A) A B C D
5 4 2 1

B) A B C D
4 5 2 1

C) A B C D
5 4 1 2

D) A B C D
4 5 1 2

Answer: A B C D
4 5 1 2

Solution: The cerebrum is responsible for decision-making and all other intellectual and voluntary activities of the body. Hence, it is called the seat of intelligence.
The cerebellum is responsible for maintaining balance and equilibrium and thus maintaining the body posture.
Hypothalamus secretes releasing and inhibiting hormones, which in turn control the secretion of hormones from the anterior pituitary.
The midbrain has the visual and auditory centers, which control vision and hearing, respectively.

Column I	Column II
Cerebrum	Seat of intelligence
Cerebellum	Maintains body posture
Hypothalamus	Controls the pituitary
Midbrain	Controls vision and hearing

Q.24. The gray matter differs from white matter in the :-

- A) Absence of axons
- B) Absence of myelin sheath
- C) Presence of myelin sheath
- D) Absence of neurilemma

Answer: Absence of myelin sheath

Solution: Nerve fibres are protected by a covering of fatty white substances that are essential for the proper functioning of the nervous system called the myelin sheath. Myelin sheath gives a whitish appearance to the nerve fibre. The white colour to the white matter of the brain is given by myelin. The main function of myelin is quick and efficient transmission of electrical impulses along the nerve cells.

Q.25. Assertion (A) : An injury to Medulla Oblongata causes sudden death.

Reason (R) : Medulla Oblongata contains vital nuclei which control heartbeat and respiration.

- A) Both A and R are true and R is the correct explanation of A.



- B) Both A and R are true and R is not the correct explanation of A.
- C) A is true and R is false.
- D) Both A and R are false.

Answer: Both A and R are true and R is the correct explanation of A.

Solution: The medulla oblongata is a long stem-like structure that is located in the brain stem, anterior to the cerebellum. It is a cone-shaped, mass of nerve cells in the hindbrain, which controls a number of autonomic (involuntary) functions and has centres for all the unconscious activities such as for the respiratory, cardiac, vomiting, and vasomotor centres. Therefore, it helps in regulating breathing, heart rate, blood pressure, blood vessel function through the sympathetic, parasympathetic nervous system and baroreceptors, and has reflex centres for swallowing, peristalsis, digestion, coughing, and sneezing. It is a very sensitive part of the brain, and if due to any injury or trauma the medulla oblongata is damaged, there occur instant death because it contains vital centres for respiration, circulation, etc. which get immediately stopped. Hence, Both A and R are true, and R is the correct explanation of A.

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